An Impact Evaluation of Chile's Progressive Housing Program

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Office of Evaluation and Oversight

Inter-American Development Bank
Office of Evaluation and Oversight
Working Paper: OVE/WP-06/08
June, 2008

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Washington, D.C

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The authors thank Ana Ramirez and Pavel Luengas of OVE for their valuable assistance. The findings and interpretations of the authors do not necessarily represent the views of the Inter-American Development Bank. The usual disclaimer applies. Correspondence to: Inder J. Ruprah, e-mail: inderr@iadb.org, Office of Evaluation and Oversight, Inter-American Development Bank, Stop B-760, 1300 New York Avenue, NW, Washington, D.C. 20577.

ABSTRACT

This paper evaluates Progressive Housing Program; a public housing program that facilitates the purchase of a new home. The evaluation finds that the program's package (savings requirement, voucher and mortgage) design is inappropriate if the program is targeted to the poor. In fact the pro-poor targeting of the program was poor with high under-coverage and high leakage. Further, the benefit, a minimum quality new house, was not sustainable as many households slipped back into the housing shortage category overtime. An impact evaluation reveals that although the program had significant positive effects on materiality conditions (access to water, sewerage, and electricity), it had a negative effect on overcrowding, and had no discernable effects on welfare indicators (poverty, school attendance, occupation ratio, etc.). This could be due to high residential segregation that resulted from attempting to maximise the number of housing solutions on the cheap. The study also cautions against the mechanical use of cost benefit calculations for policy decisions: the program's internal rate of return was higher than the official cut off rate of 12%.

INTRODUCCION

This paper presents the findings of an evaluation of Chile's Progressive Housing Program, PHP; a public housing program that financed the purchase of a new house.

The country's program had begun 1991 in an attempt to ameliorate the lack of adequate housing solutions particularly for the poorer households of the population. The country's return to democracy in 1990 brought with it a policy concern that there was a large housing shortage as there were a large number of multiple households living in single sub-standard abodes. It was also thought that the existing public housing programs excluded the poor given their stringent eligibility requirements of minimum saving and indebtedness criteria.[1] These specific concerns were within a general concern that this situation would lead to massive illegal land invasions that had been contained by the previous military government.[2] Containment of informal peripheral urban growth was attributed to overcrowding as poor households had accommodated population growth within their own sites and houses.

As far as we are aware there is no comprehensive impact evaluation of the program, a situation that is typical of housing programs in Latin America. A search be the authors for published impact evaluations came up empty handed. This paper is an attempt to begin filling this evaluative information gap. It is particularly important because Chile's Progressive Housing Program has been copied by a number of other Latin American countries including Colombia, Mexico, Nicaragua, Panama, and Peru. The "copy" has been a design that includes saving requirement for eligibility; benefit of a voucher plus a mortgage and the stipulation that construction should be by private firms.

As a preview to the findings we find that the program had some significant positive welfare impacts and had an internal rate of return higher than the government's official benchmark cut-off rate of 12%. However, the process evaluation is less rosy. The size of the program remained very small relative to the size of the housing shortage. The program's design of including mortgages had to be abandoned in the face of high delinquency rates. Public sector construction was originally the main provision mechanism but was gradually replaced by private. The benefits were not sustainable as many households that were beneficiaries of the program slipped back into the housing shortage category as their houses deteriorated over time.

The rest of the paper is structured as the following. First, we describe the design and institutional features of the program. Second, the description is followed by a

[1] See MINVU (2004), Rojas (2001), and Suarez (1991).
[2] See Greene (2004).

process evaluation. Third, the process evaluation is followed by an impact evaluation on welfare outcome indicators and calculations of the program's internal rate of return. The final section presents our conclusions.

PROGRESSIVE HOUSING PROGRAM (PHP): A DESCRIPTION

The policy problem was an inadequate stock of quality houses with the program design problem of how to increase rapidly that stock through new housing solutions for lower income households rather than providing rent subsidies. The objective of this chapter is to describe the essential design and institutional features of the progressive housing program.

The PHP was managed by the Ministry of Housing (MINVU) and operated by the Ministry's operational arm SERVIU (acronym in Spanish for Housing and Urbanization Services, *Servicio de Vivienda y Urbanización*) At the time that PHP began the Ministry operated five housing programs producing about 80,000 housing units per year.[3]

PHP was designed to provide low-cost housing solutions to the poor. However, the PHP maintained the essential design features of MINVU's existing housing programs namely an ABC (for the Spanish words of *ahorro* i.e. savings, *beca* i.e. a voucher, and *crédito* i.e. a mortgage) design. In more detail the program can be described by the financial benefits, the eligibility and priority given to the applicants, the quality of the housing solution, and modalities of application for and delivery of the housing solution.

The program's financial benefits consisted of a subsidy through a voucher and a mortgage that complemented the stipulated applicant's minimum savings. The subsidy-mortgage-minimum saving originally was in UF[4] was 100, 3, and 17, was changed in 1992 to, 120, 3 and 17 as construction costs were higher than anticipated and again in 1996 to 132, 8, and 0 in 1996. The interest free mortgage, provided directly by SERVIU was for five to eight years, with minimum payment of 0.3 UF and a maximum of up to 20% of household income. However, the unanticipated high rate of arrears was attributed to the low income of the beneficiaries of the publicly provided mortgages hence the mortgage component was eliminated in 1996 and concurrently both the subsidy and the required minimum saving increased.

[3] See Ruprah and Marcano (2007) for a description of and an impact evaluation of Chile's other housing programs.

[4] The **Unidad de Fomento** (**UF**) is a **Unit of account** that is used in Chile. The exchange rate between the UF and the Chilean peso is constantly adjusted to inflation so that the value of the UF remains constant. It has become the coommon measure for determining the cost of construction, values of housing and any secured loan, either private or of the Chilean government. For the time series of UFs see: http://www.uf.cl/

The eligibility and priority given to the applicants was built on the existing social program's systems. The country's system is built around the country's social stratification system Social Assistance Committees (CAS).[5] PHP's eligibility requirement was that the household had been surveyed in CAS within the previous 24 months. Applicants had to have a housing savings account in a recognised financial entity. The applicants were selected through a scoring system in which CAS information was used as an input to determine a priority index per applicant.[6] Note that no upper ceiling was used as a cut-off income beyond which households were ineligible although public documents suggest that the targeted population was the lower two income quintiles.

The housing solution of the PHP consists of a two-phase housing solution: The first phase consisted of an urbanised site (with connections for potable water, sewerage, electricity and roads with street pavements and drains) and a minimum construction (common room, kitchen and bathroom) for applicants that possessed land or were engaged in the purchase of land. The second phase consisted of extensions to the minimum urbanised site, i.e. additional rooms in one or two floors. Note that the program did not have one-prototype solution but allowed heterogeneity of solutions according to the region and the Construction Company or managing agency of the project.

The program consists of three modalities: (i) public, SERVIU (the operational arm of MINVU, *Servicio de Vivienda y Urbanización*) a modality available only for the first phase solution; (ii) private, i.e. situation where the beneficiary provided the site and SERVIU assisted in financing the project, a modality available for both the first and second phase; and (introduced in 1994), (iii) a private lot densification i.e. a new house built in an existing lot. This modality was introduced as the availability of land became scarce in major cities and more

[5] CAS began in 1979. It is a homogenous information system with national coverage but decentralised as the information is collected at and by municipalities who finance this task. The system is used to identify needy households; to target social programs and is often used to rank applicants to social assistance programs including PHP. The social programs do not contribute to the cost of CAS. The system provides information by household, on thirteen variables corresponding to five dimensions: housing quality, education, occupation, income and wealth of households. For a history and evaluation see O. Larranaga (2005)

[6] The base score of an applicant is obtained from the CAS assessment which is subtracted from 780, to the resulting number is added : (i) ten points for each family member, if the applicant is a widower or single parent or someone in the family is disabled another ten points are added; (ii) a half point for each month the applicant has been registered in the system and one point for each month if registered beyond 48 months; (iii) for the SERVIU modality one and a half points for each UF of accredited savings, to a maximum of eight points while for the private and lot densification modalities a half point for each UF in saving and 0.05 point for each additional UF in savings, additional 0.3 points for each UF savings contributed to the applicant by an outside sponsor and 0.05 for each assigned UF of over ten ; (iv) ten points if applicant owns the site; and (v) 50 points if the applicant complies with all the requirements.

expensive, from 1990 to 1997 the average increase in the price of land was 50%. For both SERVIU and Private modalities an application to the program could be made either individually or collectively. Collective applicants were from long existing cooperatives or groups or created ad hoc to apply to the program. The collective modality was often assisted in organising the purchase of the land, making the proposal sometimes including the architectural project by non-government organisations.

The program, see Chart 1 and 2, from 1992 to 2005, spent US$423.3 million, 95% on Phase I. The program provided 136,185 housing solutions, with 80% in Phase I. Over time, both in terms of public expenditure and the number of housing solutions, Phase I increased significantly until 1996, thereafter it remained more or less constant until 2003 when it fell precipitously. The fall was due to the phasing out of the program and introduction of new programs that began in 2002. Phase II also increased, although remained at much lower levels than Phase I, reaching its peak in 1996 and thereafter fell in an accelerated form. In 2005 the program delivered 1,300 solutions that represented 10% of the total units delivered in 1996, and around 1% of the total housing solutions of all programs of MINVU in that year.

Chart 1 - PHP: The Number of Housing Solutions

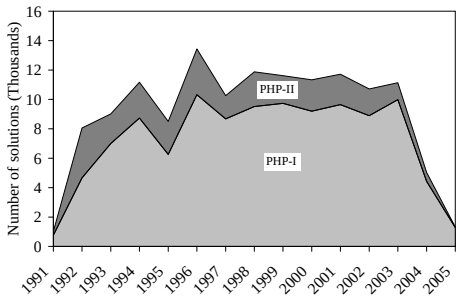
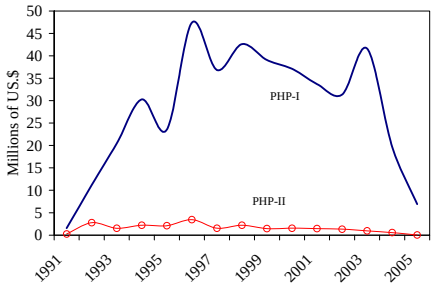


Chart 2 - PHP: Public Expenditure



Source: MINVU

The numbers suggest that Phase II was not demanded. This may have been due the program being unattractive for potential beneficiaries and for construction firms. The program's stipulation of the required passage of a minimum of 24 months restriction on application to Phase II after receiving Phase I meant that many households began self-construction soon after receiving the Step I grant. Thus, they no longer needed Phase II. Further, to the extent that not all households subscribed to the Phase II implied an increased cost and reduced revenue for construction firms who thus were not willing to participate.

It is important to keep in mind the importance of PHP amongst the different programs managed by MINVU. The relative importance of PHP can be measured both by the relative expenditure and in terms of the relative number of housing solutions. Both in 1991 and 2005 the PHP importance was about 1% of MINVU programs and reached an average of about 10% during 1996-2003.

The program began to be wound down in 2002 when there was a major reform of the country's housing programs. Progressive Housing Program's successor is Dynamic Social Housing without Debt Program. Relative to Progressive Housing Program, it finances housing solutions that are smaller (of 25 to 50 square meters) but with a larger subsidy (300 UFs) that represent about 95% of the value of the house. It uses an income based means test hence has a clear poor targeting eligibility criterion.

A PROCESS EVALUATION

In this section we subject the program to a number of typical process evaluative criteria, adequacy of the size of the program, incidence and targeting efficiency, sustainability, design problems encountered during implementation.

Size Relative to Housing Shortage

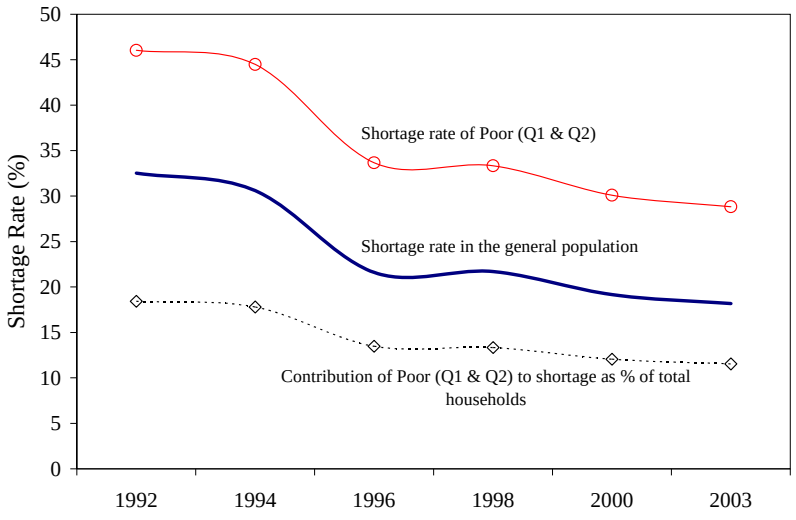
One evaluative criterion is the adequacy of the size of the program relative to the size of the housing shortage problem it was designed to tackle. Official documents define housing shortage as the number or non-recoverable houses and the number of single dwelling houses with multiple households[7]. Adopting the official definition we use the country's household survey, CASEN, to determine housing shortage.[8] The shortage is defined as the percent of households living in a dwelling: (i) without at least one basic service (of electricity, potable water, and sewerage connection); (ii) with at least one house quality problem (floor, wall, ceiling- roof in bad condition); and (iii) with multiple-households living in

[7] Numerical estimates of the housing shortage and housing shortage of the poor –the problem- vary considerably. The variation is due to different definitions, methodologies and data sources used. Estimations of housing shortage normally use one of three data sources: (i) Population and Housing Census (1982 and 2002); (iii) Household Surveys, CASEN (1990-2-4-6-8, 2000-3); and (iii) a census of the poor, CAS. The figures underlying the housing shortage used in this study can be compared with other estimations. Perhaps the most comprehensive study was done by MINVU using the 2000 Population Census and the CELADE method. This document estimates the housing shortage of around 987,000 in 2002, see MINVU, 2004 and CELADE, 1996.

[8] CASEN surveys are carried out every two years with a publication lag of one year. This study uses CASEN for the years: 1990, 1992, 1994, 1996, 1998, 2000, and 2003, 2006. The sample size of a CASEN ranges between 60,000 and 90,000 households with a national coverage with representative level in more than sixty percent of municipalities.

overcrowded conditions. The figures from the surveys were adjusted by the 2001 census and discount the intersection set of the three criteria.

Chart 3 - Housing Shortage: General Population and for the Poor
(lowest two quintiles)



Source: Own stimations based on household (CASEN) surveys (1992 to 2003).

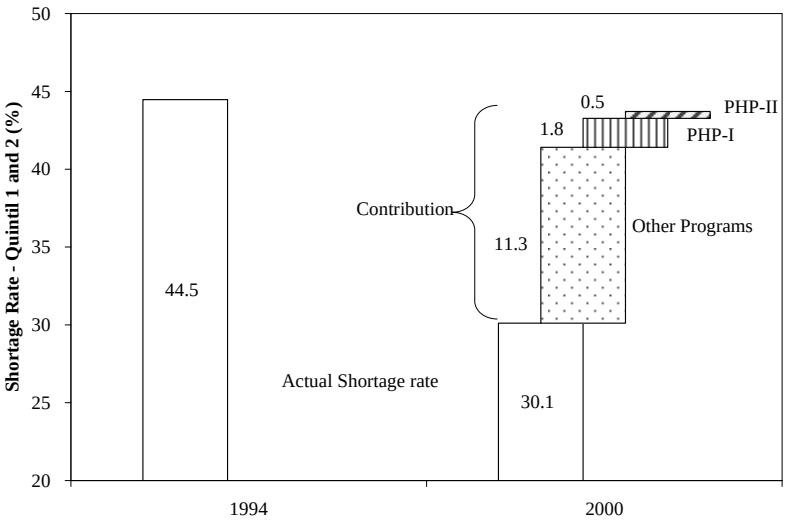
Chart 3 shows the estimates of the housing shortage from 1992 to 2003 for the general population and for the poor (defined as households in the lowest two income quintiles Q1 & Q2). As can be seen the housing shortage in 1992 was 32.5% of households i.e. 1.3 million houses. The housing shortage falls overtime such that by 2003 the housing shortage had been reduced to 18.2% i.e. 0.9 million houses. However, the Progressive Housing Program was introduced with the concern of the housing shortage of the poor. In this paper, to be compatible with government documents, we define the poor as those households whose income falls in the lowest two income quintiles. In this case the shortage problem in 1992 was 18%, i.e. i.e. 769,000 households. By 2003 the shortage figure for the poor fell to 12%, i.e.580,000 households.

Chart 4 calculates the size of the program relative to the size of problem. [9] The reduction in the shortage rate of the poor due to public housing programs was 15.4 percent with other housing programs (other HP) representing 11.3%. The

[9] Note the method used assumes that households classified as part of the housing shortage calculations leave that category when they receive the benefit and do not fall back into the category of households with housing problem. If this assumption is valid then the previous calculations overestimate the contribution of the program towards reducing the housing shortage.

contribution of PHP was a meagre 2.3%. Both "contribution" calculations assume that beneficiaries of the PHP could not have found a private solution.

Chart 4 - Contribution to the Reduction in Housing Shortage of the Poor

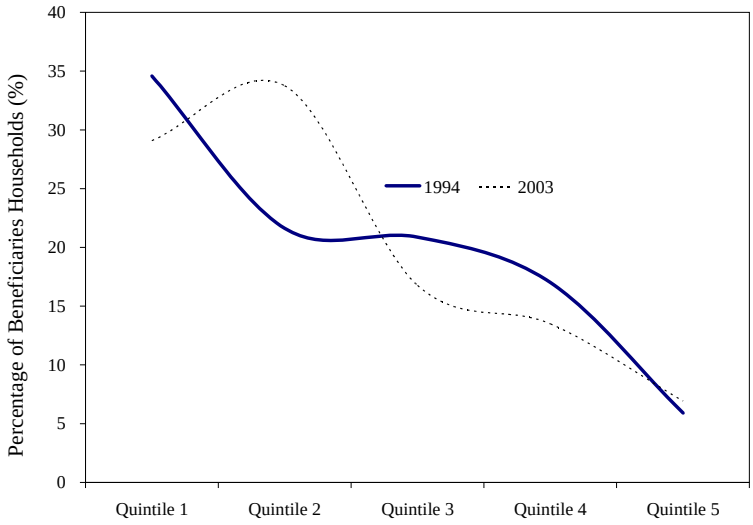


Source: Own calculations using CASEN 1994 and 2000.

Incidence and Targeting Efficiency

A typical process evaluative criterion is the incidence and targeting efficiency of the program. Although the program's housing solutions was biased towards the poor there was high under-coverage and slippage.

Chart 5 - Incidence across Household Income Quintiles



Source: Own calculations using CASEN 1994 and 2000.

	Quintil 1	Quintil 2	Q1 & Q2
	In Monthly US.$		
Non Beneficiaries	33.1	70.3	51.7
Beneficiaires of PHP-I	38.2	85.3	56.4
Total	33.2	70.5	51.8

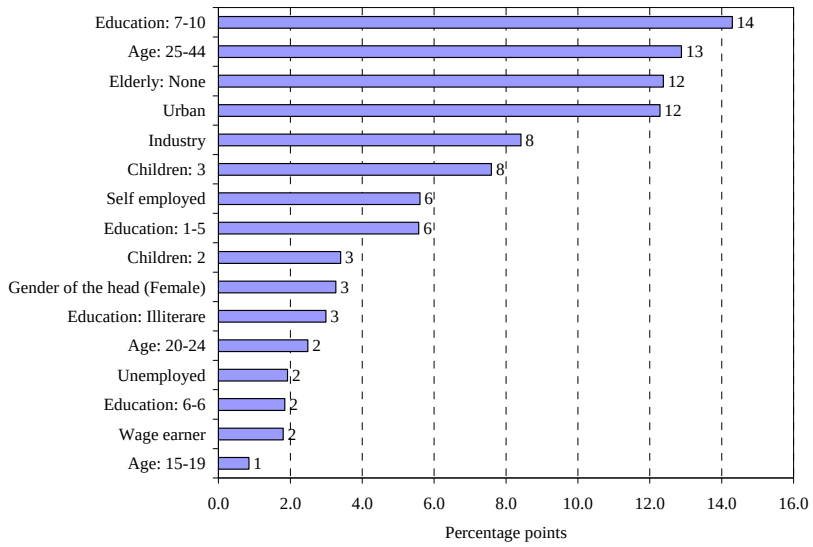
Source: Own estimations based on special processing of CASEN surveys.

Chart 5 shows the incidence and its change over time of the percent distribution of the program by household beneficiaries classified by income quintiles. As can be seen the incidence of PHP was biased towards the lowest two quintiles and that bias increased over time: the lowest two quintiles received 56.2% of total budget outlays in 1994 and 67% in 2003. An additional feature of incidence is that the beneficiaries in the lowest two quintiles were not the poorest in those categories. The mean income of beneficiary households in the lowest two quintiles was 115% for quintile 2 and 121% for quintile 1 more than the non-beneficiaries mean income levels for each quintile. This feature suggests that the design features of the program excluded the poorest of the poor households probably because of the program's requirements on co-financing by the beneficiaries of the program and the restriction that mortgage payments could not exceed 20% of household's income.

Chart 6 shows the typical profile of the program's beneficiaries. The Chart is drawn as the percentage point difference in the average value of the given

characteristic of beneficiaries with respect to that characteristic's average value of the general population. The profile of the beneficiary is someone with low education (7 to 10 years of schooling), aged between 25 to 44 years, and that lives in an urban area in Region X, and with two to four children.

Chart 6 - Profile of PHP Beneficiaries



Source: Own calculations using CASEN 2000**.**

Incidence analysis reveals little regarding targeting efficiency. Targeting efficiency is often used as a measure of cost effectiveness of a public program (see Lambert, 2001 and Ravallion, 2007). It measures type I error that is ineligible households receiving the benefit (also called vertical efficiency or errors of inclusion) and type II error of incomplete coverage of eligible households (also called horizontal efficiency or errors of exclusion).

De facto targeting efficiency calculations are summarised in see Table 1 for the relative poverty definition (i.e. lowest two income quintiles). The Table shows that under-coverage and leakage were high. Nonetheless, there appears to be an improvement over time. The temporary worsening of targeting efficiency in 1998 can be attributed to the MINVU's decision to transfer funds from the PHP and Basic Housing programs to repair houses that had been damaged due to extreme weather in Regions III to IX in the last semester of 1997.

Table 1; Targeting Efficiency
(Two lowest income quintiles as target)

	Under-coverage (a)	Leakage (b)	Under-Coverage (c)
		(%)	
1992	99.9	74.9	99.6
1994	99.7	43.8	99.4
1996	98.6	30.3	97.3
1998	95.6	36.0	93.5
2000	96.4	32.8	94.3
2003	97.0	37.2	95.2

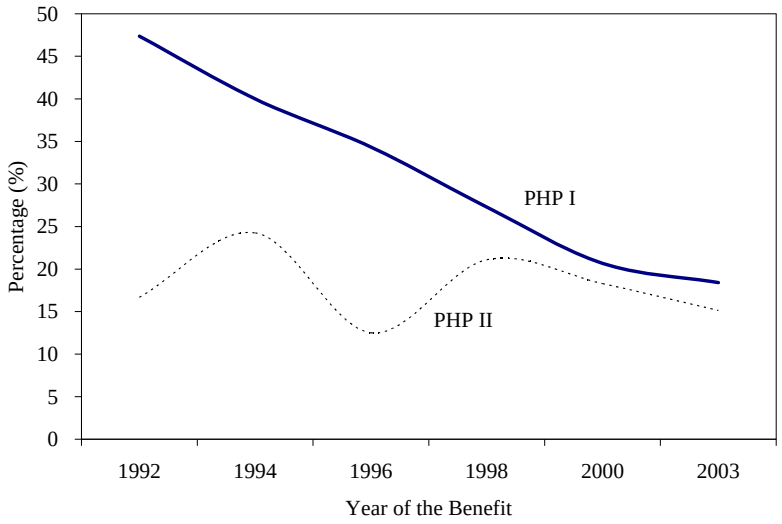
Where: (a) actual to targeted households (%), (b) solutions delivered to non-targeted beneficiaries (in quintiles 3 to 5) (%), (c) potential under-coverage with zero leakage (%).
Source: Own calculations using CASEN 2000.

Thus if the targeted population is taken to be the poor de facto targeting efficiency was far from perfect. Inadequate targeting efficiency compounded the problem of an adequate size of the program relative to the size of the problem (housing shortage of the poor). Therefore even with zero leakage under-coverage would have remained high (column c in Table 1).

Sustainability

An operational definition of sustainability is the extent the benefit continued over time. Defining benefit as a quality house Chart 7 shows that this was not the case.

Chart 7 - Re-incidence of Housing Shortage of PHP Beneficiaries



Source: Own calculations using CASEN 2003.

A significant proportion of households who in 2003 were classified as living in inadequate housing had been beneficiaries of the program some time in the past. 52.9% of the beneficiaries of the program in 1992 were so classified in 2003. 19% of those who received the benefit in 2003 were so classified in that year (mainly due to overcrowding criterion). Thus over time publicly provide houses often deteriorate, due to inadequate maintenance, such that owners fall back into housing needs household category. According to Brain and Sabatini (2006) there is no incentive to do so for the owners of social housing. While the price of land has increased about 14 times from 1990 to 2004 the price of social housing units has remained stable. There are no returns from investing in the house. To some extent this problem has been recognised by the government as it has introduced, in 2005, the program Maintenance of SERVIU Houses.

Design Problems

However, there have been at least two other main problems with the country's public housing programs in addition to a significant re-incidence of households living in sub-standard conditions whose house was originally provided through one of the public program. First, a much higher delinquency rate of publicly

(SERVIU) provided mortgages relative to privately provided mortgages. Second, the creation of social problems associated residential segregation.

SERVIU provided mortgages have had a consistently higher delinquency rates than private ones over the business cycle. The policy response to the high delinquency rates was to eliminate them for poor households thereby transforming the program to an AB design, i.e. with a voucher and a small amount of household savings. Thus instead of attributing the higher delinquency rates to the problem of moral hazard the government attributed it to the problem of incapacity to pay. [10]

In a series of papers Sabatini (2001, 2003) has documented the increase in price of land, the resulting geographical location of public housing and the ensuing result of residential segregation. Statistical analysis by Vargas (2006) confirms the hypothesis that housing subsidies result in segregation in the case of the capital, Santiago. He finds "…*housing policy has raised exogenously RS [residential segregation] by the mechanism of buying cheap soil in far from the center locations to build social dwellings.*" (P18).

Evaluations by residents in social housing parks are telling. Rodriguez and Sugranyes (2005) report that using a social housing survey about 65% of residents reveal that they want to leave citing as reasons difficulties with neighbours, problems of delinquency and drugs followed by problems of isolation from urban centers and lack of services and parks.

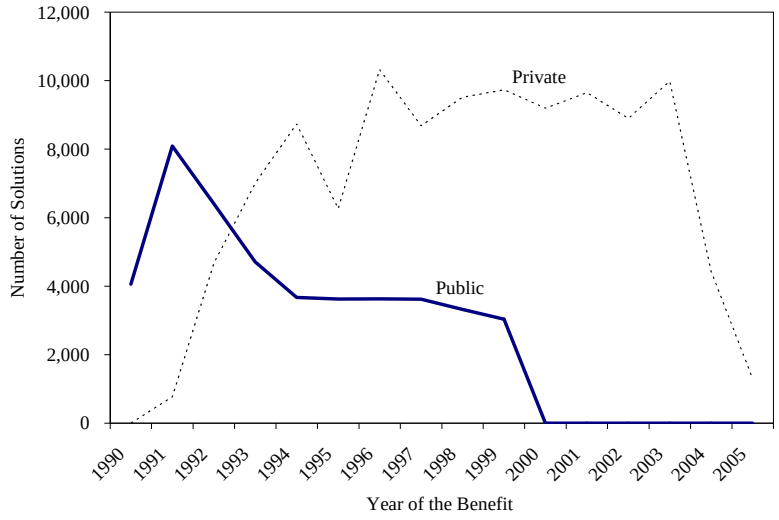
The negative results turn on its head the possible virtue of the Chilean model of the complementarities between the public (providing the financing) and private (carrying out the construction) sectors. The system, it is argued, is trapped in an undesirable equilibrium with no incentives to change. One actor is the public sector that in seeking lower costs locates the poor where the poor are already living, that is where land is relatively cheaper and creates housing parks with extremely high density without public amenities. Another actor is private construction companies who construct social housing units where economies of scale and limited budget also locate housing parks in the periphery with high density of housing solutions. There is very little competition as few companies can meet the annual quotas of construction. Thus the actors are trapped in producing low quality solutions on a massive scale.

It should also be noted that PHP did not kick off with private provision. Instead the 100% public provision was gradually replaced by private provision that

[10] MINVU carried out surveys in 1998 that concluded that the problem was one of incapacity to pay. This interpretation is confirmed by Marcano and Ruprah (2007) who test the incapacity to pay vs. moral hazard hypothesis.

became 100% provision by 2000 (see Chart 8). The Ministry carefully created private supply by working closely with the country's Construction Chamber.

Chart 8: Public & Private Provision



Source: MINVU

Today, with the size of the housing shortage considerably reduced largely thanks to public housing programs their very solutions have become the problem. Thus, ex post the country's very success of massive production of public housing solutions aimed at reducing the quantitative problem has created a quality problem, particularly for PHP houses.

WELFARE EFFECTS

Evaluative Strategy

In this section we present the welfare effects that can be attributed to the program. In determining the welfare effects two choices have to be made: (i) the vector of anticipated outcomes, and (ii) the estimation method.

Official government documents do not explicitly list the expected program outcomes other than the reduction of overcrowding and the improvement of the quality of housing. The set of outcomes used in this paper consists of five dwelling and overcrowding indicators, and six welfare outcome indicators. Dwelling indicators consisted of potable water access, sewerage connections, electricity connections, the quality of the walls, floors, and ceilings, and

overcrowding problems (more than two people living per room). These are aggregated into a composite non-weighted quality of the housing solution index.[11] The welfare indicators are: household completeness, (presence of spouse, and formally married), occupation ratio (working household's members as percentage of total household members), school attendance (children 6 to 14 years old), and under-nourishment of children younger than 6 years, indigence and poverty rates.

Estimations of the development effect of a program normally use one of the following three techniques (see Blundell and Costa 2002 for a survey of the different approaches). One approach, which can be denominated as the naïve approach, calculates the change over time in the outcome variables of the beneficiaries. These estimates are nominated as naïve because they assume that the change in outcomes can be attributed exclusively to the program being evaluated. However, they may fail to capture only the changes in outcomes due to the program as they may include changes due to other variables in which case the changes in outcomes cannot be attributed to the program.

Another approach adopts a parametric technique. This approach specifies the outcome of interest as a function of whether the household is a beneficiary of the program or not and controls for a set of covariates that may influence the outcome other than the benefit of the program. However, there is a priori doubt on the validity of the interpretation using this approach. The key problems are selection bias, misclassification bias, and confounding bias that cast doubt on the estimated parameter of interest.

An additional approach, that is a priori the preferred approach, consist of quasi-experimental techniques that attempt to calculate the impact of the program not by isolating the effects of other variables as in the econometric approach but by attempting to create a comparable group that would have a priori been similarly effected by the other variables as the beneficiary group. The differences in average values of the beneficiaries and the comparison group are taken to be the change in outcome attributable to the program. Specifically we use two methods to construct the comparison groups: the pipeline method and the propensity score (PSM), with nearest neighbourhood, and single difference technique. The pipeline method compares beneficiaries with current applicants to the program. This approach although simple to implement makes a strong assumption that may not be borne out in practice. It assumes that applicants to the program only differ

[11] The quality index is calculated as: $qi = \sum_i \frac{a_i^*}{7}$ where a_i is equal to unity if the house has adequate condition "i" (where "i"= potable water, electricity, sewerage, walls, ceilings, and no overcrowding) and zero otherwise.

with respect to being beneficiaries of the program but are similar with all other characteristics. The PSM creates the comparison group such that they share as many characteristics as the beneficiary group and is a priori the preferred method.

Results

Table 2 brings the various calculations together, where the signs "+/0/-" signify an improvement, no change, and worsening of the outcome respectively and the sign "*" indicates that the effect is statistically significant. Note the data used is from the household survey of 2000, the year with the largest number of registered applicants although for robustness reasons the impact calculations are repeated using the 2006 household survey. To check for robustness of the results and possible time effects the impact calculations are repeated using data from the household survey of 2006.

There are three key features. First, there is a considerable difference between the naïve approaches and the impact approach in terms of the direction of the calculated effect. Second, the impact calculations generally show positive effects of the programs except for overcrowding. A perverse effect on overcrowding is to be expected given that the program's housing solution consisted of one room, a bathroom and a kitchen. Third, all welfare effects (poverty, indigence, occupation ratio, school attendance, under nourishment, household completeness) are positive but for 2000 data statistically insignificant unlike the materiality effects. Note that school attendance becomes statistically significant using data from the 2006 exercise.

Table 2: Summary of Outcome Findings

Outcome	Naïve: before after /1	Pipeline method /2	Cross section regression /3	Single Difference (2000) /4	Single Difference (2006) /4
Poverty	+	+		+	+
Indigence	-	-		+	+
Occupation ratio	-	-		0	0
School attendance	0	+		+	.+*
Child under nourishment	0	-		+	+
Household completeness	-	-		+	+
Quality of house	+	+	.+,*	.+*	.+*
Overcrowding	+	-		-	-
Electricity access	+	+		.+*	.+*
Sewerage connection	+	+		.+*	.+*
Potable water access	+	+		.+*	.+*

*Statistically significant at 5% level; \1 see Annex 1; \2 see Annex 2; \3 see Annex 3 \4 See Annex 4

To conclude the calculations show an unambiguous improvement in the quality of the housing solutions. However, the impact on other outcomes is doubtful. A possible hypothesised reason for the lack of impact on welfare outcomes other than the materiality indicators could be due to the problems associated with residential segregation.

Internal Rate of Return

Finally, an evaluation needs to answer whether the cost of the program was outweighed by the benefits.

The problem of a cost to benefit analysis is that a monetary value is required on the benefit in addition to the dollar cost. Traditionally two different approaches have been taken to determine the monetary values of the benefits (see Olsen 2000). The first approach is the willingness to pay for a given characteristic of a house by contingent valuation i.e. a household is asked the maximum price they are willing to pay for such a house. The second approach uses the hedonic pricing method that at its simplest is a regression of expenditures (either market rents or values) on housing characteristics. The estimated coefficients are used to determine the "price" of a given characteristic. Hence different types of housing solutions in terms of the different bundles of house characteristics can be calculated. However, comprehensive (in terms of the time period and geographical coverage) data on either rents or values is not available therefore precluding these approaches.

We take the following approach. We proxy the monetary benefit by the additional household income normally required to purchase a given quality house. The statistically significant benefits noted above were an improvement in the composite quality index. Using this finding, first, we construct a comparison group from the set of non-beneficiaries and non-applicants who have the same

level of the quality of house and is controlled for location. This group is constructed using the nearest neighbourhood method. Chart 10 shows the difference in income for beneficiaries and non- beneficiaries-non-applicants households living in similar quality dwellings. Chart 11 shows the income difference "matched" households; the difference used as the monetary benefit of the program.

Chart 9 - Household Income by Quality of the Dwelling. Un-Matched

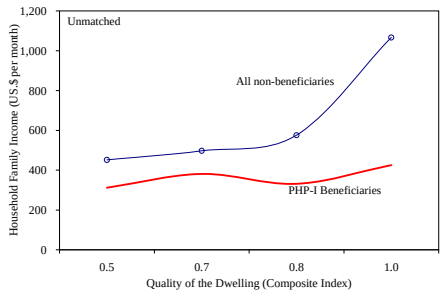
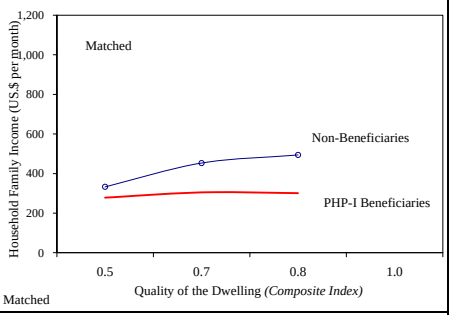


Chart 10 - Household Income by Quality of the Dwelling. Matched \1



Source: Own estimations based on special processing of CASEN surveys. \1 see annex 5.

Second, the benefit is calculated as the average difference between the filtered households with benefits and this control group. Thus we proxy "monetary value of the benefit" by the additional income normally required to purchase the house without the program's benefits.

The cost of the program is defined as the value of the subsidy and required savings.[12] The calculations shown in Table 3 reveal that the net present value of the program is positive and high. The beneficiary households would need almost US$970 more in terms of yearly family income without the program's help to obtain dwellings of an equivalent quality to the houses owned by the non-beneficiaries.[13]

[12] The implicit costs of mortgage delinquency are not imputed into the cost figures.

[13] The flow of the benefits was projected for 10 years discounted at 12% yearly, the rate used by the government of Chile in public program evaluations in 2000. The estimated Internal Rate of Return of the program (IRR) was 18% annually. This estimation does not take in consideration the additional investment that households could make at the moment of the construction of the solutions that would affect the resulting quality of the dwellings. In addition, the depreciation of the unit is estimated to occur in 10 years, but a differentiated depreciation rate between MINVU solution and private solutions is possible. Also, there is no correction by specific income level differential and by geographic location. A US$100 income differential between households may be not equivalent between modern metropolitan areas (Santiago) and small cities located at the south and north of the country.

Table 3 - Cost, Benefits and Internal Rate of Return	
Net benefit - Total benefit minus cost (US$)	1,146.2
Internal rate or return (Annual, %)	18.2
Memorandum	
Present value of the cost (Subsidy plus saving)	4,295.0
Present value of benefits (US$)	5,441.2
Depreciation (Years)	10.0
Social Discount rate (Annual, %)	12.0

Source: Own estimations.

Thus the benefits far outweighed the public costs of the program. The program had positive net benefits of about 0.16% of 2003 GDP. The internal rate of return was 18%, much higher than the country's official cut off rate of 12%. Note however, these calculations are based on the individual household and the quality of the house. It ignores the location of the house hence the negative effects associated with residential segregation.

CONCLUSIONS

The Bank's PHP was an important program. The program's design feature would become the design norm of many Latin American housing programs: target the poor, avoid asserted perverse incentives by avoiding "free lunch" by including saving requirement and that the benefit includes a mortgage (preferably by private provider at market interest rate) not a hundred percent subsidy and avoid inefficiency by insisting that construction should be by private firms not by the public sector.

However, this evaluation has shown that the program was far from being a program targeted to the poor. In fact, mortgage benefit (that carried zero interest rates not market rates) was provided by the public sector plus prior saving for program eligibility may have been responsible for excluding the poor of the poor. Further, during implementation the government redesigned the program. It abandoned the ABC design as the rising delinquency in publically provided mortgages led, in 1996, by eliminating the mortgage component and simultaneously increasing the value of the grant-voucher. The program was never just private provision on the contrary public provision was gradually wound down and private provision increased thus the program carefully created the suppliers part of the market by working closely with the country's Construction Chamber to work on large housing "projects".

Impact evaluation shows that the program has positive and significant effects on materiality conditions i.e. on potable water, sewerage, electricity. However, it increased overcrowding, the main publicly stated objective of the program.

Further no statistically significant effects were found regarding welfare indicators; a finding that maybe due to the effects from residential segregation that resulted from maximising the number of solutions on the cheap.

The evaluative lessons found in this evaluation are the following. First, this evaluation reveals that there is a trade-off between targeting the poor and the saving and mortgage design features. If the program is targeted to the extreme poor, which PHP never was- a full subsidy should be considered. A point recognised by Chile in its replacement program (Dynamic Housing Program Without Debt) that is targeted to the poor. In addition, private construction at the lower end of the market takes time to construct. Programs that kick off with only private construction may encounter problems of sufficient supply. The most disturbing finding, however, is the temporal tradeoff. With large housing shortage problem attempting to maximise the number of housing solutions on the cheap to solve an urgent problem may end up what in Chile is often dubbed "poor with a roof" living with all the problems associated with residential segregation. The very success in quantities will overtime create its own problem of an inadequate housing stock, the problem of quality. This inter-temporal trade-off is perhaps the most difficult to ease given the political imperative of solving the current problem combined with high political discount of future problems.

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Appendix I: Naïve Method

		1992	1994	1996	1998	2000	2003	Change 2003-1992
Beneficiaries of the Program PH -I								
Materiality								
Access to potable water	1/	100.0	99.7	100.0	100.0	100.0	100.0	0.0
Sewerage connection	1/	79.5	96.3	100.0	100.0	100.0	100.0	20.5
Electricity access	1/	100.0	97.5	98.8	100.0	100.0	99.5	-0.5
Overcrowding	2/	19.8	16.9	29.2	24.5	14.8	8.1	-11.7
Quality of the dwelling	3/	0.7	0.7	0.8	0.8	0.8	0.9	0.2
Living standard								0.0
Household Completeness	4/	49.5	59.4	54.8	47.9	48.1	54.7	5.3
Health: Child undernourishment	5/	0.1	0.0	0.1	0.1	0.0	0.1	0.0
Education: School attendance	6/	1.0	1.0	1.0	1.0	1.0	1.0	0.0
Ocupation Ratio	7/	44.1	37.3	30.2	30.1	27.8	34.0	-10.1
Indigence incidence	1/	0.9	6.7	14.2	14.6	11.8	4.2	3.3
Poverty incidence	1/	5.5	41.4	39.2	36.8	37.4	23.0	17.5
Beneficiaries of th eProgram PH-II								
Materiality								
Access to potable water	1/	100.0	100.0	100.0	100.0	100.0	100.0	0.0
Sewerage connection	1/	75.3	100.0	100.0	100.0	100.0	100.0	24.7
Electricity access	1/	100.0	100.0	100.0	100.0	100.0	100.0	0.0
Overcrowding	2/	24.7	0.9	21.5	23.7	4.4	4.0	-20.7
Quality of the dwelling	3/	0.8	0.8	0.9	0.8	0.9	0.8	0.0
Living standard								0.0
Household Completeness	4/	30.7	67.8	63.6	50.2	56.2	45.5	14.8
Health: Child undernourishment	5/	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Education: School attendance	6/	0.8	1.0	1.0	1.0	1.0	1.0	0.2
Ocupation Ratio	7/	37.7	33.8	30.5	27.6	33.7	36.9	-0.8
Indigence incidence	1/	24.7	16.4	17.1	5.3	9.1	4.1	-20.6
Poverty incidence	1/	54.4	32.7	54.7	34.3	33.2	18.9	-35.5

Source: Own Calculations based on Household Surveys CASEN, various years

1/ Percentage of households (%)

2/ Percentage of households with number of persons per room greater than than three (3)

3/ El índice se construye con base en 6 condiciones las cuales son: el hogar debe contar con pisos, paredes y techos en buen estado y con servicio de agua, luz y alcantarillado. Para esto se hace un conteo binario por condición y se suman las 6 condiciones, es decir un hogar con excelentes condiciones debe sumar 6. Para convertirlo en un índice, se divide por 6, convirtiendo al indicador en una medida de que tan lejos está el hogar i con respecto al hogar que suma 6. Por lo tanto entre más cercano a 1 mejor.

4/ Percentage of households where the spouse is present and it is married to the head of the household

5/ Number of children under 6 years old reported as undernourished (%)

6/ Percentage of children between 6 and 14 years old attending to school (%)

7/ Ocupation Ratio. Working household members as percentage of the total members in the households

Appendix II: Pipeline Method

Naive Evaluation of the Progressive Housing Program Phase I

		All households	PHP-I Beneficiaries (a)	Applicants to the PHP-I (b)	Naïve Difference (a-b)
Materiality					
Access to potable water	1/	88.9	100.0	87.2	12.8
Sewerage connection	1/	66.8	100.0	60.3	39.7
Electricity access	1/	93.6	100.0	94.1	5.9
Overcrowding	2/	7.3	17.7	11.6	6.2
Quality of the dwelling	3/	72.1	84.1	64.0	20.1
Living standard					
Household Completeness	4/	54.3	50.8	41.8	9.0
Health: Child undernourishment	5/	3.5	2.1	3.6	(1.6)
Education: School attendance	6/	97.6	97.7	96.3	1.4
Ocupation Ratio	7/	30.4	27.3	28.7	(1.4)
Indigence incidence	1/	7.4	13.0	11.6	1.4
Poverty incidence	1/	17.7	26.0	28.6	(2.6)

Naive Evaluation of the Progressive Housing Program Phase II

		All households	PHP-II Beneficiaries (a)	Applicants to the PHP-II (b)	Naïve Difference (a-b)
Materiality					
Access to potable water	1/	88.9	100.0	95.5	4.5
Sewerage connection	1/	66.8	100.0	76.4	23.6
Electricity access	1/	93.6	100.0	99.1	0.9
Overcrowding	2/	7.3	5.7	11.8	(6.1)
Quality of the dwelling	3/	72.1	86.3	71.4	14.9
Living standard					
Household Completeness	4/	54.3	52.0	57.3	(5.3)
Health: Child undernourishment	5/	3.5	3.5	1.3	2.2
Education: School attendance	6/	97.6	98.9	100.0	(1.1)
Ocupation Ratio	7/	30.4	32.7	29.1	3.7
Indigence incidence	1/	7.4	10.3	12.7	(2.4)
Poverty incidence	1/	17.7	24.6	15.5	9.1

Note: The estimations are based on the no-expanded CASEN survey of 2000

1/ Percentage of households (%)

2/ Percentage of households with number of persons per room greater than than three (3)

3/ El índice se construye con base en 6 condiciones las cuales son: el hogar debe contar con pisos, paredes y techos en buen estado y con servicio de agua, luz y alcantarillado. Para esto se hace un conteo binario por condición y se suman las 6 condiciones, es decir un hogar con excelentes condiciones debe sumar 6. Para convertirlo en un índice, se divide por 6, convirtiendo al indicador en una medida de que tan lejos está el hogar i con respecto al hogar que suma 6. Por lo tanto entre más cercano a 1 mejor.

4/ Percentage of households where the spouse is present and it is married to the head of the household

5/ Number of children under 6 years old reported as undernourished (%)

6/ Percentage of children between 6 and 14 years old attending to school (%)

7/ Ocupation Ratio. Working household members as percentage of the total members in the households

Data: CASEN 2000.

Appendix III: Regression Method

			Athrho	lnsigma
Dependent Variable: Quality of the Household Composite Index		Heckman Reg		
Number of Household Members (Logs)	lmem_h	-0.0402***	0.253***	
		[0.0046]	[0.012]	
Urban areas (Dummy)	durban	0.168***	0.493***	
		[0.0072]	[0.012]	
Age of the Household Head (Logs, years)	lage	0.0212***		
		[0.0067]		
Years of Schooling of the Head of the Household (Logs)	lesc	0.0626***	-0.0741***	
		[0.0033]	[0.010]	
Family Income (Logs, monthly Income)	lyfam	0.0473***	-0.131***	
		[0.0025]	[0.0064]	
Gender of the Head of the Household (Dummy, Male)	dsex	0.00982***	-0.111***	
		[0.0038]	[0.012]	
Region Number I	dreg1	-0.0680***	-0.267***	
		[0.011]	[0.033]	
Region Number II	dreg2	-0.0304**	-0.503***	
		[0.013]	[0.035]	
Region Number III	dreg3	-0.0830***		
		[0.0087]		
Region Number IV	dreg4	-0.0553***	0.226***	
		[0.0073]	[0.024]	
Region Number V	dreg5		0.01 -0.0845***	
		[0.0057]	[0.018]	
Region Number VI	dreg6	0.0188***		
		[0.0065]		
Region Number VII	dreg7	-0.0409***	-0.0776***	
		[0.0061]	[0.020]	
Region Number VIII	dreg8	-0.0552***	-0.202***	
		[0.0055]	[0.016]	
Region Number IX	dreg9	-0.0829***	0.0886***	
		[0.0058]	[0.019]	
Region Number X	dreg10	-0.0568***	-0.196***	
		[0.0069]	[0.020]	
Region Number XI	dreg11	-0.0348***	0.0879*	
		[0.013]	[0.046]	
Region Number XII	dreg12	0.0683***		
		[0.014]		
Capital Region (Dummy)	dcap			
Condition of Activity of the Head of the Household (Dummy, Employed)	doc	0.0152***	0.102***	
		[0.0043]	[0.013]	
Ocupation Category of the Head of the Household (Dummy, Self-employeed)	cat2	-0.0399***		
		[0.0042]		
Ocupation Category of the Head of the Household (Dummy, Private wage earners)	cat5			
Number of Children in Household (9 years and younger, Logs)	nin		0.00 -0.0271***	
		[0.0024]	[0.0075]	
Number of Elderly in Household (60 years and older Logs)	vie		0.00 -0.117***	
		[0.0037]	[0.0099]	

				Athrho	lnsigma
Dependent Variable: Quality of the Household Composite Index		Heckman Reg			
General Housing Subsidy	p1	0.139***			
		[0.0050]			
PET (Workers Program)	p2	0.157***			
		[0.0095]			
Rural Subsidy Program	p3	0.138***			
		[0.0055]			
Basic Housing Program	p4	0.155***			
		[0.0053]			
Progressive Housing Program Phase I	p5	0.139***			
		[0.011]			
Progressive Housing Program Phase II	p6	0.175***			
		[0.018]			
Other Housing Programs	p7	0.0775***			
		[0.0050]			
Non-Beneficiariary of Housing Program (Reference group)	Ref				
Constant	Constant	-0.141***	0.562***	0.03	-1.561***
		[0.035]	[0.073]	[0.070]	[0.0053]
Observations	Observations	72,041	72,041	72,041	72,041
R-square	R-squared	.	.	.	.
	chi2	8,320.00			
	p	0.00			
	rho	0.03			
	sigma	0.21			
	lambda	0.01			

Standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Data: CASEN 2003.

Appendix IV: Impact, Propensity Score, Single Difference

Table IV-1: Participation Equation

	1	2	3	4	5	6	7	8	9	10	11	12	13
Benficiaries Respect to Applicants of the:	**Progressive Housing Program Phase I**												
Number of Household Members (Logs)	0.447**	0.268	0.248	0.247	0.249	0.247	0.248	0.240	0.209	0.206	0.220	0.200	
	[0.19]	[0.16]	[0.15]	[0.15]	[0.15]	[0.15]	[0.15]	[0.15]	[0.15]	[0.14]	[0.14]	[0.14]	
Urban Areas (Dummy)	1.837***	1.789***	1.871***	1.873***	1.873***	1.861***	1.859***	1.849***	1.886***	1.882***	1.896***	1.916***	1.914***
	[0.22]	[0.21]	[0.21]	[0.20]	[0.20]	[0.20]	[0.20]	[0.20]	[0.20]	[0.20]	[0.20]	[0.20]	[0.20]
Age of the Household Head (Logs, years)	0.670**	0.791***	0.884***	0.884***	0.880***	0.881***	0.871***	0.864***	0.858***	0.880***	0.890***	0.893***	0.808***
	[0.33]	[0.28]	[0.23]	[0.23]	[0.23]	[0.23]	[0.23]	[0.23]	[0.23]	[0.23]	[0.23]	[0.23]	[0.22]
Years of schooling of the Head of the Household (Logs)	0.012	-0.046											
	[0.16]	[0.16]											
Family Income (Logs, monthly Income)	-0.131	-0.075	-0.075	-0.074	-0.074	-0.071	-0.073	-0.077					
	[0.094]	[0.090]	[0.086]	[0.086]	[0.086]	[0.086]	[0.085]	[0.085]					
Gender of the Head of the Household (Dummy, Male)	0.559***	0.569***	0.549***	0.549***	0.548***	0.549***	0.570***	0.582***	0.580***	0.580***	0.576***	0.571***	0.573***
	[0.18]	[0.18]	[0.17]	[0.17]	[0.17]	[0.17]	[0.16]	[0.16]	[0.16]	[0.16]	[0.16]	[0.16]	[0.16]
Region Number I	0.554	0.506	0.400	0.414	0.380								
	[0.52]	[0.51]	[0.50]	[0.47]	[0.46]								
Region Number II													
Region Number III	0.941**	0.909**	0.793**	0.806**	0.771***	0.729**	0.731**	0.656**	0.627**	0.622**	0.666**	0.742***	0.735***
	[0.37]	[0.37]	[0.36]	[0.32]	[0.30]	[0.29]	[0.29]	[0.28]	[0.28]	[0.28]	[0.28]	[0.27]	[0.27]
Region Number IV	0.152	0.170	-0.032										
	[0.43]	[0.42]	[0.39]										
Region Number V	1.164***	1.145***	1.302***	1.317***	1.282***	1.233***	1.232***	1.157***	1.121***	1.136***	1.184***	1.269***	1.280***
	[0.37]	[0.36]	[0.36]	[0.31]	[0.29]	[0.28]	[0.28]	[0.27]	[0.27]	[0.27]	[0.26]	[0.26]	[0.26]
Region Number VI	0.962**	0.954**	0.948**	0.962***	0.926***	0.883***	0.880***	0.806**	0.763**	0.733**	0.777**	0.855***	0.853***
	[0.40]	[0.39]	[0.39]	[0.35]	[0.33]	[0.33]	[0.33]	[0.32]	[0.32]	[0.32]	[0.31]	[0.31]	[0.31]
Region Number VII	0.227	0.217	0.084	0.098									
	[0.37]	[0.37]	[0.36]	[0.32]									
Region Number VIII	0.446	0.428	0.285	0.299	0.264	0.222	0.216						
	[0.34]	[0.33]	[0.33]	[0.28]	[0.26]	[0.25]	[0.25]						
Region Number IX	-0.409	-0.419	-0.435	-0.421*	-0.457**	-0.497**	-0.505**	-0.577***	-0.585***	-0.584***	-0.542***	-0.467***	-0.472***
	[0.31]	[0.31]	[0.30]	[0.25]	[0.22]	[0.21]	[0.21]	[0.19]	[0.19]	[0.19]	[0.19]	[0.18]	[0.18]
Region Number X	-0.203	-0.212	-0.230	-0.216	-0.251	-0.294	-0.297	-0.369	-0.405*	-0.389	-0.347		
	[0.35]	[0.34]	[0.33]	[0.29]	[0.26]	[0.26]	[0.26]	[0.24]	[0.24]	[0.24]	[0.24]		
Region Number XI	-0.297	-0.371	-0.432	-0.418	-0.452	-0.496	-0.497	-0.572	-0.613	-0.606			
	[0.52]	[0.51]	[0.49]	[0.47]	[0.45]	[0.45]	[0.45]	[0.44]	[0.44]	[0.44]			
Region Number XII	0.213												
	[1.26]												
Capital Region													
Condition of activity of the Head of the Household (Dummy, Employed)	-0.318	-0.425	-0.492**	-0.491**	-0.495**	-0.488*	-0.420**	-0.418**	-0.444**	-0.386**	-0.388**	-0.389**	-0.393**

	1	2	3	4	5	6	7	8	9	10	11	12	13
Benficiaries Respect to Applicants of the:	**Progressive Housing Program Phase I**												
	[0.27]	[0.26]	[0.25]	[0.25]	[0.25]	[0.25]	[0.19]	[0.19]	[0.18]	[0.18]	[0.18]	[0.18]	[0.18]
Ocupation category of the Head of the Household (Dummy, Self-employeed)	0.232	0.226	0.344	0.345	0.344	0.346	0.270	0.265	0.275				
	[0.30]	[0.30]	[0.29]	[0.29]	[0.29]	[0.29]	[0.22]	[0.22]	[0.21]				
Ocupation category of the Head of the Household (Dummy, Private wage earners)	0.073	0.088	0.102	0.102	0.103	0.098							
	[0.25]	[0.25]	[0.24]	[0.24]	[0.24]	[0.24]							
Number of children in Household (9 years and younger, Logs)	-0.094												
	[0.11]												
Number of elderly in Household (60 years and older Logs)	0.198												
	[0.21]												
Number of female in Household (Logs)	-0.118												
	[0.092]												
Constant	-3.062*	-3.955**	-4.343***	-4.365***	-4.317***	-4.301***	-4.242***	-4.088***	-4.919***	-4.995***	-5.102***	-5.172***	-4.581***
	[1.70]	[1.58]	[1.37]	[1.35]	[1.34]	[1.34]	[1.33]	[1.31]	[0.97]	[0.97]	[0.96]	[0.96]	[0.86]
Observations	873	873	945	945	945	945	945	945	962	962	962	962	962
R-Square	.	.	.	.	.	.	.	.	.	.	.	.	.
	-605	-605	-654	-654	-654	-654	-654	-654	-665	-665	-665	-665	-665
	-522	-525	-564	-564	-564	-564	-564	-565	-574	-574	-575	-576	-577
	23	19	18	17	16	15	14	13	12	11	10	9	8
	165	160	181	181	181	180	180	179	184	182	180	178	176
Pseudo R-square	0.14	0.13	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.13	0.13
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Absolute value of z statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Note: The name "Selection" is given instead of participation because the beneficiaries are compared with the applicants to the program

Table IV-2: Balancing Tests

	N1	N1C1	N1C2	N5C1	N5C2	K2	K6
Number of Household Members	OK	OK	OK	OK	OK	OK	OK
Region R.M. (Dummy)	Un-Balanced	OK	OK	Better	Un-Balanced	Un-Balanced	OK
Urban Areas (Dummy)	Un-Balanced	OK	OK	OK	OK	OK	OK
Age of the Household Head	OK	OK	OK	Better	Un-Balanced	Un-Balanced	Un-Balanced
Years of Education of the Household Head	OK	OK	OK	OK	OK	Better	Better
Family Income (Logs, autonomus monthly Income)	OK	OK	OK	OK	OK	OK	OK
Gender of the Head of the Household (Dummy, Male)	Better	OK	OK	OK	OK	OK	OK
Ocupation Category of the Household Head (Dummy, Unemployed)	OK	OK	OK	OK	Better	OK	OK
Ocupation Category of the Household Head (Dummy, Wage earner)	OK	OK	OK	Un-Balanced	Un-Balanced	OK	OK
Ocupation Category of the Household Head (Dummy, Self-employeed)	OK	OK	OK	OK	OK	OK	OK
Economic Sector of the Head (Dummy, Agriculture)	OK	OK	OK	Better	OK	OK	Better
Number of Children in Household (9 years and younger)	OK	OK	OK	OK	OK	OK	OK
Number of Elderly in Household (60 years and older)	OK	OK	OK	OK	OK	OK	OK
Number of Female in Household	OK	OK	OK	Un-Balanced	Un-Balanced	Un-Balanced	Un-Balanced
Hotelling							
F(x,n)	3.0334	0.3621	0.5988	1.8709	2.1576	1.6793	1.6252
Prob> F(x,n)	0.0002	0.9843	0.867	0.0253	0.0077	0.0537	0.0658
Kolmogorov-Smirnov Two-Sample Test							
D	0.508	0.0468	0.0167	n.a.	n.a.	n.a.	n.a.
P-Value	0.000	0.921	1.000	n.a.	n.a.	n.a.	n.a.
Sample Impact Evaluation							
Treated	311	278	239	1248	1000	1252	1255
Control	311	278	239	296	247	309	311

Where: NI is Nearest-neighbour 1, with no replacement; NICI; Nearest-neighbour 1, with no replacement calliper (0.005); NIC2 is Nearest-neighbour 1, with no replacement calliper (0.001); NSC1 is Nearest-neighbour 5, calliper (0.005); NSC2 is Nearest-neighbour 5, calliper (0.001); K2 is Kernel density matching (bandwidth=0.02); and K6 is Kernel density matching (bandwidth=0.06).

Table IV-3: Impact Calculations

PHP-I	Un-Match	N1	N1C1	N1C2	N5C1	N5C2	K2	K6
Materiality								
1) Access to Piped Water	0.045	0.045 (*)	0.040 (*)	0.025 (*)	0.023 (*)	0.025 (*)	0.023	0.025
2) Sewerage Connection	0.190	0.190 (*)	0.169 (*)	0.155 (*)	0.130 (*)	0.114 (*)	0.130 (*)	0.128 (*)
3) Access to Electricity	0.010	0.000	0.007	0.000	0.000	-0.001	0.000	0.001
4) Ovecrowding	-0.005	0.006	0.007	0.000	0.005	-0.001	0.005	0.004
5) Quality of the Dwelling	0.123	0.133 (*)	0.131 (*)	0.103 (*)	0.086 (*)	0.084 (*)	0.087 (*)	0.095 (*)
Living standards								
6) Family Completeness	0.091	-0.052	-0.022	-0.025	-0.001	-0.006	-0.002	0.022
7) Health: Child Undernourishment	-0.002	-0.010	-0.006	-0.019	0.015	-0.005	0.004	0.003
8) Education: School Attendance	-0.001	0.000	-0.004	0.011	-0.005	-0.002	-0.002	-0.003
9) Ocupation Ratio	0.015	-0.036	-0.015	-0.020	-0.005	0.001	-0.005	-0.002
10) Indigence Incidence	-0.007	0.006	-0.011	-0.004	0.002	-0.007	0.002	-0.003
11) Poverty Incidence	0.005	0.016	0.014	0.046 (*)	0.008	0.001	0.010	0.003
Additional Indicators								
12) Access to Piped Water into Dwelling	0.187	0.129 (*)	0.155 (*)	0.138 (*)	0.106 (*)	0.105 (*)	0.107 (*)	0.108 (*)
13) Sewerage Connection (excl. septic tank)	0.254	0.065	0.155 (*)	0.134 (*)	0.115 (*)	0.088 (*)	0.112 (*)	0.121 (*)
14) At least one Household Member below their Grade for Age [8-17 years of age]	0.046	0.043	-0.014	-0.018	0.054	0.034	0.036	0.033
15) Dificulty to Pay Debt	0.017	-0.030	0.015	0.004	-0.003	0.034	0.001	0.002

(*) B.S. Significance based on the Bias Corrected Standard error repoted from Bootstrapping at 1000 Reps at 5%. For Kernel estimates the significance is not based in bootstrapping

Source: CASEN 2006.

Appendix V: Construction of Comparison Group for Cost Benefit Calculations

Table V-1: Participation Equation

Logistic Regression

		Coefficients									
Non-Benficiaries respect to PHP-Beneficiaries:											
House Quality Composite Index	ind_5	-2.105***									
		[0.20]	Coefficient of Gegraphic location (Comuna level)								
Comuna (i)	dcom-		0.0107	0.151	0.745	1.57	-0.359	0.944	-0.909	1.851	0.828	1.435
			[1.07]	[1.14]	[1.17]	[1.43]	[1.08]	[1.24]	[1.06]	[1.43]	[1.24]	[1.24]
Comuna (i)	dcom-		0.174	1.231	1.081	1.907	0.819	-0.921	0.0172	-0.339	0.995	
			[1.11]	[1.43]	[1.13]	[1.43]	[1.14]	[1.05]	[1.14]	[1.06]	[1.17]	
Comuna (i)	dcom-		-1.204	0.259	0.813	0.405	0.793	1.735	0.209	0.415	2.307	
			[1.07]	[1.11]	[1.09]	[1.14]	[1.17]	[1.43]	[1.14]	[1.14]	[1.43]	
Comuna (i)	dcom-		1.198	0.744	-0.203	1.793	0.847	0.0642	0.892	1.677	0.607	
			[1.24]	[1.43]	[1.08]	[1.43]	[1.24]	[1.11]	[1.14]	[1.43]	[1.14]	
Comuna (i)	dcom-		0.289	-0.0859	0.637	0.446	0.851	1.3	0.00445	0.0279	1.791	
			[1.11]	[1.09]	[1.11]	[1.17]	[1.24]	[1.17]	[1.11]	[1.09]	[1.24]	
Comuna (i)	dcom-		-0.922	-1.016	2.34	1.372	0.898	1.211	-0.912	-0.307	1.079	
			[1.05]	[1.06]	[1.43]	[1.24]	[1.24]	[1.24]	[1.07]	[1.08]	[1.24]	
Comuna (i)	dcom-		-1.294	-0.559	-0.299	0.137	1.465	1.648	0.687	1.682	1.709	
			[1.05]	[1.06]	[1.07]	[1.11]	[1.43]	[1.43]	[1.17]	[1.43]	[1.43]	
Comuna (i)	dcom-		-0.302	0.134	0.503	1.053	1.5	1.162	2.009	0.523	1.011	
			[1.07]	[1.11]	[1.11]	[1.24]	[1.43]	[1.24]	[1.43]	[1.14]	[1.24]	
Comuna (i)	dcom-		0.0673	0.625	1.789	1.463	1.471	1.147	1.574	0.25	1.924	
			[1.11]	[1.17]	[1.43]	[1.43]	[1.43]	[1.24]	[1.43]	[1.10]	[1.43]	
Comuna (i)	dcom-		0.085	-0.441	-0.642	1.944	1.572	0.101	0.0276	1.39	2.161	
			[1.24]	[1.25]	[1.05]	[1.43]	[1.43]	[1.11]	[1.11]	[1.17]	[1.43]	
Comuna (i)	dcom-		0.867	1.237	0.851	1.214	0.482	1.158	-0.571	0.832	2.007	
			[1.14]	[1.24]	[1.24]	[1.43]	[1.17]	[1.24]	[1.06]	[1.43]	[1.43]	
Comuna (i)	dcom-		-0.017	2.002	1.479	1.728	1.599	-0.0335	-0.104	0.608	0.569	
			[1.14]	[1.43]	[1.24]	[1.43]	[1.43]	[1.10]	[1.11]	[1.14]	[1.14]	

Logistic Regression

		Coefficients									
Non-Benficiaries respect to PHP-Beneficiaries:											
House Quality Composite Index	ind_5	-2.105***									
		[0.20]	Coefficient of Gegraphic location (Comuna level)								
Comuna (i)	dcom-		0.645	1.702	0.375	0.789	0.216	0.173	0.0602	1.636	1.937
			[1.17]	[1.24]	[1.11]	[1.24]	[1.14]	[1.17]	[1.17]	[1.24]	[1.43]
Comuna (i)	dcom-		-0.249	0.98	0.959	-0.202	1.591	1.17	-0.238	2.151	2.078
			[1.14]	[1.17]	[1.24]	[1.10]	[1.24]	[1.43]	[1.06]	[1.43]	[1.43]
Gender (Head of the Household)	Sex	-0.194**									
		[0.099]									
Constant	Constant	5.294***									
		[1.03]									
Observations	Observati	24,541									
R-Square	R-squared										
Pseudo R-square	r2_p	0.10									
	Standard errors in brackets										

The list of Comunas is available on request
Absolute value of z statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Source : Own calculations based on CASEN 2000

Table V-2: Balancing Results Cost-Benefit Analysis by Propensity Score Matching

Progressive Housing Program - Phase I			Mean			Reduction	T-Test	
			Treated	Control	% Bias	of the Bias	t	|P|>t
Variable		**Sample**						
Number of Household Members (Logs)	lmem_h	Unmatched	1.29	1.40	(19.50)		(4.20)	0.00
		Matched	1.20	1.40	(36.80)	(88.40)	(5.13)	0.00
Capital Region (Dummy)	dcap	Unmatched	0.00	0.00	.	.	.	
		Matched	0.00	0.00	.	.	.	
Urban areas (Dummy)	durban	Unmatched	0.71	0.88	(43.90)		(8.43)	0.00
		Matched	0.95	0.88	18.00	59.00	4.86	0.00
Age of the household head (Logs, years)	lage	Unmatched	3.80	3.70	28.70		6.22	0.00
		Matched	3.84	3.70	39.40	(37.30)	5.79	0.00
Years of schooling of the head of the household (Logs)	lesc	Unmatched	2.05	1.94	18.70		3.90	0.00
		Matched	2.09	1.94	25.60	(37.20)	3.32	0.00
Family income (Logs, monthly income)	lyfam	Unmatched	12.49	12.02	54.10		11.26	0.00
		Matched	12.46	12.02	50.40	6.80	8.39	0.00
Gender of the head of the household (Dummy, Male)	dsex	Unmatched	0.72	0.68	7.00		1.57	0.12
		Matched	0.65	0.69	(8.40)	(19.40)	0.29	0.78
Condition of activity of the head of the household (Dummy, Employed)	doc	Unmatched	0.67	0.70	(7.20)		(1.56)	0.12
		Matched	0.63	0.71	(15.70)	(118.30)	(1.70)	0.09
Occupation category of the head of the household (Dummy, Self-	cat2	Unmatched	0.15	0.15	0.90		0.20	0.84
		Matched	0.16	0.15	3.40	(276.00)	0.91	0.36
Occupation category of the head of the household (Dummy, Private	cat5	Unmatched	0.38	0.45	(15.10)		(3.38)	0.00
		Matched	0.32	0.45	(28.00)	(84.60)	(3.99)	0.00
Number of members in the household (Logs)	nin	Unmatched	4.15	4.53	(18.50)		(4.06)	0.00
		Matched	3.78	4.52	(37.00)	(99.30)	(5.52)	0.00

Propensity Score Distribution Before and After Matching

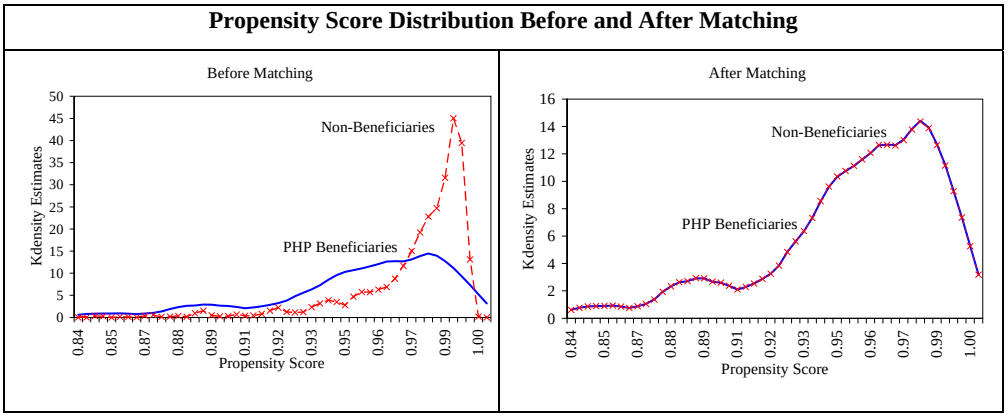

Table V-3: Impact calculations.

PSMATH Output

Variable	Sample	Treated	Controls	Difference	S.E.	T-stat
Psmatch				Impact		
PHP beneficiaries versus no-beneficiaries	Unmatched	736.2	385.3	351.0	62.9	5.6
	ATT	690.2	385.8	304.4	41.1	7.4
	ATU	385.9	695.6	309.7		
	ATE			307.1		

Psmatch2: Treatment assignment

	Support Group		
Total	Off	On	All
Untreated: PHP Beneficiaries	1	496	497
Treated: No-beneficiaries	18,275	495	18,770
Total	18,276	991	19,267

Source: Own Calculations based on CASEN 2000