Public Programs Pare Poverty: Evidence from Chile

David Glick
Brandeis University

Nidhiya Menon*
Brandeis University

Version: December 10, 2008

Abstract

This study examines the effect of government health care and education programs on the poor in Chile from 2000 to 2006. Results are obtained from a country-wide provincial level panel data-set with information on poverty and indigence head-count ratios, measures on the severity of poverty as captured by the Foster-Greer-Thorbecke P_2 statistic, per capita public expenditures on health and education, as well as other variables that are thought to influence well-being. We use fixed-effects techniques to correct for time-invariant province-specific characteristics that may affect program placement. Our analysis demonstrates that per capita public health and education expenditures significantly reduce the incidence of poverty and indigence in Chile. In particular, for a 10,000 pesos (about $23) increase in provincial per capita health spending, the poverty head-count ratio decreases by 0.48%. Per capita education expenditures are particularly important to reducing the severity of poverty. Our results indicate that for a 10,000 pesos increase in education spending, the severity of poverty declines by as much as 1.53%. Furthermore, we provide evidence that public spending in Chile is non-random. In particular, government education expenditures may be allocated in keeping with compensatory motives.

Keywords: Public Expenditures, Program Evaluation, Chile, Poverty, Indigence

JEL Classification: H51, H52, O12

We are indebted to Michael Coiner and Javier Urcid for comments on an earlier draft. Thanks also to two anonymous referees whose comments have greatly improved the paper. This paper is a modified version of Glick's senior honors thesis at Brandeis University. The usual caveat applies.
*Corresponding author: Assistant Professor, Department of Economics & International Business School, MS 021, Brandeis University, Waltham, MA 02454.

Section 1: Introduction

The Chilean governments of the 1990s and 2000s have focused heavily on poverty eradication as part of their development strategy. Much of the investment in socioeconomic development has been financed from Chile's economic growth, and many of the targets have been in accordance with the World Bank's Millennium Development Goals. By 2015, Chile hopes to reduce the percentage of its citizens living in absolute poverty (widely measured as those earning less than one dollar per day) to 1.7% from 3.5% in 1990, as well as continue to reduce poverty rates beyond the 50% reduction that has already occurred since 1990 (Gobierno de Chile, 2005a). However, it is not easy to enact public spending policies to meet these targets. This is because given resource scarcities in developing countries, finding capital to finance projects can be difficult. Determining whether government spending can reduce poverty in Chile, and measuring the efficaciousness of public expenditures, is of use to policy-makers in targeting investments appropriately. This is the aim of our research.

In this study, we investigate changes in poverty in Chile in recent years, and in particular, the role of public spending (on health care and education) in reducing poverty. The health care and education investments we analyze affect poverty and indigence (extreme poverty) by increasing human capital investments, and by equipping individuals with the means to secure better income-earning opportunities. Health care and education investments complement one another. As Contreras and Larrañaga (2001) suggests, insufficient income (poverty) may be due to a lack of income-generating assets, as well as to a low return on the assets already possessed. Human capital, broadly defined as the stock of productive capacities and knowledge of an individual, is the main asset associated with income-earning potential. Thus health and education investments may have direct and indirect effects on poverty alleviation. The direct effects result when such investments reduce poverty where poverty is broadly defined as a paucity of resources that buttress individual capabilities and performance. By incrementing human capital and by enhancing the income-earning potential of individuals, health and education investments may also have

additional indirect effects on poverty reduction. Furthermore, as noted in Helwege (1995), such investments engage the economy in a virtuous cycle whereby greater social equality stimulates economic growth crucial for future reductions in poverty. By studying public health and education expenditures, and by evaluating their potency in improving welfare, this research sheds light on an important avenue for poverty alleviation in Chile.

Our empirical evaluation of data from Chile reveals that public spending has strong mitigating effects on poverty and indigence. Correcting for the endogeneity of program placement using fixed-effects (FE) techniques, we find that provinces that have received more per capita social expenditures in health care and education are associated with lower levels of poverty and indigence. Our estimates indicate that for a 10,000 pesos (about $23) increase in provincial per capita health spending, the poverty head-count ratio decreases by 0.48%.[1] Furthermore, per capita education expenditures are found to have an ameliorating effect on indigence. Results indicate that for a 10,000 pesos increase in per capita education spending, indigence head-count ratios decline by about 0.59%. Per capita education spending is also critical for reducing the severity of poverty since our estimates suggest that for a 10,000 pesos increase in this type of public spending, the severity of poverty declines by as much as 1.53%.

In order to highlight the bias that results from ignoring the non-random nature of program placement, we estimate ordinary least squares (OLS) models that treat programs exogenously. A comparison of the OLS and FE estimates clearly shows the bias in the former set of results. Moreover, we undertake a joint estimation of program impacts since correlation matrices reveal that program placement tends to be clustered. Finally, we evaluate the "rules" that the government uses in allocating

[1] The average of per capita health care spending across the years of our data is about 14,600 pesos. Hence an increase of 10,000 pesos or about 69% is quite large. However, average of per capita education spending in our data is 76,000 pesos. So a 10,000 pesos increase is only about a 13% increase in this case. We maintain the 10,000 pesos benchmark in order to be consistent across our two measures of government spending. Moreover, health and education spending in the CASEN data are reported in thousands of pesos. These numbers had to be scaled by ten (the transformed numbers are thus interpreted in units of 10,000) in order to keep the coefficients to a size comparable to other coefficients in the model.

public programs at regional levels. This evaluation confirms that government programs are not allocated randomly; in particular, regions with poor latent endowments are more likely to receive compensatory investments in education.

Section 2: Previous Research and Facts about Poverty and Public Spending in Chile

Poverty reduction in Chile has been significant, particularly in relative terms. Previous literature indicates that from 1990 to 2000, the percent of the Chilean population living in total poverty (poverty and indigence) fell drastically from 39% to 20% (see figure 1 where the "Poverty" line measures "poverty but not indigence" and the "Indigence" line measures "indigence only"), while Latin America as a whole experienced a much smaller reduction in overall poverty (from 48% to 44%) throughout the same time-span. This decline in poverty rates may be attributed to several factors including Chile's high annual GDP growth rate of 6.1%, reduction in inflation by more than 23%, and the 8% average annual growth rate of total social public expenditures between 1990 and 2000 (Foxley, 2004).[2] Although economists have stressed the importance of macroeconomic factors such as the high rate of economic growth in Chile's development success, as this research finds, microeconomic factors such as per capita increases in social spending have also been beneficial for Chile's poor.

A brief history of economic growth and public spending in Chile is useful in setting the context for this research. Chile's sustained growth during the 1990s can be attributed to the social investments of the *Concertación*.[3] After the seventeen-year reign (1973-1990) of the Chilean dictator Augusto Pinochet, the succeeding governments of Patrico Aylwin (1990-1994) and Eduardo Frei (1994-2000) focused heavily on increasing social expenditure. Spending on social programs more than doubled in real terms between

[2] Foxley (2004) notes that official government estimates, like those depicted in figure 1, may be suspect. The purpose of figure 1 is only to illustrate general over-arching trends in poverty and indigence in Chile over time; the numbers themselves (shown in figure 1) are not used in the analysis of this research.

[3] The *Concertación*, or officially the *Concertación de Partidos por la Democracia* (Coalition of Parties for Democracy), is an alliance of left-center political parties in Chile that has won all presidential elections since 1990.

1989 and 1997. In this time period, health and education investments (mostly ignored under Pinochet) increased by 179.3% and 115%, respectively (Weyland, 1999). In fact, during Pinochet's military regime, not a single new hospital was built. The succeeding democratic governments of the *Concertación* took great efforts to correct this by investing in hospitals, housing, education, and pension reform. Much of the increase in public spending was financed by the 1990 tax reforms, as well as the increased government revenues from high levels of exports and economic growth. Weyland (1999) underlines the importance of social spending by noting that each percentage point of economic growth contributed 50% more towards reducing poverty under the *Concertación* from 1990 to 1996 (with high levels of social expenditure), than under the military regime from 1987 to 1990 (with low levels of social expenditures). Moreover, even when GDP growth fell from 6.6% in 1997 to -1.1% in 1999, poverty rates continued to decline. This was primarily because the yearly growth rate of social expenditures rose from 5.6% to 7.8% of GDP during this time period. These numbers indicate that social spending plays a key role in curtailing poverty.

Information on provincial-level determinants of spending in Chile is limited. However, as expected, at the country level, social programs have been targeted towards the poor. This has mainly been with a view to reducing overall income inequality rather than poverty alleviation per se. These social programs include expenditures on pensions, housing, health, and education. Health expenditures in the late 1990s, in particular, have been found to reduce inequality (World Bank, 1997).

Reductions in poverty and income inequality depend on identification of the poor, and the standard identifier of poor households in Chile is the "CAS-2 Card" which households request. The CAS-2 Card judges the poverty status of households based on their self-reported income and housing measures – in particular, construction materials used, and access to drinking water (Agostini and Brown, 2007). The total number of people living in a household is another criterion that is used by the CAS-2 card to judge the vulnerability status of a household. Using information provided by the CAS-2 card, a

household is assigned a score which remains valid for three years.[4] Five types of government subsidies are provided to poor households based on this card. These include the family subsidy, the assistance pensions, *Chile Solidario*, water and sewage subsidy, and unemployment subsidies.[5] The government per capita expenditure variables that we use in this research include subsidies dispensed under several of these categories.[6] Moreover, as noted in Beyer (1997) and Valdes (1999), the CAS-2 card is also used to identify specific areas where schools and health clinics would be of most value to the poor.[7] The fact that subsidies are decided, indeed, are targeted by measures in the CAS-2 card, clearly suggests that public spending occurs in a non-random fashion. For example, governments may spend more in regions with households that have disproportionately lower score values for the CAS-2 card (altruism). As noted in Soto and Torche (2004), the regional concentration of poor households between 1982 and 1992 was the primary determinant of public housing expenditure in the following decade. Furthermore, self-reported measures may be subject to manipulation; households may purposely under-report in order to avail of subsidies (demand). There is some evidence for this in Agostini and Brown (2007), where it is found that a proportionately larger share of transfers (using data from 2003) went to households in the top half of the income distribution. Misrepresentation may occur at higher levels of aggregation as well. For example, Gobierno de Chile (2005b) states that although municipalities know best what their needs are, decisions regarding development spending are taken at the nation-wide level. As a consequence, "…municipalities have an incentive to exaggerate their list of planned projects…" (author's translation), presumably in order to influence government spending (Gobierno de Chile, 2005b). For all these reasons, public expenditures may not be random, and may be subject to mismanagement and mis-targeting resulting from

[4] We thank a referee for pointing out that the CAS-2 card was replaced by another set of evaluation criteria in 2007. However, the CAS-2 card was the benchmark used at the time the data we study in this research were collected.
[5] Agostini and Brown (2007), which evaluates conditional cash transfers in Chile, has more details on these subsidies.
[6] More specifically, the public spending variables we consider include expenditures on education and health care over and above those dispensed under these five subsidy categories. A part of the public health care spending we analyze represents aid provided under the family subsidy (health care support for pregnant women and those with young children), and assistance pensions programs (provision of free health care cards to the elderly).
[7] We thank a referee for highlighting this point.

the correlation of the government spending variables with area specific heterogeneity. Hence public expenditures cannot be treated exogenously in most evaluation exercises.

Although the degree of targeting of government expenditures may have worsened in recent years, this was not the case in earlier decades. Estimates for 1990 from Chile's *Ministerio de Planificanción* (MIDEPLAN) indicate that with the exclusion of pension payments, the lower 40% of households (45% of the total population) received about 64% of social benefits provided by the government (World Bank, 1997). Another study from the same time-period indicates that the lowest twenty percent's share of social expenditures increased from 15% in 1980 to 19% in 1990 (Tanzi, 1996). Although targeting of social expenditures was relatively accurate in earlier years, there was already some evidence that the distributional repercussions of such spending may not have been uniform. For example, in response to an overhaul of the public health system, medical treatment opportunities appear to have improved disproportionately more for the relatively less-poor households in Chile (World Bank, 1997). Similarly, social reforms have also been associated with increases in inequalities related to educational outcomes (World Bank, 1997). These examples illustrate that although Chile's vulnerable population as a whole attracted the majority of public-sector spending in the 1990s, there may have been relative differences *among* the poor in amounts received and outcomes experienced. As in the case of other developing countries, government allocation decisions in Chile (amount received by different strata of the poor) may have been guided by response to demand and/or altruistic concerns (Pitt et al., 1993). Taking such considerations into account is important in accurately assessing the effect of public spending on poverty.

Several studies have examined the link between government expenditures and poverty reduction (Lipton and Ravallion, 1995; Datt and Ravallion, 1997; Castro-Leal, Dayton, Demery, and Mehra, 1999; Fan, Hazell, and Thorat, 2000; Yao, 2000; and Foxley, 2004). The majority of these investigations have adopted a macroeconomic perspective, considering the impact of investments and current spending on the poor in both the agricultural and non-farm sectors. Macroeconomic growth, defined simply as rise in a

country's gross domestic product (GDP), has been thought to be the main tool for fighting poverty. In this vein, studies of Chilean poverty reduction since 1990 have focused on the overall success of the rapid economic growth that Chile experienced in the last two decades. One empirical study comparing social policies in Chile shows that roughly 60% of the poverty reduction throughout the 1990s can be attributed to economic growth; another study from 1987 to 1996 finds that this number could be as high as 85% (Foxley, 2004; Attanasio and Székely, 2001).

Although economic growth has been important in ameliorating poverty in Chile, Contreras et al. (2001) suggests that social policies have also played an important role. Moreover, in addition to reducing poverty, Contreras et al. (2001) indicates that social policies in Chile have had positive spillover effects in reducing income inequality as well.[8] By imputing income transfers for government subsidies in health, education, and housing, Contreras et al. (2001) indicates that the Gini coefficient in 1998 fell from 0.56 to 0.50. The study concludes that the impact of social spending improved over the 1990s, primarily because of increases in budgetary allocations to government programs over that time-span.

Despite the recognition that social expenditures are critically important for eradicating poverty and for improving income inequality, relatively few studies have investigated the *microeconomic* impact of social spending in Chile. Furthermore, existing research suggests (but does not correct for the fact) that the placement of programs financed by the government of Chile may occur in a systematic, non-random fashion. In an analysis of policies that affect competition in Chile, Galetovic (2007) argues that the central government enjoys a wide mandate in deciding the implementation of laws that affect a large variety of things (taxes, environmental policies, labor policies, and regulatory standards). Given this, it is likely that public spending on health and education also occurs at the government's discretion. As noted

[8] In a study of inequality, Szekely (2000a) argues that targeted expenditures in the form of programs to alleviate poverty are critically important for improving equity in income levels in all of Latin America.

above, this implies that evaluation exercises in which programs are treated exogenously provide inaccurate results.

This research contributes to the literature in two ways. First, using micro-data from Chile, this study employs fixed-effects techniques to correct for endogeneity in program placement in evaluating the impact of public programs. This is an improvement on previous work that has, for the most part, largely ignored the presence of area specific heterogeneity which may bias results. Second, we study government "location rules" that may determine the distribution of publicly-financed programs. We confirm that government spending occurs in a non-random fashion since per capita education expenditures are found to be allocated in a compensatory manner. By undertaking a disaggregate study of the effects of public spending in Chile that conditions on the non-randomness of program placement, and by evaluating rules that underlie the distribution of public expenditures, this research addresses a gap in the literature on program evaluation in Latin America.

Section 3: Data

Panel data are necessary to study the effects of public expenditures and the relationship between program placement and provincial endowments. We construct the required panel using information from 2000, 2003, and 2006. The source of Chilean government spending data is the Chilean *Balances de Ejecución Presupuestario – BEP Educación y Salud* (Executed Budgetary Balances – Education and Health). GDP per capita data is obtained from the *Banco Central de Chile* (Central Bank of Chile). Poverty and indigence statistics are obtained from *La Encuesta de Caracterización Socioeconómica Nacional* (CASEN – The National Socioeconomic Characterization Survey), carried out by the *Ministerio de Planificanción* (MIDEPLAN – Ministry of Planning).[9,10] The CASEN surveys were conducted in

[9] We use the poverty and indigence statistics that are provided directly by the CASEN surveys for 2000, 2003, and 2006. As noted (Szekely et al. (2000b)), treatment of missing and zero incomes as well as adjustment for misreporting can change poverty statistics significantly. We abstract from these issues since we use the same source of data for the three years we

65,036 homes in 2000, in 68,153 homes in 2003, and in 73,720 homes in 2006, across all provinces of the country. Multi-stage random sampling techniques with regional stratification are used to collect data in the CASEN surveys. These surveys are considered to be nationally and regionally representative. All other data are collected from the *Instituto Nacional de Estadísticas* (INE – National Institute of Statistics).

A brief description of Chile's administrative set-up is warranted. As of early 2007, Chile is divided into 13 regions.[11] Each region is headed by a supervisor appointed by the president. Regions are numbered 1 through 13 from north to south, with the exception of region 13 (the Metropolitan Region of Santiago) which is located in the center of the country. These 13 regions are sub-divided into 3-7 provinces each, for a total of 51 provinces in the country. Each province is further divided into communes (346 in total) and municipalities (345 in total).

The CASEN surveys differentiate poor households from indigent households. *Poor but not indigent* households are "those whose incomes do not reach a level to satisfy the basic needs (food and non-food inputs) of (their) members" (Gobierno de Chile, 2005a). *Indigent* households are those for whom "when all of the income is directed towards satisfying the food needs of members, it still does not adequately cover them" (Gobierno de Chile, 2005a). Information on poverty lines in Chile indicate that in

---

study, and so assume that in calculating poverty measures, the same benchmark was used across all years. Furthermore, we do not undertake a comparison *across* poverty measures provided by different sources in this study. However, since the use of different benchmarks could influence poverty statistics as detailed in Szekely et al. (2000b), our results may only be partially applicable to poverty measures from other sources.

[10] In pooling the cross-sectional CASEN (and other) data from 2000, 2003, and 2006, we implicitly assume that the data are consistent over the three years we consider. Our assumption is grounded in the fact that that the political and economic situation in Chile was comparable in 2000, 2003, and 2006. This is because Ricardo Lagos became president in 2000 and remained in office until March 2006. Michelle Bachelet took office in March 2006 and remains president today. Both Lagos and Bachelet are members of the Socialist Party of Chile, so the political party in power (and thus its political and social agenda) has remained unchanged during the years of our study. In terms of economic indicators (from the *World Economic Outlook Database* of the IMF for October 2007), the GDP growth rate in Chile was 4.5%, 4.0%, and 4.0% in 2000, 2003, and 2006, respectively. The same source indicates that yearly inflation in Chile was 3.8%, 2.8%, and 3.4%, in 2000, 2003, and 2006, respectively. Hence the major economic indicators are comparable in magnitude across the years we consider. Given the comparability in the political and economic circumstances in 2000, 2003, and 2006, we are relatively confident in our assumption that the data are consistent across these three periods of time.

[11] This has increased to 15 regions (53 provinces) in October 207, as 2 more regions were added. However, at the time of the 2000, 2003, and 2006 CASEN surveys, Chile was divided into only 51 provinces; our estimations using the 2000, 2003, and 2006 CASEN data are thus based on the previous administrative set-up of 51 provinces.

2000, the line was set at 40,562 pesos per capita and 27,328 pesos per capita for urban and rural individuals, respectively. The indigence line was 20,281 pesos per capita and 15,616 pesos per capita for urban and rural residents, respectively. Correspondingly, in 2003, the poverty line was set at 43,712 pesos per capita and 29,472 pesos per capita for urban and rural individuals, respectively. The indigence line was 21,856 pesos per capita and 16,842 pesos per capita for urban and rural residents, respectively. Finally, in 2006, the poverty line was set at 47,099 pesos per capita and 31,756 pesos per capita for urban and rural individuals, respectively. The indigence line was 23,549 pesos per capita and 18,146 pesos per capita for urban and rural residents, respectively.[12] Information on construction of the rural/urban poverty lines is directly available from Gobierno de Chile (2004) and Gobierno de Chile (2006).

In this study, we use provincial data to estimate program impacts. Ideally, we would have liked to use municipal level information which is at a more disaggregate level. However, municipality level data were unavailable for most variables including GDP per capita, price levels, and government spending. Since these variables are key, their absence meant that we had to implement our estimations at a more aggregate level. The basis of analysis in our study is thus the province. Even at the provincial level, poverty data were missing for 4 of the 51 provinces in Chile.[13] Public spending information on health

[12] The rural/urban poverty and indigence lines for each of the three years we consider are per month figures. Furthermore, a quick perusal suggests that these figures are comparable to the "low" poverty line of the World Bank for Chile; the low World Bank poverty line considers food poverty only.

[13] We are quite confident that poverty data are not missing for these four provinces because of intentional government strategies to avoid providing information on the poorest of communities. The main reason for why poverty data is missing for these provinces is because they are *very* remote. With respect to the accessibility of these provinces, CASEN documents say that all of the Communes within these four provinces are as follows: "Commune with irregular transport, with access by highway, boat, or plane," or "Commune with regular transport, access by land, but with functional difficulties such as distance and weather conditions" (author's translation). In terms of the provinces themselves, Isla de Pascua (Easter Island) is located 2,200 miles west of Chile in the middle of the Pacific Ocean. Antarctica Chilena, the southernmost province in the country, is extremely remote. Capitan Prat and General Carrera too are remote, and covered mostly by the Andes and wilderness. These four provinces together constitute only about 0.11% of the population in the years we consider. Furthermore, based on the data for government spending on education which has no missing values, the weighted per capita average spending on education in these 4 provinces is approximately three times as high as in the remaining provinces for the three years we study. This indicates that the absence of these 4 provinces from our analysis (because of missing poverty information) introduces a conservative bias in our estimates. If we had poverty data for these 4 provinces and were able to include them in our analysis, our results would be stronger still. This is because based on the data that we already analyze, government spending is found to have mitigating effects on poverty and indigence in the three years we study.

was missing for another 2 provinces. Given this, we use data from 45 provinces in our specifications (only 45 of the 51 provinces consistently have all the required data in 2000, 2003, and 2006). However, the 6 provinces that are excluded (Aisén, Antártica Chilena, Capitán Prat, Coihaique, General Carrera, and Ísla de Pascua) constitute only about 0.67% of Chile's total population in the years we consider. Their absence is thus unlikely to strongly influence our results.

Poverty (indigence) rates are calculated using head-count ratios of the number of people in poverty (indigence) relative to the total population in a province. Weighted provincial average poverty was 14.76%, 13.82%, and 10.46%, in 2000, 2003, and 2006, respectively (where provincial population size is used as weights). Weighted provincial average indigence was 5.67%, 4.65%, and 3.20%, in 2000, 2003, and 2006, respectively. During this time-span, it is clear that on average, provincial poverty and indigence measures declined substantially. Moreover, rates of decrease for provincial-level poverty between 2003 and 2006 are markedly larger than comparable rates in the 2000-2003 time period (the average decline between 2003 and 2006 was 24.31% versus an average decline of 6.36% in the 2000-2003 time period). Rates of decrease for provincial-level indigence measures are similar in trend (the average decline between 2003 and 2006 was 31.21% versus and average decline of 17.92% in the 2000-2003 time period). Furthermore, these rates vary considerably across provinces in the country. Table 1 shows trends in poverty and indigence measures for each province.[14]

Measures quoted in the above paragraph also indicate that the percent fall in indigence is substantially greater than the percent fall in poverty across both sets of time-spans (2000-2003 and 2003-2006). One reason for this may be that transition out of indigence is more easy than transition out of poverty. This is true because often people fall just below the indigence cut-off, thus small increases in

[14] Agostini et al. (2008) indicates that the CASEN surveys are not representative at the provincial level. Furthermore, given that these surveys do not follow the same group of people over time, we are unable to make statements regarding the relative changes in poverty and indigence at the provincial level over the years of the data we analyze. Table 1 is mainly presented to indicate that official poverty and indigence measures at the provincial level varied across the time span of our data.

income are sufficient to move them out of extreme poverty. In these Chilean data, there are very few who earn substantially less than one dollar per day (the commonly used threshold for being classified as indigent). Those who transition out of indigence form part of the group that is poor. Hence even if there were movements out of the group that was poor, movements into the group from those who were previously indigent would mean that on average, there is little change in the percent that is poor.

Summary statistics for other variables at the provincial level are presented in table 2. It is clear that from 2000 to 2006, total public health spending increased. Total public education spending increased from 2000 to 2003, and then decreased to pre-2000 levels in 2006. These trends are reflected in per capita health and education expenditures. From 2000 to 2003, per capita health spending increased; the figure remained constant in 2006. Alternatively, per capita education spending has progressively decreased from 2000 to 2006. The mean Foster-Greer-Thorbecke P_2 (FGT2) measure in table 2 indicates that the severity of poverty actually increased from 2000 to 2003, and then remained relatively stable in 2006. This reflects the observation of other scholars that increased economic growth has gone hand-in-hand with increased inequality in Chile. Reflecting increased economic growth, per capita income (as measured by GDP per capita) increased over the three years of our study. However, other variables have not followed a similar rising trend. Table 2 shows that Chile's provincial average education level underwent significant fluctuations over this period of time. The average education level decreased by more than 1 year per person from 2000 to 2003, and then increased back to a level comparable to the figure for 2000, in 2006. Table 2 also reports that organization rates increased and the consumer price level decreased over the time-span of our study. Finally, the proportion of the population that is female has remained relatively stable at 49%, whereas the rate of professionalism has increased, albeit slightly, from 2000 to 2006.

Section 4: Analytical Framework

By considering the effect of public health and education expenditures on poverty, we adopt an income-centered approach that values investments in human capital. However, in order to gauge effects correctly, government health and education expenditures need to be estimated jointly. This is because in these data, the correlation between (total and per capita) health and education spending is statistically significant at the 95% confidence level (see table 3). This correlation necessitates a joint estimation of program effects in order to avoid omitted variable bias (Pitt et al., 2003).

We develop the province fixed-effects model by considering equation (1) which denotes the relationship between poverty rates, public program expenditures, population characteristics, and other economic indicators of poverty:

$$(1) \qquad P_{rit} = \theta_j G_{jit} + \beta_{j'} X_{j'it} + \mu_{ri} + \varepsilon_{rit}, \qquad r = 1,\ldots, \text{R.}$$

In this equation, P_{rit} is poverty rate r in province i in year t, G_{jit} is a matrix of government spending variables where j denotes a particular type of public spending such as in health services or in education in province i at time t, $X_{j'it}$ is a matrix of exogenous variables where j' denotes a particular exogenous variable, μ_{ri} is a province-specific time-invariant unmeasured attribute, and ε_{rit} is an independent and identically distributed idiosyncratic error term. Parameter θ_j measures the effect of government programs.

If governments are responsive to regional attributes, μ_{ri} will be correlated to G_{jit}. Government investments may be influenced by area characteristics primarily due to two reasons: (a) given resource constraints, governments are altruistic and invest in regions that have the most potential for high returns (most flood prone, prone to natural disasters, and so on), and (b), following Becker (1983), governments are responsive to regional groups and may target investments accordingly (governments respond to demand). The first reason corresponds with governments having compensatory motives in locating

programs; the second corresponds with lobbying or pressure-group theories.[15] The discussion in section 2 above suggests that (a) and/or (b) may be at play in determining the level of government spending in Chile. With the presence of (a) and/or (b), an OLS estimation of equation (1), which ignores the correlation between G_{jit} and μ_{ri}, leads to biased results.

The correlation between program placement and area specific unobservables is noted in the following equation:

$$(2) \qquad G_{jit} = \gamma_{j''} E_{i''it} + \phi_j \mu_{ri} + u_{rj'it}. \qquad r = 1,\ldots, \text{R}.$$

This equation shows government spending as a function of $E_{i''it}$, a set of exogenous determinants that includes province specific measures, and μ_{ri}, the area specific unobservable. OLS ignores the correlation between G_{jit} and μ_{ri} by assuming that $\phi_j = 0$ in (2), thus leading to biased estimates of θ_j in (1).

In what follows, we demonstrate the bias in OLS models. The dependent variable in the first three columns of table 4 is the poverty head-count ratio.[16] In the last three columns, the dependent variable is the indigence head-count ratio. We discuss results in table 4 that pertain to the poverty head-count ratio; broadly similar trends apply for results that relate to the indigence head-count ratio. From column (3) of table 4 (which includes the full set of variables), OLS estimates indicate that government spending on health care and education have insignificant effects on the poverty head-count ratio. Previewing results that follow, OLS reaches these mistaken conclusions in evaluating the effect of government expenditures because it assumes that program placement is random. When we condition on the non-random placement

[15] We thank a referee for pointing out that governments may also target investments in order to influence the popular vote, or to appease different groups in the country. We believe that such considerations fall under the second broad category of reasons that may underlie government expenditures – pressure-group theories.

[16] Since head-count ratios are bounded by 0 and 1, they are transformed to their log counterparts so that the support of the distribution is appropriate for a linear model such as OLS. That is, where x is bounded by 0 and 1, $y = \log\left(\frac{x}{(1-x)}\right)$ is used as the dependent variable in the OLS and fixed-effects models reported in the paper.

of programs using province fixed-effects (discussed in detail below), public spending on health and education are found to significantly benefit the poor.

One way of eliminating the influence of the μ_{ri} is to measure and include them directly in equation (1). However, as researchers, we do not know the "rules" that the government may be using in determining the allocation of programs. Thus μ_{ri} cannot be measured directly. An alternative technique is to eliminate the effect of the μ_{ri} from (1). Since μ_{ri} are time-invariant, fixed-effects methods may be used. Equation (3) shows the province fixed-effects model where changes in poverty indicators are related to changes in public spending and changes in exogenous characteristics:

$$(3) \qquad P_{rit+1} - P_{rit} = \theta_j (G_{jit+1} - G_{jit}) + \beta_{j'} (X_{j'it} - X_{j'it}) + (\varepsilon_{rit+1} - \varepsilon_{rit}), \qquad r = 1,\ldots, R.$$

The area specific heterogeneity μ_{ri} is absent from (3), which may now be estimated by OLS to accurately gauge the effects of public spending on poverty.[17]

Since the μ_{ri} are constant across time, the fixed-effects technique succeeds in eliminating the influence of time-invariant unobservables that may be correlated to program placement. However, other time-varying initiatives that may have been implemented to reduce poverty during the years we consider (and which are not measured in our data) may still be correlated to program intensity, and thus may still exert an influence on our estimates. That is, the fixed-effects method cannot control for time-varying heterogeneity. By using as comprehensive a data set as possible to measure the effects of program placement, we hope to have minimized the effect of unobservables that change over time. However, we acknowledge that our fixed-effects results may still reflect some heterogeneity of the time-varying nature.

Section 5: Results

[17] We develop this discussion in terms of first differences; however, as shown in Greene (1993), this is equivalent to conditioning out the area-specific unobservable by taking deviations from individual means. Individual means are calculated over the number of observations for the area-specific time-invariant attribute. The number of observations in our case is three since we have data from three time periods. Please see Greene (1993), page 467.

The main results of this study are shown in table 5, which reports the province fixed-effects estimates in equation (3). We discuss these results in the following sub-sections.

Section 5.1: Poverty head-count ratio

Table 5 shows three fixed-effects regressions for each of the two outcomes considered. Beginning with a model that includes just the program variables (columns (1) and (4)), columns (3) and (6) of table 5 depict results from a model that includes a full set of regressors that are expected to influence poverty and indigence.[18] Column (2) for the poverty head-count ratio shows that poverty declines with increases in per capita public spending on health care. The mean value of poverty and indigence in these data is 13.93% and 4.96%, respectively. At these mean values, the estimate in column (2) indicates that for a 10,000 pesos (approximately $23) increase in health spending, the poverty head-count ratio declines by 0.66%.[19] With the inclusion of other right hand side variables (columns (3)), per capita health expenditures remain significant. The coefficient on per capita health expenditures in column (3) indicates that for a 10,000 pesos (about $23) increase in provincial per capita health spending, the poverty head-count ratio decreases by 0.48%. The coefficient on per capita education expenditures in column (3) of table 5 has the expected sign, but is measured with error.

In terms of the other variables, GDP per capita is a significant determinant of the poverty head-count ratio in column (2). The negative coefficients on GDP per capita in columns (2) and (3) emphasize the importance of economic growth for reducing poverty (the coefficient is measured imprecisely in column (3)). The positive and significant coefficient on prices in column (3) indicates that this variable

---

[18] We include information on GDP per capita at the provincial level in order to proxy for the beneficial impact of economic growth on poverty. We do not have data on economic growth rates at the provincial level.

[19] As noted above, the average of per capita health care spending across the years of our data is about 14,600 pesos. Hence an increase of 10,000 pesos or about 69% is quite large. However, average of per capita education spending in our data is 76,000 pesos. So a 10,000 pesos increase is only about a 13% increase in this case. We maintain the 10,000 pesos benchmark in order to be consistent across our two measures of government spending. Moreover, health and education spending in the CASEN data are reported in thousands of pesos. These numbers had to be scaled by ten (the transformed numbers are thus interpreted in units of 10,000) in order to keep the coefficients to a size comparable to other coefficients in the model.

exacerbates the incidence of poverty. Estimates in column (3) also underline the fact that unemployment and poverty are positively correlated. Finally, a higher percentage of provincial land used for agriculture reduces the poverty head-count ratio. Agricultural land may proxy for land quality, and better quality land is associated with improved well-being.

Section 5.2: Indigence

Columns (4) – (6) of table 5 report results for the indigence head-count ratio. As evident from column (6), per capita public spending on education exerts a strong negative effect on this measure of poverty. From column (6), at the mean value for indigence in these data, a 10,000 pesos (approximately $23) increase in per capita education spending leads to a reduction in the indigence head-count ratio of 0.59%. The coefficient on per capita health expenditures in column (6) of table 5 is significant, but has an unexpected sign. This may reflect unexpected correlations such as the fact that health expenditures tend to prolong life expectancy, and thus increase the time-period over which individuals are classified as indigent.

Other significant variables in column (6) of table 5 include the consumer price level, the unemployment rate, and the proportion of agricultural land. In keeping with intuition, increases in average prices and the unemployment rate worsen the incidence of indigence in Chile. As expected, an increase in the proportion of agricultural land has a mitigating effect on the indigent head-count ratio. An increase in GDP per capita also has a similar effect, although the coefficient on this variable is measured with error.

Summary

Table 5 provides support for the use of public investments in health and education to eliminate poverty and indigence in Chile. This is because the results of table 5 underline the fact that public spending has beneficial impacts on those who are most vulnerable. Although health and education expenditures complement one another in mitigating the different measures of poverty we consider, a

simple comparison of the effects in columns (3) and (6) indicates that health spending has a stronger impact on the poverty head-count ratio as compared to education expenditures; conversely, education expenditures have stronger ameliorating effects on indigence as compared to health expenditures. Per capita education expenditures tend to reduce both poverty and indigent head-count ratios; however, based on the magnitudes (and significance) of the coefficients, education expenditures appear to have larger assuaging effects on the indigence head-count ratio.

The bias in the OLS estimates is clear upon comparing the results of table 4 with the fixed-effects results of table 5. In particular, results of the OLS method suggest that per capita health expenditures have no effect on reducing the incidence of poverty (column (3) of table 4). With the implementation of the appropriate method to correct for the presence of unobserved area specific heterogeneity, per capita health expenditures are found to have the expected allaying effect on the poverty head-count ratio (column (3) of table 5). Moreover, a comparison of the coefficients on per capita education expenditures in column (6) of tables 4 and 5 indicates that the OLS method seriously under-estimates (introduces a negative bias) the beneficial impact of this category of government spending on indigence head-count ratios.

Section 5.3: Foster-Greer-Thorbecke P_2 measure

As is well known, head-count ratios measure the incidence of poverty, not its severity. A measure that is sensitive to the severity of poverty and which reflects inequality amongst the poor is the squared poverty gap index, also known as the Foster-Greer-Thorbecke P_2 (FGT2) measure. The FGT2 is a weighted sum of poverty gaps where the weights are the poverty gaps themselves. Foster and Sen (1997) describe this measure as one that is based on a 'relative equity' principle which gives more weight (in terms of per unit of the income gap) the poorer the person. As noted immediately above, one facet of its sensitivity to the severity of poverty is that the FGT2 measure is responsive to inequality *among* the poor.

Thus for example, a transfer from a less poor to a poor person would reduce the measure, transfers from the poor to the less poor would increase the measure.

In these data, the FGT2 statistic was constructed in the following way. The aim is to measure the severity of poverty in each *municipality* relative to a provincial level benchmark of welfare in each year. Municipalities are used as the unit of construction since CASEN data at more disaggregate levels may not be reliable (Pizzolito, 2005). A provincial level benchmark of welfare is used in each year since in the fixed-effects analysis that precedes this discussion, the unit of observation is the province (the fixed-effect is a provincial-level time-invariant effect). Per person municipality welfare levels are compared to a per person provincial benchmark instead of the official urban/rural per capita poverty line as the official lines are provided at the *country* level. Initially, we used the official country level benchmark to construct the FGT2 values. However, these values were found to have very little variation, and on average, underestimated the severity of poverty.[20] This was because the predetermined urban/rural per capita poverty lines at the country level were too low compared to the urban/rural per capita poverty lines at the municipality level; there were thus hardly any municipalities that could be classified as poor based on their income shortfall from the country level official urban/rural per capita poverty line. The provincial level benchmark used in this research is the average of provincial GDP per capita values across all provinces in each year. GDP per capita values at the municipality level were obtained for 2000, 2003, and 2006, directly from information provided in the CASEN surveys. Information on population and GDP per capita values at the municipality level (directly available from the CASEN surveys) was used to calculate GDP per capita values at the provincial level in each year. Since the municipal population and GDP per capita numbers from CASEN directly take differences between urban and rural municipalities into account, the provincial GDP per capita values constructed from the municipality numbers are

[20] For example, Lopez and Anriquez (2004) use CASEN surveys to estimate that the FGT2 measure in 2000 was about 0.04. Our value based on country level per capita poverty lines for 2000 was significantly lower at 0.001.

sensitive to urban/rural variations. Once each province has a GDP per capita value in a year, the average of these across all provinces in a year forms the benchmark against which municipal GDP per capita values per year are compared. Although such a measure may not allow for direct poverty comparisons across provinces (in any case, not required in this study), it allows us to achieve our objective of judging the poverty status of municipalities relative to a consistent provincial-level benchmark.[21] The mechanics of the construction of the FGT2 statistic is as in Foster et al. (1984) and Foster and Sen (1997). As FGT2 measures are bounded by 0 and 1, a log transformation of these measures was undertaken to make the support of the distribution suitable for the implementation of linear models. The results of the FGT2 estimations are reported in table 6.[22]

The first three columns of table 6 report estimates from an OLS model, the last three columns are the preferred linear fixed-effects models. We focus the discussion of the results on estimates in columns (4) – (6), since these are unbiased for the reasons outlined above. The OLS results are presented only to underline the fact that non-random program placement can confound estimates and lead to inaccurate conclusions. Column (6) of table 6 presents estimates from the inclusion of all variables that may affect the severity of poverty. As evident, the type of government spending that is found to have an ameliorating effect on the severity of poverty is per capita education expenditures. The size of the coefficient on this variable in column (6) indicates that for a 10,000 pesos (about $23) increase in education spending, the FGT2 measure declines by 1.53%. Per capita health expenditure is significant but has the counter-intuitive sign. Again, this may be reflecting a similar unexpected correlation as in column (6) of table 5. In keeping with its counter-intuitive effect in column (6), per capita health spending is positive and significant in columns (4) and (5) as well. In addition to the reason above, the coefficient

[21] It also allows for more comparable FGT2 estimates. As noted in the manuscript, our average FGT2 measure for 2000 is 0.071; this is in the same ballpark in magnitude to Lopez and Anriquez (2004).
[22] We use the average provincial GDP value as the proxy measure for the provincial poverty line. Such a proxy is not constructed for provincial indigence lines, therefore, no separate indigence regressions are reported in table 6.

may also be picking up the effect of omitted variables that we do not have information on due to data limitations. Finally, GDP per capita, average education, and the unemployment rate have the expected signs in column (6) of table 6, with the latter two being measured with significance.

Section 5.4: Program placement

In the preceding paragraphs, we discuss and report results from a province fixed-effects approach that treats public programs endogenously. In the following analysis, we shed light on the location rules that may be adopted by the government in determining the placement of programs. This is accomplished by separately estimating Least Squares Dummy Variable (LSDV) models for 2000 and 2006, and then extracting the area specific effects from 2006 for use as instruments for the effects in 2000. Instruments are required since it is possible that there is measurement error in the estimates of regional heterogeneity in the earlier year. Once this measurement error is corrected for, the sign of the predicted area specific heterogeneity in 2000 provides information on the rules of program placement.

In order to study these rules, we aggregated provincial data to the regional level. This was done because estimating LSDV models at the provincial level is expensive in number of parameters, and the underlying matrices are not of full rank. The 45 provinces that we have information for were aggregated to 13 regions and these regions formed the basis of our estimations. To be clear, LSDV models are estimated separately for 2000 and 2006, with the number of observations in each year equal to the number of regions. The dependent variable in the LSDV model for each year is poverty. Separate regressions for indigence were not estimated since as is clear from table 2, during the time-span of our data, indigence rates fell considerably and were quite low by 2006. We were thus not confident that we would be able to identify the coefficients in the LSDV models for indigence by year. Given that observations are at the regional level, LSDV models for 2000 and 2006 were estimated using the regional equivalent of equation (1), and estimates of regional μ_{ri} from 2006 (denoted by $\hat{\mu}_{ri}$) were extracted for use as instruments for the

regional μ_{ri} from 2000. These $\hat{\mu}_{ri}$ may be interpreted as regional government spending propensities (Pitt et al., 1990).

Several studies (Pitt et al., 1990; Menon and Sanyal, 2007) show that repeated observations over time on a variable that is measured with error (μ_{ri}) can be used as instruments as long as the errors are uncorrelated over time. Given that there have been few changes in intent at the regional level between 2000 and 2006, we believe that this is true in our case.[23] Using future information to explain past decisions, regional $\hat{\mu}_{ri}$ from 2006 are valid instruments for the regional $\hat{\mu}_{ri}$ from 2000. Table 7 shows the results of this instrumental variables estimation.

We begin a discussion of the estimates in table 7 by presenting the results of tests of validity for our identifying instruments. In the case of per capita health spending, our identifying instruments include the regional $\hat{\mu}_{ri}$ from 2006, provincial GDP per capita, average education, and rural population from 2006, and a dummy for the central region of Chile.[24] An F-test that these identifying instruments are jointly zero is rejected at conventional levels (F[5,7] = 21.42, Probability > F = 0.0004). Since the CAS-2 card influences both the government's health and education expenditures, we assume that the identifying instruments for per capita education spending are the same as those for per capita health spending (the first stage for per capita education spending is the same). The result for the F-test that the identifying instruments for per capita education spending are jointly zero is thus identical to that obtained for per capita health spending (reported above). These F-test results indicate that our instruments are valid and

[23] Although the number of provinces increased effective October 2007, we justify this statement by referring to both government and non-government sources (Biblioteca del Congreso Nacional de Chile, 2007a; Biblioteca del Congreso Nacional de Chile, 2007b; Murtagh Alvarado, 2006). These documents indicate that there had been discussions for many years (preceding our data) on changing the administrative set-up in Chile. A need for these changes was felt in order to facilitate regional autonomy, and to allow each region more responsibility for development and the satisfaction of the desires of its population. However, despite long-standing discussions, nothing was implemented until a 1970s law that restricted Chile to 13 regions was rescinded. This occurred after 2005, following which, steps were taken for the creation of two new regions (and two new provinces). Since the discussions precede the years of our data, and since the changes became effective after the time-span we consider, we believe that there are few changes in intent at the regional level during the 2000-2006 years we study which could introduce a correlation in errors over time.

[24] The central region dummy includes the following areas in Chile – Coquimbo, Valparaiso, O'Higgins, Maule, Biobio, Araucania, and Santiago.

have power.[25] Finally, since the number of instruments exceeds the number of endogenous regressors, we conduct a test for over-identification. The results from this test indicate that over-identification is absent and that our instruments are credible.[26]

Continuing the discussion of the estimates in table 7, it is clear that the instrumented regional variables have significant effects on per capita education expenditures. The significance of the instrumented regional variables in table 7 stresses the importance of treating public spending endogenously. The negative coefficient for instrumented regional variables on education spending in columns (2) indicates that with respect to this category of expenditures, the government behaves in a compensatory manner. That is, those regions that have low spending propensities (more poor, prone to natural disasters, and so on) are likely to receive public education assistance.

In terms of the other variables in column (2) of table 7, the positive and significant coefficient on GDP per capita suggests that economic growth facilitates this type of government expenditures. This is as expected since increased government spending may be adequately financed only if the economy is not stagnant. Other estimates in column (2) indicate that as average education at the regional level rises, public spending on education falls. Again, this is as expected, since regions with high levels of education already understand the value of literacy. Governments do not need to spend more on education in such areas to demonstrate the importance and value of learning. Regions with greater unionization receive less public education spending – perhaps this coefficient reflects the positive correlation between membership in organized unions and the low-skilled nature of the workforce. Provinces in the southern region of the country attract positive amounts of government education expenditures. This is as expected since the southern regions of Chile are on average more poor as compared to the rest of the country. Provinces in

[25] Our F-statistic exceeds the critical values for a single endogenous variable for strong instrumentation listed in tables 1 and 2 of Stock and Yogo (2005) for acceptable bias and size levels.
[26] Wooldridge's (1995) robust score test results: Chi2(2) = 0.419, $p = 0.811$. Hence we cannot reject the null hypothesis that our instruments are valid.

the northern regions attract positive amounts of this category of public spending as well, albeit to a lower extent. Finally, the rate of professionalism variable has a significant positive influence on this type of public expenditures. If the rate of professionalism is correlated to average education levels, then this effect is contrary to intuition. However, it is possible that not just the educated have titles to their names. Thus, this variable may be reflecting the pressure exerted by lobbies with regional political clout.

Section 5.5: Other issues

In this section, we note a few issues that could not be addressed because of data constraints. The first relates to private spending on health care and education. Private spending (NGO sponsored clinics and schools) may complement public spending, particularly in remote provinces where public resources are limited. However, given lack of data on private sources of health and education expenditure at the provincial level in Chile, we cannot separately control for the effects of private spending. This implies that the parameters we measure on public expenditures may be over-estimated, since the public spending variables may absorb the effects of private spending as well. Although some bias may be present, the significance of the variables measuring public investments in table 5 indicates that this bias is likely to be relatively small. That is, even if we included separate measures of private investment in the models of table 5, it is unlikely that the government spending variables would lose their significance altogether. However, given data limitations, we are unable to corroborate this empirically.

Second, it is possible that public funds intended for certain regions did not reach their anticipated destination because of corruption. Chile, compared to other Latin American nations, has a reasonably respectable record in terms of corruption. Nevertheless, there is still a possibility that public resources were diverted illegally. However, this is a conservative bias. If funds lost due to corruption could be included in our analysis, then the results of our study would be stronger still. This is because such funds are measured in G_{jit} of equation (1), but have not affected poverty since they were siphoned away before reaching the target population. Corruption implies that a lower level of government spending (than the

levels measured in G_{jit}) had strong beneficial effects on the various indicators of poverty measured in table 5. Without corruption, we expect that the effects in table 5 would be even more pronounced.

Section 6: Conclusion and Policy Implications

This research examines the impact of government programs on the poor and indigent of Chile from 2000 to 2006. Results are obtained from a provincial-level panel data set with information on poverty and indigence head-count ratios, the severity of poverty as measured by the Foster-Greer-Thorbecke P_2 (FGT2) measure, public spending on health and education programs, and other exogenous variables. Using a province fixed-effects technique to correct for area specific heterogeneity which is correlated with program placement, this study demonstrates that per capita public health and education expenditures significantly reduce the incidence of poverty and indigence in Chile. Estimates indicate that for a 10,000 pesos (about $23) increase in provincial per capita health spending, the poverty head-count ratio decreases by 0.48%. Per capita public spending on education in particular is found to be especially effective in reducing the severity of poverty. Results of this research suggest that for a 10,000 pesos (approximately $23) increase in education spending, the FGT2 measure declines by 1.53%. Moreover, an evaluation of the rules that underlie program placement suggests that public investments in Chile are not randomly distributed – estimates in this study indicate that, in particular, public education investments may be allocated in a manner which is in keeping with compensatory motives. That is, poorly endowed areas are likely to attract the lion-share of such investments.

This research has important implications for policy. The mitigating effect of public health care and education expenditures on the incidence and severity of poverty suggests that the Chilean government should increase its focus on such spending in order to augment well-being. There is some indication that this is happening already. *Chile Solidario* (a government subsidy noted above), enacted in 2002, is a family-centered program designed to reduce the vulnerability associated with conditions of extreme

poverty. Families work closely with local agencies for a two-year period to reach a minimum level of subsistence income, and to obtain access to health care, basic social services, and schooling for children (Foxley, 2004). Although this program has been one of the most successful thus far, anecdotal evidence suggests that it still does not provide adequate support for the poor. Participants believe that they would have been more successful if they had been taught the importance of networking with community organizations, and the two-year association with local agencies is sometimes not long enough for the realization of true benefits.

Chile Solidario is only one of several government programs that has lacked features that would have made them even more useful to the poor. A major problem is that the governments of the *Concertación* have adopted strategies of fighting poverty that have consistently been *asistencial* (essentially welfare support) in nature. With such a strategy, the government provides money to poor families without creating a social network of support (Gwynne and Kay, 2002). For example, the *Instituto del Desarrollo Agropecuario* (INDAP – Institute for Agricultural Development), a public organization in charge of development in rural regions of Chile, enacted the *Programa de Desarrollo Agrícola Local* (PRODESAL – Local Agricultural Development Program) in 2005. This project, whose goal was to improve the productivity of impoverished rural farmers, provided greenhouses, irrigation canals, and barns for storing crops to 70 families in the Elicura Valley. However, the vast majority of the recipients did not know how to use the constructions effectively, and now they are hardly ever utilized.

Another government initiative, *Programa Orígenes* (Origins Program), gave indigenous families in the Elicura Valley project packages of their choosing between 2001 and 2005. These included cabins for attracting tourists, storage units, granaries, and live animals. However, this program was poorly planned because "the people did not know how to use them," says Bruno Romero who works in the office of the *Unidad de Desarrollo Económico* (Department of Economic Development) located in the municipality of Contulmo in the province of Arauco (Romero, 2006). "In the valley the programs (were)

very general and there (was) no focus on the specific needs of the communities." (Romero, 2006) He said further that he had not seen a "sufficient intervention by the government in either public programs or social support" (Romero, 2006). The beneficiaries of the program did not receive any education with regard to selecting their grant. As a result, many families elected to receive animals. However, families were given no additional resources to feed the animals and consequently, their upkeep became too expensive. Public programs of this type are well-designed in their first stage of implementation. However true long-term benefits are absent because of the lack of follow-up assistance.

Given the results of this paper and the anecdotal evidence presented above, we conclude that the impact of public spending on health care and education may have been even stronger with adequate long-term support. Furthermore, focusing directly on particular problems and assisting specific sub-groups of the population will help improve the efficaciousness of public investments in eliminating poverty.

In addition to direct effects, public spending can lead to substantial positive externalities as well. Private and foreign firms will tend to shy away from investing in regions with poor infrastructure, high levels of poverty, and an illiterate population. This is because the expected return on investments in such regions is low. The Chilean government can invest to make regions more attractive to private and foreign investment. This will have further mitigating effects on poverty through job creation and social development. Hence, in addition to its direct effects on reducing poverty, public spending plays a crucial role in laying the foundation for subsequent private commercial investments that could hasten the pace of poverty eradication.

This research underlines the fact that in addition to GDP growth, targeted government investments in health care and education are important for improving well-being in Chile. Results of this study indicate that public investments are critical for helping the poor – increasing resources devoted to such investments is thus well-justified. By undertaking a microeconomic study of the effects of public programs in Chile that conditions on the non-randomness of program placement, and by evaluating

location rules that determine the allocation of government expenditures, this research contributes to the literature on program evaluation in Latin America.

Appendix: Construction of the data set

First, prices at the provincial level needed to be constructed. The data available from the INE (*Instituto Nacional de Estadísticas* – National Institute of Statistics) lists monthly prices of 98 food and non-food inputs purchased by a given household. These prices are listed for 24 cities in Chile. To find price levels by province, all provinces were first grouped by region. Then the 24 provinces that contained a city with price data were assigned that city's price level. For example, the price level assigned to the province of Arica was the price level of the city of Arica that is located within that province. Next, using the idea that prices tend to be correlated across borders, the remaining provinces' price levels were determined by a weighted average of the physical length of the border that a province had with any other province. For example, in 2003 in region 1, Iquique and Arica both had cities listed with prices. These were 946 pesos for Iquique and 962 pesos for Arica. However, Parinacota (the remaining province in region 1) had no city with price data. Parinacota's border with Arica is approximately 150 km, and its border with Iquique is approximately 20 km. Parinacota's price level was derived as follows: $946 \times (20/170) + 962 \times (150/170) \approx 960$. Price levels for provinces missing this information were derived similarly.

Second, data for the government spending variables was compiled by adding the total spending of each municipality within a province to find a province specific value. However, a small number of municipalities did not have data listed for either health or education spending for some of the years we consider. For these municipalities, the value that was assigned was that municipality's (non-missing) value in either the preceding or following year, adjusted for inflation.

References

Agostini, Claudio, and Philip Brown. 2007. "Cash Transfers and Poverty Reduction in Chile." Universidad Alberto Hurtado and Colby College, Working Paper.

Agostini, Claudio, Philip Brown, and Diana Gongora. 2008. "Spatial Distribution of Poverty in Chile." *Estudios de Economia*, 25(1): 79-110.

Angrist, Joshua, and Alan Krueger. 2001. "Instrumental Variables and the Search for Identification: From Supply and Demand to Natural Experiments." *Journal of Economic Perspectives*, 15(4): 69-87.

Angrist, Joshua, and Alan Krueger. 1999. "Empirical Strategies in Labor Economics." Ch. 23 in Ashenfelter and Card, Handbook of Labor Economics, Vol. 3.

Attanasio, Orazio, and Miguel Székely. 2001. "Going Beyond Income: Redefining Poverty in Latin America." In Orazio Attanasio and Miquel Székely (eds.), *A Portrait of the poor: An Asset-Based Approach*, John Hopkins University Press: Baltimore, 1-43.

Becker, Gary. 1983. "A Theory of Competition Among Pressure Groups for Political Influence." *The Quarterly Journal of Economics*, 98(3): 371-400.

Beyer, H. 1997. "Distribucion del Ingreso: Antecedentes para la Discusion." *Estudios Publicos* 65: 5-58.

Biblioteca del Congreso Nacional de Chile. 2007a. "Historia de la Ley N° 20.174: Crea la XIV Región de Los Ríos y la provincia de Ranco en su territorio."

Biblioteca del Congreso Nacional de Chile. 2007b. "Historia de la Ley N° 20.175: Crea la XV Región de Arica y Parinacota y la provincia del Tamarugal en la Región de Tarapaca."

Castro-Leal, Florencia, Julia Dayton, Lionel Demery, and Kalpana Mehra. 1999. "Public Social Spending in Africa: Do the Poor Benefit?" *The World Bank Research Observer*, 14(1): 49-72.

Contreras, Dante, Larranaga, Osvaldo, Litchfield, Julie, and Alberto Valdes. 2001. "Poverty and Income Distribution in Chile 1987-1998. New Evidence." Cuad. Econ. 38(114) Santiago ago.

Contreras, Dante, and Osvaldo Larrañaga. 2001. "From Quantity to Quality: Human Capital and Income in Chile." In Orazio Attanasio and Miquel Székely (eds.), *A Portrait of the poor: An Asset-Based Approach*, John Hopkins University Press: Baltimore, 113-135.

Datt, Gaurav, and Martin Ravallion. 1998. "Why have some Indian States Done Better than Others at Reducing Poverty?" *Economica*, 65(257): 17-38.

Fan, Shenggen, Hazell, Peter, and Sukhadeo Thorat. 2000. “Government Spending, Growth and Poverty in Rural India.” *American Journal of Agricultural Economics*, 82(4), 1038-1051.

Foster, James, Greer, Joel, and Erik Thorbecke. 1984. “A Class of Decomposable Poverty Measures.” *Econometrica*, 52(3), 761-766.

Foster, James, and Amartya Sen. 1997. *On Economic Inequality*. Expanded edition. Oxford: Clarendon Paperbacks.

Foxley, Alejandro. 2004. “Successes and Failures in Poverty Eradication: Chile.” Paper Presented at the World Bank conference on Scaling Up Poverty Reduction: A Global Learning Process, Shanghai.

Galetovic, Alexander. 2007. “Competition Policy in Chile.” Universidad de los Andes, Working Paper.

Gobierno de Chile. 2004. “Pobreza, Distribución del Ingreso e Impacto Distributivo del Gasto Social.” Serie CASEN 2003, Ministerio de Planificación y Cooperación.

_____ 2005a. *Los Objetivos de desarrollo del milenio: primer informe del Gobierno de Chile*, United Nations Development Programme.

Gobierno de Chile. 2005b. "Decentralización de gasto social," Agenda Decentralización from the Subsecretaria de Desarrollo Regional y Administrativo.

Gobierno de Chile. 2006. “La Situacion de Probeza en Chile.” Serie CASEN 2006, Ministerio de Planificación y Cooperación.

Greene, William. 1993. *Econometric Analysis*. Second edition. New York: Macmillan Publishing Company.

Gwynne, Robert N. and Cristóbal Kay, eds. 2002. *Latin America Transformed: Globalization and Modernity*. London: Arnold.

Helwege, Ann. 1995. “Poverty in Latin America: back to the Abyss?” *Journal of Interamerican Studies and World Affairs*, 37(3), Special Issue: Report on Neoliberal Restructuring, 99-123.

Lopez, Ramon, and Gustavo Anriquez. 2004. “Poverty and Agricultural Growth: Chile in the 1990s.” *Journal of Agricultural and Development Economics*, 1(1): 6-24.

Lynn, Ashleigh. 2006. “El Desarrollo económico y politico en Chile: La conexión como un indicador de la democracia.” School for International Training, Santiago: Economic Development and Globalization.

Lipton, Michael, and Martin Ravallion. 1995. “Poverty and Policy.” In J. Behrman and T.N. Srinivasan (eds.), *Handbook of Development Economics*, 3, Amsterdam: North-Holland.

Menon, Nidhiya, and Paroma Sanyal. 2007. "Labor Conflict and Foreign Investments: An Analysis of FDI in India." *Review of Development Economics*, 11(4): 629-644.

Meyer, Bruce. 1995. "Natural and Quasi-Experiments in Economics." *Journal of Business and Economic Statistics*, 13(2): 151-161.

Murray, Michael P. 2006. "Avoiding Invalid Instruments and Coping with Weak Instruments." *Journal of Economic Perspectives*, 20: 111-132.

Murtagh Alvarado, Pauline. 2006. "Las Nuevas Regiones." *Educación*, Instituto Geográfico Militar, www.igm.cl.

Pitt, Mark M., Mark R. Rosenzweig, and Md. Nazmul Hassan. 1990. "Productivity, Health, and Inequality in the Intrahousehold Distribution of Food in Low-Income Countries." *The American Economic Review*, 80(5), 1139-1156.

Pitt, Mark M., Mark R. Rosenzweig, and Donna M. Gibbons. 1993. "The Determinants and Consequences of the Placement of Government Programs in Indonesia." *World Bank Economic Review*, 7(3).

Pizzolito, Georgina. 2005. "Poverty and Inequality in Chile: Methodological Issues and a Literature Review." Documento de Trabajo No. 20, CEDLAS.

Romero Belmar, Bruno. 2006. "La Mediería y el desarrollo." Interviewed by David A. Glick, The Municipality of Contulmo, Chile, 16 May.

Sistema Nacional de Indicadores Municipales (SINIM). 2006. "Variables e Indicadores SINIM."

Soto, Raimundo and Aristides Torche. 2004. "Spatial Inequality, Growth, and Migration in Chile." *Cuadernos de Economia*, 41, 401-424.

Stock, James H. and Motohiro Yogo. 2005. "Testing for Weak Instruments in Linear IV Regression In Identification and Inference for Econometric Models: A Festschrift in Honor of Thomas Rothenberg." Edited by James. H Stock and Donald W. K. Andrews. Cambridge, UK: Cambridge University Press, 80-108.

Szekely, Miguel. 2000. "Inequality in Latin America at the Verge of the 21st Century." Paper presented at the GDN Meetings, Tokyo.

Szekely, Miguel, Lustig, Nora, Cumpa, Martin, and Jose A. Mejia. 2000. "Do We Know How Much Poverty There Is?" Research Department, Inter-American Development Bank, Working Paper No. 437.

Tanzi, V. 1996. "Fiscal Policy and Income Distribution." International Development Bank Workshop on Income Distribution, Santiago, Chile.

Valdes, A. 1999. “Pobreza y Distribucion del Ingreso en una Economia de Alto Crecimiento: Chile, 1987-1995.” *Estudios Publicos* 75: 5-47.

Weyland, Kurt. 1999. “Economic Policy in Chile’s New Democracy.” *Journal of Interamerican Studies and World Affairs*, 41(3), 67-96.

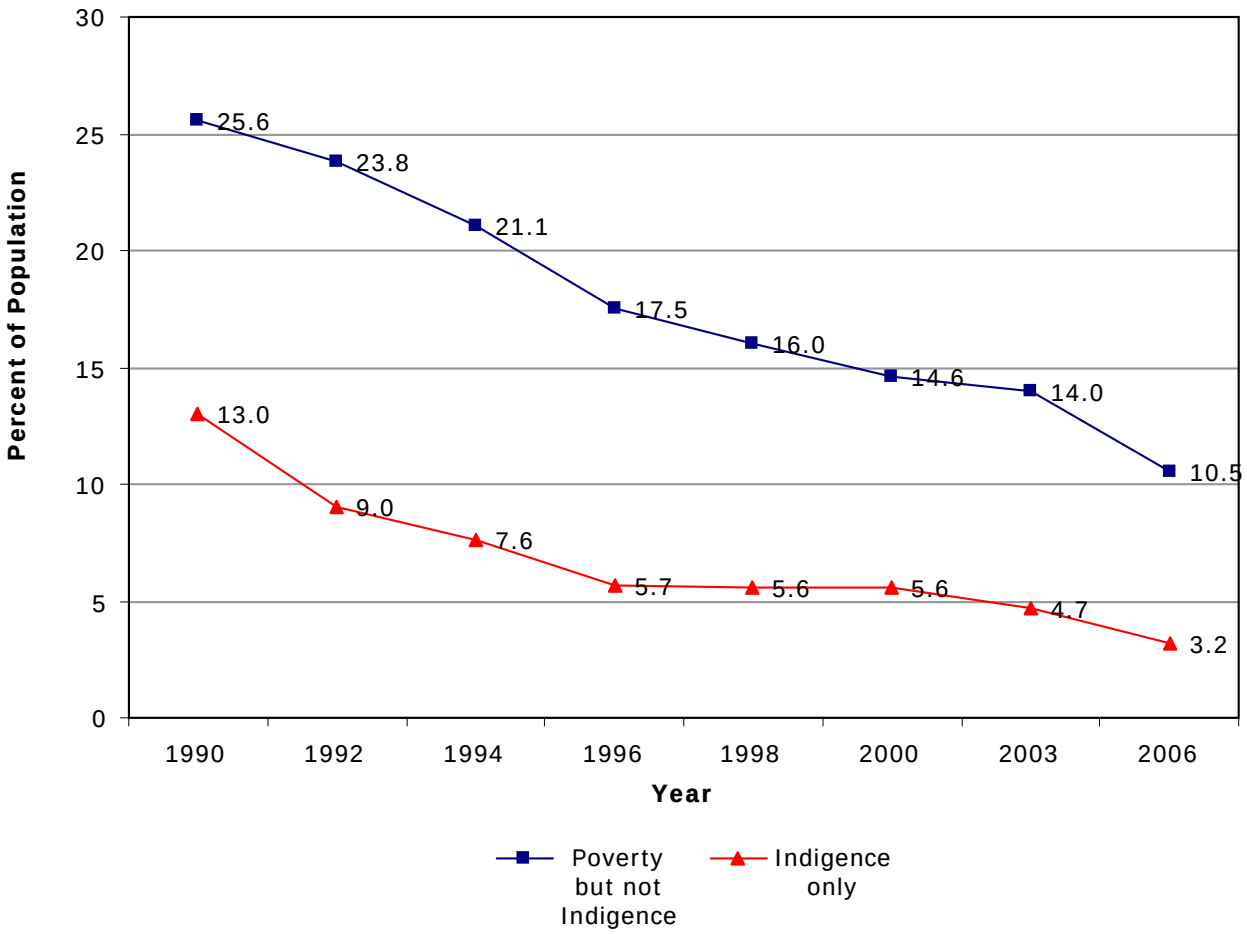
Wooldridge, Jeffrey. 1995. “Score Diagnostics for Linear Models Estimated by Two Stage Least Squares,” in *Advances in Econometrics and Quantitative Economics*, ed. G.S. Maddala, P.C.B. Phillips, and T.N. Srinivasan. Oxford: Blackwell, 66-87.

World Bank. 1997. “Chile - Poverty and Income Distribution in a High Growth Economy: 1987-1995. Latin America and Caribbean Region, Report No. 16377-CH.

Yao, Shujie. 2000. “Economic Development and Poverty Reduction in China over 20 years of Reforms.” Economic Development and Cultural Change, 48(3): 447-474.

FIGURE 1

EVOLUTION OF POVERTY AND INDIGENCE: 1990-2006
(PERCENTAGE OF THE TOTAL POPULATION)



Source: Gobierno de Chile, 2006.

Table 1 - Provincial Poverty and Indigence Levels and Trends

Province	2000		2003		2006		2000-2003 % Change		2003 -2006 % Change	
	Poverty	Ind.	Poverty	Ind.	Poverty	Ind.	Poverty	Ind.	Poverty	Ind.
Iquique	11.64	5.23	7.88	1.60	9.22	2.34	-32.30	-69.41	16.95	46.54
Arica	17.09	3.35	19.14	4.33	14.35	4.19	12.00	29.25	-25.05	-3.34
Parinacota	20.56	22.17	24.28	7.61	11.37	2.75	18.09	-65.67	-53.15	-63.82
Antofagasta	10.28	3.58	8.07	2.42	3.35	2.66	-21.50	-32.40	-58.54	9.95
El Loa	7.07	1.28	7.27	4.71	9.00	0.66	2.83	267.97	23.80	-85.93
Tocopilla	24.19	8.14	10.38	4.83	8.69	1.93	-57.09	-40.66	-16.28	-60.01
Copiapó	15.18	7.20	17.56	9.28	8.70	3.45	15.68	28.89	-50.45	-62.87
Chañaral	13.65	4.13	13.74	6.59	5.14	2.79	0.66	59.56	-62.62	-57.71
Huasco	19.06	10.81	16.20	6.71	6.01	0.98	-15.01	-37.93	-62.91	-85.39
Elquí	17.58	4.59	13.78	5.32	12.39	2.11	-21.62	15.90	-10.06	-60.39
Choapa	24.37	9.84	22.96	9.15	11.27	3.96	-5.79	-7.01	-50.93	-56.69
Limarí	19.04	7.71	18.82	3.30	15.66	4.12	-1.16	-57.20	-16.81	24.85
Valparaíso	12.02	4.49	13.52	4.75	12.71	2.32	12.48	5.79	-6.03	-51.13
Isla de Pascua	-	-	-	-	-	-	-	-	-	-
Los Andes	11.18	4.78	16.56	3.33	8.27	1.10	48.12	-30.33	-50.09	-67.00
Petorca	13.60	3.61	20.06	3.16	13.03	4.02	47.50	-12.47	-35.06	27.24
Quillota	14.89	6.20	16.18	5.14	12.62	2.58	8.66	-17.10	-22.03	-49.79
San Antonio	18.03	6.95	16.23	6.03	13.75	6.59	-9.98	-13.24	-15.27	9.30
San Felipe de Aconcagua	16.40	5.93	14.63	3.42	11.37	3.49	-10.79	-42.33	-22.26	2.18
Cachapoal	15.09	3.69	12.73	3.56	8.71	1.95	-15.64	-3.52	-31.58	-45.10
Cardenal Caro	16.50	7.30	16.66	5.85	12.65	5.05	0.97	-19.86	-24.07	-13.61
Colchagua	17.55	4.92	16.72	4.10	10.05	2.09	-4.73	-16.67	-39.92	-49.12
Talca	18.48	6.27	16.39	6.74	14.16	2.98	-11.31	7.50	-13.61	-55.83
Cauquenes	21.90	10.26	23.51	4.22	18.19	7.54	7.35	-58.87	-22.62	78.71
Curicó	16.84	3.59	15.15	3.60	8.62	3.33	-10.04	0.28	-43.12	-7.61
Linares	19.68	9.39	19.94	6.27	16.39	6.12	1.32	-33.23	-17.79	-2.47
Concepción	16.22	6.73	17.58	7.35	14.24	4.53	8.38	9.21	-19.03	-38.38
Arauco	27.77	11.92	23.05	11.81	21.00	7.31	-17.00	-0.92	-8.91	-38.14

Source: CASEN surveys from 2000, 2003, and 2006. "Ind." denotes indigence. Poverty data were unavailable for the Isla de Pascua province.

Table 1 continued - Provincial Poverty and Indigence Levels and Trends

Province	2000		2003		2006		2000-2003 % Change		2003-2006 % Change	
	Poverty	Ind.	Poverty	Ind.	Poverty	Ind.	Poverty	Ind.	Poverty	Ind.
BíoBío	20.45	8.98	23.35	7.75	15.28	5.24	14.18	-13.70	-34.54	-32.33
Ñuble	20.68	8.35	19.40	10.07	16.32	5.71	-6.19	20.60	-15.87	-43.30
Cautín	19.60	10.14	18.22	8.94	12.80	5.15	-7.04	-11.83	-29.76	-42.41
Malleco	27.74	13.92	22.74	9.07	18.50	9.43	-18.02	-34.84	-18.65	4.00
Llanquihue	15.17	6.20	14.41	3.42	6.80	2.71	-5.01	-44.84	-52.82	-20.83
Chiloé	13.25	2.38	10.69	1.93	6.83	1.85	-19.32	-18.91	-36.15	-3.97
Osorno	26.62	7.89	20.57	5.15	14.74	3.63	-22.73	-34.73	-28.36	-29.46
Palena	14.69	5.38	9.34	2.63	2.61	2.68	-36.42	-51.12	-72.02	2.05
Valdivia	20.90	8.24	20.34	7.19	13.57	5.21	-2.68	-12.74	-33.29	-27.59
Coihaique	8.03	2.81	10.19	3.21	6.86	5.01	26.90	14.23	-32.68	56.07
Aisén	14.28	9.75	9.40	4.04	2.27	3.45	-34.17	-58.56	-75.82	-14.65
Capitán Prat	-	-	-	-	7.01	2.34	-	-	-	-
General Carrera	-	-	-	-	2.21	1.20	-	-	-	-
Magellanes	6.42	3.82	9.67	2.35	3.00	2.70	50.62	-38.48	-68.98	14.89
Antartica Chilena	-	-	-	-	1.38	1.48	-	-	-	-
Tierra del Fuego	5.42	5.50	4.57	1.30	4.58	0.71	-15.68	-76.36	0.18	-45.08
Ultima Esperanza	14.35	2.09	12.25	3.43	8.81	1.84	-14.63	64.11	-28.08	-46.36
Santiago	10.64	4.19	9.33	2.87	7.60	2.09	-12.31	-31.50	-18.56	-27.15
Cordillera	13.34	4.64	8.98	1.63	7.58	2.98	-32.68	-64.87	-15.65	82.91
Chacabuco	19.07	8.14	18.48	3.05	11.04	3.14	-3.09	-62.53	-40.26	3.00
Maipo	13.97	5.18	16.32	3.47	13.04	4.74	16.82	-33.01	-20.08	36.48
Melipilla	12.86	4.06	11.15	3.69	8.84	0.92	-13.30	-9.11	-20.74	-75.18
Talagante	16.70	4.11	15.41	3.74	9.27	2.65	-7.72	-9.00	-39.82	-29.07
Provincial Average	16.38	6.59	15.40	4.98	10.24	3.40	-6.00	-24.44	-33.53	-31.82

Source: CASEN surveys from 2000, 2003, and 2006. "Ind." denotes indigence. Some years of poverty data were missing for the Capitan Prat, General Carrera, and Antartica Chilena provinces.

Table 2

Summary Statistics

Variables	2000 Obs.	2000 Mean	2000 Std. Dev.	2003 Obs.	2003 Mean	2003 Std. Dev.	2006 Obs.	2006 Mean	2006 Std. Dev.
Poverty (%)	47	16.4	5.2	47	15.4	5.0	50	10.2	4.6
Indigence (%)	47	6.6	3.6	47	5.0	2.5	50	3.4	1.9
Foster-Greer-Thorbecke P_2 measure	43	0.071	0.050	43	0.098	0.057	43	0.097	0.060
Total public health spending[a]	46	340948	718593.4	46	420229.2	887244.2	46	524118	1028720
Total public education spending[a]	51	1423929	1999420	51	1537346	2187221	51	1383869	1900246
Per capita health spending[a]	46	1.4	2.3	46	1.5	2.1	46	1.5	0.7
Per capita education spending[a]	51	7.9	4.3	51	7.8	3.9	51	7.1	3.7
Total population	51	298260.9	676447.7	51	309284.4	697209.3	51	322207.2	697382.3
Rural population (%)	51	24.9	18.1	51	23.6	16.8	51	23.1	16.3
GDP per capita (in 1000s of pesos)	51	77.5	54.9	51	106.4	91.3	51	126.6	103.0
Unemployment rate (%)	50	7.5	3.9	51	9.5	4.3	46	6.5	2.8
Average education (years)	47	9.1	1.1	51	7.9	0.8	51	9.0	1.4
Organization rate (%)	51	11.9	7.0	51	14.3	9.1	51	18.0	18.3
Average consumer price level (in pesos)	50	974.8	55.2	50	955.7	74.6	50	832.4	167.9
Agricultural land (%)	50	12.2	15.5	50	11.8	15.0	50	10.2	12.7
Land with no vegetation (%)	51	18.0	25.2	51	18.0	25.2	51	19.5	24.6
Female population rate (%)	51	48.7	2.8	51	48.8	3.0	51	48.8	3.0
Rate of professionalism (%)	51	18.2	4.9	51	19.7	5.8	51	21.5	5.7

[a] Expenditure variables are in terms of 10,000 Chilean Pesos. All variables at the provincial level. All monetary variables are corrected for inflation and listed in 2000 (year) Pesos.

Organization rate = measure of the percent of persons in a given community that are members of a labor or social organization, including unions and cooperatives.

Average consumer price level = the average price in Pesos of 98 food and non-food inputs in province.

Rate of professionalism = according to the CASEN surveys, this is the proportion of the provincial population with titles to their names (eg. “Dr.”).

Table 3

Pair-wise Correlation Coefficients for Health and Education Expenditures

	Total health spending	Total education spending
Total health spending	1.000	
Total education spending	0.951**	1.000

	Per capita health spending	Per capita education spending
Per capita health spending	1.000	
Per capita education spending	0.316**	1.000

** Denotes significance at the 95% confidence level.

Table 4

Ordinary Least Squares Estimates

	Poverty head count ratio (in %)			Indigence head count ratio (in %)		
	(1)	(2)	(3)	(4)	(5)	(6)
Per capita health expend.	-0.011	-0.015	0.0008	0.001	-0.011	0.029
(x 10^{-4} pesos)	(0.054)	(0.019)	(0.015)	(0.049)	(0.033)	(0.022)
Per capita education	-0.008	-0.119***	-0.018	0.009	-0.066*	-0.055**
expend. (x 10^{-4} pesos)	(0.045)	(0.042)	(0.023)	(0.046)	(0.036)	(0.028)
GDP per capita		0.0001	0.0002		0.0003	-0.002**
(x 10^{-3} pesos)		(0.002)	(0.0005)		(0.0009)	(0.001)
Organization rate (in %)		0.0006	-0.019*		-0.020**	-0.002
		(0.012)	(0.011)		(0.020)	(0.010)
Average education		-0.524***	-0.187***		-0.455***	0.001
(in years)		(0.110)	(0.065)		(0.154)	(0.076)
Rural population (in %)		0.011	0.010**		0.015*	0.019***
		(0.009)	(0.003)		(0.008)	(0.006)
Average consumer price			-0.0005			0.002**
level (in pesos)			(0.007)			(0.001)
Unemployment rate			0.003			0.096***
(in %)			(0.014)			(0.026)
Agricultural land (in %)			0.002			0.001
			(0.003)			(0.006)
Female population rate			10.053***			4.032*
(in %)			(1.741)			(2.332)
Rate of professionalism			-4.475***			3.100**
(in %)			(1.021)			(1.384)
Constant	-2.170***	3.130***	-3.797***	-3.367***	1.160	-8.437***
	(0.294)	(1.082)	(1.199)	(0.343)	(1.359)	(1.654)
Observations	136	136	136	136	136	136
R-squared	0.005	0.710	0.905	0.002	0.555	0.803

*Denotes significance at the 90% confidence level; ** significance at 95%; *** significance at 99%.
Standard errors in parentheses. All regressions are weighted by the size of the province's population.

Table 5

Fixed-effects Estimates

	Poverty head count ratio (in %)			Indigence head count ratio (in %)		
	(1)	(2)	(3)	(4)	(5)	(6)
Per capita health expend.	-0.035	-0.055**	-0.040***	0.033	0.025	0.053**
(x 10^{-4} pesos)	(0.039)	(0.024)	(0.013)	(0.064)	(0.042)	(0.021)
Per capita education	0.014	0.022	-0.061	0.014	0.001	-0.125*
expend. (x 10^{-4} pesos)	(0.044)	(0.046)	(0.040)	(0.071)	(0.073)	(0.066)
GDP per capita		-0.001*	-0.0004		-0.001	-0.0002
(x 10^{-3} pesos)		(0.001)	(0.0003)		(0.001)	(0.001)
Organization rate (in %)		-0.010**	0.010		-0.016***	0.009
		(0.005)	(0.008)		(0.004)	(0.013)
Average education		-0.075*	0.053		-0.115**	0.119
(in years)		(0.045)	(0.048)		(0.052)	(0.074)
Rural population (in %)		0.068***	0.032		0.049*	-0.013
		(0.022)	(0.024)		(0.025)	(0.028)
Average consumer price			0.003***			0.005***
level (in pesos)			(0.001)			(0.001)
Unemployment rate (in %)			0.026***			0.034**
			(0.010)			(0.014)
Agricultural land (in %)			-0.029**			-0.064***
			(0.012)			(0.017)
Constant	-1.924***	-2.659***	-5.416***	-3.262***	-2.985**	-7.347***
	(0.295)	(0.833)	(0.735)	(0.462)	(1.119)	(0.902)
Observations	136	136	136	136	136	136
Number of prov_id	46	46	46	46	46	46
R-squared	0.015	0.292	0.497	0.009	0.197	0.455

*Denotes significance at the 90% confidence level; ** significance at 95%; *** significance at 99%.
Standard errors in parentheses. Models in columns (3) and (6) were initially run with the female population rate and the rate of professionalism variables. However, these were subsequently excluded given their insignificance in both runs. All regressions are weighted by the size of the province's population.

Table 6

Foster Greer Thorbecke (FGT2) Estimations

	OLS			Fixed-effects		
	(1)	(2)	(3)	(4)	(5)	(6)
Per capita health expend.	0.075	0.290	-0.054	0.618**	0.706**	0.537*
(x 10^{-4} pesos)	(0.508)	(0.463)	(0.331)	(0.243)	(0.270)	(0.304)
Per capita education	-0.339**	-0.166	-0.00003	-0.065	-0.103	-0.189**
expend. (x 10^{-4} pesos)	(0.134)	(0.114)	(0.080)	(0.098)	(0.103)	(0.091)
GDP per capita		-0.030***	-0.021**		-0.003	-0.006
(x 10^{-3} pesos)		(0.011)	(0.009)		(0.008)	(0.008)
Organization rate (in %)		-0.019	0.023		0.002	0.005
		(0.020)	(0.023)		(0.004)	(0.004)
Average education		0.175	-0.295*		-0.199***	-0.142***
(in years)		(0.206)	(0.168)		(0.050)	(0.048)
Rural population (in %)			-0.056*			-0.117
			(0.030)			(0.080)
Unemployment rate (in %)			-0.017			0.045**
			(0.043)			(0.017)
Female population rate			58.293***			
(in %)			(11.292)			
Constant	-1.019	-1.212	-26.353***	-3.050***	-0.958	1.720
	(1.056)	(1.822)	(6.178)	(0.808)	(1.124)	(1.886)
Observations	124	124	124	124	124	124
R-squared	0.191	0.341	0.607	0.066	0.122	0.205
Number of prov_id				43	43	43

*Denotes significance at 90%; ** significance at 95%; *** significance at 99%.
Standard errors in parentheses. Models in columns (3) and (6) were initially run with the rate of professionalism variable. However, this was subsequently excluded given its insignificance in both runs. The model in column (6) also initially included the female population rate variable. Again, this was subsequently excluded given its insignificance in the regression. All regressions are weighted by the size of the province's population.

Table 7

Instrumental Variables Estimates for Program Placement

	Per capita health spending (1)	Per capita education spending (2)
Instrumented region fixed	-12.978	-1.353***
effect from 2000	(11.987)	(0.022)
GDP per capita	-0.0004	0.063***
	(0.018)	(0.001)
Average education (years)	-4.228	-2.036***
	(3.513)	(0.090)
Organization rate (%)	-0.179	-0.194***
	(0.151)	(0.014)
Average consumer price	0.001	-0.034***
level (in pesos)	(0.021)	(0.003)
Agricultural land (in %)	0.134	-0.010*
	(0.156)	(0.006)
Unemployment rate	-0.703	-0.118***
(in %)	(0.739)	(0.024)
Northern region dummy	9.122	1.914***
	(9.703)	(0.115)
Southern region dummy	5.501	3.919***
	(5.071)	(0.189)
Rate of professionalism	85.503	22.604***
(in %)	(81.233)	(2.898)
Constant	98.332	59.919***
	(94.510)	(2.406)
Observations	12	13
R-squared	0.900	0.999

*Denotes significance at the 90% confidence level; ** significance at 95%; *** significance at 99%.
Standard errors adjusted for clustering at the regional level in parentheses. Tests for instrument validity are presented in the body of the paper. North region dummy includes the first four regions: Tarapaca, Antofagasta, Atacama, and Coquimbo. South region dummy includes the southern three regions: Los Lagos, Aisen, and Magallanes. Models in both columns were initially run with the female population rate variable. However, this was subsequently excluded given its insignificance in both runs. All regressions are weighted by the size of the province's population.