

Inequality and the Top of the Income Distribution in Chile 1990-2012: Questioning the Consensus

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Abstract

In Chile, the official figures on income distribution show no significant progress in the last 22 years, despite very fast economic growth and a significant reduction in poverty. This result is based almost exclusively on one household survey, the Socioeconomic Characterization Survey (CASEN). This article challenges this result on income distribution by comparing the micro data from CASEN with the outcomes emanating from the Supplementary Survey of Income (ESI) and the New Supplementary Survey of Income (NESI), surveys conducted by INE, Chile's National Statistic Institute. The micro data are available for both the INE and the CASEN surveys since 1990. The study shows that both surveys critically differ on the data on the upper end of the distribution and demonstrates that the behaviour of income tied to the richest 1% of the households is the fundamental determinant of the Gini. It also evidence that labor income is best represented in (N)ESI, while non-labor incomes in CASEN. Finally, using Gini decompositions, it proofs that, given the above, the Gini presents significant reductions along the period. The overall conclusion is that, contrary to the ongoing consensus, important improvements in income distribution can be shown for the period.

Keywords: I: Inequality, Gini, Income Distribution, Top Shares, Labor Shares
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1. Introduction

Chile's economic growth in the last twenty five years has averaged 5.6%, reaching the highest per capita GDP in the region (ECLAC 2012a) and surfacing as one of the fastest growing economies in the world, comparable to the Asian Tigers or Malaysia. Related to this there has been a very significant reduction in poverty (ECLAC 2012b). However, according to the official figures on income distribution, Chile shows no significant progress, remaining within the group of countries with the highest inequality in Latin America and in the world.

The fact that income per capita has increased by 220% since 1986 and yet income distribution has apparently failed to improve is very disturbing. On the one hand, it would show that forces that are supposed to favour the improvement in equality following the Kuznets inverted U curve are not acting. On the other, the civilian governments that took office after the Pinochet regime in 1989 had explicitly included inequality in their agenda. Their plans that compounded increased social spending with progressive changes in tax and labor legislation would have, according to these statistics, blundered completely. The failure of these policies in achieving more equality, and the failure of the Kuznets forces in a context of rapid economic growth would present a very serious setback, questioning whether Latin American economies can join the group of advanced economies not only in terms of income per capita, but also in terms of equality.

This paper reviews what has happened in terms of inequality in Chile in the period 1990-2012 and, contrary to the on-going consensus, finds that important improvements on income distribution took place that benefited 90% of the population. For this purpose income distribution data from the Survey of Socioeconomic Characterization (CASEN) is compared with results emanating with data from the Supplementary Survey of Income (ESI) and the New ESI (NESI). Using Gini decompositions, this study shows how central the behaviour of income tied to the richest 1% of the households is, and how both surveys critically differ in the data on the upper end of the distribution. It shows how labor incomes in hands of the richest remain stagnant in CASEN while they fall significantly in (N)ESI, and how the opposite happens for non-labor incomes.

By examining the distribution of household income frequencies of the richest 1% this study determines the existence of biases and errors in CASEN, and shows how these undermine income distribution parameters estimated from data associated to the top of the distribution. On the other hand, the recognition by (N)ESI that the non-labor data collected before 2010 is unreliable poses additional difficulties to the task of estimating the real behaviour of the Gini for the period 1990-2012. Gini decompositions are used to determine the importance of the changes in income associated to the richest percentiles, and to construct a Gini using CASEN's non-labor incomes and ESI's labor incomes that challenges the on-going consensus.

The article has 4 sections. The first reviews the literature on income distribution followed by the methodology and data section. The third section focuses on the top of the income distribution and the final section concludes.

2. Literature Review

Much of the analysis on income distribution starts with the traditional inverted U curve of Kuznets, where he notes that after a decline in the early stages of industrialization, a variety of forces favor its improvement following economic advancement. Between 1947 and 1968 income distribution in the United States behaved according to theory, but then fell into stagnation until 1980. However, as of 1981 income distribution in the United States suffers a reversal and begins to deteriorate considerably. Data from several other developed countries show similar trends, which led to a global resurgence of interest in research on income distribution (Atkinson, 1997). Numerous articles confirm that the trend also occurs in developing countries, and global analysis verify that basically two-thirds of countries worsened their income distribution between 1980 and 2000 (Cornia, Addison and Kiiski (2004)).

Piketty and Saez (2003) analyzed the behaviour of the top of the distribution for the U.S. and demonstrated the relevance of the richest households in inequality. Burkhauser et al. (2009) show that in the United States, since 1993, the worsening distribution is explained by changes in the income of the richest 1% of households. Atkinson, Piketty and Saez (2011) cover a set of 22 countries and conclude that in most of these the share of income held by households in the top has grown, with the U.S. leading the increase.

The interest in the study of inequality in Latin America has been continuous as the region has historically been the most unequal in the world. The now classic article of Fishlow (1972) on Brazil reflects the distributional evils of the entire continent. This situation persists until today; Gasparini and Lustig (2011) identify ten Latin American countries among the fifteen most unequal in the world. The distribution of income in Latin America deteriorated markedly in the 1980's (Fishlow 1995), yet Gasparini and Lustig (op. cit) and Gasparini, Cruces and Tornarolli (2011), after documenting this, show evidence of a significant recovery from 2000 onwards.

The finding that rising inequality is very much related to the income of households in the upper end of the distribution has implications regarding how income is measured in that stratum. Atkinson, Picketty and Saez (op. cit) point out that indicators of inequality, including the Gini index, are particularly sensitive to measurements in the top, and as a result measurement errors there can skew the results importantly. The problem is particularly serious because one of the major difficulties faced by household surveys is non-response and this difficulty increases with income. Korinek et al. (2006, 2007) and Kennickell (2009) show that participation and response rates fall monotonically with income levels and discuss these issues in detail. Problems arise as a result of not being able to contact these households or upon their refusal to participate or to answer questions related to income, and are aggravated by the omission of certain kinds of earnings or their sub-statement. There is consensus among researchers that questions of income are sensitive questions and are therefore subject to lower response rates (Tourangeau, Rips and Rasinski, 2000). Dahlhamer et al. (2004) analyse household surveys conducted in the U.S. and observes refusal rates above 20% in itemized income and between 9 and 40% for reconciled income. This contrasts with the rate of non-response to other questions, such as participation in the labor force, which fluctuate between 5 and 8%

Schrpler (2006) and Dahlhamer et al. (op. cit) indicate that those who agree to participate in a survey are typically different from those who refuse to participate. Korinek et al., (2006) analyses the Current Population Survey for the years 1998-2004 and shows that the lack of proper correction for non-response leads to more dispersion for the case of the United States than what is real and skews down the value of the median income. Standard correction procedures involve re-weighting those households that did respond, but Korinek et al. (2007) show that this procedure is valid only if the problem of non-response is not present within subgroups of income, and show that this is an unlikely assumption.

Classic texts on the subject agree that surveys should minimize non-response rates in order to reduce the possibility of bias. Alreck and Settle (1995, p.184) write "It is obviously important to do everything possible to reduce non-response and promote

an adequate response rate; Babbie (2007, p. 262) states that "A literature review of published research in the social sciences suggests that the response rate should be at least 50 per cent to be considered adequate. A 60 per cent response is good, a response rate of 70 per cent is very good"; Singleton and Straits (2005, p. 145) mark "Therefore, it is very important to pay attention to response rates. For interview surveys a response rate of 85 per cent is minimally adequate; below 70 per cent there is a real possibility of bias".

Chilean income distribution in the fifties, sixties and early seventies was better than the Latin America average (Uthoff, 1977). Yotopolous (1989) analyzes the effects of privatization after 1973 and concludes that concentration at the upper end of the scale greatly increased when comparing 1969 with the late seventies. Torche (1995) explains that income distribution of the first 9 deciles based on CASEN is not particularly unbalanced, and better than the United States, advancing that inequality in Chile results from concentration in the top percentiles. Contreras (1999) using CASEN concluded that inequality is explained by the top of the distribution. Solimano and Torche (2008) using CASEN for 2009, show that inequality is largely explained by the single impact of the tenth decile.

Larraaga and Valenzuela (2011), use CASEN to study the Chilean economy in the period 1990-2003, and point out that the lack of progress in terms of inequality is due to the swelling in the income of those at the upper end of the distribution. Sanhueza and Mayer (2011) taking a longer period with data for Santiago from the Employment Survey of the University of Chile show that the current concentration is determined by the income of the richest 5%. They estimate that the top 1% and top 5% particularly enriched themselves in the period 1990-2009 with no great variation in the 90-95 percentile. Valenzuela and Durye (2011) use CASEN to show that the difference in inequality between Chile and other Latin American nations is mostly explained by the income held by the richer 5%.

Part of the discrepancy between the Chilean Gini derived from CASEN and the Gini of other countries is due to methodological differences. CASEN methodology introduces an adjustment to national accounts which is not carried out in most countries, either in Latin American or elsewhere, and therefore the Chilean Gini should be estimated without this procedure to be comparable. Pizzolitto (2005) estimated the labor income Gini for Chile based on CASEN reversing the adjustment to national accounts and concludes that this would be 0.02 points lower in 1990 and 0.03 points lower in 2000. Feres (2007) indicates that adjusting household surveys to national accounts is a controversial process, but also argues that not adjusting is also problematic, since such surveys suffer from significant underreporting of income. He then estimates the household Gini from CASEN omitting the adjustment to national accounts for the years 87, 90, 92, 94, 96 and 98. These estimates indicate that the unadjusted Gini is approximately 0.03 points lower than the official Gini, and that this decline is relatively constant in time. Bravo and Valderrama (2011) study the adjustment to national accounts in CASEN for the years 1990-2006 and conclude similarly to Feres (op. cit), that the unadjusted Gini is evenly about 0.03 points lower. Finally, for households that participated, but omitted income, Pizzolitto (op. cit) shows a negligible effect on the Gini of the fix used in CASEN over the period 1990-1998.

3. Methodology and Data

Two household surveys, the Socioeconomic Characterization Survey (CASEN) and the (New) Supplemental Income Survey ((N)ESI) are conducted regularly in Chile and can be used to estimate inequality indicators. Although both are available as micro-data since 1990, the vast majority of researchers only use CASEN for these purposes. This article estimates inequality indicators of both CASEN and (N)ESI for the period 1990-2012 using identical definitions of household and income for both surveys throughout the whole time period and shows their results differ significantly. Top decile and income shares and Gini decompositions as proposed by Shorrocks (1982) and Lerman and Shlomo (1985) were used to explain the differences between both surveys. Further decompositions are used to determine whether the differences can be identified as originating in labor income.

CASEN, a multipurpose household survey, is the most utilized to make social and economic measurements. CASEN was performed for the first time in 1985, then in 1987, and from 1990 to 2000 was run every two years, to then change its frequency to

every three years. Officially it is sustained that projections issued by both the first and the second survey carried out in 1985 and 1987 were not representative and therefore they are not publicly available nor are used to obtain government of socio-economic variables. As of 1990, CASEN is officially employed for the analysis of socio-economic distributional variables. Households are surveyed starting mid or late November and field work may last until mid January and provides a representative cross-section at the regional level. All polls have been requested by the Government and implemented by the University of Chile, except for the years 2006 and 2009 that were performed by the Alberto Hurtado University.

Throughout time CASEN has varied its sample size from a minimum of around 25,000 households in 1990 to a maximum of almost 87,000 in 2012. A large battery of economic, social and cultural questions is always performed to characterize in detail the Chilean population and also to verify the degree of targeting of the different social programs implemented by the Government. Yet the reliability of CASEN's results and several of its methodological issues have been strongly questioned,¹ with an increasing set of divergences surrounding the survey's procedures. To deal with these controversies the 2013 CASEN survey had to be called off to allow time for a thorough re-examination of its methodology.

The Supplementary Survey of Income (ESI) is a representative survey at the regional level, conducted continuously the last quarter of the year with a sample of approximately 36,000 homes, assigning 12,000 homes each month. The survey is conducted by the National Institute of Statistics of Chile (INE), and available since 1990 in micro-data, except the peculiar vacuum for 1994, year for which there is no information. The aim of the survey is to provide the elements to assess the evolution of household and individual income, along with the attributes of household heads and of the other inhabitants of the household. The survey is complementary to the National Employment Survey (ENE) and done as an extension of that survey. The (N)ESI methodology is somewhat different from CASEN, but it is especially reliable in terms of labor statistics, as it sustains in the same sample and methodology utilized in the National Employment Survey, which is considered the most reliable labor survey. (N)ESI is directed at identifying in detail the occupational variables and because of it is known as especially reliable and very precise in this area.

The two surveys take into account all types of labor and non-labor earnings, and exclude income from independent secondary activities of dependent workers. Labor income considers the following in both: salaries and wages, monetary or in-kind royalties, commissions and incentives to be given annually or more regularly, income also includes the value of goods and services withdrawn from the business for use or consumption of the household (this is the case for business owners) and income from independent professionals and self-employed workers. Non-labor income correspond to the following: property income, interest and dividends received from financial instruments including deposits, bonds and shares, imputed rents, transfers covering pensions, widow's pensions, healthcare transfers, cash subsidies and cash scholarships and other state cash subsidies. It also includes allowances, maintenance (alimony) and other transfers or grants from household to household.

Despite including all sources of income, it is usually sustained that (N)ESI's measures of non-labor income are not as reliable as CASEN's. (N)ESI does not separate household income into as many categories as CASEN, and groups payments only into 7 items that add up to total household's income. This also limits the possibility of estimating autonomous income before 1995, because monetary transfers are not separable from other sources of income. CASEN makes many more inquiries on non-labor income and divides this data in a greater number of categories in order to measure the specific impact of various social programs.

To overcome ESI's weakness in measuring non-labor income, in 2010 the new ESI (named NESI) was introduced. In NESI the questions on non-labor income were expanded and enhanced and the methodology to identify non-labor incomes was adjusted thoroughly. Additionally, the procedures used to recognize and separate imputed rentals (which may reach 50% of non-labor income) were changed. As a result of these changes, the ESI data is hardly comparable with the NESI series in non-labor income, especially so if there is a need to analyze separate components, as imputed rentals or government monetary transfers. The changes made in the ESI questionnaire in 2010 were basically done to increase the information provided in the survey,

match workers with salaries for both previous and current jobs, correct de information on working hours and to specify information on secondary jobs. The above changes increased the reliability of the income data without a major breakdown in the comparability of future and past data. Yet, the questions on non-labor income and imputed rentals underwent fundamental changes: the questions were remade to include income from sources not accounted before. These changes were implemented because the National Statistics Institute concluded the data on non-labor income was unreliable. This brought about major changes in non-labor incomes that fundamentally improve the quality of the data, while on the one hand, seriously undermines the comparability of data post 2009 non-labor income data with previous information.²

One of the relevant methodological differences between (N)ESI and CASEN is the adjustment to national accounts, which involves adjusting (on average significantly up) various incomes, so as to assimilate with the results from the national accounts. ² This adjustment is only done in the case of CASEN and it involves a number of corrections that are estimated to counter the potential sub-statements of the respondents who are usually assumed to have a certain even behavior among them. However, the CASEN adjustment to national accounts has particularly strong effects on two sectors. On one hand, income reported in the survey by self-employed workers is almost doubled to adjust to national accounts. Self-employed workers are over 20% of the labor force, so this increment changes income distribution. On the other hand, the income adjustment for rents, interests and dividends are entirely assigned to the upper quintile and multiplies these income sources by a multiple, procedure which also affects inequality. The literature section reviewed in detail the effects on the Gini arising from this adjustment to national accounts.³

Table 1 presents the official results of the Government of Chile for the Gini for 1990-2012 calculated from the CASEN survey. These results are widely known and show a high level of inequality, which has changed little throughout these twenty two years. It is important to note that the stagnation of income distribution indicators is given in a context of high growth that has more than doubled income per person in the period. The table below presents the only available official Gini results constructed on a per person basis, meaning that household income was shifted to per capita household income to estimate the Gini.

Table 1
Official Gini 1990 - 2012
Government statistics

Year	Gini
1990	0.56
1992	0.56
1996	0.56
1998	0.57
2000	0.58
2003	0.56
2006	0.53
2009	0.53
2012	0.52

Source: Gini for household monetary income on per capita basis, released as official Government statistics. See them at: <http://observatorio.ministeriodesarrollosocial.gob.cl>

3.1. CASEN and (N)ESI Gini 1990-2012.

Table 2 presents estimates for 1990-2012 of the Gini for household income using the CASEN and (N)ESI household survey data. The calculations are made for the calculations are made for monetary and total household income and use carefully homologized definitions to obtain comparable outcomes for both surveys.⁴ Monetary income is a standard definition that adds government monetary transfers to autonomous income and also providing a measure of the redistributive effect of monetary government transfers. Total income adds imputed rentals to the previous definition. Although total income it is not as prevalent a definition as monetary or autonomous income, together with monetary income, it can be estimated from (N)ESI for the entire period under analysis, while autonomous income is only available from 1995 onward, as explained in the Data section of the paper.

The results for CASEN's monetary Gini in Table 2 differ from the official results presented in Table 1 because they are derived for household income, while all official data on Gini (as in Table 1) are only available on a per capita basis. Although per capita definitions may have advantages in terms of welfare characterization, this paper seeks to elucidate at the most basic level what has happened in terms of income distribution in Chile, so the Gini is presented in its most general form, avoiding per capita adjustments.

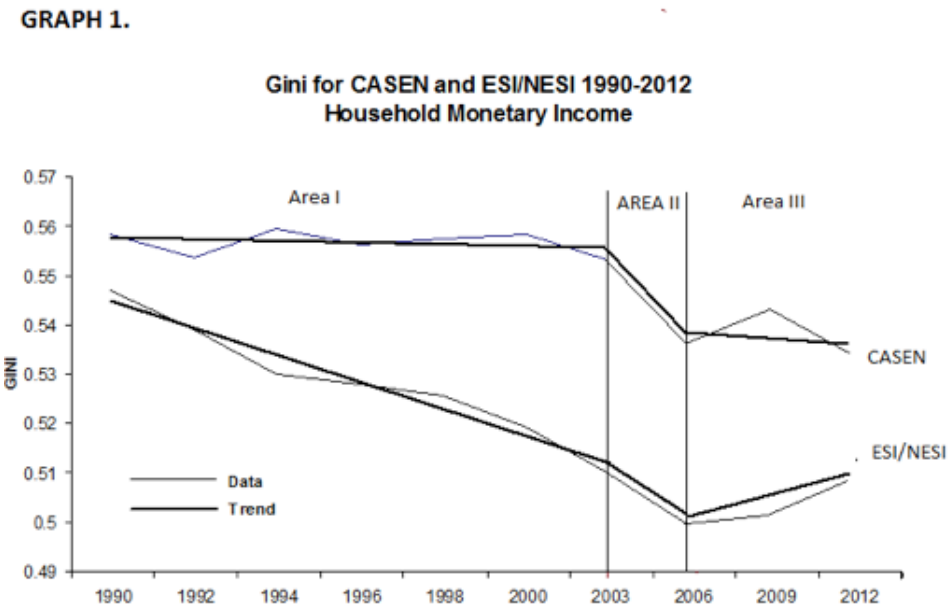
Table 2
Gini for CASEN and ESI 1990-2012

Year	Gini CASEN	Gini (N)ESI	Gini CASEN	Gini (N)ESI
1990	0.559	0.547	0.548	0.527
1992	0.554	0.546	0.544	0.522
1994	0.560	0.530	0.547	0.507
1996	0.557	0.528	0.544	0.503
1998	0.558	0.526	0.544	0.497
2000	0.559	0.520	0.545	0.488
2003	0.553	0.511	0.540	0.476
2006	0.531	0.497	0.518	0.461
2009	0.539	0.499	0.527	0.468
2012	0.528	0.508	0.515	0.472
Difference				
1990-2003	0.005	0.039	0.032	0.056
1990-2006	0.028	0.050	0.029	0.066
1990-2009	0.019	0.048	0.020	0.060
1990-2012	0.031	0.039	0.032	0.056

Source: Gini for household monetary income on per capita basis, released as official Government statistics. See them at: <http://observatorio.ministeriodesarrollosocial.gob.cl>

The Gini outcomes for CASEN are different from (N)ESI in a number of aspects, which can be clearly distinguished in Graph 1. First, the initial values of the CASEN Gini in 1990 are higher than those for (N)ESI. Second, along the period 1990-2003 (Area I in graph) CASEN's Gini remains practically stagnant, while (N)ESI's falls substantially. Third, the only year CASEN's Gini falls in any sizeable way is 2006 (Area II in graph), where both CASEN and (N)ESI show similar downward slopes. Fourth, for the period 2006-2012, CASEN practically does not change, while the (N)ESI trend reverses and increases slightly. This implies

that CASEN's results sharply contradict with (N)ESI about what happened with equality along these 22 years.



The disparity in the initial 1990 value of the Gini between CASEN is probably explained by the difference in methodology associated with the CASEN adjustment to match national accounts, procedure that (N)ESI does not incorporate. As detailed in section 2, the effect of the adjustment to national accounts has been studied in detail by previous researchers, and can shift the CASEN Gini upwards, explaining the initial differences between the two surveys in 1990. Yet, beyond the initial values, what is truly interesting is by how much the progression of the Gini along the period differs between both sources.

This paper aims to determine what actually happened in Chile in terms of income distribution between 1990 and 2012. As observed in Graph 1 and in Table 2, the discrepancy in the behavior of the Gini as delivered by the two surveys is strong, contrasting the distributive immobility of CASEN with the significant decline shown in (N)ESI, particularly until 2003. The next sections analyze income shares and decompose the Ginis to point up to where the differences between both surveys lay and what are the correct values for the Gini.

3.2.Decile and percentile shares and the top 1%

Understanding the movements in income distribution is nowadays associated to understanding the trends in the income of the richer percentiles of households, as analyzed by much of the literature on income distribution written after the influential Piketty and Saez (2003) article. As noted in previous sections, in the United States and other developed countries changes in Gini are closely related to alterations in the income share of the richer percentiles; sharp falls in their income will mean steep falls in the Gini.

Table 3 presents the shares of income allocated to each decile and top percentile(s) for 1990-2012 in CASEN and (N)ESI for both monetary and total household income. Note that in both CASEN and (N)ESI the shares of income in the stretch 90-95%for total and monetary income remain basically constant over the period 1990-2012, always in the 12%range, implying that adjustments concentrate in the uppermost percentiles. Indeed, observe how changes in income for the richest 5%closely follow the changes in Gini in both monetary and total income: CASEN's share remains stagnant until 2003, falls in 2006 and again basically stagnates for the period 2006-2012. In (N)ESI the share falls strongly through 2006, trend that reverses slightly between 2009 and 2012.

Although the above results indicate that the income of the richest 5%explains the difference in trends in both surveys, the location can still be more accurate. Note that Table 3 shows that in both CASEN and (N)ESI the shares of income for the 95-99% intervals also remain basically unchanged for both definitions of income. This then implies that the explanation for the

difference in the behavior of income shares between CASEN and (N)ESI lies in the richest 1%

In CASEN, income maintained by the top 1% remains stagnant until 2003, and then falls moderately, so that the share by 2012 is slightly less than 85% of what it was in 1990. In (N)ESI the share held by the top 1% drops sharply, to 63% or less of what it was in 1990. This shows that the difference between both surveys concentrates on the income of the richest percentile.

The key significance of the upper end of the distribution in the determination of inequality has been subject to extensive study in the international literature, and to analyze the concentration of income in the upper end of the distribution the literature generally proceeds to separate labor and non-labor income, as shown below.

Table 3
Household income 1990-2012 by decile and top percentiles
(share of household income)

	decil	1990	1992	1994	1996	1998	2000	2003	2006	2009	2012
CASEN Monetary	1	0.011	0.011	0.011	0.012	0.011	0.011	0.011	0.010	0.011	0.011
	2	0.022	0.021	0.021	0.022	0.021	0.022	0.022	0.023	0.023	0.024
	3	0.029	0.029	0.030	0.030	0.029	0.031	0.031	0.031	0.032	0.033
	4	0.038	0.038	0.039	0.039	0.038	0.039	0.040	0.041	0.042	0.042
	5	0.048	0.048	0.048	0.048	0.049	0.049	0.050	0.052	0.053	0.053
	6	0.060	0.061	0.062	0.061	0.062	0.061	0.063	0.065	0.066	0.067
	7	0.080	0.080	0.081	0.080	0.081	0.078	0.080	0.083	0.084	0.084
	8	0.106	0.107	0.108	0.106	0.106	0.104	0.105	0.109	0.111	0.111
	9	0.158	0.159	0.159	0.156	0.160	0.153	0.155	0.158	0.161	0.160
	10	0.448	0.446	0.443	0.445	0.443	0.453	0.444	0.427	0.416	0.415
	90-95%	0.128	0.121	0.124	0.127	0.128	0.123	0.122	0.124	0.122	0.124
	95-99%	0.186	0.184	0.171	0.189	0.184	0.186	0.181	0.173	0.179	0.181
CASEN Total	95-100%	0.320	0.324	0.321	0.317	0.315	0.330	0.324	0.292	0.304	0.292
	98-100%	0.198	0.206	0.208	0.194	0.194	0.207	0.206	0.177	0.186	0.172
	99-100%	0.134	0.140	0.150	0.128	0.131	0.144	0.143	0.119	0.125	0.111
	1	0.012	0.013	0.012	0.012	0.012	0.013	0.013	0.013	0.012	0.013
	2	0.023	0.023	0.023	0.022	0.022	0.024	0.024	0.025	0.024	0.025
	3	0.031	0.031	0.030	0.031	0.031	0.032	0.032	0.034	0.033	0.034
	4	0.039	0.040	0.039	0.040	0.040	0.041	0.041	0.043	0.043	0.044
	5	0.049	0.049	0.049	0.050	0.050	0.050	0.051	0.054	0.053	0.054
	6	0.062	0.062	0.063	0.063	0.063	0.063	0.064	0.067	0.066	0.067
	7	0.080	0.081	0.081	0.082	0.081	0.079	0.081	0.085	0.084	0.084
	8	0.107	0.106	0.108	0.108	0.108	0.105	0.106	0.111	0.109	0.111
	9	0.158	0.156	0.159	0.158	0.160	0.152	0.154	0.160	0.157	0.159
ESI/NESI Monetary	10	0.438	0.437	0.435	0.433	0.433	0.442	0.435	0.408	0.418	0.407
	90-95%	0.128	0.120	0.123	0.125	0.126	0.121	0.119	0.122	0.121	0.122
	95-99%	0.181	0.182	0.168	0.185	0.180	0.185	0.178	0.170	0.176	0.177
	95-100%	0.311	0.317	0.312	0.308	0.306	0.321	0.316	0.286	0.297	0.285
	98-100%	0.190	0.200	0.200	0.189	0.187	0.201	0.201	0.172	0.182	0.168
	99-100%	0.129	0.136	0.145	0.124	0.126	0.137	0.138	0.116	0.121	0.108
	1	0.013	0.013	0.013	0.013	0.012	0.012	0.011	0.011	0.013	0.012
	2	0.024	0.024	0.024	0.024	0.023	0.025	0.025	0.025	0.026	0.025
	3	0.032	0.032	0.033	0.033	0.032	0.033	0.035	0.035	0.036	0.033
	4	0.041	0.041	0.042	0.042	0.042	0.043	0.045	0.046	0.046	0.044
	5	0.050	0.050	0.053	0.053	0.053	0.054	0.056	0.058	0.058	0.056
	6	0.062	0.063	0.066	0.067	0.066	0.067	0.069	0.072	0.071	0.071
ESI/NESI Total	7	0.078	0.080	0.084	0.084	0.085	0.085	0.087	0.091	0.088	0.090
	8	0.102	0.104	0.109	0.109	0.112	0.112	0.114	0.118	0.114	0.116
	9	0.149	0.148	0.155	0.155	0.162	0.163	0.161	0.167	0.162	0.164
	10	0.449	0.446	0.422	0.420	0.412	0.406	0.397	0.376	0.386	0.389
	90-95%	0.120	0.114	0.117	0.117	0.123	0.126	0.123	0.124	0.122	0.125
	95-99%	0.178	0.169	0.171	0.179	0.176	0.170	0.171	0.161	0.164	0.169
	95-100%	0.329	0.332	0.305	0.304	0.289	0.280	0.274	0.252	0.264	0.264
	98-100%	0.213	0.221	0.193	0.189	0.173	0.165	0.162	0.143	0.154	0.150
	99-100%	0.151	0.162	0.134	0.125	0.112	0.109	0.102	0.091	0.101	0.095
	1	0.016	0.016	0.016	0.016	0.016	0.016	0.015	0.015	0.018	0.017
	2	0.026	0.026	0.027	0.027	0.027	0.029	0.030	0.031	0.031	0.030
	3	0.034	0.034	0.035	0.036	0.036	0.038	0.039	0.040	0.040	0.039
	4	0.042	0.043	0.045	0.045	0.045	0.047	0.049	0.050	0.049	0.048
99-100%	5	0.052	0.053	0.055	0.056	0.056	0.057	0.059	0.061	0.060	0.060
	6	0.064	0.065	0.068	0.069	0.069	0.070	0.073	0.075	0.073	0.073
	7	0.080	0.082	0.085	0.086	0.086	0.087	0.090	0.093	0.090	0.091
	8	0.103	0.105	0.110	0.111	0.112	0.113	0.115	0.118	0.114	0.116
	9	0.150	0.148	0.153	0.155	0.160	0.161	0.159	0.163	0.159	0.160
	10	0.433	0.427	0.406	0.400	0.391	0.383	0.371	0.352	0.367	0.367
	90-95%	0.121	0.112	0.116	0.115	0.120	0.122	0.117	0.119	0.117	0.119
	95-99%	0.172	0.166	0.166	0.170	0.165	0.160	0.160	0.151	0.155	0.160
	95-100%	0.312	0.316	0.291	0.285	0.272	0.261	0.254	0.234	0.250	0.248
	98-100%	0.199	0.208	0.180	0.173	0.163	0.153	0.148	0.132	0.146	0.140
	99-100%	0.140	0.149	0.125	0.115	0.107	0.101	0.094	0.083	0.095	0.088

Source: Gini for household monetary income on per capita basis, released as official Government statistics. See them at: <http://observatorio.ministeriodesarrollosocial.gob.cl>

3.3. Labor and non-labor shares

To specify the structure of household earnings Table 4 below divides them into four: labor and non-labor income of the richest 1% 2% 5%and 10%and labor and non-labor income of the respectively remaining 99% 98% 95%and 90% The results show that holdings of labor income of the richer 10%in CASEN fall by very little for both monetary and total income between 1990 and 2012; from 38.7%to 36.9%and from 35.9%to 35.1%respectively and that these small changes are realized in the top 1% whose share falls from 11.7%to 10.0%(monetary income) and from 10.9%to 9.4%(total income).

The very opposite situation takes place in (N)ESI, where labor shares fall very steeply: in the period 1990-2012 the fraction of labor earnings of the top 10% falls from 43.3% to 34.9% for monetary income and from 38.5% to 30.7% for total income. For monetary income 75% of this fall lies in the top 1% that drop from 14.3% to 8.6% an additional 15% of it lies in the following percentile (98-99) and all the fall is located in the upper 5%.⁵ An almost identical distribution holds for total income. These numbers reveal how very differently the surveys portray the behavior of labor income along the period.

Non-labor income, mainly referring to interests, dividends, transfers and rents in the case of monetary income and adding imputed rents for total income, also shows major discrepancies between CASEN and (N)ESI. For monetary income in CASEN, non-labor income of the richest decile reaches a share of 6.1% in 1990, and falls to 4.6% in 2012, while for total income it falls from 8.0% to 5.7%. In (N)ESI monetary income the non-labor share of the richest decile starts at 1.7% in 1990 and increases to 4.2% in 2012, and for total income it starts at 4.8% and rises at 6.0%. In most cases these changes distribute more evenly across the top 10% with 75% in the top 5% not concentrating as much in the top percentiles as was the case for labor income.

The above implies that the largest differences between CASEN and (N)ESI are due to the discrepancy in the data collected by each survey on the changes that took place in labor income along the period, where almost all of the disparities arise from the earnings of the richest 1%. A smaller, yet also meaningful discrepancy arises from the opposing measures each survey presents of the progression of non-labor incomes for the top 10% in the period 1990-2012.

Unveiling whether the changes in household income shares originate from labor or non-labor income is always a central step in the process of understanding what brought about the changes in inequality. In the Chilean case the finding that the largest part of the decline shown in shares in (N)ESI originates from a fall in the labor earnings is also particularly important for a second reason; there is consensus that (N)ESI measures labor income particularly well, and this is an important argument in settling the dispute on whether the values of CASEN or (N)ESI are correct.

On the other hand, CASEN is credited with special strength in the analysis of non-labor income, while (N)ESI is signaled as especially weak in this area. (N)ESI acknowledged this weakness and in 2010 it introduced major changes in the non-labor income section of the questionnaire to enhance this segment of the survey. It should again be noted that both surveys have nationwide representation and control for all revenues, either labor or non-labor. By that standard, both surveys should produce similar results, yet the differences in the measures of labor and non-labor income of the richest unequivocally indicates that one of the two, or both, are measuring these revenues deficiently and as a result, producing erroneous income distribution statistics.

Table 4
Labor and non-labor household income for the top 1%, 2%, 5%, 10%, and remaining shares
(shares of household income)

		Year	1990	1992	1994	1996	1998	2000	2003	2006	2009	2012
CASEN MONETARY INCOME	Labor	Top 1%	0.117	0.126	0.138	0.115	0.116	0.126	0.121	0.107	0.110	0.100
		Remaining 99%	0.775	0.774	0.766	0.787	0.767	0.763	0.726	0.798	0.759	0.760
		Top 2%	0.172	0.186	0.190	0.174	0.172	0.184	0.176	0.160	0.166	0.154
		Remaining 98%	0.721	0.714	0.713	0.728	0.711	0.704	0.672	0.745	0.703	0.705
		Top 5%	0.277	0.290	0.294	0.287	0.280	0.296	0.275	0.268	0.274	0.261
		Remaining 95%	0.615	0.609	0.610	0.616	0.604	0.593	0.572	0.637	0.595	0.599
		Top 10%	0.387	0.399	0.405	0.400	0.393	0.407	0.380	0.382	0.386	0.369
		Remaining 90%	0.505	0.500	0.499	0.502	0.490	0.482	0.468	0.523	0.483	0.490
	Non-Labor	Top 1%	0.018	0.014	0.012	0.013	0.015	0.017	0.021	0.012	0.015	0.011
		Remaining 99%	0.090	0.087	0.084	0.085	0.102	0.094	0.131	0.083	0.116	0.129
		Top 2%	0.027	0.020	0.017	0.020	0.022	0.023	0.030	0.017	0.020	0.018
		Remaining 98%	0.081	0.080	0.079	0.078	0.095	0.088	0.122	0.078	0.111	0.123
		Top 5%	0.043	0.033	0.028	0.030	0.035	0.034	0.048	0.024	0.031	0.031
		Remaining 95%	0.064	0.067	0.069	0.067	0.081	0.077	0.105	0.071	0.100	0.109
		Top 10%	0.061	0.046	0.041	0.043	0.051	0.047	0.066	0.035	0.041	0.046
		Remaining 90%	0.047	0.054	0.055	0.054	0.066	0.065	0.087	0.060	0.090	0.094
CASEN TOTAL INCOME	Labor	Top 1%	0.109	0.118	0.130	0.107	0.110	0.118	0.114	0.102	0.105	0.094
		Remaining 99%	0.718	0.723	0.718	0.743	0.723	0.720	0.686	0.760	0.726	0.723
		Top 2%	0.158	0.173	0.178	0.165	0.162	0.174	0.167	0.153	0.159	0.147
		Remaining 98%	0.669	0.668	0.670	0.685	0.671	0.664	0.634	0.709	0.672	0.671
		Top 5%	0.256	0.271	0.275	0.269	0.264	0.280	0.260	0.255	0.261	0.247
		Remaining 95%	0.571	0.569	0.573	0.581	0.570	0.559	0.540	0.607	0.569	0.570
		Top 10%	0.359	0.372	0.379	0.376	0.370	0.383	0.358	0.363	0.368	0.351
		Remaining 90%	0.468	0.469	0.468	0.474	0.463	0.456	0.442	0.499	0.462	0.467
	Non-Labor	Top 1%	0.021	0.018	0.015	0.016	0.017	0.019	0.023	0.014	0.017	0.013
		Remaining 99%	0.152	0.142	0.137	0.134	0.150	0.143	0.176	0.124	0.153	0.169
		Top 2%	0.032	0.027	0.022	0.025	0.025	0.027	0.034	0.020	0.023	0.021
		Remaining 98%	0.141	0.132	0.130	0.125	0.142	0.135	0.165	0.119	0.146	0.162
		Top 5%	0.055	0.046	0.037	0.040	0.043	0.042	0.056	0.030	0.036	0.038
		Remaining 95%	0.118	0.113	0.115	0.111	0.124	0.120	0.144	0.108	0.133	0.145
		Top 10%	0.080	0.065	0.056	0.057	0.063	0.059	0.077	0.045	0.050	0.057
		Remaining 90%	0.093	0.094	0.096	0.093	0.104	0.102	0.123	0.094	0.120	0.126
ESI MONETARY INCOME	Labor	Top 1%	0.146	0.160	0.132	0.120	0.107	0.105	0.097	0.088	0.093	0.083
		Remaining 99%	0.822	0.815	0.842	0.830	0.845	0.842	0.850	0.862	0.834	0.803
		Top 2%	0.205	0.218	0.189	0.181	0.166	0.158	0.155	0.138	0.144	0.129
		Remaining 98%	0.763	0.757	0.785	0.769	0.787	0.789	0.791	0.812	0.783	0.756
		Top 5%	0.318	0.326	0.298	0.291	0.278	0.267	0.262	0.244	0.249	0.232
		Remaining 95%	0.650	0.650	0.676	0.659	0.675	0.679	0.685	0.706	0.678	0.653
		Top 10%	0.433	0.437	0.413	0.401	0.396	0.389	0.381	0.364	0.365	0.349
		Remaining 90%	0.535	0.538	0.562	0.549	0.557	0.558	0.566	0.586	0.562	0.537
	Non-Labor	Top 1%	0.005	0.002	0.002	0.006	0.005	0.005	0.006	0.003	0.008	0.012
		Remaining 99%	0.027	0.022	0.024	0.045	0.042	0.049	0.048	0.047	0.065	0.103
		Top 2%	0.007	0.004	0.003	0.008	0.007	0.007	0.007	0.005	0.010	0.021
		Remaining 98%	0.025	0.021	0.022	0.043	0.040	0.046	0.047	0.045	0.063	0.094
		Top 5%	0.011	0.006	0.007	0.013	0.011	0.012	0.012	0.008	0.015	0.032
		Remaining 95%	0.021	0.018	0.019	0.038	0.036	0.041	0.041	0.042	0.058	0.082
		Top 10%	0.017	0.009	0.010	0.020	0.016	0.017	0.016	0.012	0.021	0.041
		Remaining 90%	0.015	0.015	0.016	0.031	0.031	0.036	0.037	0.038	0.052	0.073
ESI TOTAL INCOME	Labor	Top 1%	0.130	0.140	0.117	0.104	0.093	0.089	0.083	0.075	0.081	0.073
		Remaining 99%	0.738	0.720	0.740	0.718	0.728	0.720	0.736	0.746	0.730	0.713
		Top 2%	0.183	0.191	0.165	0.155	0.142	0.133	0.133	0.119	0.126	0.113
		Remaining 98%	0.684	0.668	0.692	0.667	0.678	0.676	0.686	0.703	0.686	0.673
		Top 5%	0.282	0.285	0.261	0.249	0.237	0.227	0.225	0.208	0.217	0.205
		Remaining 95%	0.586	0.574	0.596	0.572	0.583	0.582	0.594	0.613	0.595	0.581
		Top 10%	0.385	0.382	0.359	0.344	0.336	0.328	0.326	0.312	0.317	0.307
		Remaining 90%	0.482	0.477	0.498	0.478	0.484	0.480	0.493	0.510	0.494	0.479
	Non-Labor	Top 1%	0.010	0.010	0.008	0.011	0.014	0.012	0.011	0.008	0.014	0.015
		Remaining 99%	0.122	0.131	0.135	0.167	0.166	0.179	0.170	0.171	0.175	0.199
		Top 2%	0.016	0.016	0.015	0.019	0.020	0.020	0.015	0.014	0.020	0.027
		Remaining 98%	0.116	0.124	0.128	0.160	0.159	0.171	0.166	0.165	0.169	0.187
		Top 5%	0.030	0.030	0.030	0.036	0.034	0.034	0.029	0.026	0.033	0.043
		Remaining 95%	0.102	0.110	0.113	0.142	0.145	0.157	0.152	0.153	0.156	0.171
		Top 10%	0.048	0.045	0.047	0.057	0.055	0.054	0.045	0.041	0.049	0.060
		90%	0.085	0.095	0.096	0.122	0.125	0.137	0.136	0.138	0.139	0.154

Source: Gini for household monetary income on per capita basis, released as official Government statistics. See them at:
<http://observatorio.ministeriodesarrollosocial.gob.cl>

3.4. Gini decomposition

The previous sections show the disparity in the measures of income for the richest regarding the results presented by CASEN and (N)ESI. However, changes in the fraction of income in the hands of the wealthy do not imply that the Gini changes in similar manner. Though there is a close link between the income of the richest and the Gini, this relationship must be quantified. Leigh (2007) carried a detailed exercise using data from 12 countries and showed there is a close relationship between shares of the top percentiles and the Gini, but Gini decompositions must be used to estimate the relationship correctly.

Table 5 relates income in the hands of the richest percentiles with changes in the Gini for the period 1990-2012. The contributions to the Gini are decomposed into four categories: (i) Labor contributions of the top percentile(s); (ii) Non-labor contributions of the top percentile(s); (iii) Labor contributions of the remaining households; (iv) Non-labor contributions of the remaining households. The Gini decomposition calculates the precise consequences of the changes in the income of the richest over the Gini, decomposing the Gini in the contribution made by richest 1%, 2%, 5% and 10% and the respectively remaining households.

Table 5
Gini decomposition 1990-2012
Labor and non-labor contributions top percentiles

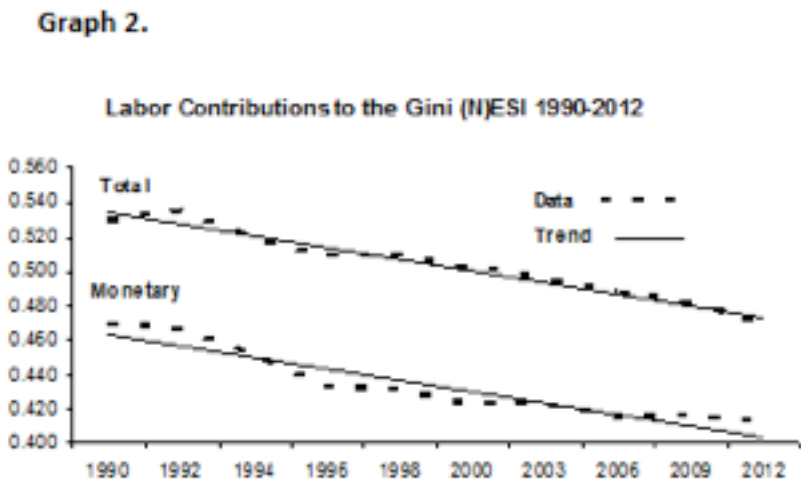
			1990	1992	1993	1995	1997	1999	2002	2005	2008	2012
CASEN MONETARY INCOME	Labor	Top 1%	0.116	0.125	0.137	0.114	0.116	0.125	0.120	0.106	0.109	0.099
		Remaining 99%	0.371	0.376	0.374	0.392	0.383	0.378	0.360	0.388	0.389	0.381
		Top 2%	0.169	0.183	0.188	0.172	0.170	0.182	0.173	0.158	0.163	0.152
		Remaining 98%	0.318	0.318	0.323	0.334	0.328	0.322	0.307	0.336	0.334	0.329
		Top 5%	0.267	0.281	0.284	0.276	0.270	0.286	0.266	0.258	0.264	0.251
		Remaining 95%	0.219	0.220	0.227	0.229	0.228	0.217	0.214	0.236	0.234	0.230
		Top 10%	0.361	0.374	0.379	0.373	0.366	0.380	0.355	0.355	0.359	0.344
		Remaining 90%	0.125	0.127	0.132	0.132	0.132	0.123	0.125	0.139	0.138	0.137
	Non-Labor	Total	0.487	0.501	0.511	0.506	0.498	0.503	0.480	0.494	0.498	0.481
		Top 1%	0.018	0.014	0.012	0.013	0.015	0.017	0.021	0.012	0.015	0.011
		Remaining 99%	0.054	0.040	0.037	0.038	0.045	0.038	0.052	0.025	0.027	0.036
		Top 2%	0.026	0.020	0.017	0.019	0.021	0.023	0.030	0.017	0.020	0.017
		Remaining 98%	0.046	0.033	0.032	0.032	0.038	0.033	0.043	0.020	0.022	0.030
		Top 5%	0.042	0.032	0.027	0.029	0.034	0.033	0.047	0.024	0.030	0.030
		Remaining 95%	0.030	0.021	0.022	0.022	0.025	0.022	0.027	0.013	0.012	0.017
		Top 10%	0.057	0.043	0.038	0.040	0.047	0.044	0.061	0.032	0.038	0.043
		Remaining 90%	0.015	0.010	0.011	0.010	0.012	0.012	0.012	0.004	0.004	0.005
		Total	0.072	0.053	0.049	0.051	0.060	0.055	0.073	0.037	0.042	0.047
CASEN TOTAL INCOME	Labor	Top 1%	0.108	0.117	0.129	0.107	0.109	0.117	0.113	0.101	0.104	0.094
		Remaining 99%	0.341	0.348	0.348	0.368	0.359	0.356	0.339	0.368	0.370	0.361
		Top 2%	0.156	0.170	0.176	0.162	0.160	0.172	0.164	0.150	0.156	0.144
		Remaining 98%	0.292	0.295	0.302	0.312	0.309	0.301	0.289	0.319	0.317	0.310
		Top 5%	0.247	0.262	0.266	0.259	0.254	0.270	0.251	0.246	0.251	0.238
		Remaining 95%	0.202	0.203	0.211	0.215	0.214	0.203	0.201	0.223	0.222	0.217
		Top 10%	0.335	0.348	0.355	0.351	0.345	0.358	0.335	0.338	0.343	0.326
		Remaining 90%	0.113	0.117	0.122	0.124	0.123	0.115	0.118	0.131	0.130	0.128
	Non-Labor	Total	0.448	0.465	0.477	0.475	0.468	0.473	0.453	0.469	0.474	0.455
		Top 1%	0.021	0.017	0.015	0.016	0.016	0.019	0.023	0.014	0.017	0.013
		Remaining 99%	0.078	0.061	0.055	0.053	0.060	0.053	0.064	0.035	0.037	0.047
		Top 2%	0.032	0.027	0.022	0.024	0.024	0.026	0.034	0.019	0.023	0.021
		Remaining 98%	0.067	0.051	0.049	0.045	0.052	0.045	0.053	0.030	0.031	0.040
		Top 5%	0.053	0.044	0.036	0.038	0.041	0.040	0.054	0.029	0.035	0.037
		Remaining 95%	0.046	0.034	0.034	0.031	0.035	0.031	0.034	0.020	0.019	0.024
		Top 10%	0.075	0.061	0.052	0.053	0.058	0.055	0.072	0.042	0.047	0.052
		Remaining 90%	0.024	0.018	0.018	0.016	0.018	0.016	0.015	0.007	0.007	0.008
		Total	0.099	0.078	0.070	0.070	0.076	0.072	0.087	0.049	0.054	0.060
ESI MONETARY INCOME	Labor	Top 1%	0.145	0.159	0.131	0.119	0.107	0.104	0.096	0.087	0.092	0.082
		Remaining 99%	0.384	0.376	0.388	0.389	0.402	0.398	0.399	0.400	0.389	0.387
		Top 2%	0.203	0.215	0.187	0.178	0.163	0.155	0.153	0.136	0.142	0.127
		Remaining 98%	0.326	0.320	0.333	0.330	0.345	0.347	0.343	0.351	0.339	0.342
		Top 5%	0.307	0.315	0.288	0.281	0.268	0.257	0.252	0.234	0.240	0.223
		Remaining 95%	0.222	0.219	0.231	0.227	0.241	0.245	0.243	0.253	0.241	0.247
		Top 10%	0.406	0.411	0.386	0.374	0.368	0.361	0.353	0.337	0.339	0.323
		Remaining 90%	0.123	0.124	0.134	0.134	0.140	0.141	0.142	0.150	0.142	0.147
	Non-Labor	Total	0.529	0.535	0.519	0.508	0.508	0.502	0.495	0.487	0.481	0.470
		Top 1%	0.005	0.002	0.002	0.006	0.005	0.005	0.006	0.003	0.008	0.012
		Remaining 99%	0.013	0.008	0.009	0.015	0.013	0.013	0.010	0.007	0.011	0.027
		Top 2%	0.007	0.004	0.003	0.008	0.007	0.007	0.007	0.005	0.010	0.020
		Remaining 98%	0.011	0.007	0.008	0.013	0.011	0.011	0.008	0.005	0.008	0.018
		Top 5%	0.011	0.006	0.006	0.012	0.011	0.012	0.012	0.008	0.015	0.031
		Remaining 95%	0.007	0.005	0.004	0.008	0.008	0.006	0.004	0.002	0.003	0.008
		Top 10%	0.015	0.009	0.009	0.018	0.015	0.016	0.015	0.011	0.020	0.039
		Remaining 90%	0.003	0.002	0.002	0.002	0.003	0.002	0.000	-0.001	-0.002	0.000
		Total	0.018	0.011	0.011	0.020	0.018	0.018	0.015	0.010	0.018	0.039
ESI TOTAL INCOME	Labor	Top 1%	0.129	0.139	0.116	0.103	0.092	0.088	0.083	0.075	0.081	0.072
		Remaining 99%	0.340	0.327	0.335	0.330	0.339	0.334	0.339	0.340	0.335	0.339
		Top 2%	0.181	0.189	0.163	0.152	0.140	0.131	0.131	0.117	0.124	0.111
		Remaining 98%	0.288	0.277	0.288	0.280	0.291	0.291	0.291	0.298	0.291	0.300
		Top 5%	0.273	0.277	0.252	0.241	0.229	0.218	0.216	0.200	0.209	0.197
		Remaining 95%	0.196	0.189	0.199	0.192	0.202	0.203	0.205	0.214	0.207	0.214
		Top 10%	0.361	0.359	0.336	0.321	0.313	0.305	0.303	0.289	0.294	0.284
		Remaining 90%	0.108	0.106	0.115	0.111	0.117	0.116	0.118	0.126	0.121	0.127
	Non-Labor	Total	0.469	0.466	0.451	0.433	0.431	0.422	0.421	0.415	0.415	0.411
		Top 1%	0.010	0.010	0.008	0.011	0.014	0.012	0.011	0.008	0.013	0.015
		Remaining 99%	0.048	0.047	0.049	0.059	0.052	0.054	0.043	0.039	0.039	0.046
		Top 2%	0.016	0.016	0.015	0.018	0.020	0.020	0.015	0.014	0.019	0.027
		Remaining 98%	0.042	0.041	0.042	0.052	0.046	0.046	0.039	0.033	0.033	0.034
		Top 5%	0.029	0.029	0.029	0.035	0.033	0.033	0.028	0.024	0.032	0.041
		Remaining 95%	0.029	0.028	0.028	0.036	0.033	0.033	0.026	0.022	0.021	0.019
		Top 10%	0.044	0.042	0.043	0.052	0.050	0.050	0.041	0.038	0.046	0.056
		Remaining 90%	0.014	0.015	0.013	0.018	0.016	0.016	0.013	0.009	0.007	0.004
		Total	0.058	0.057	0.056	0.071	0.066	0.066	0.054	0.047	0.052	0.060

*Source: Gini for household monetary income on per capita
basis, released as official Government statistics. See them at:
<http://observatorio.ministeriodesarrollosocial.gob.cl>*

3.4.1. Gini decomposition: labor

Table 5 shows that according to CASEN, labor contributions to the Gini basically remained unchanged between 1990 and 2012, from 0.486 to 0.481 for monetary income and from 0.448 to 0.454 in total income. Contrary to the above, note from the table that between 1990 and 2012 labor contributions to the Gini in (N)ESI fell strongly: from 0.529 to 0.470 for monetary income and from 0.469 to 0.411 for total income, respectively implying falls of 0.059 and 0.058. This means that according to (N)ESI, major shifts in the contribution of labor earnings to the Gini took place along the period and that the fall follows a regular and continuous trend throughout the 22 years as can be observed in graph 3.

The table also indicates that in (N)ESI labor contributions to the Gini of the households of the top 1% fall by 0.057 for both monetary and total income along the period. This shows that practically the entire decline in inequality that took place after 1990 in (N)ESI is explained by the fall in the contribution of labor incomes to the Gini, and in turn these come from the households in the top 1% the households in the top 1%. The decline, as can be observed in graph 2, follows a constant and pretty much steady downward trend throughout the period.



3.4.2. Gini decomposition: non-labor

Table 5 also shows the contributions to the Gini from non-labor incomes. Non-labor incomes are several times smaller than labor incomes and so are their contributions to the Gini. In CASEN, non-labor contributions to the Gini go from 0.072 in 1990 to 0.048 in 2012 for monetary income, and from 0.099 to 0.060 for total income. In the first case, Gini contributions fell by 0.024 and in the second, by 0.040, both numbers still relevant in terms of Gini.

In (N)ESI non-labor contributions to the Gini behaved very differently, going in the opposite direction. They go from 0.018 to 0.039 in monetary income and from 0.058 to 0.060 in total income. Yet, (N)ESI acknowledges (see Data section), that the survey is not a reliable source for non-labor income in the period 1990-2009. The questions were incomplete and did not trail these incomes in detail or consistently throughout time. After 2009 NESI changed the questions directed at the non-labor earnings of the households, and it is now reliable. Yet, these new numbers are not comparable with data for the previous years, and they do not overlap, thus it is not possible to connect the old series with the new numbers.

3.5. Robustness and consistency of the data on the top

The fact that by 1990 in Chile, according to both surveys, a significant fraction of the income was concentrated in the upper 1% of the households means that the Gini will depend critically on correctly measuring this subset of high-income households, as demonstrated by the Gini decomposition carried out in the previous section. Section 2 analyzed in detail the literature on the difficulties associated with sampling the upper end of the distribution, and how these problems may seriously bias results. Table

4 showed how the reported income shares for the top 1% were almost 50% higher in CASEN than in (N)ESI in 2012. Therefore, the search for possible errors and problems in the surveys should critically focus in analyzing the behavior shown by the richest households.

Determining which of the surveys (or both) is mistaken would be simpler with access to (i) raw data; (ii) details about those that refuse to respond or could not be contacted and (iii) the procedures for replacing these observations, none of which is available. However, even without this information, by comparing the character of the distributions derived from the surveys with information from outside sources, much can be learned about the robustness of the data. In the case of income, actual information obtained in surveys can be compared with statistical patterns derived from modeling income distributions, after the proposals of Pareto (1896). Some of the most relevant studies include Champernown (1953); Rutherford (1955) and Mandelbrot (1960).

In essence, this literature on income distribution patterns sustains there is an inverse relationship between the number of homes and income, where the number of richer households decays with income. This is even more so for the top of the distribution, where there is a general consensus that the number of household distributes according to the Pareto law for top incomes, given by: $x^{-\alpha-1}$, where x is income. The Pareto law is exponential and thus strictly decreasing as income increases. Further evidence is provided in Atkinson, Piketty and Saez, 2011, section 5, where there is a detailed discussion on why the top of the distribution should resemble the Pareto law for top incomes, followed by a description of the literature on the subject.

To the degree that the distribution derived from a particular survey diverges from these expected patterns, it shows inconsistencies and strongly suggests that it is not robust. The rest of this section revises the inconsistencies observed in the richest households in CASEN and (N)ESI from the standpoint of the Pareto law for top incomes. In this sense, as income increases, in the very least, the number of households should diminish continually. The main observation is that in CASEN high-income households present too many incoherencies where higher incomes are in lots of occasions associated with higher frequencies instead of smaller. To explore the consistency of the data the analysis focuses on the approximately 100,000 richest households. These 100,000 are fitted in intervals of \$1,000,000 starting from \$1,000,000 up to \$19,000,000 and more. Table 6 panels a and b show the frequencies for the richest households for CASEN and (N)ESI for 1990-2012.

Table 6a

Income frequencies for richest households CASEN

Bracket (millions Chilean \$)	CASEN 1990	CASEN 1992	CASEN 1996	CASEN 1998	CASEN 2000	CASEN 2003	CASEN 2006	CASEN 2009	CASEN 2012
1-2	30865	65960	-	-	-	-	-	-	-
2-3	6720	20681	38280	54299	35366	-	-	-	-
3-4	2171	6155	22160	21350	26724	33239	37250	-	-
4-5	1981	4207	8883	14516	15690	19729	16413	22053	-
5-6	112	684	6687	4149	5545	10560	14477	16826	25516
6-7	199	1265	2609	3515	3599	5624	4766	12605	13957
7-8	124	822	1109	1375	1229	2926	4828	3940	9239
8-9	0	218	239	2928	7091	1580	4034	7895	7306
9-10	208	122	2408	769	4277	1186	2633	5634	3109
10-11	-	14	151	445	743	1812	994	2440	3815
11-12	-	20	196	279	670	184	730	922	2272
12-13	-	121	45	384	500	1720	765	6485	594
13-14	-	-	89	526	166	609	308	793	1556
14-15	-	-	-	213	444	1171	921	180	387
15-16	-	-	-	-	92	105	419	633	543
16-17	-	-	-	49	-	146	46	466	753
17-18	-	-	-	-	33	78	175	180	670
18-19	-	-	-	313	17	43	201	-	42
19 plus	-	-	183	865	1377	1475	974	1539	1344

Source: Author’s calculations from CASEN data for household monetary income.

Note: If the initial frecuencies behaved correctly showing an inverse relation between number of households and earning, then to make the chart less burdensome these initial intervals were excluded. Accordingly, 1990 starts in \$1,000.000, 1996 starts in \$2,000.000 and 2006 starts in \$3,000.000 which implies that all previous excluded intervals for the richest 100,000 household behaved correctly.

Table 6b

Income frequencies for richest households ESI

Bracket (millions Chilean \$)	ESI 1990	ESI 1992	ESI 1996	ESI 1998	ESI 2000	ESI 2003	ESI 2006	ESI 2009	ESI 2012
1-2	21270	43537	-	-	-	-	-	-	-
2-3	3912	7213	25351	49102	40724	60657	-	-	-
3-4	1820	5520	8344	14262	8369	18058	27711	42261	-
4-5	764	2034	2921	4424	3804	10962	13025	15858	36000
5-6	967	1803	1243	1881	616	3670	4612	12684	15730
6-7	110	1503	380	2793	717	1485	2344	4157	9454
7-8	554	807	564	1030	118	0	632	2646	8679
8-9	35	369	1079	104	79	54	2058	1218	1167
9-10	-	369	138	263	0	54	1171	671	661
10-11	55	-	361	472	795	173	313	491	1129
11-12	-	-	65	-	898	-	83	71	904
12-13	-	-	-	-	460	-	225	237	290
13-14	-	-	457	48	-	-	-	-	327
14-15	-	-	77	-	-	219	232	115	244
15-16	-	-	373	-	-	-	44	539	405
16-17	-	-	-	-	-	-	-	-	-
17-18	-	-	-	-	-	-	-	-	315
18-19	-	-	-	-	-	-	-	-	-
19 plus	-	-	996	-	414	86	-	135	926

Source: Author’s calculations from ESI data for household monetary income

Note: If the initial frecuencies behaved correctly showing an inverse relation between number of households and earning, then to make the chart less burdensome these initial intervals were excluded. Accordingly, 1990 starts in \$1,000.000, 1996 starts in \$2,000.000 and 2006 starts in \$3,000.000 which implies that all previous excluded intervals for the richest 100,000 household behaved correctly.

Observing Table 6a, it is apparent that since 1996 in CASEN, households with higher income have, at various intervals, larger frequencies than households with lower income. Such inconsistencies did not exist in 1990 or in 1992, but they have become common since 1996. The table shows that the sampling problems in the high income segment tend to worsen over time and the data increasingly does not match the expected patterns of decay in the number of households as income increases.

The histograms for the period 1990-2012 presented in Graphs 1 and 2 are directly derived from Tables 6a and 6b and represent the relationship between frequencies and income for the richest households. These histograms provide a picture of how consistent the top behaves in the surveys. The histograms divide between those years that behave as expected where the number of households in each interval is inversely related to household income and those that behave incorrectly where for large sequences of households, higher incomes are associated with larger populations.⁶

The first two histograms presented in Graph 2 for CASEN 1990 and (N)ESI 2009 are examples of histograms that behave correctly. The relationships are, as in all social observations, not strictly perfect, and small disparities are observable, but

what they show is a pattern of decay where factions with higher incomes are associated with smaller populations for the richer 100,000 households. These two histograms differ markedly with number 3 in Graph 1, corresponding to CASEN for 2009, which does not show the expected pattern of decay as income increases. In this histogram the darkened columns highlight the main inconsistencies; among the most important contradictions in CASEN 2009, observe that the number of households receiving 8-9 million are twice as many as the households that earn 7-8 million and households with an income of 9-10 million are nearly 50% more than households with income of 7-8 million. Also, households earning 12-13 million are twice as many as households with an income of 7-8 million, and exceed those with an income of 11-12, 10-11, and 9-10 million. The histogram again jumps in the range 15-16 million, surpassing the 14-15 million. The behavior of the high-income households in CASEN 2009 has too many inconsistencies. The contradictions observed in the CASEN histograms for 2009 in the high income households are not exceptional cases. In Graph 2 histogram 4 shows how CASEN 2003 behaves randomly in all the range 8-17 million, with ups and downs in the frequencies, and no observable pattern of decay as income increases.

CASEN's 2006 histogram also reveals serious problems, as can be seen in Graph 2 in the appendix; again these problems have been darkened in order to highlight them. There are more households earning 7-8 million than those earning 6-7 million and there are more households earning 14-15 million than earning 11-12, 12-13 and 13-14 million. There also are more households that earn 18-19 million than those that earn either 16-17 million or 17-18 million. In general, for earnings over 6 million, households with more income are more numerous than those with less. This erratic behavior in the CASEN data is also found in 2000 where CASEN estimated the number of homes in the 8-9 million and 9-10 million ranges inconsistent with the number of households in the 6-7 million and 7-8 million ranges. The analysis for the years 1998 and 1996, though with fewer inconsistencies than in previous years, still shows numerous contradictions.

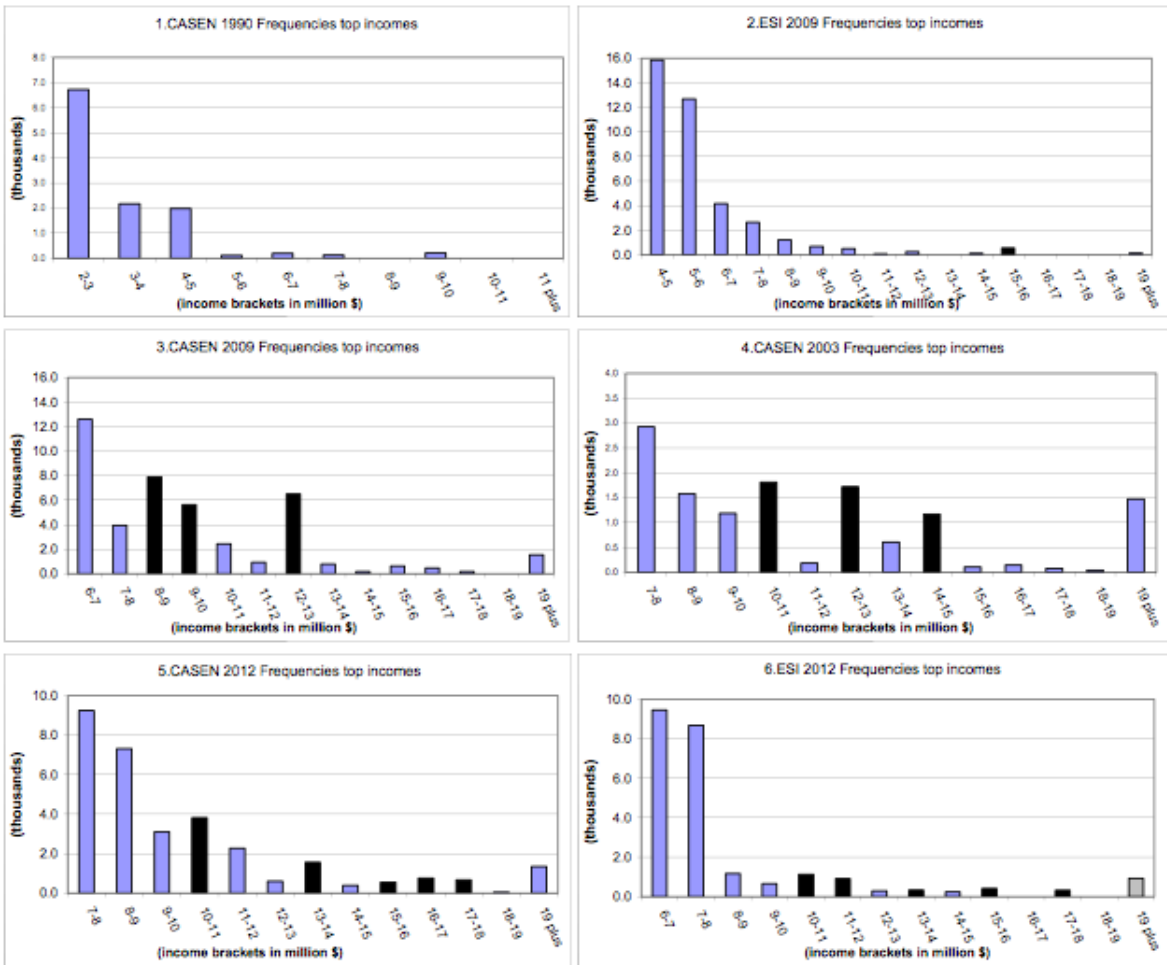
This contrasts with the (N)ESI histograms for the period (shown in Graph 2 in the appendix) that behave well, showing a decline in the number of households as income increases. There are some inconsistencies, but these are both small and significantly fewer than those found in CASEN, and only a small fraction of homes contradict the higher revenues/fewer households rule. In all histograms, the problems have been darkened in order to highlight them. The histograms also show that years 1990 and 1992 are basically consistent in both surveys.

The 2012 histograms for CASEN and (N)ESI shown in Graph 2 plot the richest 31,600 households in CASEN and the richest 24,500 households in (N)ESI. CASEN again shows a large number of inconsistencies; households that earn 10-11 million are significantly more than those that earn 9-10 million, and those in the 13-14 million bracket are almost three times more than those in the 12-13 million bracket; 15-16 million are more than 14-15 million, and both 16-17 and 17-18 million are more than 15-16, each doubling the number of households that earn 14-15 million.

(N)ESI 2012 behaves more erratically than in previous years; the 10-11 million bracket has higher frequency than the 9-10 million; and the 13-14, 15-16 and 17-18 million intervals are inconsistent. Yet, the numbers of households in the erratic intervals in CASEN (marked in black in the histogram) are much larger, basically tripling (N)ESI's. In CASEN, the share of total household income lying in the inconsistent intervals is 2.4% (estimated excluding the households in the 19 million plus bracket) or 3.2% (estimated including the households in the 19 million plus bracket). In (N)ESI the fraction of income in these inconsistent intervals is 0.7% three to four times less, again showing that (N)ESI is much more robust than CASEN in 2012.

Summarizing, CASEN's representation of the top of the distribution appears seriously flawed for the years 2000, 2003, 2006, 2009 and 2012, and presents questionable data for 1998 and 1996, while (N)ESI's results are substantially consistent throughout the 22 years.

Graph 3 Frequencies top incomes



Source: Estimated by authors from household monetary income for CASEN and ESI.

3.6.Gini: progression 1990-2012

It was shown in sections 3.2 through 3.4 why the Gini estimated from CASEN differs so much from that of ESI's: according to ESI, labor contributions fall sharply along the period 1990-2012, while they remain invariant in CASEN; and non-labor contributions drop deeply according to CASEN, while they increase slightly in ESI.

The relevant question at this stage is which data set should be used to estimate the Gini index correctly. There are four basic alternatives: (i) use solely CASEN data; (ii) use solely (N)ESI data; (iii) use CASEN labor income data with (N)ESI non-labor income data; and (iv) use ESI labor income data and CASEN non-labor income data.

The first two cases, solely using CASEN or (N)ESI data were analyzed in section 3.1, though no discussion was made on which of the two is more reliable. On that matter as was discussed in the Data section, CASEN, makes detailed inquiries on non-labor income and divides this data in a great number of categories. The exhaustive non-labor income section of the CASEN questionnaire is especially strong in controlling for these earnings, suggesting that CASEN's non-labor data is more reliable than ESI's. This can be also verified using the post-2010 NESI that complies with OECD standards on non-labor income. For 2012 shows that the share of non-labor income over all earnings is 11.4%for monetary income and 21.4%for total income, while for the richest 1%, the ratio of non-labor incomes to all incomes is 12.6%and 17.2%for monetary and total income respectively.. This compares favorably with the average share of non-labor income in CASEN for 1990-2012; it is 11.5%for monetary income and 16.5%for total income. Similarly for the richest 1%, the ratio of non-labor incomes to all incomes averages 11.3%and 13.5%for monetary and total income respectively. The NESI results for 2011 are very similar to the 2012 numbers, again confirming the above.

Very importantly, Section 3.5 analyzed the robustness of the data for the richest 1%of CASEN and (N)ESI for the period 1990-2012 and showed the (N)ESI data in these top segments to be much more reliable and convincing than CASEN's.⁷ Given

that in sections 3.2 through 3.4 it was shown that the difference between CASEN and (N)ESI mainly lies in the top 1%of labor incomes, by showing in section 3.5 that the (N)ESI data for the top 1%is superior to CASEN’s implies that the valid Gini for Chile for the period 1990-2012 should be estimated using (N)ESI data for labor income.

On the other hand, (N)ESI non-labor data has been recognized by the INE, the national statistical bureau in charge of the survey, to be unreliable for the period 1990-2009, and particularly less dependable for the series on monetary income than for total income. The fact that the ESI non-labor monetary income data (1990-2009) is very different from the NESI data, also strongly suggests that for monetary Gini the ESI non-labor data should not be used. Also it must be noted that that there is no junction between the new NESI and the old ESI data. For total income, the differences are large, but not as large as for monetary.⁸

The above means that using a 1990-2012 series with ESI and (N)ESI labor data generates reliable results. Yet, its non-labor complement must be brought from another source. Although CASEN’s data for the top 1%is unreliable, the labor data for the remaining 99%behaves similarly with that of (N)ESI, pointing out to the fact that it is a reliable sample for the remaining 99% So, with the important limitation that CASEN’s non-labor data is a good representation for all but the top 1% CASEN may be the outside non-labor source that complements (N)ESI’s labor data.

All the above implies that the best alternative for estimating the Gini for Chile for the period 1990-2012 is to use the (N)ESI data for labor income and CASEN data for non-labor income. Alternatively, a second best is to assume that non-labor contributions to the Gini remained unchanged along the 1990-2012 period. Both alternatives are presented in Table 6 below. Observe that when CASEN non-labor data is added to (N)ESI’s labor data, the monetary Gini falls by 0.084 points while the total Gini falls by 0.097 points along these 22 years. If, instead, the assumption is that non-labor contributions did not change, then the monetary Gini falls by 0.059 points while the total Gini falls by 0.058 points.

Estimated Gini and Changes 1990-2012												
		1990	1992	1994	1996	1998	2000	2003	2006	2009	2012	Diff. 1990-2012
Monetary	labor (N)ESI contributions	0.529	0.535	0.519	0.508	0.508	0.502	0.495	0.487	0.481	0.470	0.059
Income	non-labor CASEN contributions	0.072	0.053	0.049	0.051	0.060	0.055	0.073	0.037	0.042	0.047	0.025
	Gini	0.601	0.588	0.568	0.559	0.568	0.557	0.568	0.524	0.523	0.517	0.084
Total	labor (N)ESI contributions	0.469	0.466	0.451	0.433	0.431	0.422	0.421	0.415	0.415	0.411	0.058
Income	non-labor CASEN contributions	0.099	0.078	0.070	0.070	0.076	0.072	0.087	0.049	0.054	0.060	0.039
	Gini	0.568	0.544	0.521	0.502	0.507	0.493	0.509	0.464	0.469	0.472	0.097

4. Conclusions

The two surveys reach very different conclusions about what happened in Chile with regard to income distribution for the period 1990-2012. (N)ESI reflects a substantial fall in the contribution of labor income to the Gini; by 5.9 points in monetary income and 5.8 points in total income, while CASEN shows an important fall in the contributions to the Gini of non-labor incomes; by 2.5 points in monetary income and 3.9 points in total income. On the other hand, labor income contributions in CASEN remain stagnant throughout the period, while non-labor contributions to the Gini in (N)ESI increase slightly.

Without access to the raw data it is not possible to infer exactly which of the two surveys is the correct. Yet, the available information and the analysis of the top of the distribution show that (N)ESI is substantially more consistent. In fact, the erratic behavior of CASEN in the measurement of the top 1% of the distribution casts serious doubts on measures of income distribution derived from CASEN. The top segment is the most critical section in determining the Gini, and CASEN data appears seriously flawed in that interval. Misrepresentation as large as those shown in the CASEN histograms seriously question the validity of the CASEN data for the richest households and in consequence, the CASEN Gini.

The above points to the fact that the (N)ESI data is much more dependable than CASEN's, but this is only true for labor incomes that may compromise up to 90% of total earnings. ESI non-labor data is unreliable before 2010 and should not be used. Though non-labor incomes are much smaller than labor income, they may have important effects over the Gini. To overcome this limitation one possibility is to use CASEN non-labor data. Although CASEN's labor data for the top 1% is seriously flawed, capturing non-labor data is one of the survey's strongest points, so it may be less defective. Also, the remaining 99% of CASEN's data is balanced, implying that if the main alterations took place in the 0-99% interval, then they will be correctly captured in CASEN. Under these assumptions, using CASEN's non-labor incomes and ESI's labor incomes implies a total fall in Gini for the period 1990-2012 that reaches 0.084 for monetary income and 0.097 for total income.

Alternatively it may be supposed that non-labor incomes are not measured correctly in CASEN. If no other source exists for non-labor incomes, then its best to assume these remained unchanged, which would thereby imply that the Gini fell by 5.9 points in monetary income and 5.8 points in total income.

In either case the fall in Gini observed along the period 1990-2012 has been considerable, implying major progress in equality. Still, the initial Gini in 1990 was extremely high, so that even if the monetary Gini fell by 0.084, it would still be as high as 0.517 in 2012. Yet, given how much equality has advanced along these 22 years, the correct strategy is to identify those policies that have helped reduce inequality and push these further. This issue is very important because successful income distribution strategies may be abandoned after deriving erroneous conclusions about their impact based in biased CASEN data.

The evidence shows that almost all the difference between CASEN and (N)ESI derives from how the share of labor income of the richest 1% is measured; while these shares remains virtually stagnant in CASEN, in (N)ESI they fall by almost 40% from 1990 to 2012. Both surveys show that in the beginning (1990) the top 1% concentrates extremely high shares of household income, but while they experience important falls according to (N)ESI, they basically stay constant in CASEN.

Using a Gini decomposition this study demonstrates that the fall observed in the (N)ESI Gini is mostly a consequence of the downward movement in the fraction of labor income held by the richest 1%. The finding that much of the decline in the (N)ESI Gini originates from a fall in the labor income of those households in the extreme upper end of the distribution is particularly important, because there is consensus that (N)ESI measures labor income particularly well, so this provides another important argument in favor of (N)ESI in the dispute over which survey is more credible.

(N)ESI derived data leads to evaluating the Chilean redistributive experience for the period 1990-2012 positively, with an accurate targeting in the top 1% of households, in contradiction with CASEN. Although future research must provide a definite answer to the issue of which survey measures correctly, the evidence provided in this paper supports the (N)ESI results and questions the existing consensus on the poor performance of income distribution in Chile during the period 1990-2012.

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Footnotes

¹See Temas Pblico NCE1076, Libertad y Desarrollo, (http://www.lyd.com/wp-content/files_mf/tp107610respuestasalacasenll.pdf).
²Esee http://www.ine.cl/canales/chile_estadistico/mercado_de_l_trabajo/nene/nesi/archivos/antecedentes%20metodologicos/manuales

³ECLAC makes the adjustment as shown in Feres (2007).

⁴As mentioned before, building a series for autonomous income is not possible because government monetary transfers are not identifiable in ESI before 1995. Yet, autonomous income behaves very similarly to monetary income from 1995 to 2012.

⁵For total income 72% of the fall lies in the top 1% (that goes from 13.0% in 1990 to 7.3% in 2012), 17% of it lies within the 98-99 percentile and 98% within the top 5%.

⁶The histograms do not show the initial 60,000 plus households that earn less than 7 million in CASEN and less than 5 million in ESI because in both 2012 surveys these initial frequencies behave correctly and show an inverse relation between number of households and earnings. By building the histograms in this manner, the vertical scale emphasizes the inconsistent sequences, which come about at the very extreme of the distribution.

⁷ This does not contradict the above, because given the relatively small size of non-labor earnings, it indicates that the labor income data for the top 1% in (N)ESI is more robust than CASEN’s.