THE WORLD BANK ECONOMIC REVIEW, VOL. 13, NO. 3: 509-38

Calm After the Storms: Income Distribution and Welfare in Chile, 1987-94

Francisco H. G. Ferreira and Julie A. Litchfield

After rising during most—but not all—of the 1960–85 period, inequality in Chile seems to have stabilized since around 1987. Following the stormy period of economic and political reforms of the 1970s and 1980s, no statistically significant Lorenz dominance results could be detected since 1987. Scalar measures of inequality confirm this picture of stability, but suggest a slight change in the shape of the density function, with some compression at the bottom being "compensated for" by a stretching at the top. As inequality remained broadly stable, sustained economic growth led to substantial welfare improvements and poverty reduction, according to a range of measures and with respect to three different poverty lines. Poverty mixed stochastic dominance tests confirm this result. All of these findings are robust to different choices of equivalence scales.

Two "storms" have recently raged over the distribution of income in Chile. The first, and most important, was caused by a series of structural reforms of the economy—which started in 1974 and were largely completed by the late 1980s—and by successive changes in political regime—which had important implications for, among other things, the regulation of labor markets. The economic reforms included trade liberalization, privatization of state-owned assets, deregulation of various markets, and reforms in the structure of taxes, subsidies, and benefits. They have been extensively discussed elsewhere, and are well beyond the scope of this paper. (See Edwards and Edwards 1987 and Scott 1996 for excellent summaries.) The political changes were fundamentally the military coup d'état of 1973, which installed General Pinochet as president, and the restoration of democracy in 1990, with the election of President Aylwin.

The second storm, closer to the "tea cup" variety, has raged in academic and policy circles, as the effects of the Chilean model on poverty and inequality have been hotly debated. This storm also had two separable components that, for

Francisco H. G. Ferreira is with the Economics Department at the Catholic University of Rio de Janeiro, and Julie A. Litchfield is with the Economics Department at the University of Sussex. Their e-mail addresses are fferreira@econ.puc-rio.br and j.a.litchfield@sussex.ac.uk. The authors are grateful to Dante Contreras, Indermit Gill, Jesko Hentschel, Osvaldo Larranaga, Chris Scott, Tony Shorrocks, Miguel Szekely, Alberto Valdes, Michael Walton, two anonymous referees, and participants at conferences in Santiago and London for their very useful comments and contributions. The authors particularly wish to thank Iris Delgado at MIDEPLAN and Juan Carlos Feres at CEPAL for being so generous with their vast knowledge of the details of the CASEN data.

convenience, we will name "Chile versus Stolper-Samuelson" and "See, All is Not Well After All." The former component originates from the finding that, as Chile liberalized its trade regime, the ratio of the wages of skilled workers to those of unskilled workers rose, rather than fell (Robbins 1994). If the Chilean and the world economies could be approximated by a model in which unskilled and skilled labor were the only two factors of production, and the other Hecksher-Ohlin assumptions held (notably constant technology and the absence of non-tradable goods), then this finding would violate the predictions of the Stolper-Samuelson theorem, which establishes the link between goods and factor prices in a Hecksher-Ohlin world. If Chile, like other developing countries, had relatively abundant supplies of unskilled labor, opening the country to trade should have increased the returns to this factor relative to the returns to skilled labor—the opposite of what Professor Robbins finds.

The second strand, "See, All is Not Well After All," draws on Robbins's findings, but percolates beyond academia to Chilean politics and society more broadly. The *Concertacion* governments of Presidents Aylwin and Frei made "growth with equity" their paramount objective. Failure to promote equity—indeed, the observation of actual increases in inequality—can be seized on as evidence of their failure to deliver on their stated objectives. Income distribution statistics became increasingly important in the Chilean political and social debate of the mid-1990s, to the point where the Catholic Church's *Conferencia Episcopal de Chile* issued an open letter in January 1996 entitled, "Is Chile an Equitable Country?" Its concluding section began by stating that, "The current distribution of income in our country should be cause for scandal among Christians . . . The distance between the rich and the poor has grown in Chile in an alarming fashion. A caring nation cannot accept this reality. Neither can a modern country tolerate these differences." (*Comision Nacional de Justicia y Paz* 1996:24).

Indeed, although there was no single *national* household survey that *regularly* collected detailed information on incomes *from all sources* prior to 1985, the dominant view is that inequality in Chile did rise substantially throughout the 1960s, 1970s, and 1980s (except for a brief decline in 1970–73).[1] This information is largely based on the long time series of the Universidad de Chile Household Survey data, which covers only Greater Santiago. Riveros (1983) was the first to note the rising trend in the Gini coefficient, focusing on the period from 1958 to 1982. This was corroborated by Robbins (1994), and by Montenegro (1996), for wage incomes, although both authors find that the trend changed in 1990. More recently, using the only national data available, Londono and Szekely (1997) confirm these findings for total household income across the entire country. Data points satisfying these requirements prior to 1990 are available only for 1971, 1980, and 1989. Londono and Szekely (1997) report that the Gini coefficient rose over those three years from 0.47 in 1971, to 0.53 in 1980, and to 0.59 in 1989. They, too, find a reversal beginning in 1990, with the Gini falling to 0.57 in 1994.

1. For a dissenting view see Marcel and Solimano (1994), who emphasize the limited variation in income distribution across different presidential mandates in Chile since the 1950s.

Nevertheless—although Robbins (1994) finds a decline in the skilled-unskilled wage ratio from 1990 to 1992, Montenegro (1996) finds that the wage Gini for greater Santiago fell from 0.57 in 1987 to 0.46 in 1996, and Londono and Szekely (1997) report the aforementioned small decline in the national total income Gini between 1989 and 1994—there does not yet seem to be a consensus on the post-1990 part of the story. Robbins (1995) himself plays down the post-1990 decline, attributing it to the rise in the number of graduates from "low-quality" private universities. The bishops who wrote the 1996 letter also clearly doubt that there has been an improvement since the turn of the decade. Having become accustomed to three decades of rising inequality, it is as if Chilean society (and some foreign economists) refuse to believe that a reversal is possible, and wonder what economic mechanisms might underlie it. Meller (1996) suggests that a reduction in wage disparities might be due, after all, to Stolper-Samuelson at work. Robbins (1996) and Wood (1997) remain unconvinced.

In part, room for this controversy is generated by the absence of a thorough, definitive analysis of the best available data since 1987. Such an approach should be based on as solid a treatment of the data as possible, taking into account issues such as regional price variations and differences in family composition. It should also overcome the ambiguity inherent to inequality analysis based on scalar measures: income share ratios might fall, while Ginis rise; coefficients of variation might suggest increasing dispersion, while the mean log deviation suggests declines. And it should deal explicitly with the statistical nature of inequality analysis: some of the changes observed, particularly in the 1990s, have been so small that one wonders whether or not they are statistically significant.

This article aims to fill that gap, and to contribute to the debate on the dynamics of personal income distribution in Chile, by establishing which facts and conclusions are indeed empirically robust. It provides a comprehensive description of the levels of and changes in poverty and inequality in Chile from 1987 to 1994, drawing primarily on a detailed analysis of four household survey microdata sets—the *Caracterización Socioeconómica Nacional* (CASEN) surveys of 1987, 1990, 1992, and 1994 (these are discussed briefly in section I below, and described in more detail in appendix A). We address the ambiguity of scalar measurement of welfare, poverty, and inequality by relying on stochastic dominance techniques. The article incorporates the need for statistical testing of hypotheses about changes in income distribution by applying the Howes (1993) intersection-union test for statistical significance of stochastic dominance. It also addresses the issue of robustness with respect to the assumptions made about different needs across households and economies of scale within households, by presenting all results for equivalized income, as well as for per capita income.

I. Concepts, Data, and Methodology

In studying the evolution of the Chilean distribution of income during 1987–94, this article presents results concerning three distinct, but related concepts:

social welfare, poverty, and inequality. Social welfare is perhaps the vaguest of the three: it seeks to capture the level of well-being of a society or population. Because of information constraints, it is usually proxied in household survey studies by income or by consumption expenditures.[2] Many have argued for more encompassing measures, which would include a value for leisure or other non-monetary dimensions of quality of life, such as the availability of public goods, whether environmental in nature or not.[3] Although including these dimensions would be ideal in principle, we are constrained in practice—by data availability and reliability—to relying on either consumption expenditures or income for detailed distributional analysis.

Since the CASEN surveys—widely regarded in Chile as the best available sources of information on households since their creation in 1985—use income as the welfare concept, we will here as well. Hence, the social welfare measures we will be concerned with are nondecreasing functions of current income and are symmetric (they do not discriminate among recipients along any dimension other than income). We will not present values for any specific social welfare measures in this study, relying instead on the theorems of stochastic dominance (discussed below) to investigate changes in social welfare.

In seeking to measure welfare, whose current income should one consider? The income distributions conventionally studied in the Chilean literature are household income per capita per household distributions; which is to say that the income unit is household income per capita, and the recipient unit is the household. Using this recipient unit creates a number of inconveniences. For example, higher deciles have smaller shares of the population than lower deciles because household size declines with household income per capita in Chile (see MIDEPLAN 1992:34).[4] Or, the headcount poverty measure is less than the proportion of the

2. There are two reasons why consumption expenditures are usually preferred to income as a welfare indicator. First, if capital markets work at all, expenditures are a better proxy for permanent income. Second, there is a growing consensus among practitioners that income data from household surveys are less reliable than expenditure data because of a number of problems related to misreporting and mismeasurement. See Deaton (1997) and Chauduri and Ravallion (1994) for discussions. Chile's last available expenditure survey, however, is the *Encuesta de Presupuestos Familiares* of 1987–88. Apart from being old and unable to provide any information on changes during the recent high-growth period, it covered only the Metropolitan Region of Santiago.

3. Becker (1965) proposes a "full income" concept that includes an imputed value for leisure. Sen (1981) proposes a concept of entitlements that aims to capture some of the benefits of public goods, in addition to the value of income. Since 1990, the United Nations Development Programme (UNDP) has been computing a Human Development Index (HDI), which is meant to complement income-based indicators by incorporating life expectancy, adult literacy, and median years of schooling, in addition to per capita income. In Chile life expectancy at birth rose from 71.0 to 72.0 years between 1982 and 1992. Over the same period adult literacy rose from 91.1 percent to 94.6 percent; median years of schooling rose from 5.7 to 7.6. Combining all of these improvements in non-money-metric dimensions of welfare with the income increases discussed below, Chile's HDI registered a 13.5 percent increase from 1982 to 1992, to 0.851. This places the country in the UNDP's "high human development" category. For details see UNDP (1996).

4. Strictly speaking, a decile is a separator. There are nine deciles, and decile i is the income that separates tenth i from tenth i+1 in the distribution. Like other quantiles (such as percentiles or quintiles), decile is widely misused to refer to the actual tenth (or hundredth, or fifth) of the distribution. Rather than

population (in persons) that is poor. We therefore adopt the individual as the recipient unit throughout: all of our distributions are vectors of individuals. Their imputed income is one of two income concepts that we adopt: household income per capita, to allow for comparisons with previous studies and for ease of direct interpretation, and household income per equivalent adult, to take account of differences in needs arising from distinct household sizes and compositions. Below we discuss the specific equivalence scale that we use.

Poverty can be thought of as the negative of a welfare function defined over a censored distribution. It is negative in the sense that a rise in poverty, everything else remaining constant, is a decline in welfare. More important, poverty measures are defined over a censored distribution in the sense that they measure the welfare of those below a certain threshold in the overall distribution.[5] That threshold is the poverty line, which, in this article, as in many others, is defined as an absolute income level (fixed over time in real terms) that is judged just sufficient to provide an individual with minimum nutritional and other requirements. Details are discussed in section III.

Inequality, like welfare, is defined over complete distributions of an indicator. Unlike welfare, however, it is independent of the mean of those distributions, concerning itself only with their second moment. Inequality measures are defined over mean-normalized income distributions. They are generally required to satisfy the Pigou-Dalton transfer principle, which demands that the measure rise (or at least not fall) in response to a mean-preserving spread.

There are, of course, many such inequality measures, which may validly rank the same two distributions in opposite ways, if the measures are more or less sensitive to distances in different parts of the distribution. The best remedy to this ambiguity is to rely on stochastic dominance, which is discussed below. But we will also present four different inequality measures, to provide information on changes in inequality from a number of different perspectives. These measures are the Gini coefficient (which is most sensitive to incomes in the middle of the distribution), the mean log deviation (which is most sensitive to incomes at the bottom of the distribution), the Theil index (whose sensitivity is constant across the distribution), and a transform of the coefficient of variation (which is most sensitive to incomes at the top of the distribution). Their formulas are given in section II.

We now turn briefly to the CASEN data sets for the years 1987, 1990, 1992, and 1994, on which the analysis below is based.[6] The CASEN surveys are nationally and regionally representative household surveys, conducted by the Chilean Ministry of Planning (MIDEPLAN), through the Department of Economics of the

---

confuse the reader by departing from the usual misnomer, decile (and its finer and coarser analogues) will be used to mean tenth (or hundredth, or fifth) in this article.

5. Most poverty measures, including all those used in this study, satisfy the focus axiom, which requires them to be invariant with respect to any change in income levels above the poverty line.

6. A first CASEN survey was conducted in 1985, but it is widely reported to be less comparable with subsequent surveys, in addition to being less reliable and of inferior quality.

Universidad de Chile. They have the dual objectives of generating a reliable portrait of socioeconomic conditions across the country and monitoring the incidence and effectiveness of the government's social programs and expenditures. Given these ends, questions are asked pertaining both to the household and to the individuals within the household. Topics covered include demographics; characteristics of the dwelling; access to utilities and public services; educational attainment (if currently enrolled, detailed questions are asked about the school, method of education financing, benefits, and so on); health conditions; health insurance; health services used and benefits received; occupation and employment; and income. The questions on income are designed to permit the distinction between labor income in cash, labor income in kind (agricultural and nonagricultural), income from capital, rental income, imputed rent, employment-related transfers (such as occupational, invalidity, or widow's pensions), and entitlement transfers (such as the basic pensions, PASIS, or the family allowance, SUF). Details on the sampling methodology employed by the Universidad de Chile, as well as on the adjustments made to the raw data by the United Nations Economic Commission for Latin America and the Caribbean (CEPAL), are provided in appendix A.

The income variable from the CASEN data used as the welfare indicator in this study is total household income, further adjusted in two ways. First, we deflate the income vector by a regional price index, with Santiago as the base location. Traditionally, nominal income has been deflated only by a common national consumer price index, taking no account of regional variations in price levels, which, as table A-1 (in appendix A) indicates, can be considerable in some cases. This is at odds with most current views of best practice in the analysis of income distribution. If average price levels vary considerably across space, nominal currency units have different real purchasing power along that dimension, just as they do over time. The rationale for regional price deflation is exactly analogous to that for temporal price deflation: in comparing an income value for 1994 with one for 1987, one wants to ensure that any variation in average price levels is taken into account, so that a "real" peso buys the same over time. Likewise, in comparing incomes in Santiago with those in Iquique, one wants to adjust them to take into account any variation in average price levels, so that a real peso buys the same across space.[7]

The need for such price deflation is reinforced by Chile's geography: the extreme southern and northern regions have substantially higher average prices than do the regions closer to Santiago. Our regional price deflation is based on the only source of prices outside Santiago, the National Statistical Institute's (INE) *Anuario de Precios* survey of 16 cities.[8] Given the variation in price levels from year to year, we use an

7. See Deaton (1997) and Ravallion and Bidani (1994) on the need for regional price deflation and alternative methodologies.

8. There are no systematic surveys of prices in any rural areas in Chile. Although in the past rural prices were assumed to be lower than prices in urban areas, we find no justification for this arbitrary markdown. We thus generalize urban prices to the whole region.

average of the index from 1985 to 1994 (the values are given in table A-1) . We then deflate regionally adjusted incomes over time by the national consumer price index for November (the survey month) of the relevant years, as given in CEPAL (1995:24). All income values reported in this article, therefore, are expressed in 1994 Santiago pesos (except for incomes in appendix B).

To ensure transparency about the effects of regional price deflation, we present the basic poverty and inequality results of the paper for the undeflated distribution of per capita income in tables B-1, B-2, and B-3 in appendix B. A comparison of those tables with tables C-1, C-2 (in appendix C), and 7, which contain the analogous results for the deflated per capita distribution, reveals that regional price deflation entails a slight reduction in measured mean and median incomes (since it acknowledges the fact that measured prices in the regions are higher on average), a commensurately slight increase in poverty statistics, and only negligible changes in the values of the inequality measures. Income shares are also largely unaltered, except for the bottom two deciles, whose income shares seem to be overstated in the absence of regional deflation. Trends in all variables are also basically unchanged.[9]

The second adjustment we make is to introduce the concept of household income per equivalent adult, by adopting an equivalence scale. We do this to capture the changes in measured inequality and poverty that arise when we take into account the different needs of households with different compositions (such as a household with four adults compared to a household with two adults and two small children), as well as economies of scale that arise from sharing fixed housing or other costs. There are a number of different approaches to deriving an equivalence scale, and there is no single accepted dominant method. Rather than attaching excessive importance to the specific values of our chosen coefficients, we sought to provide a reasonably reliable alternative to the per capita income concept, which is well known to constitute an extreme assumption in terms of differences in needs (it recognizes none), as well as in terms of economies of scale (it assumes these absent).

Our chosen scale is a revised version of the equivalence scale for Chile, calculated by Contreras (1995), using the Rothbarth adult-goods method. Contreras estimates his scale excluding all households with a single adult from the sample and taking two-adult households as the reference type. He finds that adult-good expenditures are restored to the level of a childless couple when incomes for families with one child in a particular age category are raised by a particular percentage amount. The age categories and amounts are given in table 1.[10]

9. Note, however, that it would be wrong to infer from this exercise that regional price deflation is an innocuous or irrelevant procedure. This is not entirely true even for country aggregates, but its real importance would arise in the context of interregional comparisons, such as a poverty profile. Although we do not make such comparisons here, the aggregate results we obtain would be compatible with them.

10. The entries in table 1 are bottom-line approximations. Although they capture the results at an appropriate level of confidence, they do not do justice to the complexity of the estimation method and do not take into account the different standard errors associated with different age categories. See Contreras (1995) for these and other details.

Table 1. *Proportional Compensating Variations for Children in Chile*

Child age (years)	*No child*	*0–4*	*5–10*	*11–15*
Cost increase (percent)	0	15	20	40

Source: Authors' calculations.

Since we must also cover those households made up by a single individual, and in order to take into account some economies of scale within the household, we assume the cost of a single adult to be 60 percent of that of a couple. (This is roughly equivalent to saying that the cost of the second adult is 70 percent of the cost of the first adult.[11]) Our equivalence scale is therefore given by:

(1) $Y_i = X_i / M_i$, with $M_i = 1.2 + 0.8\ (N_{aa} + N_{11\text{-}15}) + 0.4\ N_{5\text{-}10} + 0.3\ N_{0\text{-}4}$,

where Y_i is household i's equivalized income, X_i is total household income prior to equivalization, M_i is the equivalence scale applied to the household, N_{aa} is the number of additional adults in the household, $N_{11\text{-}15}$ is the number of children ages 11–15 (inclusive) in the household, $N_{5\text{-}10}$ is the number of children ages 5–10 (inclusive) in the household, and $N_{0\text{-}4}$ is the number of children ages 0–4 (inclusive) in the household. Note that this formulation maintains households with two adults as the reference group. Their household income will be divided by two. An additional child in the 11–15 age category "costs" an extra 40 percent, as before. An additional child in the 5–10 age category costs an extra 20 percent, as before. And an additional child in the 0–4 age category costs an extra 15 percent, as before. The second adult accounts for 40 percent of the couple's total costs.

By introducing the equivalence scale and the regional price adjustments directly to the incomes to be analyzed, we ensure consistency in the assumptions underlying the inequality and poverty analyses. Also, since all incomes are effectively expressed in 1994 Santiago pesos, there is no need for regional poverty lines. Lines expressed in 1994 Santiago pesos are the appropriate comparators for all incomes. Similarly, there is no need to develop different poverty lines for different household types; it suffices to compare household income per equivalent adult with an individual adult poverty line.[12] The advantage of this approach over introducing those concepts through different poverty lines, in addition to simplicity, is that the inequality analysis now incorporates regional price and equivalence scale adjustments.

The analysis of inequality and welfare changes in the next section relies on equivalized household income, based on the equivalence scale described above. In order to both preserve comparability with previous studies and demonstrate

11. This is a common assumption, adopted, for instance, in the construction of the Organisation for Economic Co-operation and Development's (OECD's) equivalence scale (see OECD 1982).

12. However, the absolute values of the poverty measures do, of course, depend on the type of reference household chosen in defining the scale.

the robustness of the main results to the adoption of the scale, we replicate the analysis for household income per capita in appendix C.

II. Levels of and Changes in Chilean Inequality and Social Welfare

Before presenting the detailed results, it is worthwhile to highlight the broad picture that arises from the data. This picture can be characterized by three stylized facts. First, the entire distribution function shifts to the right over time, with people in the same relative positions earning higher incomes in later years. Although this is not strictly the case for every segment of the distribution in every year, it is the case in general.[13] This is clearly the result of economic growth.

Second, the dispersion of the distribution seems to remain broadly stable as it moves to the right over this period. If anything, there is some indication of a slight reduction in overall inequality, although there are no significant unambiguous changes in inequality between any of the years surveyed by CASEN.[14] This result would suggest that the benefits of economic growth were distributed in a pattern roughly similar to that of the existing income distribution. Third, to the extent that there are any discernible changes in the shape of the density function, within the broad context of stability, these appear to be a slight compression in the lower tail and a slight increase in dispersion in the upper tail. That is, inequality among the poor fell, while inequality among the very rich, and between the very rich and those just poorer than them, seems to have increased.

As stated in the previous section, the four scalar inequality measures we use in this study are the Gini coefficient, the mean log deviation, the Theil index, and a transform of the coefficient of variation (half of its square, to be precise). In their formulas below we use the following standard notation: y_i is the income of individual i, $i \in (1, 2, ..., n)$; the subscript j denotes any individual other than i; n is the number of individuals in a given distribution; and $\mu(y)$ is the arithmetic mean of the distribution.The Gini coefficient is given by:

$$G = \frac{1}{2n^2\mu(y)} \sum_{i=1}^{n} \sum_{j=1}^{n} |y_i - y_j|. \tag{2}$$

The other three measures are all members of the generalized entropy class of inequality indexes, which satisfy a number of desirable properties, such as symmetry, population replication, scale invariance, and decomposability (see Cowell 1995 for details). The general formula for the parametric class is given by:

$$E(\alpha) = \frac{1}{\alpha^2 - \alpha} \left[\frac{1}{n} \sum_{i=1}^{n} \left(\frac{y_i}{\mu(y)} \right)^{\alpha} - 1 \right]. \tag{3}$$

13. The first-order welfare dominance results reported below specify the instances in which it was true for the entire distribution.

14. That is, there are no statistically significant Lorenz dominances between any two years in our sample. See below.

Using l'Hopital's rule, we can obtain $E(0)$, the mean log deviation:

$$E(0) = \frac{1}{n}\sum_{i=1}^{n}\log\left(\frac{\mu(y)}{y_i}\right). \tag{4}$$

Similarly, the Theil index corresponds to $E(1)$, which is given by:

$$E(1) = \frac{1}{n}\sum_{i=1}^{n}\frac{y_i}{\mu(y)}\log\left(\frac{y_i}{\mu(y)}\right). \tag{5}$$

The fourth measure we use is $E(2)$, which can be expressed as:

$$E(2) = \frac{1}{2n\mu(y)^2}\sum_{i=1}^{n}[y_i - \mu(y)]^2. \tag{6}$$

Table 2 lists mean and median incomes, as well as the four inequality measures, for the household income per equivalent adult distribution in each of the four years we analyze.

The impact of economic growth can be seen immediately through the sharp upward trend in mean and median incomes. The large differences between the mean and the median, which persist over the period, are an indication of the skewness of the distribution. The four measures of inequality confirm the high level of inequality in Chile, by international standards.[15]

In terms of temporal evolution, the Gini coefficient, which is not especially sensitive to the top or the bottom of the distribution, changes very little over the period. The Theil index, $E(1)$, behaves slightly differently, displaying a sine pattern. It also does not suggest a strong trend in either direction. The other two measures suggest the small changes referred to above: the mean log deviation, $E(0)$, which is particularly sensitive to low incomes, falls a little more markedly than the Gini throughout. $E(2)$, a transform of the coefficient of variation that picks up differences in the upper tail with greater weight, rises monotonically from the beginning to the end of the period. Overall, there appears to be limited change in inequality, but with greater distances at the top compensating for smaller distances at the bottom. Table 3 allows us to investigate a more disaggregated picture, listing decile shares for household income per equivalent adult. The first row, taken as a memo item from table 2, provides the overall average $\mu(y)$. To

15. Although the average Gini coefficient for Chile in this period—with respect to distributions of household income per capita (see appendix C) for comparability—was 0.5539, a recently compiled international inequality database indicates that the average Gini in the 1980s (1990s) was 0.3323 (0.3375) in industrial countries and high-income developing countries; 0.2501 (0.2894) in Eastern Europe; 0.3501 (0.3188) in South Asia; 0.3870 (0.3809) in East Asia and the Pacific; 0.4045 (0.3803) in the Middle East and North Africa; 0.4346 (0.4695) in Sub-Saharan Africa; and 0.4975 (0.4931) in Latin America and the Caribbean (see Deininger and Squire 1996). Not only is Chile in a different league than industrial countries, or indeed than countries in Asia, but its Gini coefficient is higher than the Latin American average.

Table 2. *Monthly Household Income Per Equivalent Adult and Descriptive Statistics*

Statistic	*1987*	*1990*	*1992*	*1994*
Mean income[a]	67,232	75,007	90,797	93,981
Median income[a]	36,265	42,455	50,212	53,196
Gini coefficient	0.5468	0.5322	0.5362	0.5298
$E(0)$	0.5266	0.4945	0.4891	0.4846
$E(1)$	0.6053	0.5842	0.6151	0.5858
$E(2)$	1.3007	1.3992	1.5050	1.5634

a. In 1994 Santiago pesos.
Note: See text for definition of statistics.
Source: Authors' calculations.

Table 3. *Decile Income Shares of Household Income Per Equivalent Adult* (percent)

Income category	*1987*	*1990*	*1992*	*1994*
Mean income (1994 Santiago pesos)	67,232	75,007	90,797	93,981
Decile 1	1.34	1.39	1.52	1.43
Decile 2	2.41	2.57	2.60	2.57
Decile 3	3.17	3.33	3.38	3.36
Decile 4	3.97	4.19	4.16	4.18
Decile 5	4.88	5.14	5.04	5.14
Decile 6	6.04	6.28	6.16	6.33
Decile 7	7.66	7.92	7.73	7.93
Decile 8	10.24	10.39	10.16	10.55
Decile 9	15.71	15.51	14.82	15.76
Decile 10	44.58	43.28	44.43	42.73
Top percentile	12.02	12.35	13.68	12.41

Source: Authors' calculations.

derive the decile-specific mean income $\mu_d(y)$, simply note that $\mu_d(y) = 10s_d\mu(y)$, where s_d denotes the income share of decile d.

If one looks at the evolution of decile-specific means, calculated as above, one obtains a remarkable confirmation of the gains to all deciles from economic growth. In fact, every decile has seen its average income rise in every subperiod, with only two exceptions: the bottom and top deciles in 1994. This sustained increase in real incomes across the distribution, over a period of seven years, is an achievement most countries would be proud of.

As for the exceptions, the fall in mean income for the first decile in 1994 has been the subject of considerable debate in Chile since the data first became available. This study confirms that the decline also took place if the measure used is household income per equivalent adult. There seems to be little question that it was due, at least in part, to the decline in the overall rate of GDP growth, which was 11.8 percent in the second semester of 1992 and 4.3 percent in the same period of 1994. In particular, this cyclical deceleration—brought about largely by contractionary monetary policy aimed at curbing inflationary pressures—caused unemployment to increase from 4.8 percent to 6.5 percent.[16] The unemployment rate was much higher in the poorest quintile, relative to the other quintiles, rising there from 18 percent to 22 percent (see Cowan and De Gregorio 1996). Since labor earnings are such an important component of the incomes of the poor, the reduction in demand for unskilled labor, which is behind the rise in unemployment, is bound to have contributed to the recorded decline in their overall incomes.[17] This means, of course, that the sustained increases in social welfare achieved from 1987 to 1992 did not continue unambiguously through 1994, despite continued GDP growth. Similarly, some (low) poverty lines would indicate an increase in poverty from 1992 to 1994, as indeed is the case for some poverty measures with respect to the indigence line (reported in the next section).

Table 3 also sheds light on inequality, as depicted by decile shares. The overall impression is once again of a stable (mean-normalized) distribution, with changes in decile shares being generally small in proportion to the shares themselves. Nevertheless, there is some evidence of a trend of compression at the bottom of the distribution and increased dispersion at the top, certainly until 1992.[18] For the first three years in the sample the shares of the bottom three deciles rise, while those for deciles 8 and 9 fall. The top decile shows no trend, but there is some indication that incomes at the very top are climbing faster than others, with the share of the richest 1 percent of the population rising over the period.

However, 1994 does represent a break in this trend. The decline in mean incomes at the top and the bottom must imply a reduction in shares for deciles 1 and 10. Since the overall mean continued to grow, we do in fact see a reduction in the shares of the first three deciles. Those who gained were the middle classes, broadly defined as deciles 4 to 9. We must emphasize, however, that despite an absolute loss in income in the bottom decile—which does have implications for poverty and welfare—it would be wrong to conclude, as many commentators have, that inequality increased unambiguously from 1992 to 1994. Decile shares provide merely a (somewhat) disaggregated view of the distribution, rather than an accurate yardstick of inequality. There is no Lorenz dominance of 1992 over 1994, and, indeed, three of our four measures actually fall in that interval. From the evidence presented in this study, we could claim that inequality (defined so as to be consistent with the Pigou-Dalton transfer principle) worsened only if we choose $E(2)$ as the only measure that matters.

In closing this section, we turn to stochastic dominance analysis. As the preceding discussion illustrates, inequality comparisons of different distributions

16. These figures are from the three months ending with November (the CASEN survey month) of both years, according to Cowan and De Gregorio (1996).

17. See also Beyer (1995) for an interesting discussion of the patterns of employment and labor force participation in the first quintile.

18. The increased dispersion at the top of the distribution is suggested both by the rising share of the top percentile (shown in table 3) and by the sustained rise in the value of $E(2)$ (shown in table 2).

depend on the specific measures employed, and ambiguities are often inevitable. The concept of stochastic dominance, which originates from the analysis of financial risk, was introduced to the field of income distribution analysis to help establish when we can make unambiguous comparisons of inequality or social welfare.

Distribution *A* displays first-order stochastic dominance over distribution *B* if its cumulative distribution function $F_A(y)$ lies nowhere above and at least somewhere below that of *B*, $F_B(y)$. For any income level *y*, fewer people earn less than *y* in distribution *A* than in distribution *B*. If that is the case, a theorem due to Saposnik (1981) establishes that any social welfare function that is increasing in income will record higher levels of welfare in *A* than in *B*.

Distribution *A* displays second-order stochastic dominance over *B* if its deficit function—the integral of the distribution function $G(y_k) = \int_0^{y_k} F(y)dy$—lies nowhere above (and somewhere below) that of *B*. It is a weaker concept than its first-order analogue and is in fact implied by first-order dominance. Shorrocks (1983) has shown that if second-order stochastic dominance holds, any social welfare function that is increasing *and* concave in income will record higher levels of social welfare in *A* than in *B*.

The dominance criteria described above are alternative concepts suitable for comparing welfare. To measure inequality, we must abstract from the mean and concentrate on the dispersion of the distribution. For this purpose mean-normalized second-order dominance—also known as Lorenz dominance—is the appropriate concept. Distribution *A* is said to Lorenz-dominate distribution *B* if the Lorenz curve associated with *A* lies nowhere below, and at least somewhere above, that associated with *B*. A Lorenz curve is a mean-normalized integral of the inverse of a distribution function: $L(p) = \frac{1}{\mu(y)} \int_0^p F^{-1}(\pi)d\pi$. In other words, it plots the share of income accruing to the bottom *p* percent of the population against *p*. For a Lorenz curve *A* to lie everywhere above another *B* means that in *A* the poorest *p* percent of the population receive a greater share of the income than in *B*, for every *p*. Atkinson (1970) has shown that if this condition holds, inequality in *A* is lower than in *B* according to any inequality measure that satisfies the Pigou-Dalton transfer axiom.

Table 4 presents the results of these three types of dominance comparisons among the four years for which we have CASEN data, using both income concepts. We first made the comparisons at the percentile level of aggregation, and then checked the completely disaggregated sample, testing its statistical significance according to the endogenous bounds method of Howes (1993). The results (including their significance tests) for both the household income per capita and the household income per equivalent adult distributions are identical in every case except one. The exception is the (statistically insignificant) Lorenz dominance of

Table 4. *Welfare and Inequality Stochastic Dominance Comparisons*

Year	*1987*	*1990*	*1992*	*1994*
1987				
1990				
1992	F^*, S^*	S^*		
1994	F^*, S^*	F^*, S^*, (L)		

Note: A letter F, S, or L in cell (i, j) indicates that year i respectively first-order, second-order, or Lorenz dominates year j. The letter is inserted when dominance is found at the percentile level. An asterisk indicates that the dominance is statistically significant at the 95 percent confidence level over a range greater than or equal to 99 percent in Howes's endogenous bounds test for the complete sample, and hence that the hypothesis of no population dominance can be rejected at that level. Parentheses indicate that dominance was statistically insignificant.

Source: Authors' calculations.

1994 over 1990, which is found only for the per capita income distribution. All Lorenz comparisons for equivalized income display crossings.

We can immediately make two observations. First, there are a number of significant welfare dominance results below the diagonal, indicating that welfare rose unambiguously from some earlier to some later years. Second, with the exception of the statistically insignificant case of 1994 over 1990 for per capita income, there are no instances of Lorenz dominance. This suggests that, with the possible exception of an improvement between 1990 and 1994, inequality comparisons between the years in this period are ambiguous and will depend on the specific measure used. This result confirms those presented in table 2.

Much more can be said in terms of the evolution of social welfare. Since our measure of welfare depends entirely on income, as discussed in the introduction, we would expect rapid economic growth to have a powerful impact. Nevertheless, the dominance results are interesting because they tell us something about the distribution of the gains from growth across households. Rapid growth between 1987 and 1990, for instance, was not sufficient to lead to unambiguous welfare gains, because the poorest 1 or 2 percent of the population were worse off in 1990. Gains above the second or third percentile indicate that there was still a rise in the mean income of the first decile, as reported earlier in this section. The highly disaggregated nature of dominance analysis allows us to capture finer changes. This loss to the poorest people in Chile at the end of the 1980s means that welfare functions very sensitive to their circumstances would not show an increase in social welfare since 1987, despite the substantial increase in incomes elsewhere in the distribution.

Growth from 1990 to 1992 did not seem to have this perverse effect at the bottom of the distribution. Rises in income across every percentile ensured that both 1992 and 1994 first-order dominate 1987. Both years also second-order dominate 1990.[19] However, 1994 and 1992 cannot be ranked by either the first- or second-order criterion. This is because a decline in income for those below the

19. Because of a crossing above the ninety-ninth percentile, 1992 does not first-order dominate 1990. Except for the very rich, everyone (in an "anonymous" sense) was better off in 1992 than in 1990.

eighth or ninth percentile (which was sufficient to lower the mean income of the first decile, as discussed earlier) co-existed with gains for all other social groups. This welfare loss to the very poor means that we cannot say unambiguously that social welfare rose over the last two years in our sample. The loss was not sufficient, however, to outweigh gains to those at the bottom of the distribution since 1990: 1994 does first-order dominate both 1987 and 1990.

These results add rigor to our earlier analysis and broadly support its findings. The first fundamental feature of the period is economic growth, which led to welfare dominance of the last two years over the first two. On two occasions, however, economic growth failed to improve measured living standards for the most vulnerable people in society: from 1987 to 1990 and, more famously, from 1992 to 1994. For these two periods we cannot make such an unambiguous welfare comparison.

The second fundamental feature—the relative stability in the dispersion of the distribution, but with a slight compression at the bottom and a stretching at the top—is also compatible with the absence of significant Lorenz dominance results. Such changes in the shape of the density function, reducing distances in one part of the distribution while increasing them elsewhere, is exactly what causes different inequality indexes to rank distributions in opposite ways. Although this section emphasizes that the evidence on inequality is not sufficiently clear to identify any real tendency in either direction, so that the most appropriate description is one of broad stability or inconclusive changes, the (insignificant) Lorenz dominance of 1994 over 1990 for the per capita income distribution suggests that, if one were pushed to indicate a tentative direction for change in inequality over the period, it would more likely be downward.

III. The Evolution of Poverty

The high GDP growth rates that Chile achieved over this period undeniably contributed to a considerable reduction in poverty from the relatively high levels of the mid-1980s. In this section we present detailed results on the changes in the incidence of poverty between 1987 and 1994, relying on our adjusted data set and comparing the numbers for household per capita income with those for household income per equivalent adult. Although the general downward trend confirms previous findings (see, for example, Larranaga 1994 and Contreras 1995), these new numbers reflect our adjustments, such as the incorporation of regional price differences, the adoption of a new equivalence scale, and the improved treatment of domestic servants (see appendix A). Before presenting the specific results, we briefly discuss the derivation of the poverty lines, with respect to which all of the measures must be understood.

We use three poverty lines in this study, all of them expressed in 1994 Santiago pesos per month: an indigence line set at P$15,050, a lower-bound poverty line (L) set at P$30,100, and an upper-bound poverty line (H) equal to P$34,164. The first two are the official indigence and poverty lines widely used in Chile.

The incomes against which we compare them, however, differ from most earlier studies in that we have "converted" them to 1994 Santiago pesos, using as an "exchange rate" the regional price index in table A-1 and the November consumer price index The derivation of the upper-bound line is explained below.

All three lines are absolute poverty lines, deriving from a standard food basket specified by CEPAL. The basket is chosen so as to provide 2,187 Kcal per person per day, the national average caloric requirement, which is obtained from the demographic characteristics of the population and from the Food and Agriculture Organization/World Health Organization recommended caloric intakes for different age and gender groups. The specific commodity composition of the basket is based on the actual consumption patterns of a reference group chosen by CEPAL. The reference group is the third quintile, measured according to consumption expenditures, in the Household Expenditure Survey of 1987–88. It is valued at average prices for November 1994 in Santiago. The monthly cost of this standard CEPAL food basket has traditionally been used in Chile as an indigence (or extreme poverty) line, separating the hard-core poor—those whose current monthly incomes are insufficient even to purchase a minimum diet—from the rest of society. In 1994 this amount was P$15,050, which we report below as the indigence line.

International practice, however, deems the indigence line too strict a criterion to identify the poor. There are, after all, other basic expenditures in addition to food that everyone must make, such as shelter, clothing, and public transport. We apply a standard methodology to arrive at a sensible poverty line: we multiply the cost of the food basket by the inverse of the share of food in total expenditures (the Engel coefficient) for some suitable reference group. Based on the estimates of the Engel coefficient for the lower quintiles of the Chilean expenditure distribution, (reported in table 5), we adopt the standard value of 0.5, which implies a doubling of the indigence line, to arrive at the poverty line.[20] However, although table 5 is reassuring in that the coefficients vary little from total household expenditures to expenditures per capita (suggesting robustness with respect to the equivalence scale adopted), they are substantially lower for the concept of per capita income including imputed rent. Since this is the welfare concept that we adopt for a large part of our analysis, we feel that we cannot ignore its implications for poverty measurement.[21] Weighing the relevant coefficients for the first and second quintiles by 0.8 and 0.2, respectively, we derive an Engel coefficient of approximately 0.44. Applying its inverse (2.27) to the cost of the food basket yields our upper-bound poverty line (H) of P$34,164.

We also use the same three lines discussed above when computing poverty measures using the vector of real household incomes per equivalent adult. Given our choice of two-adult households as the reference type, the per capita poverty

20. Doing so has the important advantage of allowing some comparability with the findings of earlier studies, most of which have used this line.

21. We also could not ignore it since the household income per equivalent adult concept also includes imputed rents.

Table 5. *Engel Coefficients*

Quintile	*Total expenditures*	*Expenditures per capita*	*Income per capita (including imputed rent)*
1	0.530	0.539	0.451
2	0.494	0.489	0.397

Source: CEPAL (1996, p. 31, table 13).

line is unchanged for that household type. As with any equivalence scale designed to take account of different relative costs of children and of economies of scale, ours implies different per capita poverty lines for household types other than the reference. This reflects the re-ranking of households that the scale inherently causes. Table 6 sets out what our equivalence scale implies in terms of household and per capita poverty lines.

Let us now turn to the poverty measures. For a given poverty line, z, we can define different poverty indexes, each aggregating information on the living standards of those below the poverty line in different ways. We work with three of the most common measures, all of which can be expressed as members of the following parametric class, proposed by Foster, Greer, and Thorbecke (1984):

$$P_\alpha = \frac{1}{n}\sum_{i=1}^{n}\left[\max\left(\frac{z-y_i}{z},0\right)\right]^\alpha \tag{7}$$

where y_i is the income of the ith individual (of which there are n). The Foster-Greer-Thorbecke (FGT) measures are rather intuitive. As is well known, when $\alpha = 0$, P simplifies to p/n, the headcount index. When $\alpha = 1$, we get the normalized poverty deficit, and $\alpha = 2$ yields the FGT(2) measure, which incorporates some convexity to the distances between incomes and the poverty line, and is hence sensitive to inequality among the poor. Table 7 lists the values of each of these measures for the whole country, in each relevant year, for the distribution of household per capita income. Each index is listed for each of the three poverty

Table 6. *Implied Household and Per Capita Poverty Lines*

Household type	*Equivalence factor*	*Household poverty line*[a]	*Implied per capita poverty line*[b]
Single Adult	1.2	36,120	36,120
Couple	2.0	60,200	30,100
Couple + Child (age 0–4)	2.3	69,230	23,077
Couple + Child (age 5–10)	2.4	72,240	24,080
Couple + Child (age 11–15)	2.8	84,280	28,093
Couple + Child (age 0–4) + Child (age 11–15)	3.1	93,310	23,328

a. Equivalence factor x 30,100 = household poverty line.
b. Household poverty line / number of persons = implied per capita poverty line.
Source: Authors' calculations.

Table 7. *Poverty Measures for Household Income Per Capita*

Index	*1987*	*1990*	*1992*	*1994*
Indigence line, P$15,050				
Headcount	0.2209	0.1646	0.1403	0.0996
Poverty deficit	0.0756	0.0561	0.0325	0.0336
FGT (2)	0.0382	0.0295	0.0172	0.0184
Lower poverty line (L), P$30,100				
Headcount	0.5137	0.4427	0.3603	0.3386
Poverty deficit	0.2274	0.1838	0.1329	0.1269
FGT (2)	0.1299	0.1017	0.0681	0.0663
Upper poverty line (H), P$34,164				
Headcount	0.5679	0.5002	0.4206	0.3940
Poverty deficit	0.2647	0.2181	0.1637	0.1554
FGT (2)	0.1560	0.1240	0.0861	0.0831

Note: See text for definition of poverty indexes.
Source: Authors' calculations.

lines derived above. Table 8 is analogous to table 7, and lists the values of the same measures for the whole country, in each relevant year, for the distribution of household income per equivalent adult.

According to all three measures there has undoubtedly been a remarkable reduction in both poverty and extreme poverty from 1987 to 1994. Poverty in Chile was quite high in the mid-1980s, in the aftermath of the serious recession of 1982–84. Between 51 and 57 percent of the population lived in poverty in 1987, according to the per capita income concept, or 41–47 percent according to the income per equivalent adult concept.[22] By 1994 the figures were 34–39 percent for per capita income, or 23–29 percent for equivalized income.[23] The incidence of indigence fell from 22 to 10 percent according to the per capita concept, or 13 to 5 percent according to the equivalized concept.

22. These poverty ranges refer to the values with respect to the lower-bound and upper-bound poverty lines.

23. The poverty headcount figures for the per capita distribution are higher than those reported by several earlier studies (see Haindl 1996 for a survey). This is due primarily to the following methodological corrections that we make. First, some earlier studies report as a headcount the proportion of households below the poverty line. We report the proportion of individuals below the poverty line. Since poorer households tend to be larger, our method increases the figure. Second, incorporating regional price differences raises poverty since Santiago prices are the lowest in the country. Deflating incomes elsewhere to take this into account reduces their real incomes. Third, because we do not apply the arbitrary 0.66 factor to reduce prices in rural areas (see appendix A), we do not lower poverty lines for rural areas. We believe that there is no justification for that practice, particularly in light of the fact that reported figures for own consumption from household production among the rural poor do not appear to be unrealistic. The empirically baseless reduction of rural prices by an arbitrary factor might have been contributing to an underestimation of rural poverty. Finally, our inclusion of domestic servants as individuals with their own incomes—rather than those of their employers—might add some individuals to the ranks of the poor. See appendix A.

Table 8. *Poverty Measures for Household Income per Equivalent Adult*

Index	*1987*	*1990*	*1992*	*1994*
Indigence line, P$15,050				
Headcount	0.1268	0.0894	0.0474	0.0511
Poverty deficit	0.0412	0.0311	0.0174	0.0192
FGT (2)	0.0213	0.0176	0.0108	0.0118
Lower poverty line (L), P$30,100				
Headcount	0.4069	0.3306	0.2418	0.2308
Poverty deficit	0.1568	0.1196	0.0776	0.0762
FGT (2)	0.0822	0.0614	0.0376	0.0382
Upper poverty line (H), P$34,164				
Headcount	0.4726	0.3889	0.3000	0.2852
Poverty deficit	0.1905	0.1483	0.1006	0.0978
FGT (2)	0.1028	0.0777	0.0491	0.0492

Note: See text for definition of poverty indexes.
Source: Authors' calculations.

As others have pointed out before, the reductions were largest in the years of faster growth, from 1987 to 1992, and smallest in the more sluggish years of 1992–94. In fact, although all headcount indexes for the per capita income distribution record poverty reductions in 1992–94, as do the other two poverty measures, it is noteworthy that the poverty deficit and the FGT(2) measures for indigence actually record slight increases in extreme poverty between 1992 and 1994. The picture is even more severe for the equivalized income distribution, for which, in addition to increases in P_1 and P_2, the indigence headcount also rises, suggesting that the number of people living in extreme poverty increased from 1992 to 1994, despite continued economic growth. Furthermore, FGT(2) also rises (marginally) for the other two poverty lines as well.

This is a result of the decline in real incomes in the first decile of the income distribution (discussed in the previous section). Clearly, the closer a poverty line is to that decile, the likelier it is to record an increase in poverty, whereas more generous lines still record declines as a result of income gains to people in the second and third deciles. But even for those lines, poverty measures that are more sensitive to large distances between incomes and the poverty line (that is, those that place greater weight on greater destitution), such as FGT(2), are liable to have the losses at the very bottom outweigh gains closer to the upper poverty lines.

This picture of a considerable reduction in poverty throughout the period, albeit with some ambiguity between 1992 and 1994, is confirmed by stochastic dominance analysis. It has been shown that if a distribution A displays poverty mixed dominance [PMD(z^-, z^+)] over a distribution B, then any poverty measure that is decreasing in income, and satisfies the focus axiom and the transfer axiom (in situations where a crossing of the poverty line does not occur), will indicate that poverty is lower in A than in B for any poverty line between z^- and z^+.[24] This class of poverty measures includes all members of the FGT P_α class and

24. See Howes (1993) for a discussion, and Ferreira and Litchfield (1996) for an application to Brazil.

Table 9. *Poverty Mixed Stochastic Dominance Comparisons*

Year	*1987*	*1990*	*1992*	*1994*
1987				
1990				
1992	*P*	*P*		
1994	*P*	*P*		

Note: The letter *P* in cell (i, j) indicates that year i dominates year j.
Source: Authors' calculations.

is therefore particularly appropriate for this study. Poverty mixed dominance essentially requires that distribution *A* display second-order dominance over *B* from zero to the lower-bound poverty line (z^-), and first-order dominance from z^- to z^+. Table 9, which is analogous to table 4, presents the results for Chile, with z^- set at the indigence line and z^+ set at the upper-bound poverty line (*H*). As before, we checked dominance for both per capita income and income per equivalent adult; both concepts yield exactly the same results.

These results reveal that there was unambiguously less poverty in 1992 and in 1994 than in either 1987 or 1990, whether poverty is measured by the headcount, the poverty deficit, or indeed any of a host of other sensible poverty measures, and for any poverty line set between P$15,050 and P$34,164 per month in 1994 Santiago pesos. This sort of unambiguous poverty reduction, independent of the specific measure used and valid for such a large range of poverty lines, is not common. Its achievement confirms the widely held view that Chile has made substantial strides in the fight against poverty during the past decade.[25]

Yet there is also confirmation that growth did not lead to unambiguous poverty reductions in two subperiods: from 1987 to 1990 and from 1992 to 1994. On both occasions, although the headcount for the headline poverty line indicates a reduction in the number of poor people, there were income losses in the lowest percentiles of the distribution. These losses imply that some poverty measures in the wide class defined above would indicate increases in poverty for at least some of the poverty lines in the covered range. Indeed, in 1992–94 this was the case for all three indigence measures reported in table 8, for the equivalized income distribution. Still, the dominance of 1994 over both 1987 and 1990 indicates that the losses to some of the poor in the last two years were at least not sufficient to outweigh the gains made between 1990 and 1992.

Overall, there is no question that Chile's growth and social policies were tremendously successful in reducing the incidence, intensity, and inequality of poverty between 1987 and 1992, with the poverty deficits being roughly halved across all three poverty lines (a little less for per capita income, a little more for equivalized

25. All but one of the positive dominance results reported in table 9 follow directly from the first-order dominances reported in table 4. Table 9 contains new information only for the cases in which there was no dominance, as well as for the dominance of 1992 over 1990, the distribution functions of which clearly do not cross between z^- and z^+.

income).[26] The recent reversal in the performance of the poorest of the poor, between 1992 and 1994, does, however, provide a cautionary signal against complacency.[27]

IV. Conclusions

In presenting an overview of welfare, inequality, and poverty trends in Chile during 1987–94, this article has sought to establish a number of empirical conclusions that can be drawn with confidence from a careful treatment of the data. These can be summarized as follows. Chilean inequality is high by international standards, and it remained largely unchanged between 1987 and 1994. Scalar inequality measures—such as the Gini coefficient and the Theil index—varied little over the period, and there were no statistically significant Lorenz dominances between any of the years in the sample.

Within this broad picture of stability in inequality, however, there is some evidence that the shape of the density function may have altered slightly, with a compression at the lower tail (reducing bottom-sensitive inequality measures such as the mean log deviation), and an increase in dispersion at the upper tail (leading to rises in top-sensitive measures such as the coefficient of variation).

Economic growth has had a substantial and clearly beneficial impact, helping shift the distribution function to the right. Welfare, as measured by any reasonable social welfare function, was unambiguously higher in both 1992 and 1994 than it had been in either 1987 or 1990. Similarly, poverty was incontrovertibly lower. The bulk of these welfare improvements took place between 1987 and 1992, however, and the slowdown in growth and increase in unemployment after 1992 were associated with losses to the poorest 8 or 9 percent of the population. Although other social groups—including many of the poor—continued to gain, the losses at the very bottom of the distribution were associated with an increase in indigence between 1992 and 1994. Over the whole period, however, growth and other factors led to a remarkable decline in poverty, however it is measured, and for a wide range of plausible poverty lines. For some of these lines, headcounts and poverty deficits were halved from 1987 to 1994.

Although we have found that some assumptions underlying previous studies contributed to underestimating both poverty and inequality—whether by arbitrarily reducing prices when calculating poverty lines for rural areas, taking households rather than individuals as the unit of analysis, or ignoring live-in domestic

26. Larranaga (1994) decomposes the changes in poverty in Chile between 1987 and 1992 into a growth and a redistribution component, using a methodology of Datt and Ravallion (1992). Although he finds that some 80 percent of the reduction could be explained by the effects of growth, some of the changes were also due to a redistribution effect, which may have followed—at least in part—from the government's social policies and expenditures.

27. Although the unit record data set of the CASEN 1996 was not made available for this study, the tabulated findings reported by MIDEPLAN (1997) suggest that faster growth after 1994 led to a resumption of previous rates of poverty reduction and that inequality remained broadly stable.

servants—another important adjustment made in this study goes in the opposite direction, suggesting that previous reports may have overestimated poverty and inequality. We have found that both poverty and inequality measures for Chile are considerably reduced when household income is adjusted to take into account differences in needs between children and adults, and to take into account economies of scale inherent in the sharing of fixed costs within the household.

Space constraints prevented us from investigating the determinants of the structure of and the changes in inequality in Chile in this article. However, our previous work suggests that education is by far the most important candidate variable. Ferreira and Litchfield (1998) find that differences between groups partitioned by educational attainment explain a much greater share of overall inequality than do differences in any other household attribute, and that changes in returns to education appear to lie behind the reduction in bottom-sensitive inequality measures over the period (see also World Bank 1997).

In that paper we argue that the importance of increases in education and the stability of overall inequality, taken together, also suggest that Chile may have reached a dynamic equilibrium between rising demand for and supply of skills. This would explain the recent reversal (or flattening) of the upward trend in both earnings and personal income dispersion that other authors had identified for periods prior to 1990. With the profound political and economic changes of the 1970s and 1980s behind it, and regardless of its trade patterns, Chile's income distribution is, for the moment, calm.

Appendix A. The Data Set

The CASEN sampling methodology can be described as multi-stage random sampling with geographical stratification and clustering. The country is first divided into strata comprising the rural and urban sectors of each of the 13 regions.[28] The rural sectors are final-level strata. The urban sectors are further subdivided into three categories of towns, according to population: towns with between 2,000 and 9,999 inhabitants; towns with between 10,000 and 39,999 inhabitants; and towns with 40,000 or more inhabitants. All of the latter are sampled (that is, they are final-level strata). For other towns there is a level of clustering in the selection of towns for sampling. At this level, with selected small towns, all large towns, and the rural sectors, a first stage samples primary units (*zonas de empadronamiento*), with probabilities proportional to the population. A second stage samples households. This process is described in more detail in annex III to MIDEPLAN (1992). The sample sizes for our analysis are as follows: the 1987 sample includes 23,403 households; the 1990 sample consists of 26,248 households; the 1992 sample numbers 36,587 households; and the 1994 sample covers 45,993 households.[29]

28. For this purpose an urban area is any grouping of dwellings with a population in excess of 2,000.

29. These sample sizes are slightly larger than those reported in the official MIDEPLAN records of the surveys, reflecting our treatment of live-in domestic servants as separate households. See below.

Once each survey is completed, the data are entrusted to CEPAL, which conducts two types of adjustments to the raw figures. The first type corrects for nonresponses, which are made in three instances: when people who declare themselves employed report no income from their main occupation, when people who state that they receive an occupational or widow's pension do not report a value for this benefit, or when owner-occupiers of their domiciles do not report a value for imputed rent. In all three cases missing income values are replaced by the average value of the specific income variable in the group to which the household belongs, where the group is defined by a partition according to a number of variables, including region, gender of household head, educational attainment of household head, occupational sector, and category. See appendix 1 to CEPAL (1995) for details.

The second type of adjustment seeks to correct for underreporting or overreporting of different income categories, a common problem with household income surveys everywhere. For this purpose CEPAL uses as the reference point for aggregate income flows the Household Incomes and Expenditures Account of the National Accounts System (SCN) of the Central Bank of Chile. First, by a careful process the information in the original Central Bank accounts is converted to the income concepts surveyed by CASEN. Once that is achieved, totals by specific income category are compared for CASEN (with recourse to the appropriate expansion weights) and the national accounts. Finally, the proportional differences for each income category between the two sources are imputed uniformly to each income recipient in CASEN, with two notable exceptions: the adjustment in capital incomes is applied only to the top quintile (of households), proportionally to the primary incomes (*ingresos autonomos*) of all recipients there; and incomes from entitlement transfers and gifts are not adjusted.[30] The underlying assumption justifying this procedure is that misreporting differs fundamentally across income categories, rather than income levels.[31] In fact, the imputation would be strictly correct only if the income elasticity of misreporting within each income category was unitary. The only exception to this assumption, as noted, is in the treatment of capital incomes, which are imputed proportionally, but exclusively within the richest 20 percent of households. A detailed account of CEPAL's adjustment methodology, complete with the numbers used in each of the four years, is available in CEPAL (1995).

We also make three adjustments to the data set after it is processed by CEPAL. The income variable from the CASEN records on which our analysis is primarily based is total adjusted household income (YTOTHAJ), which includes all primary

30. It is suggested that the main reason for not adjusting entitlement transfers and gifts is that underreporting of transfers consists mostly of complete omissions of benefits by some households, rather than proportional underreporting of values by all recipients. There being no way to identify which households are omitting this information, no adjustment was found that would have improved the picture obtained from the survey.

31. It may be interesting to note that the proportional adjustments do vary substantially across income categories. In fact, imputed rents are consistently found to have been overreported and are adjusted downward in every survey.

income, monetary transfers,[32] and gifts, as well as imputed rent, after the CEPAL adjustments.[33] It is from this variable that we construct both of the income concepts listed above—household income per capita and household income per equivalent adult—by appropriate choice of denominator. Our first adjustment is in the treatment of live-in domestic servants. It is unclear how previous studies treated them, since YTOTHAJ is defined to exclude their incomes. Household-based studies are likely to have unwittingly excluded them from the sample altogether, by simply imputing YTOTHAJ to the household. For this article, in households with live-in domestic servants, all other members received YTOTHAJ divided by the appropriate denominator (their number in the per capita income case, or the equivalence scale defined over them), while the servants were treated as a separate household whose income was the sum of total adjusted individual incomes (YTOTHAJ) over them.

The second adjustment is to exclude from the analysis the three richest households in the 1994 sample. This decision was carefully considered, and was based on the impression that these households reported sufficiently disproportionate incomes to be regarded as genuine outliers.[34] This impression was reinforced by the fact that two of these households were identical in every respect, having clearly been double-sampled,[35] and by the position of the three households as outliers in a plot of the Pareto distribution of the top 1 percent of the sample.

The third adjustment, as described in section I, is to deflate all incomes by a regional price index. The values of the regional deflators are given in table A-1.

32. We believe that the questionnaire coverage of monetary transfers from the state, whether at the federal or municipal level, is exhaustive. Questions are asked and amounts are registered for the following benefits: *Asignaciones Familiares*, PASIS, SUF, *Subsidio al Consumo de Agua Potable*, and *Subsidio de Cesantia*. See MIDEPLAN (1996) for a description of each of these entitlement benefits. Other benefits, associated with formal employment, such as *jubilaciones, pensiones de invalidez*, and *montepios* are also included, although they are aggregated as part of primary, rather than secondary, income.

33. We would have liked to use an even broader income concept, which takes into account the values of the transfers in-kind that the government makes to many households through programs in the areas of education, health, and housing. Monitoring these expenditures is in fact one of the objectives of the CASEN, and an exercise of valuation of these benefits is carried out by MIDEPLAN, relying on answers to survey questions about the usage of services and on cost data provided by the relevant ministries. Although the methodology for these valuations is discussed in MIDEPLAN (1993) and a tabulation of the imputations is available for quintiles of households in MIDEPLAN (1994), the disaggregated imputations at the household level—which would have been necessary for our analysis—are not made available with the other CASEN variables. This is due to alleged problems of methodology and reliability. The results are therefore only available at the quintile level, for distributions of households, and are of very limited comparability with the distributions used in this study. One should bear in mind that the—often substantial—value of these services, many of which are targeted, is omitted from the income data, when interpreting the distributional results that follow, or attempting to draw any conclusions about the social policies followed during the period.

34. The value of $E(2)$—see below—when the outliers are included, is 6.58 in 1994. Its range over the other years is from 1.39 to 1.74.

35. The practice of imputing all values from one household (randomly selected within the cluster) to another when the latter has failed to respond, is often adopted as a way of maintaining representativeness within a small cluster. When the doubled household is the Rockefellers, the practice requires revision.

Table A-1. *Regional Price Indexes*

Region	*Price index*
I	1.2163
II	1.1668
III	1.1112
IV	1.0859
V	1.0420
VI	1.0269
VII	1.0136
VIII	1.0441
IX	1.0500
X	1.0383
XI	1.0856
XII	1.2208
XIII (RM)	1.0000

Appendix B. Inequality and Welfare Analysis for Per Capita Incomes Without Regional Price Deflation

Table B-1. *Descriptive Statistics for Household Income Per Capita with No Regional Price Adjustment*

Statistic	*1987*	*1990*	*1992*	*1994*
Mean income[a]	56,558	66,963	77,548	80,944
Median income[a]	29,803	36,520	41,793	45,116
Gini coefficient	0.5596	0.5523	0.5512	0.5429
$E(0)$	0.5624	0.5444	0.5310	0.5219
$E(1)$	0.6300	0.6401	0.6432	0.6079
$E(2)$	1.3726	1.7297	1.6227	1.6468

a. In 1994 Santiago pesos.
Note: See text for definition of statistics.
Source: Authors' calculations.

Table B-2. *Decile Income Shares for Household Income Per Capita with No Regional Price Adjustment*
(percent)

Income category	*1987*	*1990*	*1992*	*1994*
Mean income (1994 Santiago pesos)	56,558	66,963	77,548	80,944
Decile 1	1.24	1.30	1.44	1.35
Decile 2	2.20	2.33	2.39	2.36
Decile 3	2.96	3.09	3.16	3.15
Decile 4	3.78	3.93	3.94	4.00
Decile 5	4.73	4.88	4.86	5.00
Decile 6	5.95	6.12	6.09	6.26
Decile 7	7.67	7.74	7.72	7.94
Decile 8	10.41	10.25	10.19	10.65
Decile 9	16.02	15.50	15.05	15.92
Decile 10	45.04	44.85	45.16	43.36
Top percentile	12.44	13.52	14.08	12.82

Source: Authors' calculations.

Table B-3. *Poverty Measures of Household Income per Capita with No Regional Price Adjustment*

Index	*1987*	*1990*	*1992*	*1994*
Indigence line, P$15,050				
Headcount	0.2132	0.1417	0.0968	0.0928
Poverty deficit	0.0726	0.0479	0.0303	0.0313
FGT(2)	0.0367	0.0255	0.0163	0.0173
Lower poverty line (L), P$30,100				
Headcount	0.5053	0.4151	0.3456	0.3212
Poverty deficit	0.2214	0.1657	0.1259	0.1191
FGT(2)	0.1258	0.0898	0.0641	0.0620
Upper poverty line (H), P$34,164				
Headcount	0.5584	0.4725	0.4068	0.3774
Poverty deficit	0.2584	0.1989	0.1558	0.1465
FGT(2)	0.1515	0.1106	0.0814	0.0779

Note: See text for definition of poverty indexes.
Source: Authors' calculations.

Appendix C. Inequality and Welfare Analysis for Per Capita Income

For comparability purposes this appendix replicates some of the analysis described in section II for household income per equivalent adult, using instead the distributions of household income per capita. This is intended not only to show that the main results of the paper are remarkably robust to the choice of unit, but also to enable comparisons with other studies found in the earlier Chilean literature.

Table C-1 is analogous to table 2, and reports mean and median incomes, as well as the same four inequality measures, for the per capita distributions. Two changes from table 2 are noteworthy. First, there is a decrease in the absolute values of the mean and median incomes for each year, which follows from the fact that there are many more households for which the denominators are reduced by the application of the equivalence scale used in section II, than there are households for which they are increased.[36] Second, all inequality measures are higher for this distribution than for the distribution of income per equivalent adult. This is in keeping with international experience, where it has been repeatedly found that the per capita income distributions generate upper-bound values for inequality, when compared to other assumptions about differences in needs and economies of scale within the household (see Coulter, Cowell, and Jenkins, 1992, and Ferreira and Litchfield 1996). The reason is essentially that large households, or those with many small children, are re-ranked upward from the per capita to the equivalized distribution, with the usual impact of reducing overall disparities.

36. Only single-person households would have an increased denominator and would have lower entries in the distribution of income per equivalent adult than in the per capita distribution.

Table C-1. *Descriptive Statistics for Household Income Per Capita*

Indicator	*1987*	*1990*	*1992*	*1994*
Mean income[a]	55,367	63,293	75,371	78,281
Median income[a]	29,148	34,153	40,378	43,277
Gini coefficient	0.5603	0.5563	0.5534	0.5454
E(0)	0.5611	0.5495	0.5287	0.5212
E(1)	0.6349	0.6509	0.6551	0.6194
E(2)	1.3903	1.7447	1.6680	1.7121

a. In 1994 Santiago pesos.
Note: See text for definition of the statistics.
Source: Authors' calculations.

Despite those changes in level, there are no modifications to the perceived trends in inequality: the Gini still suggests a slight downward trend, but it is basically stable. The Theil index, too, is trendless. The mean log deviation continues to indicate a reduction in bottom-sensitive inequality, and the $E(2)$ continues to point to a gradual increase in top-sensitive inequality. This picture is broadly confirmed by the shares of each decile in the distribution of household income per capita, as revealed by table C-2.

Table C-2. *Decile Income Shares for Household Income Per Capita*
(percent)

Income category	*1987*	*1990*	*1992*	*1994*
Mean income	55,367	63,293	75,371	78,281
Decile 1	1.21	1.21	1.35	1.28
Decile 2	2.19	2.26	2.35	2.33
Decile 3	2.95	3.03	3.13	3.11
Decile 4	3.77	3.87	3.91	3.96
Decile 5	4.72	4.84	4.83	4.96
Decile 6	5.94	6.07	6.05	6.22
Decile 7	7.66	7.71	7.70	7.91
Decile 8	10.37	10.25	10.18	10.60
Decile 9	15.89	15.49	14.97	15.95
Decile 10	45.30	45.26	45.63	43.66
Top percentile	12.54	13.60	14.31	12.94

Source: Authors' calculations.

REFERENCES

The word "processed" describes informally reproduced works that may not be commonly available through library systems.

Atkinson, A. B. 1970. "On the Measurement of Inequality." *Journal of Economic Theory* 2(3): 244–63.

Becker, Gary. S. 1965. "A Theory of the Allocation of Time." *Economic Journal* 75: 493–517.

Beyer, H. 1995. "Logros en la Pobreza; Frustracion en la Igualdad?" *Estudios Publicos* 60(1):15–33.

CEPAL (United Nations Economic Commission for Latin America and the Caribbean). 1995. "La Medicion de los Ingresos en la Perspectiva de los Estudios de Pobreza: El caso de la Encuesta CASEN de Chile: 1987–1994." CEPAL Working Paper LC/R1604. Santiago. Processed.

_____. 1996. "La Sensibilidad del Indicador de Pobreza." CEPAL Working Paper LC/R1657. Santiago. Processed.

Chauduri, Shubham, and Martin Ravallion. 1994. "How Well do Static Indicators Identify the Chronically Poor?" *Journal of Public Economics* 53(3):367–94.

Comision Nacional de Justicia y Paz. 1996. "Es Chile un Pais Equitativo?" Area Pastoral Social de la Conferencia Episcopal de Chile. Santiago. Processed.

Contreras, Dante. 1995. "Poverty, Inequality and Welfare in Chile: 1987–1992." Department of Economics, Universidad de Chile. Processed.

Coulter, F. A. E, F. A. Cowell, and S. P. Jenkins. 1992. "Equivalence Scale Relativities and the Extent of Inequality and Poverty." *Economic Journal* 102(414):1067–82.

Cowan, K., and J. De Gregorio. 1996. "Distribucion y Pobreza en Chile: Estamos mal? Ha habido progresos? Hemos retrocedido?" Ministerio de Hacienda de Chile. Santiago. Processed.

Cowell, F.A. 1995. *Measuring Inequality*. Second Edition. Hemel Hempstead: Harvester Wheatsheaf.

Datt, Gustav, and Martin Ravallion. 1992. "Growth and Redistribution Components of Changes in Poverty Measures." *Journal of Development Economics* 38(2):275–95.

Deaton, Angus. 1997. *The Analysis of Household Surveys: Microeconometric Analysis for Development Policy*. Baltimore, Md.: The Johns Hopkins University Press.

Deininger, Klaus, and Lyn Squire. 1996. "A New Data Set Measuring Income Inequality." *The World Bank Economic Review* 10(3):565–91.

Edwards, Sebastian, and A. C. Edwards. 1987. *Monetarism and Liberalization: The Chilean Experiment*. Chicago: University of Chicago Press.

Ferreira, Francisco H. G., and Julie A. Litchfield. 1996. "Growing Apart: Inequality and Poverty Trends in Brazil in the 1980s." LSE STICERD DARP Discussion Paper 23, Suntory and Toyota International Centres for Economics and Related Disciplines, London School of Economics, London.

_____. 1998. "Calm After the Storms: Income Distribution in Chile, 1987–1994." Policy Research Working Paper 1960, Development Research Group, World Bank, Washington, D.C.

Foster, James. E., Joel Greer, and Erik Thorbecke. 1984. "A Class of Decomposable Poverty Measures." *Econometrica* 52(3):761–66.

Haindl, E. 1996. "Poverty and Income Distribution in Chile: A Survey." World Bank, Washington, D.C. Processed.

Howes, S. R. 1993. "Income Distribution: Measurement, Transition and Analysis of Urban China, 1981-1990." Ph.D. dissertation, London School of Economics.

Larranaga, Osvaldo. 1994. "Pobreza, Crecimiento y Desigualdad: Chile, 1987–1992." *Revista de Analisis Economico* 9(2):69–92.

Londono, J. L., and M. Szekely. 1997. "Persistent Poverty and Excess Inequality: Latin America during 1970–1995." Office of the Chief Economist, Inter-American Development Bank, Washington, D.C. Processed.

Marcel, M., and Andres Solimano. 1994. "The Distribution of Income and Economic Adjustment." In B. P. Bosworth, Rudiger Dornbusch, and Raul Laban, eds., *The Chilean Economy: Policy Lessons and Challenges*. Washington, D.C.: The Brookings Institution.

Meller, P. 1996. "Trade Liberalization and Wage Differentials in Chile." Paper presented at the XIV Latin American Econometric Society Meetings, Rio de Janeiro, August. Processed.

MIDEPLAN. 1992. *Poblacion, Educacion, Vivienda, Salud, Empleo y Pobreza: CASEN 1990*. Santiago: Ministerio de Planificacion y Cooperacion.

_____. 1993. *Programas Sociales: Su impacto en los hogares chilenos, CASEN 1990*. Santiago: Ministerio de Planificacion y Cooperacion.

_____. 1994. *Integracion al Desarrollo: Balance de la politica social, 1990–1993*. Santiago: Ministerio de Planificacion y Cooperacion.

_____. 1996. *Balance de Seis Anos de las Politicas Sociales: 1990–1996*. Santiago: Ministerio de Planificacion y Cooperacion.

_____. 1997. "Pobreza y Distribucion del Ingreso en Chile, 1996: Resultados de la CASEN." Santiago. Processed.

Montenegro, C. 1996. "The Structure of Wages in Chile, 1960–1993: An Application of Quantile Regressions." Inter-American Development Bank, Washington, D.C. Processed.

OECD (Organisation for Economic Co-operation and Development). 1982. *The OECD List of Social Indicators*. Paris.

Ravallion, Martin, and Benu Bidani. 1994. "How Robust is a Poverty Profile?" *The World Bank Economic Review* 8(1):75–102.

Riveros, L. 1983. "Distribucion del Ingreso en el Gran Santiago." *Revista de Economia*, 9, Universidad de Chile.

Robbins, D. 1994. "Worsening Relative Wage Dispersion in Chile During Trade Liberalization and its Causes: Is Supply at Fault?" Harvard Institute for International Development, Cambridge, Mass. Processed.

_____. 1995. "Relative Wage Structure in Chile, 1957–1992: Changes in the Structure of Demand for Schooling." *Estudios de Economia* 21(1):51–78.

_____. 1996. "HOS Hits Facts: Facts Win. Evidence on Trade and Wages in the Developing World." Harvard Institute for International Development, Cambridge, Mass. Processed.

Saposnik, R. 1981. "Rank-Dominance in Income Distribution." *Public Choice* 36(1):147–51.

Scott, C. 1996. "The Distributive Impact of the New Economic Model in Chile." In V. Bulmer-Thomas, ed., *The New Economic Model in Latin America and its Impact on Income Distribution and Poverty*. London: Macmillan.

Sen, Amartya K. 1981. *Poverty and Famines: An Essay on Entitlement and Deprivation.* Oxford: Clarendon Press.

Shorrocks, A. F. 1983. "Ranking Income Distributions." *Economica* 50(1):3–17.

UNDP (United Nations Development Programme). 1996. *Desarrollo Humano en Chile, 1996.* Santiago.

Wood, Adrian. 1997. "Openness and Wage Inequality in Developing Countries: The Latin American Challenge to East Asian Conventional Wisdom." *The World Bank Economic Review* 11(1):33–57.

World Bank. 1997. *Chile—Poverty and Income Distribution in a High-Growth Economy: 1987–1995.* Report 16377-CH, Latin America and the Caribbean Region, Washington, D.C.