



**A META-IMPACT EVALUATION
OF SOCIAL HOUSING PROGRAMS:
THE CHILEAN CASE**

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A Meta-Impact Evaluation of Social Housing Programs: The Chilean Case

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TABLE OF CONTENTS

[INTRODUCTION](#)

I.	THE HOUSING PROBLEM AND CONTEXT	1
A.	Affordability	1
B.	Housing Shortage.....	6
C.	Housing Ownership	8
II.	THE RESPONSE: SOCIAL HOUSING PROGRAMS	10
III.	THE PROGRAMS IN PRACTICE: EFFECIENCY AND EFFECTIVENESS	16
A.	Size of the Public Program	16
B.	Cost Effectiveness.....	18
C.	Implementation Problems	18
IV.	INCIDENCE AND TARGETTING EFFECIENCY	25
A.	Profiles	25
B.	Incidence	27
C.	Targeting Efficiency	28
V.	THE WELFARE RESULTS: NAIVE AND IMPACT ESTIMATIONS.....	31
VI.	THE COSTS AND BENEFITS	35
VII.	THE BEST?	39
VIII.	CONCLUSIONS	41

[REFERENCES](#)

ANNEXES

[ANNEX 1](#)

[ANNEX 2](#)

[ANNEX 3](#)

[ANNEX 4](#)

[ANNEX 5](#)

INTRODUCTION

This paper presents the findings of a meta-evaluation of Chile's Social Housing Programs since the country's return to democracy in 1990.¹ Chile's housing policy and the specific programs embedded in it represent an interesting case study. The country's housing policy and programs are one of the most copied amongst the Chilean policies. The home-grown policy (see Gilbert 2001) was and is considered a vanguard way of approaching housing problems. Hence, many countries in Latin America either directly or indirectly through technical advice from the multilaterals have imported the Chilean housing policy model.

Although there have been overviews of the Chilean housing programs (see Pérez-Iñigo González, 1999, Gilbert, 1999, and Rojas, 2001), the programs have not been subject either to a comprehensive "rigorous" evaluation in the sense of an impact evaluation or systematically compared and contrasted to each other, i.e. a meta-evaluation. These are the main tasks that this paper sets itself with the aim to contribute to the answer to the general question: which housing program is the best?

The structure of the paper is built around a set of specific evaluative questions in search of the answer to the above overall question. After the introduction, the second Section attempts to answer: what was the general context and specific housing needs that the programs attempted to tackle? The third Section discusses: what were the policy responses and the evolving design features of the housing programs? The fourth Section's underlying questions are: were the sizes of the programs adequate relative to the magnitudes of the housing needs, were the programs cost efficient, and what were the main problems that were encountered during implementation of the programs? The fifth Section responds to the question: what was the beneficiaries' profile, and what was the incidence of and de facto income based targeting efficiency of the programs? The sixth Section, discusses what were the welfare outcome effects of the programs from both naïve and impact evaluation viewpoints. The seventh Section's main question is whether the costs are greater or less than the benefits of the programs? The penultimate section brings together the findings to answer the question: which program is the best. The final section presents the conclusions.

¹ This paper grew out of a previous evaluation of Chile's Progressive Housing program that was partly financed by an IDB loan; see Marcano and Ruprah (2006).

I. THE HOUSING PROBLEM AND CONTEXT

The objective of this section is to define and measure the housing policy problem over time and to describe the context in which it evolved. The policy problem for most of the period analysed was considered to be an inadequate stock of houses and an insufficient flow of new houses from the private sector. The problem then was to decrease the stock and flow shortage of houses and to increase the owner occupancy rates rather than providing rent subsidies as the preferred housing solution.

Two complementary approaches can be used to determine the numerical estimation of the problem, namely affordability and shortage. The two approaches not only give different numerical estimates of the housing shortage but also give different emphasis on the appropriate policy solution.

A. Affordability

The affordability approach (see Hulchanski, 1995 and Pelletiere 2006) leads to a focus on if there is an enabling framework (see HABITAT, 1988, and the World Bank, 1992) or not. That is generally on macroeconomic policy and context conditions, which have been favourable in Chile and specific policies like the introduction of inflation index ((UR units of foment from the Spanish Unidades de Fomento) and pension reform. Thus the policy focus under this approach is on obtaining a better enabling environment through promoting the instruments and actors in the provision of private solutions.

To determine the size of the housing shortage problem the affordability approach requires defining a benchmark with which households' income can be compared with. The affordability benchmark used in this paper is that household income where mortgage payments for a typical house represent less than 30%. ²This can be used to calculate the number of households whose real income is below that

² The affordability index is defined as below:

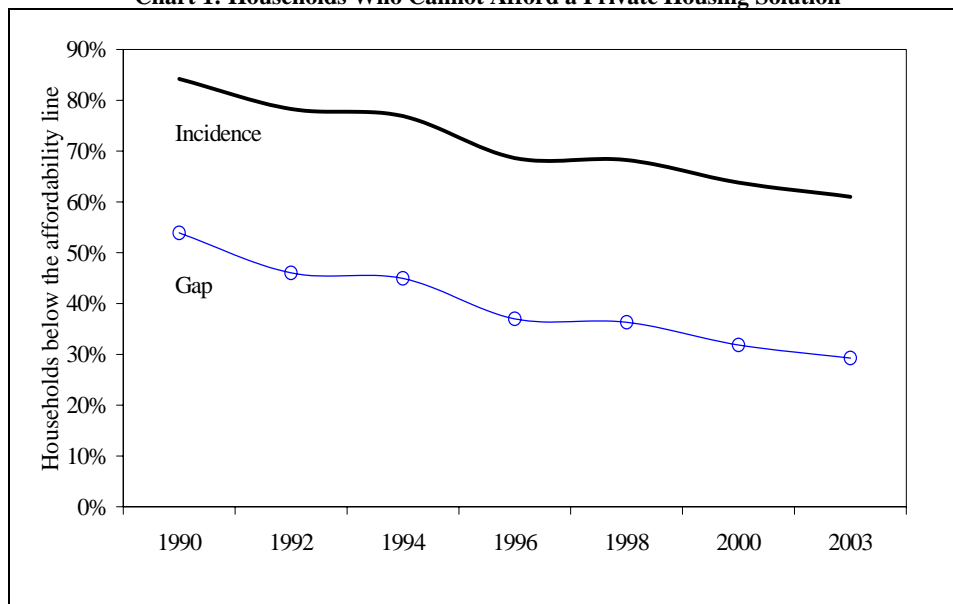
$$\text{Afford.Index} = \frac{\text{Mean_Household_Income}}{\text{Monthly_Payment}},$$

$$\text{Monthly_Payment} = \frac{H \cdot i_t}{[1 - (1 + i_t)^{-n}]}, \text{ Where } H \text{ is the median house price by region.}$$

i_t is the interest rate at moment t and n is the maturity of the loan, (20 years in this case).

required to buy a typical house³ with a market mortgage with no down payment. Chart 1 shows the incidence, i.e. is the proportion of households below the affordability line, and the income gap, i.e. is the average gap between household income and the affordability line.⁴ The housing problem, measured by both the incidence and gap indicators, has fallen over time. In 1990 un-affordability incidence was 84%, and the households' average income gap was 54% below the affordability line. By 2003, incidence had fallen to 61% with an income gap reduced to 29%.

Chart 1: Households Who Cannot Afford a Private Housing Solution



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

The fall in the affordability problem reflects the country's success in obtaining an increasingly better enabling environment for housing solutions. Specifically, the increase in affordability is due to the increase in household income, and the fall

³ The "typical" house corresponds to a dwelling of 60 m². The price of reference is the median price adjusted by geographic location (municipality) per square meter multiplied by the size. The house (ask) prices were estimated from www.portalinmobiliario.com <<http://www.portalinmobiliario.com>>.

⁴ The incidence and gap measures follow the Foster-Greer-Thorbeck indicators that are defined as:

$$fgt^{\alpha} = \frac{1}{n} \sum_{i=1}^p \left[\frac{(z - y_i)}{z} \right]^{\alpha}$$

where z is the "affordability" line, y_i is the household income

and α is the unaffordability aversion parameter. With $\alpha=0$ is obtained incidence and with $\alpha=1$ is obtained the income gap.

in the interest rate for a given change in the price of a house. Chart 2 shows by how much affordability has improved over time. Two thirds of the improvement, from 1990 to 2003, was due to the reduction in mortgage interest rates (see Chart 3). The other third of the improvement was due to the net income effect. The latter effect captures the change in real household income and the change in the relative price of houses relative to other goods and services.⁵

Chart 2: Affordability Index

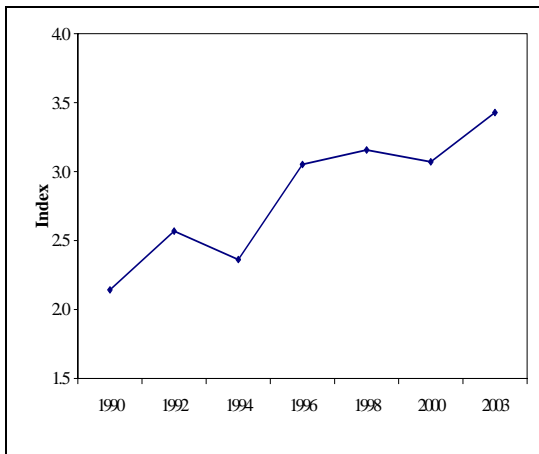
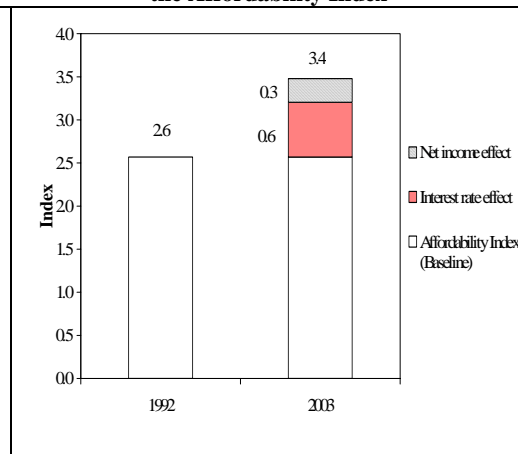


Chart 3: Factors Contributing to the Change of the Affordability Index

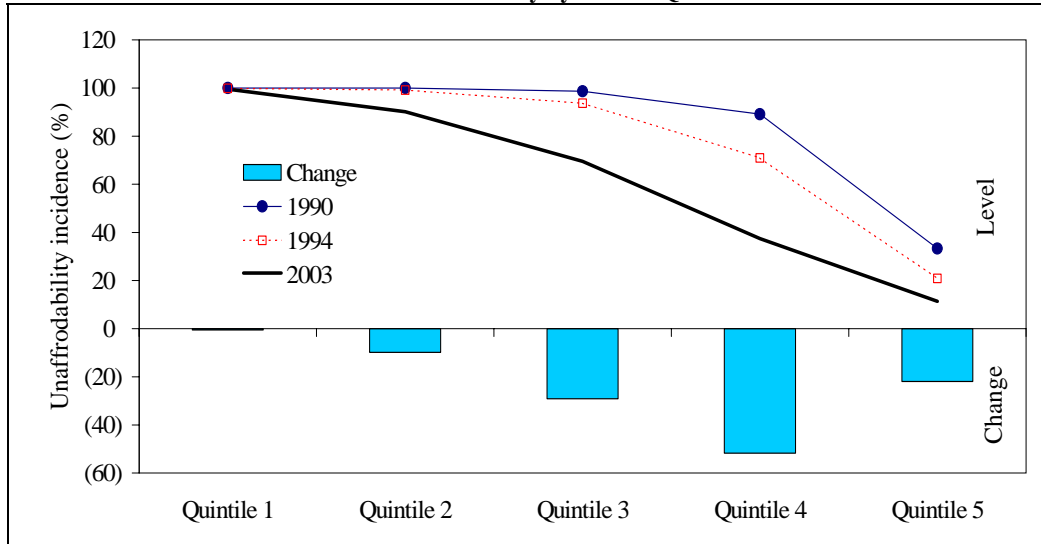


Source: Own estimations based on CASEN surveys.

However, the incidence of the affordability problem across household income has increasingly concentrated in the lower income levels but not exclusively so. Chart 4 shows the incidence of un-affordability by income quintile, with quintile 1 being the lowest income. As expected un-affordability increases with decreasing household income; a relation that held in 1990, 1994 and 2003. Most of the improvement in affordability has been for the top three quintiles. For the bottom two quintiles there has been practically no change.

⁵ Real household income definition used is: $(Y/P)(P_h/P_{nh})$ where Y is household income, P is the consumer price index, P_h is the housing component of P and P_{nh} is the non-house component of P. We used the housing component of the consumer price index because no housing price index is available. However, Cox and Parrado (2006) calculate an index of house prices, using a combined hedonic and repeated sales technique, for the Greater Santiago Metropolitan area. They find a similar result “... we find that the recent sustained rise in home prices coincides with the sustained increase in disposable income and the decreasing trend of long-term interest rates, factors that have strongly driven the expansion of mortgage loans.”

Chart 4: Affordability by Income Quintile



Source: Own estimations based on CASEN.

The fall in interest rates captures the country's sustained success in macroeconomic stability that has been accompanied by an increase in the depth and efficiency of the private market's supply of mortgages.⁶ Thus in terms of number of mortgages from 1998 to 2003 there was a growth of 100% with contribution to that growth by Private (39%), Banco Estado, a government owned commercial bank, (38%), and SERVIU, the operational arm of the ministry of housing, (18%). Relative importance of the providers thus changed. While the percentage importance of Private had been 6% in 1998, the growth of 705% meant its market share has increased to 22%, although remained as the third most important provider after Banco Estado (40%) and SERVIU (33%).

The depth of mortgage market in turn coincides with the increase in savings particularly in private pension funds. Note savings also include house savings accounts⁷ that are a requirement for eligibility of the social housing programs. In Chart 5 is shown the increasing depth of the mortgage market (value of outstanding mortgages as a percent of GDP), and its positive temporal association with long-term savings. Long-term savings are defined as savings with a tenor greater than a year. However what is mainly driving the mortgage

⁶ For a discussion and analysis of mortgage markets in Latin America in general and in Chile in particular see Hassler (2002 and 2003); Gonzalez (2002), Lora and Galindo (2004); Montes (2006); Morande and Garcia (2004); and Pardo (2000)

⁷ see Errazuriz et al (2001)

market is pension savings. A simple bivariate OLS regression, see Table 1, of mortgages on different types of long-term savings indicates (as only 16 data points are used) that an increase of pension fund balance of one percent of GDP results in an increase of 0.25% in mortgages to GDP ratio.⁸

Chart 5 Saving and Depth of the Mortgage Market

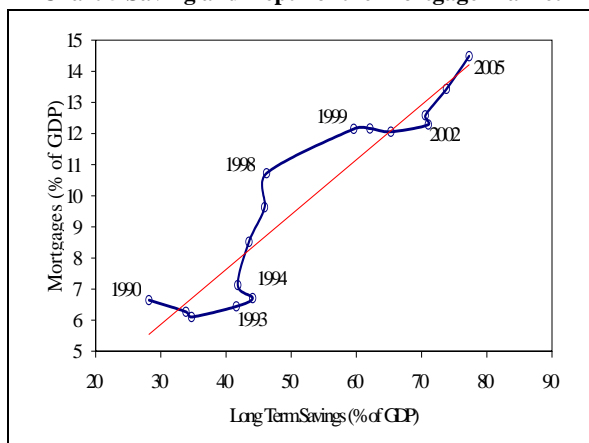


Table 1: Mortgages and Savings

Coefficient	R1	R2	R3
Mortgages 1/			
Total Long Term Saving 2/	0.177*** [0.017]		
Bank Long Term Saving 3/		0.228 [0.16]	
Pension Funds Balance 4/		0.156** [0.068]	0.246*** [0.025]
Constant	0.531 [0.91]	0.961 [1.60]	-0.736 [1.11]
Observations	16	16	16
R-squared	0.89	0.89	0.87
F-Stat	114.00	53.14	97.24

Standard errors in brackets
 *** p<0.01, ** p<0.05, * p<0.1
 1/ As % of GDP. 1990-2005
 2/ Includes saving one year and over and Pension Funds balances. % of GDP
 3/ Only saving one year and over. % of GDP
 4/ Only Pension Funds balances. % of GDP

Table 1.A Structure and Growth of Mortgages by Provider

	structure 1998	structure 2003	growth	contribution
SERVIU	49%	33%	37%	18%
Banco Estado	43%	40%	89%	38%
Private Financial Institutions	6%	22%	705%	39%
Other	3%	4%	182%	5%
Total Mortgages	100%	100%	100%	100%

Source: Estimations based on data from the “Superintendencia de Bancos e Instituciones Financieras de Chile”, and CASEN surveys.

However, these positive developments, as measured by aggregate values, need to be complemented for a fuller in understanding the policy problem by the incidence of private mortgages by household’s income.

The accessibility by households to private mortgages is obviously highly positively correlated with the household’s income. Table 2 shows that accessibility by income quintile of households and by provider. The total pattern is a monotonic increase from low to high income, a pattern repeated for Banco

⁸ See Lira (1994) for a proposal to increase social efficiency of savings by allowing workers to use accumulated funds in their accounts for home purchases.

Estado and private financial Banks. Incidence of SERVIU mortgages in contrast has a “U” shaped pattern. However, what is worrying is that although the overall size of the market is increasing simultaneously, there is a decrease in accessibility for all providers for the lowest three income quintiles.

Table 2: Access To Mortgages by Provider and Income Quintile

	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	Total
Incidence: (%)						
1998						
SERVIU	19	24	25	22	11	100
Banco Estado	5	16	22	30	26	100
Private Financial Institutions	2	5	10	29	54	100
Other	11	13	15	32	29	100
Total Mortgages	12	19	23	26	20	100
Change in incidence 2003-1998: (%)						
SERVIU	-6.7	-0.9	-2.1	3.3	6.3	
Banco Estado	-1.9	-5.8	-1.1	2.5	6.3	
Private Financial Institutions	-1.1	-3.2	-5.0	-17.9	27.2	
Other	-6.9	-6.2	-4.5	-10.5	28.1	
Total Mortgages	-6.1	-6.6	-5.0	-1.1	18.8	

Source: Own estimations based CASEN.

Thus, the non-affordability problem has been increasingly concentrated in the lowest two quintiles and access to private mortgages for the lowest two income quintiles was and remains practically zero. Further, all three providers have reduced their mortgages to the three lowest income quintiles.

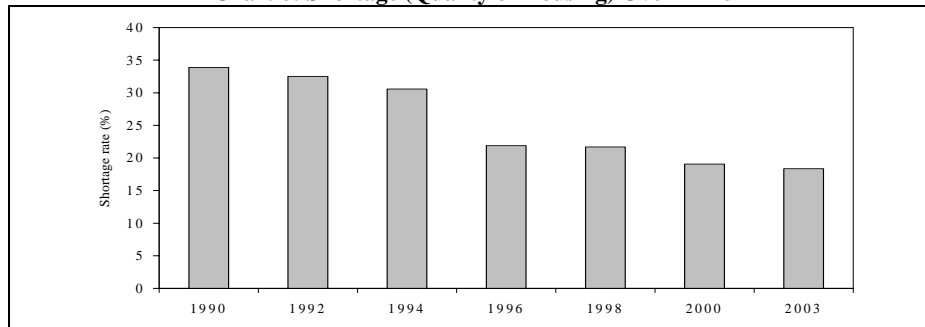
B. Housing Shortage

An alternative definition of the housing problem, more akin to the definition used in the country, is the quality of housing, i.e. the number of non-recoverable houses and the number of single dwelling houses with multiple households⁹. Chart 6 shows the estimates of the housing shortage from 1992 to 2003. The

⁹ 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); (ii) 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. (see MINUV 2004, see also MINUV 1991 and 1992, CELADE, 1996) 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. The 2006 survey is not yet available. 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.

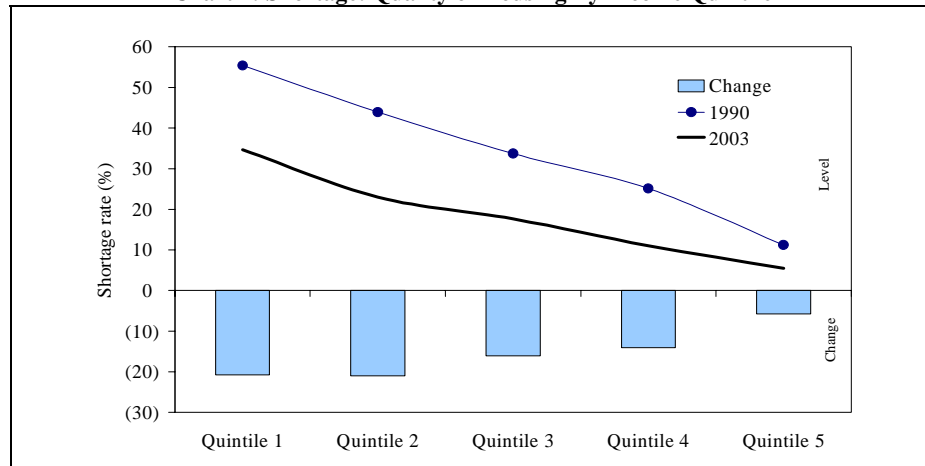
shortage is defined as the percent of households living in a dwelling: (i) without access to at least one basic service (electricity, potable water, and sewerage connection); (ii) with at least one house quality problem (floor, wall, ceiling- roof in bad condition); and (iii) with multiple-households living in overcrowded conditions.¹⁰ 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. The incidence of housing shortage by household income quintile is given in Chart 7. As can be seen the largest decreases have been for the lowest two income quintiles.

Chart 6: Shortage (Quality of Housing) Over Time



Source: Own estimations based on CASEN.

Chart 7: Shortage: Quality of Housing By Income Quintile



¹⁰ The figures from the surveys were adjusted by the 2001 census and discount the intersection set derived from the three criteria. Note failure to adequately discount the intersection explains the larger numbers found in the literature on housing shortage in Chile.

C. Housing Ownership

Before ending this section and reviewing the changing housing programs we briefly discuss owner-occupancy, as this was one of the problems identified by the authorities and an increase in owner-occupancy rates was one of the objectives of policy. Owner-occupancy has many claimed virtues. It is widely believed, although less often tested for, that house ownership: (i) allows a family to obtain an asset that grows in value and generates financial security; (ii) enables households to have greater control over and exercise more responsibility over their immediate living environment; (iii) helps stabilise neighbourhoods and strengthens communities and (iv) generates jobs and stimulates economic growth.

In Table 3 below is shown the evolution of house ownership overtime. As can be seen ownership has increased significantly since the early nineties, increasing from 62% in 1990 to 70% by 2003 while renting and “other” has fallen.¹¹

Table3: Housing Ownership

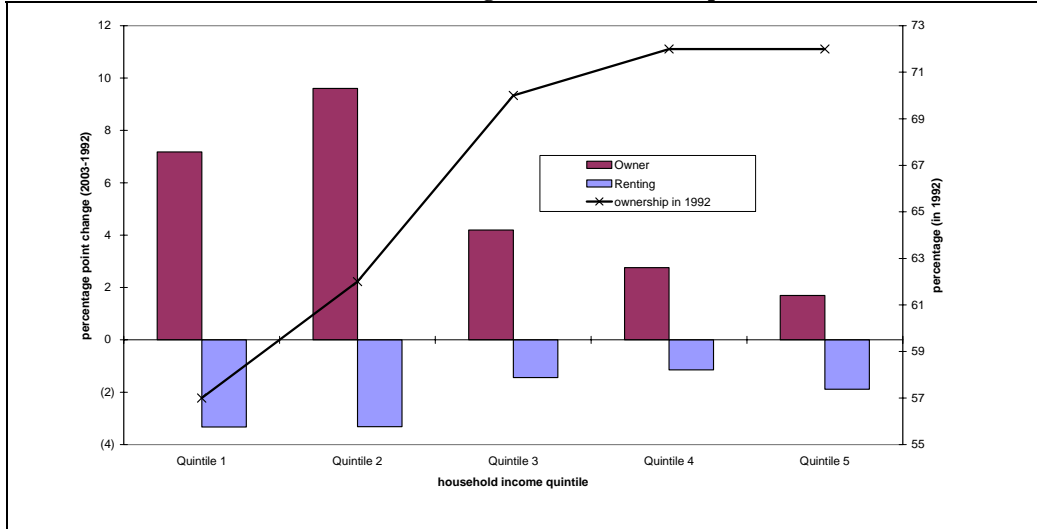
	Owner			Renter			Other		
	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural
1990	61.5	63.6	50.8	17.2	19.7	5.2	21.3	16.7	44.0
1992	64.2	64.9	60.2	17.9	20.2	5.7	17.9	14.9	34.1
1994	65.4	65.8	63.1	17.6	20.0	4.8	17.0	14.2	32.1
1996	67.9	68.4	64.8	16.2	18.2	4.1	15.9	13.3	31.1
1998	69.9	70.3	67.7	16.4	18.4	3.6	13.7	11.3	28.7
2000	70.0	70.4	67.3	16.2	18.2	3.2	13.8	11.4	29.4
2003	70.3	69.7	74.8	16.8	18.9	3.2	12.8	11.5	21.9

Source: Own estimations based on CASEN

However, there is a highly differential level and change of ownership by income quintile. As Chart 8 shows there has been an increase for all income quintiles, however, the largest increase has been in the bottom two income quintiles.

¹¹ “Other” category includes irregular, lent by family member, etc.

Chart 8: Change in House Ownership



Source: Own estimations based on CASEN

Thus, housing needs either measured by affordability or by housing quality have fallen significantly over time and housing ownership has increased significantly. Partially, the fall in the problem can be attributed to the country's macroeconomic success and pension reform that resulted in a virtuous cycle of increasing household income and savings and in an increasing depth (and reduced cost) of mortgages: an improving enabling environment. However, opening the home-buying private market to underserved households remains a challenge. The aggregate figures shroud the problems still faced by households in the lowest two income quintiles. Households in these two income levels have not seen an improvement in affordability, on the contrary access to mortgages for the three lowest quintiles has fallen for all three types of providers. Nonetheless, the lowest two income quintiles have seen the largest increase in house ownership. To account for that increase we turn to the country's public social housing programs managed by MINVU.

II. THE RESPONSE: SOCIAL HOUSING PROGRAMS

The objective of this section is to describe the individual social housing programs managed by the country's Housing Ministry, MINVU.

The country housing policy has two main features. First, policy has focused on obtaining an efficient and effective enabling environment for private sector solutions. Housing policy in this wide sense was briefly touched upon in the previous section. Second, a changing set of specific housing programs, managed by MINVU, to complement the private sector market. This aspect of housing policy is the topic of this section.

However in a reading of the different programs it is important to keep in mind that we focus almost exclusively on six traditional housing programs (Progressive Housing Program Phase I (PHPI) and phase II (PHPII), Basic (BHP), Workers Housing Program (PET), Unified Subsidy Program (USP), and Rural Subsidy Program (PET). Thus we do not explicitly describe a number of programs that were introduced recently.¹²

The individual public housing programs can be compared by using three dimensions: (i) the benefits i.e. the financial assistance and quality of the housing solution; (ii) the programs' intended beneficiaries and the eligibility requirements of the program; and (iii) the modality and delivery system.

The programs' financial assistance and the quality of the housing solution are summarised in Table 4. The programs include a mix of mortgages and grants. Mortgages in general cannot exceed 75% of the value of the house except for PET whose limit is 65%. Mortgages are provided: (i) in PHP directly by MINVU where the mortgage is without interest payments, tenor of eight years, and where the amortisation payments cannot exceed 25% of the households income. This component of PHP was eliminated in 1996; (ii) in Basic, where the mortgage carries a real interest of 8% and a tenor of 20 years. The mortgage is guaranteed by SERVIU but provided by *Banco Estado* (although in principle can also be provided by commercial banks); and (iii) that provides mortgage letters of 12 to

¹² These include (year introduced): Leasing (in 1996); Housing Solidarity Fund (in 2000), Housing Without Debt (in 2001), Housing Subsidy and Patrimony programs (both in 2004), and Improvement in SERVIU Houses (in 2005).

20 year tenors for PET, Rural, and Unified Subsidy (1st phase) at market interest rates.¹³

Table 4: Financial Assistance and Quality of Housing Solutions

PHP.I	PHP II	Basic	PET	Unified Subsidy	Rural Subsidy
Grant of up to 132 UFs for SERVIU version or for private version up to 150 UF. Mortgage (abandoned in 1996)	Grant of up to 35 UF.	Voucher up to 140 UF. Mortgage of maximum 80 UF (for free election version maximum 100F)	Subsidy of 90 UF mortgage not greater than 65% of the value of the house.	Subsidy different for three levels: (i)max 130, (ii) 110; (iii) 90 UF Mortgage –by a commercial bank– up to 1000 UF but never more than 75% of the value of the house	Subsidy of 250 UF. (more for specific areas e.g 250 for indigenous areas and 240 for the Ultima Esperanza province)
A minimum urban construction	Construction value maximum of up to 70 UF	New or old house, or construction if owner of a plot valued up to 600 UF	New house of 40 to 50mt ² of 1 or 2 floors.	Buy house, new, used or construct a new house if owner of a plot.	Construction of 38 to 40 mt ² in a locality with at least 2,500 habitants

Eligibility and the targeted population differ from program to program (see Table 5) although share some common eligibility criteria and have overlapping targeted populations. House savings accounts are a minimum requirement for eligibility of the programs and consist of a minimum quantity combined with sometimes a minimum seniority of the saving account. For PHP and PET there is no seniority requirement but there is for Unified Subsidy. The second typical requirement is that applicant must have a current CAS, a national information system which gives points regarding the “needs” of the household¹⁴ The CAS points are used as one element in defining the applicants priority amongst applicants.¹⁵ The third typical condition is that the beneficiary or spouse cannot have received a

¹³ In end nineties was introduced a subsidy to commercial banks to induce them to provide mortgages of less than 340 UFS (US\$10,200).

¹⁴ 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. 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. See O. Larranaga (2005)

¹⁵ The use of CAS points as ceilings are in Dynamic Social Housing Without Debt (points less than 543) and in Solidarity Competitive Fund (points less than 543).

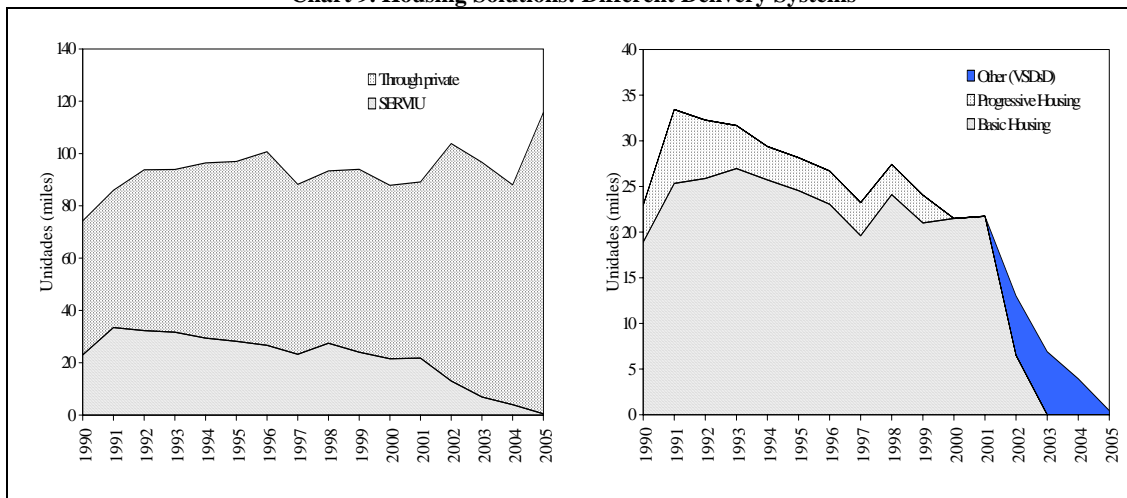
previous housing grant. Note there is no income upper ceiling of the households for eligibility .

Table 5: Eligibility Requirements and Priority Factors

PHP I	PHP II	Basic	PET	Unified Subsidy	Rural Subsidy
Not owner of land; (or is an owner of plot for the private version) has not received housing subsidy previously; a minimum savings of 132 UF;	Ownership of building plot; without previous housing subsidy other than PHPI; minimum savings of 8 UF;	Not an owner of a house; without previous housing subsidy, minimum saving of 10 UF (or 20 UF for the free election version)	Postulant pertains to a union or similar organisation; application collectively not individually, has a rent of 11 UF, minimum saving of 40 UF	Minimum saving for levels: (i) 50UF; (ii) 100UF; (iii) 150 UF.	Be a rural resident for given list of occupation. Minimum savings of 10 UF
Priority determined by savings, age, family size, and CAS points.	Priority determined by points in CAS and capacity to pay.	Priority determined by CAS points, plus savings, family size,	Priority determined by union		Priority determined by CAS points

Modality refers to if applicants can apply individually or collectively. Almost all the programs have both options except PET that only has the collective option. The collective option requires applicants to form a legally registered Housing Committee that is charged with complying with the application process. The delivery system refers to if the house was constructed by SERVIU (the operational arm of MINVU) and delivered to the beneficiary or if a voucher was given to the beneficiary who then hires a private construction firm. Chart 9 shows the gradual decline in the direct public production (SERVIU) of houses. The chart also shows that direct production was mainly in two programs Progressive and Basic (in 1995 the private option was introduced in this program). Both began to be wound down from 2002 onwards with the consequent sharp fall in direct production since then.

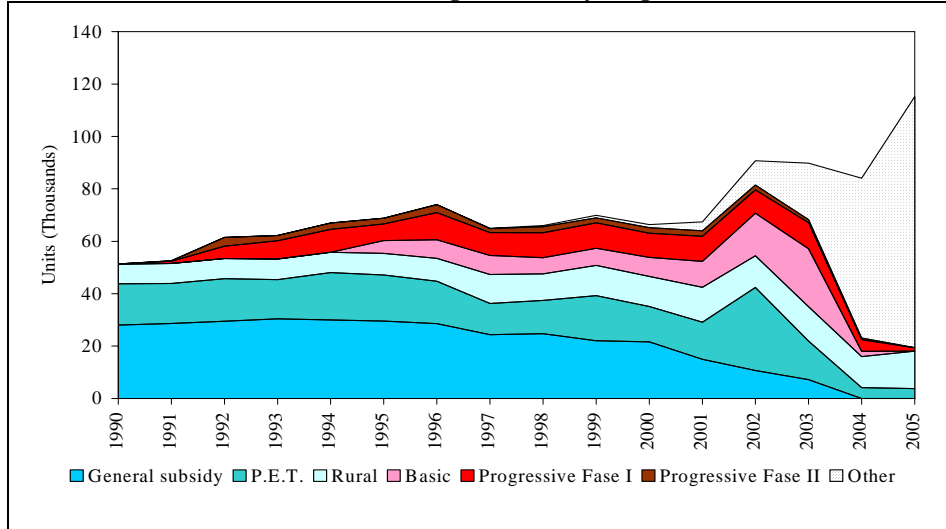
Chart 9. Housing Solutions: Different Delivery Systems



The housing programs have been gradually modified, most of the veteran programs detailed above have been wound down and new programs introduced in response to the changes in context including the size and incidence of the housing shortage in which they operate. The introduction of new programs, winding down of some existing programs, and the temporal change in the relative importance of the different social housing programs can be viewed from the number of housing solutions provided by the different programs (see Chart 10). As can be seen the three programs; PET, and USP that already existed in 1990 have or nearly so closed by 2005. Only Rural of the programs that existed in 1990 has been maintained with a almost constant number of solutions per year. Of the new programs introduced in the early nineties, Progressive Housing I and II (introduced in 1991) have also almost disappeared. The only other program introduced in the nineties is Leasing (in 1996), which has remained a small program although has gradually increased in size. Thus by 2005 the main programs (in terms of percentage of solutions provided) were all introduced after 2000: SSH (in 2004), FSV (in 2001), and MPF (in 2004). These three programs provided 70% of the total number of solutions in 2005.¹⁶

¹⁶ These three programs are not evaluated in this paper given that the household survey of 2006 is not yet available to the public.

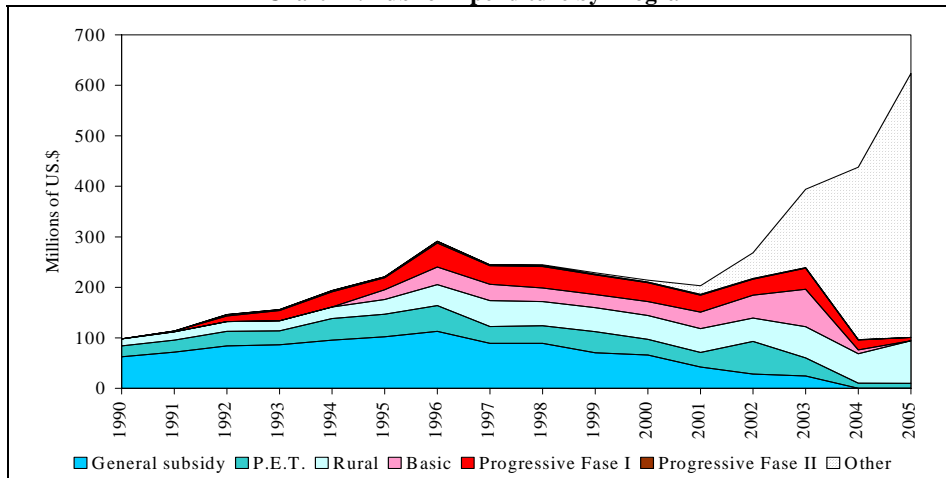
Chart 10: Housing Solutions By Program



Source: MINVU

By 2005, budgetary outlay on public housing programs was US\$ 628.5 millions i.e. 3.2% of government expenditure in that year and 110% more in real terms compared to 1990. Expenditure grew steadily until 1996 and thereafter fell until 2002 whence it again started to increase. The temporal change in the relative importance of the different programs can also be viewed from the budgetary allocation to the different programs (see Chart 11).

Chart 11: Public Expenditure by Program



Source: MINVU

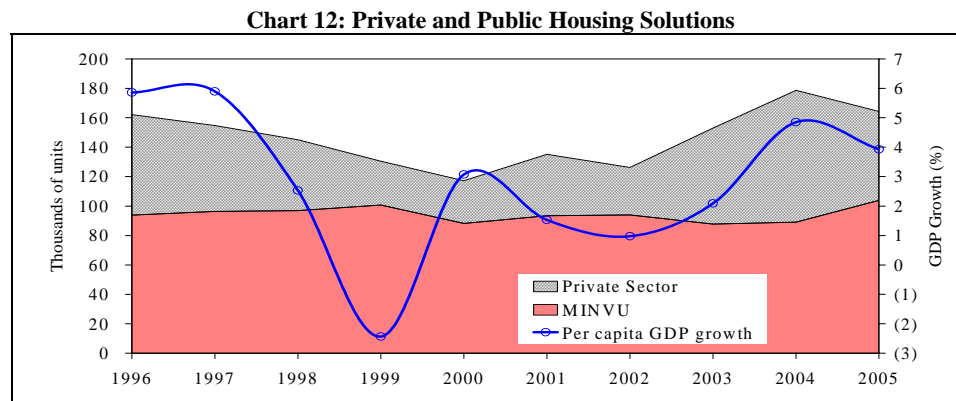
Thus Chile's set of public housing programs are characterised by an almost continuous change, a change involving modifications of an existing program or the winding down of existing programs and the introduction of new programs. It is a history of program change based on experience and as the context –the size and type of problem being tackled - changed.

III. THE PROGRAMS IN PRACTICE: EFFICIENCY AND EFFECTIVENESS

The objective of this section is to evaluate the programs in practice. Specifically: (i) to determine if the size of the programs were adequate; (ii) if the deliverables of the program were provided cost efficiently; (iii) and what main problems were encountered during implementation. We look at three main problems namely delinquency rates of mortgages, non-sustainability of the housing solutions and residential segregation.

A. Size of the Public Program

Before discussing the adequacy of the policy response it is useful to view the public housing solutions with respect to private solutions. The total size of the social housing programs has not significantly varied over time. Chart 12 shows the number of housing solutions of the social housing programs and the number of private solutions. For the period 1996-2003 public housing solutions were 94 thousand per year with a standard deviation of 5.3. Private sector solutions were lower, they averaged 52 thousand per year, with a higher standard deviation of 19.7.

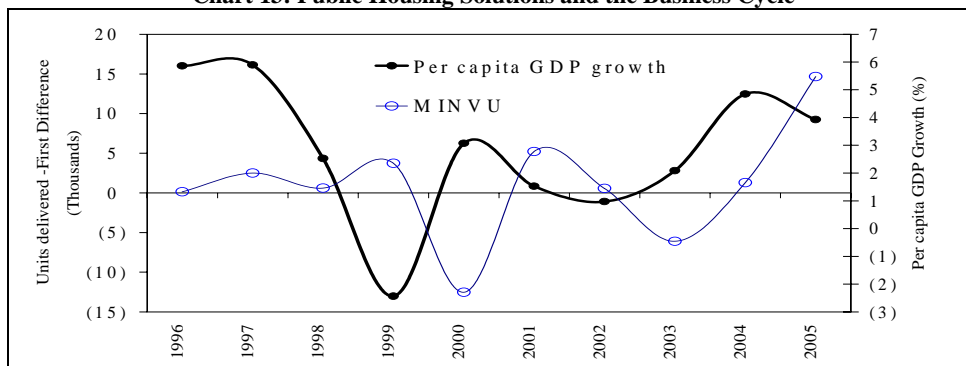


Source: Own estimations based on data from MINVU and the BCC.

The difference between the standard deviations of the public and private solutions suggests a different relation between the two with respect to the business cycle. While the private sector shows high pro-cyclical pattern with respect to real GDP growth the public sector appears to be anti-cyclical (see Chart 13). Given that the construction industry is pro-cyclical (as picked up by the private sector solutions relative to GDP per capita growth) the anti-cyclical

behaviour of the public housing programs suggests possible macroeconomic level benefits –including employment generation- not studied in this report.

Chart 13: Public Housing Solutions and the Business Cycle



Source: Own estimations based on data from MINVU and the Central Bank of Chile

To determine whether the programs were of sufficient scale given the size of the housing needs requires calculating the contribution of the programs in reducing the housing shortage. The calculations presented in Chart 14 assume: (i) no crowding out of equivalent-quality-low income provided by the private sector; and (ii) the benefits of the program are sustained, i.e. beneficiaries permanently leave the category of poor housing condition. Under these assumptions without the public provision of housing needs would have reached 41.9% in 2003 instead of the observed 18% of households.¹⁷

Chart 14: Contribution of the Social Housing Programs to the Housing Shortage



Source: Own estimations based on data from MINVU and CASEN.

¹⁷ The figure of 43% is calculated by adding to the observed shortage rate of 18% the cumulative number of public housing solutions from 1992 to 2003.

B. Cost Effectiveness

The efficiency – the cost effectiveness- of the different programs can be gauged by the cost per housing solution, see Table 6. One option is to measure cost by simply dividing government budgetary outlay (in 2004 pesos) by the number of housing solutions for each program. The figures reveal that in 1998 the most expensive program was Basic and least cost program was Progressive II. There was an upward drift over time with the largest increase of 93% for basic and actual fall for PHPII. Thus if cost per unit is taken as a measure of cost efficiency the increase overtime can be interpreted as a fall in inefficiency.

Table 6: Cost Efficiency

	Basic Housing	General Subsidy	PET	Rural Subsidy	PHP-I	PHP-II
Unit Cost (million 2004 pesos)						
1992	3.5	2.1	1.3	1.8	1.8	0.6
Change 92/03	93%	3%	10%	61%	24%	-10%
quality adjusted unit cost (million 2004 pesos)						
1992	4.7	2.4	1.5	3.2	2.5	0.7
Change 92/03	55%	-3%	6%	-7%	23%	-15%

Source: Own estimations based on data from MINVU and CASEN.

However, the above calculations assume a constant quality of housing solutions. This assumption does not hold. Cost needs to be adjusted for the quality of the housing solution¹⁸. Quality adjustment not only changes the rankings from high to low but more importantly shows the pitfall of using simple average costs over time to gauge efficiency. For three programs, General Subsidy, Rural Subsidy, and PHPII, quality adjusted costs reveal an increase in efficiency. For the other programs simple cost per unit overstates the fall in inefficiency.

C. Implementation Problems

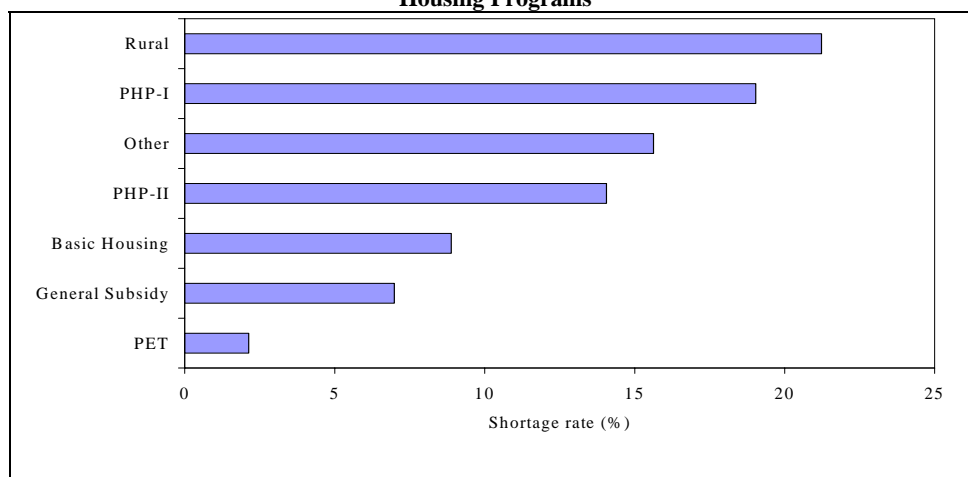
During implementation a number of major problems were encountered that led to program changes or introduction of new programs. We identify three main implementation problems. First, that the provision of a housing solution does not prevent some households falling back into the “inadequate housing” category, i.e. the benefit is not always sustained. The second problem is the high delinquency rate of publicly provided mortgages. The third problem is the decreasing

¹⁸ 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.

availability of cheap land has led to the provision of housing solutions being provided in isolated areas, which in turn has led to residential segregation.

The first implementation problem was that the assumption of a permanent solution for a household from the housing need category on obtaining a publicly provided housing solution is invalid.¹⁹ Benefits were not necessarily sustained. Chart 15 shows the distribution of households living in inadequate housing in 2003 who had previously been beneficiaries of one of the public housing programs.²⁰ Of the total number of households living in inadequate conditions in 2003 about 12% had been previous beneficiaries of one of the social housing programs. The re-incidence of housing problem of beneficiaries varies considerably between the programs with the highest to lowest re-incidence being Rural to PET. Chart 16 shows how the passage of time after receiving the benefit increases the probability of a household re-entering the “shortage” category. Over time publicly provide houses deteriorate, due to inadequate maintenance, such that owners fall back into housing needs household category. To some extent this problem has been recognised by the government as it has introduced, in 2005, the program Maintenance of SERVIU Houses.

Chart 15: Quality of House Shortage Rate Incidence of Previous Beneficiaries of Public Housing Programs

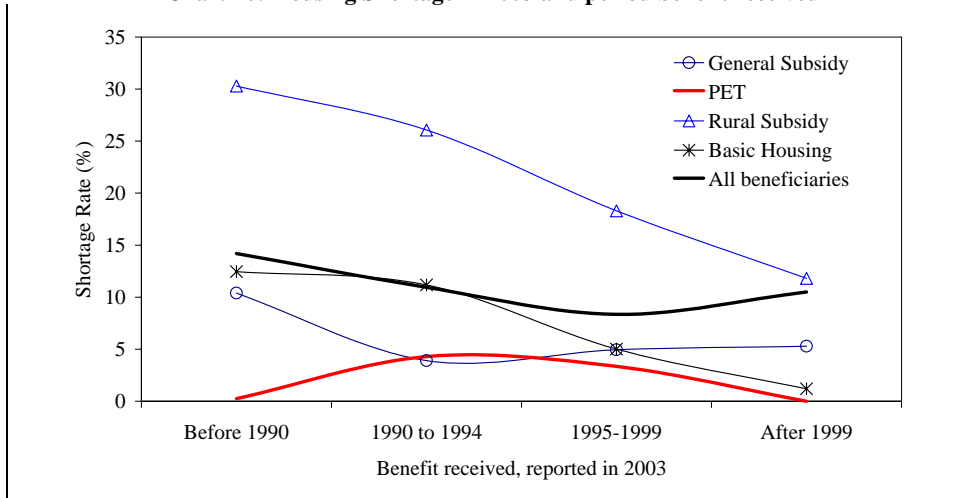


Source: Own estimations based on data from CASEN (2003).

¹⁹ Problem housing situation is defined as a household living condition with one or more of the following characteristics: (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 overcrowded conditions. The most frequent “problem” was one or more of house quality problem.

²⁰ See Annex 1 for a description of the sample

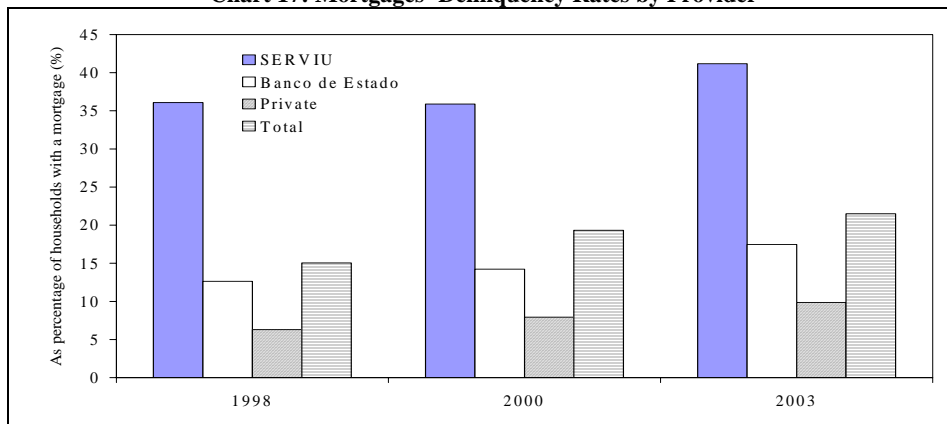
Chart 16: Housing Shortage in 2003 and period benefit received



Source: Own estimations based on data from CASEN (2003).

The second implementation problem encountered was the delinquency rate of publicly provided mortgages. The mortgage delinquency rate, see Chart 17, is higher for SERVIU, followed by Banco del Estado, followed by private sector provided mortgages. This higher delinquency rate for publicly provided mortgages has been attributed to the fact that SERVIU is a public provider and an example of moral hazard problem as SERVIU does not engage in foreclosure and not due to an incapacity to pay of the clients.²¹

Chart 17: Mortgages' Delinquency Rates by Provider



²¹ This point has often been made. See Morande and Garcia 2004 who use a logit regression that is shown in Table 7.

The descriptive numbers appear to be confirmed by an estimated probit regression, see Table 7. The probit model specifies the provider of the mortgage and controls for socio-economic characteristics of the household and for the geographical location of the household. The estimation reveals a statistically significant effect; a 14% increased probability of delinquency of a SERVIU client relative to a private entity's client. However, re-estimating the probit equation but correcting for selection bias gives that there is perfect co-linearity between household income and the probability to obtain a private loan. This implies that from this approach it is impossible to determine if the problem is the provider or whether it is a problem of the household's income.

Table 7: Delinquency Incidence Regression

	Probit regression		Logit Regression	
	Coef.	DF/DX	Coef.	Odd Ratios
Dependent variable is DELINQUENCY (Yes=1 / No=0)				
Imputed rent as percentage of the household income	-2.046*** [0.38]	-0.569*** [0.10]	-1.999*** [0.63]	0.136*** [0.085]
Age in years of the head			-0.00995*** [0.0035]	0.990*** [0.0035]
Gender of the head (Male =1 / Female = 0)			0.051 [0.081]	1.052 [0.085]
Years of schooling of the head	0.0343* [0.019]	0.00955* [0.0054]	-0.0252** [0.011]	0.975** [0.010]
Years of schooling of the head - Square	-0.00208** [0.0010]	-0.000578** [0.00028]		
Income of the head - Logs	-0.260*** [0.039]	-0.0724*** [0.011]	-0.293*** [0.067]	0.746*** [0.050]
<u>Mortgage provider - SERVIU / respect other providers</u>	<u>0.507***</u> [0.12]	<u>0.143***</u> [0.033]	<u>0.805***</u> [0.21]	<u>2.236***</u> [0.47]
Mortgage provider - Banco del Estado / Respect other providers	0.143 [0.12]	0.041 [0.034]	0.234 [0.21]	1.264 [0.27]
Mortgage provider - Private / Respect other providers	0.131 [0.13]	0.038 [0.040]	0.097 [0.24]	1.102 [0.27]
Head with labor contract =1 / Non contract =0	-0.456*** [0.041]	-0.134*** [0.012]	-0.791*** [0.067]	0.453*** [0.030]
The household is beneficiary of SERVIU program subsidy			0.305*** [0.11]	1.356*** [0.15]
Head in public employment	-0.151** [0.072]	-0.0398** [0.018]		
Total household income (Logs)	-0.343*** [0.046]	-0.0954*** [0.013]	-0.477*** [0.076]	0.620*** [0.047]
Number of members in the household (Logs)	0.437*** [0.046]	0.122*** [0.013]		
Regions (for details see annex)				
Constant	6.618*** [0.59]		9.127*** [0.94]	9202*** [8695]
Pseudo - R Square	0.16	0.16	0.13	0.13

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

Source: Own estimations based on data from CASEN (2003).

One option to deal with this problem is to opt for a non-parametric approach that is more suitable to the question at hand, i.e., compare the delinquency rates of

households that have an equal probability of obtaining a SERVIU and private mortgage. To determine what is the probability of a SERVIU client to obtain a private credit is estimated through a propensity score matching approach.²² The estimated equation is summarised in Table 8a. Thus from a sample of 3,280 households a support group –that is similar households- of 653 households was obtained that consisted of 325 SERVIU and 328 private clients²³. The small sample is indicative of the assertion previously made of a “segmented” market. As shown in Table 8b the naïve –unmatched- difference of delinquency rates of SERVIU (used as the control group) and private (used as the treated group) was 11.9%, a figure that corresponds to the probit equation coefficient of 14.3%. However, for the propensity score method the figure –average treatment of the treated falls to 1.5%. This figure is, by using bootstrapping –500 iterations- statistically insignificant for either normal, percentile or biased corrected procedures. Thus, there is no evidence that the provider (public or private) has an influence on the delinquency rate. Evidence suggests that delinquency is due to the low capacity to pay of the clients. These results confirm the analysis carried out by SERVIU in 1996 through a survey of beneficiaries that concluded that the problem was capacity to pay.²⁴ As a consequence withdraw from the mortgage market and increased the grant component of its programs.

Table 8a: Participation Equation for SRRVIU and Private Beneficiaries Only.

Description of the coefficient	Coef.
Private beneficiaries = 1 / SERVIU beneficiaries = 0	
Age in years	0.0134** [0.0067]
Years of schooling	0.248*** [0.021]
Working Contract (Yes = 1 / No = 0)	0.365** [0.17]
Head in public employment	-0.346* [0.19]
Head working as self-employed	-0.413** [0.20]
Total household income (Logs)	1.919*** [0.11]
Total working members in the household (Logs)	-1.035*** [0.23]
Region number VII	-1.238*** [0.37]
Residence area (Urban = 1 / Rural = 0)	-0.716*** [0.24]
Constant	-29.71*** [1.46]
Observations	3280
Pseudo R-squared	0.507
Standard errors in brackets	
*** p < 0.01, ** p < 0.05, * p < 0.1	

Source: Own estimations based on data from CASEN (2003).

²² See Blundell and Cost-Diaz (2002)

²³ See Annex 2 for a description of the sample used in the “delinquency calculations.

²⁴ See MINUV (1998)

Table 8b: Delinquency Incidence Differential between SERVIU and Private Beneficiaries.

Sample	Treated	Controls	Difference (Impact)	Bootstrapping [95% Conf. Interval] Method	
Delinquency incidence: Psmatch					
Unmatched	0.05	0.17	(0.119)		
ATT	0.06	0.08	(0.015)	(0.06)	0.03 (N)
				(0.08)	0.02 (P)
Cases	Off support	On support		(0.05)	0.04 (BC)
SERVIU	2,205	325			
Private	422	328			
Total	2,627	653			

Note: Receiving a private loan is equivalent to the receiving the treatment
Here we are trying to see a SERVIU beneficiary behavior when receive a private loan

Source: Own estimations based on data from especial processing of CASEN (2003).

The third major implementation problem encountered was the increasing price and decreasing availability of adequate land. According to some commentators this in turn has led to: (i) an increased absorption of grants into the purchase of land; (ii) a decreased quality of the housing solutions; (ii) the creation of ghettos - residential segregation; and (iv) a reduction in the quality of life.²⁵

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. The argument is that this result is due to the interplay of three actors. 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. Another actor is private construction companies that provide housing solutions similar to those found in the neighbourhood. The third actor is illegal land squatters who in order to reduce eviction risk locate themselves in lands of low value, normally in the periphery of a city. Statistical analysis by Vargas (2006) confirms the hypothesis that housing subsidies result in segregation in the case of the capital, Santiago. He calculates a number of segregation indices and using a number of control variables estimates a log likelihood function of a housing subsidy on an isolation index. 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).

Thus to conclude this section the following points can be made. First, public housing solutions were on an annual basis about 182% of private sector solutions, with the additional advantage that they are anti-cyclical while private

²⁵ See Sabatini (2001 and 2003), Bain , Produje (2000) Robles et al (1996), Simioni and Arriagada (2002), Smolka and Sabatini (2002), Jiron (2003) and Vargas (2006).

sector solutions are pro-cyclical. Second, without public housing solutions the housing shortage would have been in 2003 about 42% instead of the observed shortage of 18%. These positive findings, however, have to be counter-balanced with the poor sustainability of the interventions according to housing shortage measures. Further, the drive to increase the number of solutions but simultaneously contain budgetary costs may have resulted in the negative outcome of residential segregation. Finally, the assertion that high delinquency of publicly provided mortgages was due to moral hazard was rejected. Instead a comparison of similar households holding public and private provided mortgages revealed that the high delinquency rates was due to incapacity to pay.

IV. INCIDENCE AND TARGETTING EFFECIENCY

Three key aspects of a public program are: (i) the profile of beneficiaries (ii) the incidence by the income of the beneficiaries and (iii) the program's targeting efficiency. These three dimensions are the subject matter of this section.

A. Profiles

The beneficiary household profile is summarised in Table 9. The Table shows the percentage difference in means for a series of key household characteristics between the programs beneficiaries (total and for each housing program) and non-beneficiaries. A positive figure represents "over-representation" while a negative number represents an "under-representation" of that feature of the beneficiaries in the housing programs.

The following holds for the characteristic of the household head: (i) the ages 20-24 are underrepresented but ages 25 to 64 practically are overrepresented in all housing programs except PET; (ii) female headed households are generally under-represented except for Basic and Progressive programs; (iii) the household head is in the labour force, working in industry or services-government except for Rural in which case there is over-representation of heads employed in agricultural activities; (iv) the household head's education -years of schooling- is over-represented in the seven to fifteen years bracket except for the Rural, Basic and Progressive programs where there is over-representation of the lower levels of education from one to ten years education bracket.

Table 9: Profile of Programs' Beneficiaries: Household Head.

	Total beneficiaries of housing programs				Basic Housing	Progressive Housing	Progressive Housing
	General Subsidy	PET	Rural	Program Phase I		Program Phase II	
Gender of the head							
Females	(1.7)	13.2	14.7	8.3	(29.4)	(3.6)	0.9
Age of the head							
15-19	0.2	(0.3)	(0.6)	(1.3)	(1.3)	(0.1)	1.0
20-24	(0.6)	6.8	5.8	3.7	(5.4)	(1.1)	1.2
25-44	11.2	19.9	18.9	9.7	(43.3)	17.1	13.2
45-64	(3.0)	(13.8)	(12.6)	(7.1)	(32.3)	(1.7)	(1.4)
65 y más	(7.7)	(12.5)	(11.5)	(5.2)	(17.8)	(14.2)	(14.0)
Economic sector of the head							
Agriculture	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Industry	(5.1)	(10.6)	(8.5)	4.9	(25.4)	(14.7)	(11.3)
Services and other	(0.4)	2.3	2.4	(3.5)	(5.2)	0.8	3.4
Occupation of the head							
Out of labor force	(18.0)	6.9	1.6	(2.1)	(39.9)	11.1	5.0
Unemployed	0.0	0.0	0.0	0.0	(100.0)	0.0	0.0
Wage earner	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Self-employed	(4.7)	(10.9)	(8.8)	4.6	(25.7)	(14.9)	(11.5)
Entrepreneur	(0.4)	2.3	2.4	(3.5)	(5.2)	0.8	3.4
Education of the head, years of schooling							
Illiteracy rate	0.0	0.0	0.0	0.0	(100.0)	0.0	0.0
1-5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6-6	16.7	9.2	19.6	25.9	(18.4)	(3.7)	7.6
7-10	13.4	8.3	8.3	(1.9)	(18.6)	0.7	8.9
11-11	(1.3)	1.7	(4.1)	6.4	(18.5)	2.2	4.0
12-15	(9.5)	(1.4)	(9.4)	(13.6)	(19.7)	1.6	(3.0)
16 or more	(19.4)	(17.9)	(14.3)	(16.6)	(24.8)	(0.9)	(17.5)

Source: Own estimations based on data from CASEN (2000).

The following holds for the household: (i) household's income by quintiles is over-represented in quintile one for Rural, Basic, and Progressive, for PET in quintile 2 and 3, for Basic in quintile 3, and PET and General in quintile 4; (ii) the composition of the household is one with one or two children but with no elderly member over-represented; and (iii) over-representation of households in urban areas except, as would be expected, for Rural.

Table 10: Profile of Beneficiaries: Characteristics of the Household and Location

Total beneficiaries of housing programs	General Subsidy	PET	Rural	Basic Housing	Progressive Housing Program Phase I	Progressive Housing Program Phase II
Type of household						
Individual	(9.5)	(1.4)	(9.4)	(13.6)	(19.7)	1.6 (3.0)
Rest	(19.4)	(17.9)	(14.3)	(16.6)	(24.8)	(0.9) (17.5)
Children (0 to 10) in the households						
None	0.0	0.0	0.0	0.0	0.0	0.0
One	(54.8)	7.3	1.0	6.8	(84.0)	15.5 15.8
Two	54.8	(7.3)	(1.0)	(6.8)	(16.0)	(15.5) (15.8)
Three	0.0	0.0	0.0	0.0	(100.0)	0.0 0.0
Four and over	0.0	0.0	0.0	0.0	0.0	0.0 0.0
Elderly (60 and over) in the household						
None	(0.1)	1.2	2.0	(0.8)	(1.5)	(0.2) 1.0
One	6.7	0.4	4.4	(2.7)	(3.9)	0.2 1.2
Two	(5.2)	(0.2)	(5.8)	6.5	(11.6)	(3.3) (1.3)
Three	4.5	(1.9)	(2.2)	(1.9)	(5.3)	(1.9) (1.6)
Four and over	5.0	(3.2)	2.4	(2.8)	(5.7)	(1.4) (1.3)
Income (Quintil)						
Quintil 1	6.7	0.4	4.4	(2.7)	(3.9)	0.2 1.2
Quintil 2	(5.2)	(0.2)	(5.8)	6.5	(11.6)	(3.3) (1.3)
Quintil 3	4.5	(1.9)	(2.2)	(1.9)	(5.3)	(1.9) (1.6)
Quintil 4	5.0	(3.2)	2.4	(2.8)	(5.7)	(1.4) (1.3)
Quintil 5	4.9	0.7	(0.5)	(8.4)	(12.7)	(1.6) (2.7)
Area						
Urban	(0.7)	1.8	(0.9)	3.6	(1.0)	(0.0) 0.4
Rural	(21.0)	1.3	(25.5)	(10.8)	(37.6)	15.7 11.7

B. Incidence

Incidence is defined as the percentage distribution of a program across household income strata. Chart 18 shows the aggregate incidence of all the housing programs for two years: 1994 and 2003. The incidence pattern is essentially an inverted U shape with the turning point shifting towards the lower quintiles, i.e. shifting from an upper middle class to the lower middle class. Chart 19 shows the incidence of the individual programs in 1994. The programs can be classified into two sets. The first set includes the programs Rural, Progressive, Basic programs whose incidence has a negative pattern with respect to income, i.e. a decrease in incidence as household income increases. The second set is composed of the programs PET, General, and Others, that have an inverted “U” shape pattern i.e. incidence increases as income increases but after reaching a

certain level starts to decline as income further increases. The two sets of programs' pattern also holds in 2003.

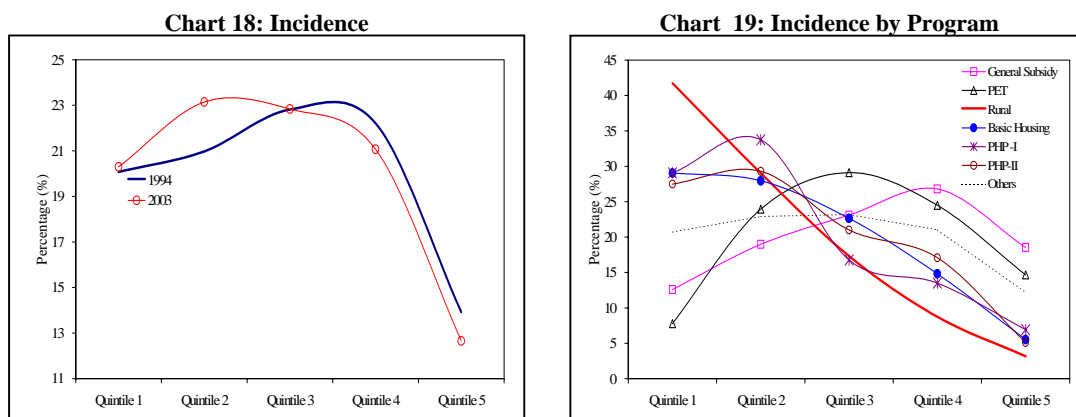


Table 11: Change in Incidence (1994-2003)

	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
General Subsidy	(1.7)	1.9	(1.5)	2.0	(0.6)
PET	(9.4)	(1.0)	7.7	1.5	1.2
Rural	2.2	0.2	(0.4)	(2.0)	0.0
Basic Housing	(2.1)	0.0	2.9	(1.1)	0.3
PHP -I	(5.5)	12.1	(4.1)	(3.5)	1.0
PHP-II	(4.4)	(3.1)	5.7	1.8	(0.1)
Others	4.1	2.1	(0.3)	(3.1)	(2.8)
All	0.2	2.2	0.0	(1.1)	(1.3)

Source: Own estimations based on data from CASEN.

However, there have been changes in incidence from 1994 to 2003 (see Table 11). For two programs (Rural, and others) there has been an unambiguous increase in incidence in the lowest two quintiles. For PET there has been an increase for the top three quintiles. Except for Rural and Others there has been a significant reduction in incidence in the lowest quintile. The changes in incidence is due to: (i) dropping of programs; (ii) introduction of new programs; and (iii) increased pro-poor targeting of existing programs.

C. Targeting Efficiency

In this section we evaluate the targeting efficiency of the programs. An evaluation of the efficiency of targeting normally uses the calculations of the

errors in targeting.²⁶ There are two potential types of errors: (i) error type I, that is, the under-coverage of the targeted population; and (ii) error type II, that is leakage to non-targeted population i.e. leakage. We take the lowest two income quintiles as the targeted population

However, a reading of the targeting efficiency calculations should be read with caution. The Chilean programs did not generally have an income upper bound built into the eligibility conditions, as described in Section III. Policy for most of the period studied is better described as one aimed to achieve progressiveness, i.e. increasingly biased towards the lower income households.

The calculations, of “what if” the targeted population was the lowest two income quintiles with respect to the stock of shortage are summarised in Table 12. Overall leakage and under-coverage falls. This pattern reflects that while new programs like PHP in which targeting improved other programs like PET and General Subsidy worsened.

Table 12: Targeting Efficiency

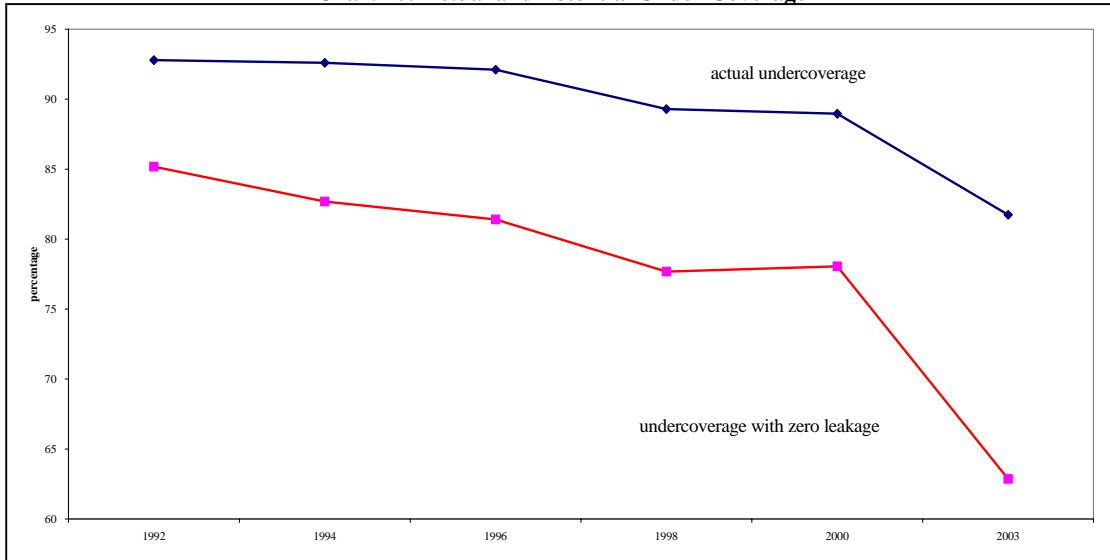
Leakage to quintiles 3, 4 and 5							
	General		Rural	Basic			
	Subsidy	PET	Subsidy	Housing	PH -I	PH-II	All
1992	26.6	38.4	39.4	56.8	68.4	59.5	58.5
2003	29.2	43.0	42.9	56.4	0.0	68.3	56.6
Under-Coverage of quintiles 1 and 2							
1992	96.9	97.6	98.7	100.0	99.8	99.7	92.8
2003	98.2	96.7	95.2	95.2	96.9	99.5	81.7

Source: Own estimations based on CASEN.

Chart 20 shows the under coverage in the case of zero leakage. With the existing income based targeting it would take 10 years to eliminate the shortage stock of 2003 while a “perfectly targeted” program would take six years. However, the lesson from Chile’s housing programs is to have a number of programs with different targeted population and appropriate designs and gradually shift the aggregate targeting to lower income groups as the enabling environment improves and the width of the problem is reduced.

²⁶ See Sadoulet E. and de Janvry A (2004)

Chart 20: Actual and Potential Under Coverage



V. THE WELFARE RESULTS: NAIVE AND IMPACT ESTIMATIONS

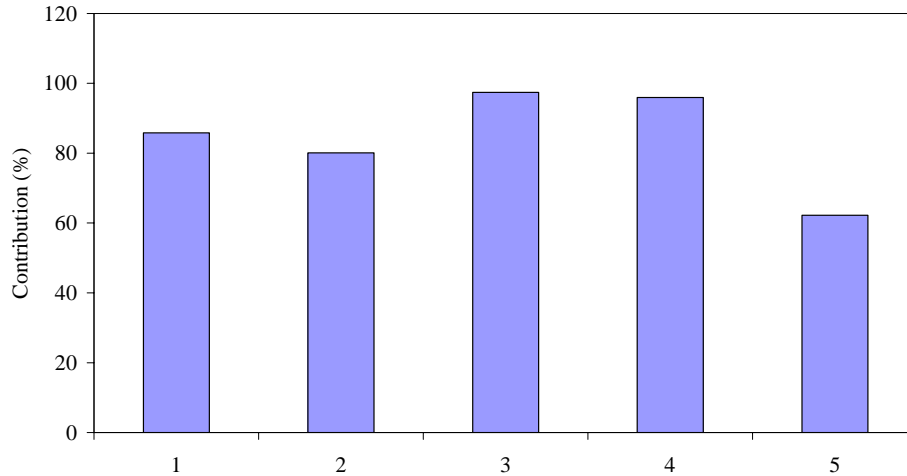
The objective of this section is to present the estimations of the contribution of the program to the observed changes in the welfare indicators of the program's beneficiaries.

In determining the outcomes of the program two key choices have to be made: (i) the set of outcomes expected from the program; and (ii) the methodology used. In an ex-post evaluation, unfortunately, not only the feasible outcome set but also the feasible methodology is conditioned by the available data set.

The main data set available for this study was the country's household survey, CASEN. This limits the method to determine impacts to either a cross-section econometric estimation or a propensity score matching for a single difference. We compare the matching single difference with the naïve pipeline method.

The second choice concerns the definition of the set of expected outcomes from the program. Official government documents do not explicitly list the expected program outcomes other than the reduction of overcrowding and improved quality of housing. Nonetheless, a revision of the literature on the benefits of public housing solutions suggests a number of potential welfare outcomes. However, the set of outcomes evaluated in this document are those that can be encountered in the available data. The set evaluated 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. The welfare indicators are: household completeness, (presence of spouse, and formally married), occupation ratio (working households 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.

Chart 21: MINVU's Contribution to House Ownership by Quintile



Source: Own estimations based on data from CASEN (2000).

Before discussing the findings regarding impacts it is useful to discuss the social housing programs' contribution to housing ownership. Housing ownership has many claimed virtues that are not picked up by the outcomes considered in this paper. Of the increased ownership from 1992 and 2003 of 1,039,040, about 85% may be attributed to public programs. Chart 21 shows the MINVU's program's contribution to ownership by income quintile.

Two estimated impact effects are presented for two different calculations: (i) naïve-pipeline effect, that is a simple difference between the average values between the beneficiaries and current applicants and presented in Table 13 as the column "unmatched"; (ii) average treatment of the treated effect, column ATT in the Table, which is the difference between the beneficiaries and comparison group created through propensity score method *a la* nearest neighbour method.²⁷ Statistical significance of the coefficients is based on the conventional standard error and the standard error based on the boot strapping method. The following "impact" discussion uses the average treatment of the treated effect and statistical significance as measured by the standard error obtained by the bootstrapping.

²⁷ See Annex 3 for a description of the sample and underlying analysis.

Table 13: Impact Estimates

	General Subsidy		PET		Rural		Basic		PHP - Phase I		PHP - Phase II		
	Difference (Beneficiaries - Comparison group)												
	Un-Matched	ATT	Un-Matched	ATT	Un-Matched	ATT	Un-Matched	ATT	Un-Matched	ATT	Un-Matched	ATT	
Nearest Neighbor													
Materiality													
Access to potable water	1/	0.04	0.01	0.01	0.00	0.01	0.02	0.07	0.04	0.13	0.09	0.05	0.02
	S.E.	0.00	0.01	0.00	0.00	0.01	0.02	0.00	0.01	0.02	0.02	0.02	0.02
	B.S.		**						**		**		**
Sewerage connection	1/	0.16	0.10	0.15	0.16	0.04	0.09	0.28	0.19	0.41	0.27	0.24	0.11
	S.E.	0.01	0.02	0.01	0.04	0.02	0.02	0.01	0.02	0.02	0.04	0.03	0.06
	B.S.		**		**		**		**		**		**
Electricity access	1/	0.02	0.01	0.03	0.01	(0.01)	0.01	0.04	0.01	0.06	0.03	0.01	0.00
	S.E.	0.00	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.01	0.02	0.01	0.00
	B.S.		**				**		**		**		**
Overcrowding	2/	(0.05)	(0.03)	(0.08)	(0.15)	(0.08)	(0.08)	(0.08)	(0.08)	0.06	0.05	(0.06)	0.02
	S.E.	0.01	0.01	0.01	0.04	0.01	0.01	0.01	0.01	0.02	0.03	0.03	0.04
	B.S.		**		**		**		**		**		**
Quality of the dwelling	1/	0.12	0.09	0.09	0.12	0.14	0.16	0.19	0.16	0.20	0.16	0.18	0.18
	S.E.	0.01	0.01	0.01	0.03	0.01	0.01	0.01	0.01	0.02	0.02	0.03	0.04
	B.S.		**		**		**		**		**		**
Living standard													
Household Completeness	1/	0.04	0.06	0.03	(0.04)	0.10	0.04	0.10	0.05	0.09	0.03	(0.06)	(0.03)
	S.E.	0.02	0.03	0.04	0.06	0.02	0.02	0.02	0.02	0.03	0.05	0.06	0.08
	B.S.		**		**		**		**		**		**
Health: Child undernourishment	3/	0.00	0.01	0.02	0.02	0.03	0.03	(0.00)	(0.00)	(0.02)	(0.01)	0.01	0.01
	S.E.	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.03	0.05
	B.S.		**		**		**		**		**		**
Education: School attendance	4/	(0.00)	0.00	0.00	0.00	(0.01)	(0.01)	0.00	0.00	0.01	0.03	(0.01)	0.00
	S.E.	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.00
	B.S.		**		**		**		**		**		**
Occupation ratio	5/	(0.00)	0.04	0.01	0.02	(0.02)	0.01	0.01	0.03	(0.02)	0.00	0.05	0.04
	S.E.	0.01	0.01	0.02	0.03	0.01	0.01	0.01	0.01	0.02	0.02	0.03	0.04
	B.S.		**		**		**		**		**		**
Indigence incidence	1/	0.01	(0.00)	0.03	0.00	0.03	0.00	0.01	(0.03)	0.02	(0.01)	(0.02)	(0.07)
	S.E.	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.02	0.03	0.04	0.06
	B.S.		**		**		**		**		**		**
Poverty incidence	1/	(0.02)	(0.04)	0.05	(0.02)	0.07	0.05	0.02	(0.00)	(0.03)	(0.01)	0.12	0.12
	S.E.	0.01	0.02	0.03	0.03	0.02	0.02	0.01	0.02	0.03	0.04	0.05	0.07
	B.S.		**		**		**		**		**		**

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

S.E. Standard Error reported by PSMATCH2
 (***) B.S. Significance based on the Bias Corrected Standard error reported from Bootstrapping at 1000 Reps at 5%.
 (-) No-significant at 5%

Source: Own estimations based on CASEN (2000).

With respect to the quality of house composite indicator the impact is positive and statistically significant for all the programs. However, looking at the individual components of the composite indicator shows that for PHP I and II there was an opposite to desired effect; the programs increased rather than reduced overcrowding. All the other programs significantly reduced

overcrowding. The larger quality improvement of different programs is associated with larger increased sewerage connection and overcrowding reducing effects.

With respect to welfare indicators the following holds. First, the impact on household completeness and occupation ratio is positive and statistically significant for the BHP and GHP. Second, the programs PET and RS had a small negative effect on child under-nourishment. Third, only PHP had a positive impact on school attendance for children ages six to fourteen. For indigence and poverty a reduction effect was found for BHP and RP had a poverty increasing effect.

The residential segregation effects of the programs could account for the rather poor impacts on the welfare indicators other than materiality indicators. The literature on residential segregation effects documents how it affects adversely occupation rates, academic performance, single parenthood, and poverty and income inequality.²⁸

²⁸ See Larrañaga and Sanhueza (2007) who show that residential segregation reduces opportunities of the poor as it negatively effects pre-school attendance, school drop outs and lagging in grades at school. They do not find effects on probability of being an adolescent or single mother or on health although point out the measures are noisy approximations hence are preliminary findings.

VI. THE COSTS AND BENEFITS

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

Conventionally the valuation of a program involves a comparison of the present value of the total cost of providing the housing with the present value of the monetary value of the benefit.²⁹ Traditionally two different approaches have been taken to determine the monetary values of the benefits. The first approach is the willingness to pay for a given characteristic of a house by contingent valuation i.e. households are 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, precluding this approach.³⁰

Instead we proxy the monetary benefit by the household income normally required to service a market priced mortgage for given quality house. We take the following approach. The statistically significant benefits were an improvement in the composite dwelling index. Using this finding we construct a group from the set of non-beneficiaries and non-applicants who have the same level of the quality of house and housing location.³¹ Second, from the latter group is constructed a comparison group by using the nearest neighbourhood method to

²⁹ See Edgar O. Olsen (2000) for a review of the cost and benefits approach and Malpezzi (2002) for a review of hedonic pricing models.

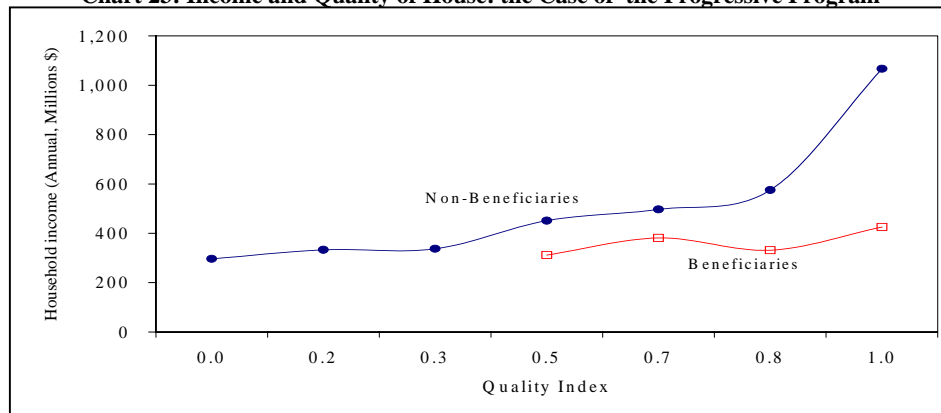
³⁰ However, see Arenas and Balaguer-Coll (2006) who calculate hedonic prices for five urban areas in Chile and Cox and Parrado (2006) for the greater metropolitan area of Santiago.

³¹ This exercise reduced the sample size; only 110 beneficiaries and 1823 non-beneficiaries households were selected to carry the matching out. Those households were selected from 22 municipalities where the number of the reported beneficiaries were greater than 5 and the quality of the dwelling composite quality indicator was lower than 1. The latter was used in order to avoid the huge dispersion in quality among the richest households.

³¹ 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 estimation does not take in consideration the additional investment that households made. In addition, the depreciation of the unit is estimated to occur in 10 years with no differentiated depreciation rate between MINVU solution and private solutions. Further, no correction is made for 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).

only include those households that in principle are eligible to apply to the relevant program and have same geographical location.³² For example for the PET program formal workers were used as a proxy for union members. Third, is calculated the average difference between the beneficiaries and the comparison group for different levels of house quality. For example in Chart 23 is shown the case for the Progressive program. Fourth, to that difference in average incomes only 30% was defined as the benefit. The latter invokes the Engel’s rule-of-thumb that housing expenditure is about 30% of income. Thus the “monetary value of the benefit” is the additional household income normally required to purchase equivalent program benefits via a mortgage.³³

Chart 23: Income and Quality of House: the Case of the Progressive Program



The cost was taken to be the unit public expenditure of the program. The net present values of the benefits and costs were calculated using a 12% discount and

³² See Annex 4 for a description of the data used for this exercise.

³³ The benefit of the program is defined as : $Benefit = \int_0^1 [Y_{NB}^*(q) - Y_B^*(q)]dq$ where q is the dwelling quality indicator that ranges from 0 to 1, and Y is the average household income of non-beneficiaries (NB) and (beneficiaries (B) households from a support group created by matching the eligibility criteria established by the program and identical geographic location. This is indicated by the (*). The matching is performed by exact matching on location and quality of the dwelling after filtered by eligibility. Thus the average benefit will be,

$$Benefit = \frac{1}{|N|} \sum_{i \in N} \left(y_i - \frac{1}{|J_i|} \sum_{j \in J_i} y_j \right)$$

where N is the number of units in the treatment group, J_i is the set of comparison units matched to treatment unit i and $|J_i|$ is the number of comparison units in J_i .

a 10% depreciation rate. The calculations are given in Table 14 in which net present values and internal rates of return are given with and without the discount factor of 30%.

Applying the discount the net present value figure is US\$14.7 million and the average annual rate of return is 14.5%. These aggregate figures have widely differing numbers for the individual programs. Three of the traditional programs have negative net present values (General Subsidy, Basic Housing, and Progressive Housing Phase II). The lowest internal rate of return was for Basic Housing and the highest return was for PHPI.

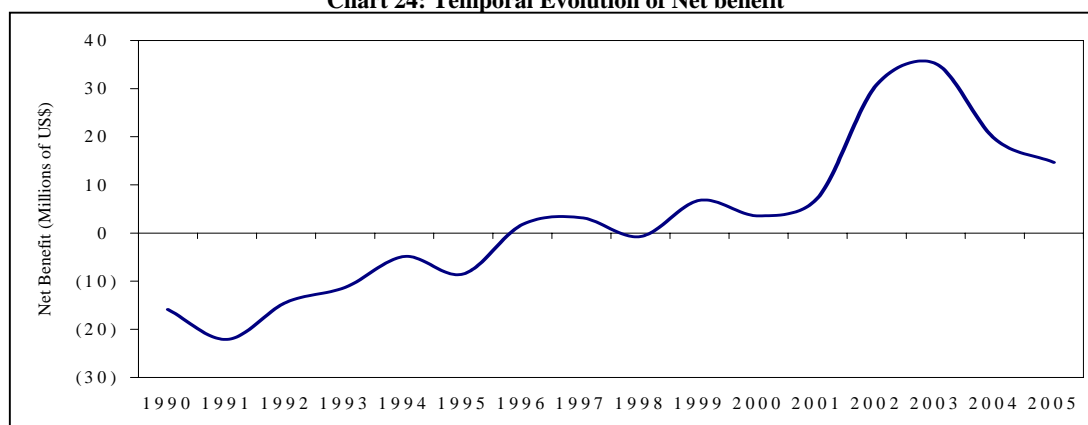
Table 14: Cost and Benefit Calculations by Program

	General Subsidy	PET	Rural Subsidy	Basic Housing	PHP-I	PHP-II
Net Benefit US\$ (Benefit - Cost), 100%	8,250.8	7,203.2	10,132.5	13,025.5	16,743.7	10,700.7
Net Benefit US\$ (Benefit - Cost), 30%	(208.3)	414.3	728.4	(1,168.9)	2,110.2	(67.9)
IRR, 100%	55.1	68.4	71.7	48.5	88.8	57.5
IRR, 30%	10.7	15.9	17.2	7.9	23.4	11.6

Source: Own estimations based on data from CASEN (2000). 100% and 70% indicates the percentage taken of the difference in incomes of beneficiaries and comparable non beneficiaries

However, the changing relative importance of the programs with its consequent increasingly pro-poor bias has implied an important shift in the aggregate calculations over time as shown in Chart 24.

Chart 24: Temporal Evolution of Net benefit



Source: Own estimations based on data from CASEN (2000).

As the chart shows the decline in relative importance of these three programs (General Subsidy, Basic Housing, and Progressive Housing Phase II) combined with the increasing pro-low income bias of most of the programs has implied that the aggregate annual value of the net present value calculations of the country's housing programs has shifted from negative values in the early nineties to positive numbers post mid-nineties.

Thus the cost-benefit calculations show a positive net present value, a high internal rate of return, both of which increased over time. However, individual programs show a large variation, from negative to positive values.

VII. THE BEST?

The general evaluative question underlying a meta-evaluation is which program is the best? In this section we bring together the different findings of the evaluation to answer this question.

In Table 15 are summarised the ranking of the different programs according to the different evaluative criteria used in this paper. A ranking of 6 is the “best” and 1 the “worst”³⁴. As was evident in the previous sections, different evaluative criteria give different rankings of the six programs.

The first point is that in a multi-dimensional meta-evaluation there is a high probability that a consistently “best” categorisation of a program is low. Indeed the evidence suggests programs can be classified as best under some evaluative criteria and worst in others. For example the Basic Housing program comes out as the best in terms of size, in the reduction of under-coverage and has the largest impact on reducing the indigence rate. Simultaneously it is the worst in terms of internal rate of return.

The second point is that care should be taken in using a single dimensional evaluative criteria. Often proposed and used is the internal rate of return for evaluating public programs. The Basic Housing example illustrates the pitfall in doing so. Interest groups will often use single dimension evaluative criteria. If household completeness (husband and wife formally married living under one roof) is considered a proxy for social well being then PHP I is the best. However, it is the worst in reducing overcrowding which itself is used as a proxy for negative welfare effects.

Third, the results caution against searching for mechanical rules to aggregate different evaluative criteria to obtain an overall ranking. For the eighteen different criteria their non weighted averages would give the following ranking from best to worst: Basic Housing, PHP I, General Subsidy, PET, Rural Subsidy, PHP I. However, the ranking is very sensitive to different weighing schemes.

³⁴ Note the statistically insignificant impact calculations are set to zero. See Annex 5.

Table15: Rankings of the Programs

Levels								
	Solutions	Unit Cost (Quality adj.)	Sustainability	Leakage	Under-Coverage	Female household head Incidence		Sub-Average
General Subsidy	5	1	5	1	2		4	2
PET	4	4	6	2	4		1	4
Rural Subsidy	3	5	1	6	5		3	5
Basic Housing	6	3	4	4	6		5	6
PHP-I	2	2	2	5	3		6	3
PHP-II	1	6	3	3	1		2	1
Impact								
	Internal Rate of Return	Potable Water access	Sewerage access	Electricity access	Over-Crowding	Quality of dwellings		Sub-Average
General Subsidy	2	3	2	5	3		1	3
PET	4	1	4	1	6		2	4
Rural Subsidy	5	1	1	1	4		4	3
Basic Housing	1	5	5	4	5		5	5
PHP-I	6	6	6	6	1		3	6
PHP-II	3	4	3	1	1		6	4
Impact								
	Household Completeness	Health: Child undernourishment	Education: School attendance	Occupation ratio	Indigence incidence	Poverty incidence		Sub-Average
General Subsidy	6	3	1	6	1		2	5
PET	1	2	1	1	1		2	2
Rural Subsidy	1	1	1	1	1		1	1
Basic Housing	5	3	1	5	6		2	6
PHP-I	1	3	6	1	1		2	4
PHP-II	1	3	1	1	1		2	3

Source: See Annex 5

VIII. CONCLUSIONS

This paper presents the findings of an evaluation of Chile's Social Housing Programs. The following was encountered.

The policy problem of housing needs, either measured by affordability or by housing quality, has fallen significantly over time. Housing ownership has increased significantly. Partially the fall in the housing needs can be attributed to an improving enabling environment, i.e. the country's sustained macroeconomic success and structural, particularly pension, reform that resulted in a virtuous cycle of increasing household income and savings and in an increasing depth (and reduced cost) of mortgages. However, opening the home-buying private market to underserved households remains a challenge. The aggregate figures shroud the problems still faced by households in the lowest two income quintiles. Households in these two income levels have not seen an improvement in affordability, on the contrary both public and private providers have reduced their exposure to the lowest three quintiles. Nonetheless, the lowest two income quintiles have seen the largest increase in house ownership. An increase in which public housing programs have played a critical role.

Chile's sets of public housing programs offer a combination of a subsidy and a mortgage to provide a house of a given quality. Different programs offer different combination and sizes of grants (through vouchers) and mortgages for different quality of houses. Although with some overlap the different programs are directed at different populations. The overlap is justified by providing a menu of options rather than one rigid solution. Although with some minimum standards specified the programs allow flexibility in the specific design of the house. The programs allow individual or collective applications and publicly constructed or voucher (hence private constructed house). The set of public housing programs are characterised by change. A change involving modifications of an existing program or winding down of existing programs and introduction of new programs. It is a history of program change based on experience and as the context –the size and type of problem being tackled- changed.

In terms of targeting, the Chilean programs did not generally have a specific income based *ex ante* targeting explicitly built into their beneficiary selection process. Selection criteria used differed amongst programs in which income was only one criteria and where income did not have an upper bound. Policy for most of the period studied is better described as one aimed to achieve progressiveness, i.e. increasingly biased over time towards the lower income quintiles. Nonetheless, looking at targeting efficiency, a "what if" the programs were

targeted to the lowest two income quintiles, reveals that overall leakage and under coverage have improved slightly.

In terms of size, public programs are the most important actors in the housing market. Note however, the direct production of houses by the public sector steadily fell towards zero while private providers in the public programs concurrently increased. Public housing solutions were on an annual basis about 182% of private sector solutions; with the additional advantage that they are anti-cyclical while private sector solutions are procyclical. Without public housing solutions the housing shortage would have been, in 2003, 42% instead of the 18%.

These positive numbers, however, have to be counter-balanced with implementation problems. The first problem is the non-sustainability of the benefits. A portion of houses living in inadequate conditions had been a previous beneficiary of the public housing programs. Inadequate maintenance expenditure by beneficiaries of their houses needs to be included into public program design. Chile's solution is to introduce a program that periodically finances that upkeep. The second problem was that the drive to increase the number of housing solutions but simultaneously to contain the budgetary costs has resulted in income residential segregation. Thus the successful number drive may have been accompanied in a less than desired quality of life of the beneficiaries. The third problem was the high delinquency rates of publicly provided mortgages. Although this problem has often been attributed to moral hazard, the evaluation found the problem was the capacity to pay, with little difference between public and private providers for similar low-income families. The solution, adopted by Chile, is to fold the mortgage into the grant for programs directed at low-income families.

Regarding the impacts of the programs the following was found. First of the increased owner-occupancy rates ownership from 1992 to 2003 about 85% can be attributed to MINVU. The largest beneficiaries were households in income quintiles three and four, followed by the lowest two income quintiles. Second, the impact of the programs on the quality of house composite indicator the impact is positive and statistically significant for all the programs. However, for PHP I and II the programs increased rather than reduced overcrowding. All the other programs significantly reduced overcrowding. The larger quality improvement of different programs is associated with larger increased sewerage connection and overcrowding reducing effects. Third, statistically significant impact on desirable welfare effects was not generally found; different programs had different effects including perverse effects. The claimed residential

segregation effects of the programs could account for the rather poor findings regarding impacts on the welfare indicators other than materiality indicators.

In terms of cost benefit the average annual rate of return of 14.5%. Underlying these aggregate figures are largely differing numbers for the individual programs. Three of the traditional programs have negative net present values (General Subsidy, Basic Housing, and Progressive Housing Phase II). The lowest internal rate of return was for Basic Housing and the highest return was for PHPI. Further, the changing relative importance of the programs with its consequent increasingly pro-poor bias has implied that the aggregate annual value of the net present value calculations of the country's housing programs has shifted from negative values in the early nineties to positive numbers post mid-nineties.

The paper reveals that the search for the "best" program is misplaced. There is no holy grail regarding public housing programs. On the contrary, as revealed by the Chilean case, different programs introduced and wound down as the size and type of problems and context changes is the preferred option.

Nonetheless, there are three key ramifications regarding program design. First, to the extent the program is directed at poor households the mortgage component should be eliminated and folded into the grant component. Second, the high re-occurrence of quality defined housing shortage of beneficiaries of public programs suggests complementary mechanisms, including additional financing, to ensure minimum maintenance expenditure. Third, to place greater care in the location of housing solutions to avoid residential segregation.

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ANNEX 1

Sample size: Number of households by quality of the household (Shortage) and social Programs						
	1992	1994	1996	1998	2000	2003
Number of households (Good Conditions / Non shortage)						
Non beneficiaries	20,165	28,989	24,408	31,162	40,888	43,477
General Housing Subsidy	1,941	1,745	1,781	3,627	3,799	4,239
PET (Workers Program)	89	95	136	309	581	580
Rural Subsidy Program	283	474	443	1,294	2,669	3,913
Basic Housing Program	374	717	645	1,982	2,791	2,683
Progressive Housing Program Phase I	10	39	109	341	403	452
Progressive Housing Program Phase II	5	25	35	86	143	157
Other programs	2,921	1,846	946	2,088	3,241	5,109
Total	25,788	33,930	28,503	40,889	54,515	60,610
Number of households (Bad Conditions / Shortage)						
Non beneficiaries	14,895	19,020	11,233	14,743	21,789	18,706
General Housing Subsidy	376	284	139	375	367	437
PET (Workers Program)	23	7	4	11	36	17
Rural Subsidy Program	233	259	295	696	911	1,154
Basic Housing Program	82	187	112	316	396	369
Progressive Housing Program Phase I	9	26	57	128	105	102
Progressive Housing Program Phase II	1	8	5	23	32	28
Other programs	1,427	924	402	1,141	1,207	1,494
Total	17,046	20,715	12,247	17,433	24,843	22,307

Impact Evaluation: Samples			
	Applicants	Beneficiaries	All
Total households in CASEN (2000)			
General Housing Subsidy	969	4,166	5,135
PET (Workers Program)	151	617	768
Rural Subsidy Program	1,331	3,580	4,911
Basic Housing Program	1,668	3,187	4,855
Progressive Housing Program Phase I	467	508	975
Progressive Housing Program Phase II	108	175	283
On Support			
General Housing Subsidy	925	3,989	4,914
PET (Workers Program)	115	553	668
Rural Subsidy Program	567	1,611	2,178
Basic Housing Program	624	968	1,592
Progressive Housing Program Phase I	175	151	326
Progressive Housing Program Phase II	81	122	203

ANNEX 2

Delinquency Rate: Private versus Public Loans (2003)		
	Total	On support
Total households (2003)	82,116	
Own - Paid	52,831	
Own - Paying Loan	7,557	653
<i>SERVIU</i>		325
<i>Banco Estado</i>		328
<i>Private Institution</i>		293
<i>Other Institutions</i>		
Rent and others	21,428	
Irregular occupation	300	
The total of households used in the impact evaluation was 3280 households currently paying loans (SERVIU and Private Institution).		
Note: Receiving a private loan is equivalent to the receiving the treatment		

ANNEX 3

Impact Evaluation: Samples			
	Applicants	Beneficiaries	All
Total households in CASEN (2000)			
General Housing Subsidy	969	4,166	5,135
PET (Workers Program)	151	617	768
Rural Subsidy Program	1,331	3,580	4,911
Basic Housing Program	1,668	3,187	4,855
Progressive Housing Program Phase I	467	508	975
Progressive Housing Program Phase II	108	175	283
On Support			
General Housing Subsidy	925	3,989	4,914
PET (Workers Program)	115	553	668
Rural Subsidy Program	567	1,611	2,178
Basic Housing Program	624	968	1,592
Progressive Housing Program Phase I	175	151	326
Progressive Housing Program Phase II	81	122	203

Return		1	2	3	4	5	6	7
		General Housing Subsidy						
Beneficiaries respect to applicants of the:								
Number of Household Members (Logs)	lmem_h	0.420*** [0.10]	0.384*** [0.087]	0.384*** [0.087]	0.383*** [0.087]	0.383*** [0.087]	0.383*** [0.086]	0.384*** [0.086]
Urban areas (Dummy)	durban	2.704*** [0.16]	2.725*** [0.16]	2.730*** [0.16]	2.731*** [0.16]	2.733*** [0.16]	2.738*** [0.16]	2.738*** [0.16]
Age of the household head (Logs, years)	lage	1.719*** [0.17]	1.964*** [0.15]	1.964*** [0.15]	1.966*** [0.15]	1.966*** [0.15]	1.966*** [0.15]	1.968*** [0.15]
Years of schooling of the head of the household (Logs)	lesc	-0.247** [0.11]	-0.246** [0.11]	-0.245** [0.11]	-0.245** [0.11]	-0.245** [0.11]	-0.245** [0.11]	-0.244** [0.11]
Family income (Logs, monthly income)	lyfam	-0.009 [0.056]						
Gender of the head of the household (Dummy, Male)	dsex	0.168* [0.096]	0.117 [0.095]	0.116 [0.095]	0.116 [0.095]	0.115 [0.095]	0.115 [0.095]	0.114 [0.095]
Region number I	dreg1	-1.308*** [0.28]	-1.124*** [0.26]	-1.112*** [0.25]	-1.106*** [0.25]	-1.092*** [0.25]	-1.079*** [0.25]	-1.077*** [0.25]
Region number II	dreg2	-0.157 [0.32]	-0.190 [0.32]	-0.178 [0.32]				
Region number III	dreg3	0.648* [0.36]	0.632* [0.36]	0.644* [0.35]	0.650* [0.35]	0.663* [0.35]	0.676* [0.35]	0.678* [0.35]
Region number IV	dreg4	0.352 [0.24]	0.353 [0.24]	0.365 [0.24]	0.370 [0.24]	0.384 [0.24]	0.398* [0.24]	0.399* [0.24]
Region number V	dreg5	-0.092 [0.13]	-0.087 [0.13]	-0.075 [0.13]	-0.069 [0.13]			
Region number VI	dreg6	0.341** [0.17]	0.346** [0.16]	0.359** [0.16]	0.365** [0.16]	0.379** [0.16]	0.393** [0.16]	0.395** [0.16]
Region number VII	dreg7	-0.062 [0.15]	-0.057 [0.14]					
Region number VIII	dreg8	-0.113 [0.12]	-0.100 [0.12]	-0.087 [0.12]	-0.082 [0.12]	-0.068 [0.12]		
Region number IX	dreg9	-0.312* [0.18]	-0.311* [0.18]	-0.299* [0.18]	-0.293 [0.18]	-0.279 [0.18]	-0.265 [0.18]	-0.263 [0.18]
Region number X	dreg10	0.216 [0.20]	0.211 [0.20]	0.224 [0.19]	0.230 [0.19]	0.244 [0.19]	0.258 [0.19]	0.261 [0.19]
Region number XI	dreg11	-0.305 [0.57]	-0.359 [0.57]	-0.346 [0.57]	-0.341 [0.57]	-0.326 [0.57]	-0.312 [0.57]	
Region number XII	dreg12	-0.397 [0.44]	-0.547 [0.42]	-0.534 [0.42]	-0.529 [0.42]	-0.515 [0.42]	-0.500 [0.42]	-0.498 [0.42]
Capital Region (Reference)	dcap							
Condition of activity of the head of the household (Dummy, Employed)	doc	-0.828*** [0.14]	-0.801*** [0.14]	-0.803*** [0.14]	-0.802*** [0.14]	-0.803*** [0.14]	-0.803*** [0.14]	-0.806*** [0.14]
Occupation category of the head of the household (Dummy, Self-employed)	cat2	0.421*** [0.15]	0.413*** [0.14]	0.416*** [0.14]	0.416*** [0.14]	0.417*** [0.14]	0.421*** [0.14]	0.424*** [0.14]
Occupation category of the head of the household (Dummy, Private wage earners)	cat5	0.203* [0.11]	0.197* [0.11]	0.201* [0.11]	0.202* [0.11]	0.204* [0.11]	0.209** [0.11]	0.212** [0.11]
Number of children in household (9 years and younger, Logs)	nin	-0.295*** [0.061]						
Number of elderly in household (60 years and older Logs)	vie	-0.141 [0.12]						
Number of female in household (Logs)	muj	0.122** [0.052]						
Constant	Constant	-6.784*** [0.92]	-7.769*** [0.70]	-7.787*** [0.70]	-7.799*** [0.70]	-7.815*** [0.69]	-7.838*** [0.69]	-7.849*** [0.69]
Observations	Observations	4,936	4,967	4,967	4,967	4,967	4,967	4,967
R-Square	R-squared							
	ll_0	-2.405	-2.415	-2.415	-2.415	-2.415	-2.415	-2.415
	ll	-2.049	-2.071	-2.071	-2.071	-2.071	-2.071	-2.072
	df_m	24	20	19	18	17	16	15
	chi2	712	689	689	689	688	688	688
Pseudo R-square	r2_p	0.15	0.14	0.14	0.14	0.14	0.14	0.14
	N_cdf	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	N_cds	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Standard errors in brackets						
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								

	1	2	3	4	5	6	7
Beneficiaries respect to applicants of the:							
Number of Household Members (Logs)							
	PET (Workers Program)						
lmem_h	-0.491 [0.31]	-0.302 [0.28]	-0.298 [0.28]	-0.301 [0.28]	-0.304 [0.28]	-0.310 [0.28]	-0.343 [0.27]
Urban areas (Dummy)	durban	3.747*** [0.59]	3.805*** [0.61]	3.804*** [0.61]	3.823*** [0.61]	3.828*** [0.61]	3.777*** [0.60]
Age of the household head (Logs, years)	lage	1.262** [0.51]	1.284*** [0.45]	1.359*** [0.45]	1.369*** [0.45]	1.372*** [0.45]	1.392*** [0.44]
Years of schooling of the head of the household (Logs)	lesc	-0.548 [0.43]	-0.415 [0.41]	-0.405 [0.41]	-0.404 [0.41]	-0.378 [0.41]	-0.354 [0.40]
Family income (Logs, monthly income)	lyfam	-0.654*** [0.18]	-0.710*** [0.18]	-0.733*** [0.17]	-0.737*** [0.17]	-0.736*** [0.17]	-0.723*** [0.17]
Gender of the head of the household (Dummy, Male)	dssex	0.650** [0.31]	0.661** [0.31]	0.680** [0.31]	0.682** [0.31]	0.682** [0.31]	0.676** [0.31]
Region number I	dreg1	-0.918 [0.75]	-0.919 [0.75]	-1.008 [0.74]	-1.040 [0.74]	-1.079 [0.74]	-1.143 [0.73]
Region number II	dreg2	-2.338* [1.25]	-2.352* [1.26]	-2.467** [1.25]	-2.501** [1.25]	-2.531** [1.25]	-2.570** [1.25]
Region number III	dreg3	0.469 [0.55]	0.483 [0.55]	0.394 [0.54]	0.364 [0.53]		
Region number IV	dreg4	0.573 [0.48]	0.589 [0.48]	0.499 [0.46]	0.471 [0.46]	0.437 [0.45]	0.388 [0.45]
Region number V	dreg5	0.243 [0.35]	0.290 [0.35]	0.194 [0.33]	0.163 [0.32]	0.130 [0.32]	
Region number VI	dreg6						
Region number VII	dreg7	0.242 [0.44]	0.273 [0.43]	0.178 [0.42]			
Region number VIII	dreg8	0.508 [0.34]	0.528 [0.34]	0.433 [0.32]	0.402 [0.31]	0.371 [0.31]	0.330 [0.30]
Region number IX	dreg9	0.614 [0.46]	0.638 [0.46]	0.538 [0.44]	0.505 [0.44]	0.471 [0.43]	0.427 [0.43]
Region number X	dreg10	0.373 [0.41]	0.399 [0.41]				
Region number XI	dreg11	-0.094 [0.70]	-0.180 [0.66]				
Region number XII	dreg12	0.527 [0.60]	0.554 [0.60]	0.464 [0.58]	0.436 [0.58]	0.399 [0.58]	0.369 [0.57]
Capital Region	dcap						
Condition of activity of the head of the household (Dummy, Employed)	doc	-0.787 [0.48]	-0.702 [0.46]	-0.681 [0.45]	-0.687 [0.45]	-0.699 [0.45]	-0.703 [0.45]
Occupation category of the head of the household (Dummy, Self-employed)	cat2	-0.019 [0.41]					
Occupation category of the head of the household (Dummy, Private wage earners)	cat5	-0.533* [0.29]	-0.499* [0.26]	-0.526** [0.25]	-0.531** [0.25]	-0.536** [0.25]	-0.533** [0.25]
Number of children in household (9 years and younger, Logs)	nin	-0.009 [0.16]					
Number of elderly in household (60 years and older Logs)	vie	-0.439 [0.39]					
Number of female in household (Logs)	muj	0.213 [0.14]					
Constant	Constant	3.420 [2.88]	3.635 [2.71]	3.702 [2.70]	3.746 [2.69]	3.699 [2.69]	3.556 [2.68]
Observations	Observations	706	706	706	706	706	706
R-Square	R-squared	-	-	-	-	-	-
	ll_0	-361	-361	-361	-361	-361	-361
	ll	-292	-293	-294	-294	-294	-295
	df_m	23	19	17	16	15	14
	chi2	139	136	135	135	134	133
Pseudo R-square	r2_p	0.19	0.19	0.19	0.19	0.19	0.19
	N_cdf	0.000	0.000	0.000	0.000	0.000	0.000
	N_cds	0.000	0.000	0.000	0.000	0.000	0.000
	Standard errors in brackets						
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							
Beneficiaries respect to applicants of the:							
Number of Household Members (Logs)							
	Rural Subsidy Program						
lmem_h	0.713***	0.699***	0.699***	0.702***	0.706***	0.705***	0.704***

		Progressive Housing Program Phase I						
Beneficiaries respect to applicants of the:								
Number of Household Members (Logs)	lmem_h	0.447**	0.268	0.248	0.247	0.249	0.247	0.248
		[0.19]	[0.16]	[0.15]	[0.15]	[0.15]	[0.15]	[0.15]
Urban areas (Dummy)	durban	1.837***	1.789***	1.871***	1.873***	1.873***	1.861***	1.859***
		[0.22]	[0.21]	[0.21]	[0.20]	[0.20]	[0.20]	[0.20]
Age of the household head (Logs, years)	lage	0.670**	0.791***	0.884***	0.884***	0.880***	0.881***	0.871***
		[0.33]	[0.28]	[0.23]	[0.23]	[0.23]	[0.23]	[0.23]
Years of schooling of the head of the household (Logs)	lesc	0.012	-0.046					
		[0.16]	[0.16]					
Family income (Logs, monthly income)	lyfam	-0.131	-0.075	-0.075	-0.074	-0.074	-0.071	-0.073
		[0.094]	[0.090]	[0.086]	[0.086]	[0.086]	[0.086]	[0.085]
Gender of the head of the household (Dummy, Male)	dssex	0.559***	0.569***	0.549***	0.549***	0.548***	0.549***	0.570***
		[0.18]	[0.18]	[0.17]	[0.17]	[0.17]	[0.17]	[0.16]
Region number I	dreg1	0.554	0.506	0.400	0.414	0.380		
		[0.52]	[0.51]	[0.50]	[0.47]	[0.46]		
Region number II	dreg2							
Region number III	dreg3	0.941**	0.909**	0.793**	0.806**	0.771***	0.729**	0.731**
		[0.37]	[0.37]	[0.36]	[0.32]	[0.30]	[0.29]	[0.29]
Region number IV	dreg4	0.152	0.170	-0.032				
		[0.43]	[0.42]	[0.39]				
Region number V	dreg5	1.164***	1.145***	1.302***	1.317***	1.282***	1.233***	1.232***
		[0.37]	[0.36]	[0.36]	[0.31]	[0.29]	[0.28]	[0.28]
Region number VI	dreg6	0.962**	0.954**	0.948**	0.962***	0.926***	0.883***	0.880***
		[0.40]	[0.39]	[0.39]	[0.35]	[0.33]	[0.33]	[0.33]
Region number VII	dreg7	0.227	0.217	0.084	0.098			
		[0.37]	[0.37]	[0.36]	[0.32]			
Region number VIII	dreg8	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	dreg9	-0.409	-0.419	-0.435	-0.421*	-0.457**	-0.497**	-0.505**
		[0.31]	[0.31]	[0.30]	[0.25]	[0.22]	[0.21]	[0.21]
Region number X	dreg10	-0.203	-0.212	-0.230	-0.216	-0.251	-0.294	-0.297
		[0.35]	[0.34]	[0.33]	[0.29]	[0.26]	[0.26]	[0.26]
Region number XI	dreg11	-0.297	-0.371	-0.432	-0.418	-0.452	-0.496	-0.497
		[0.52]	[0.51]	[0.49]	[0.47]	[0.45]	[0.45]	[0.45]
Region number XII	dreg12	0.213						
		[1.26]						
Capital Region	dcap							
Condition of activity of the head of the household (Dummy, Employed)	doc	-0.318	-0.425	-0.492**	-0.491**	-0.495**	-0.488*	-0.420**
		[0.27]	[0.26]	[0.25]	[0.25]	[0.25]	[0.25]	[0.19]
Occupation category of the head of the household (Dummy, Self-employed)	cat2	0.232	0.226	0.344	0.345	0.344	0.346	0.270
		[0.30]	[0.30]	[0.29]	[0.29]	[0.29]	[0.29]	[0.22]
Occupation category of the head of the household (Dummy, Private wage earners)	cat5	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)	nin	-0.094						
		[0.11]						
Number of elderly in household (60 years and older Logs)	vie	0.198						
		[0.21]						
Number of female in household (Logs)	muj	-0.118						
		[0.092]						
Constant	Constant	-3.062*	-3.955**	-4.343***	-4.365***	-4.317***	-4.301***	-4.242***
		[1.70]	[1.58]	[1.37]	[1.35]	[1.34]	[1.34]	[1.33]
Observations	Observations	873	873	945	945	945	945	945
R-Square	R-squared	.	.	.	.	.	.	.
	ll_0	-605	-605	-654	-654	-654	-654	-654
	ll	-522	-525	-564	-564	-564	-564	-564
	df_m	23	19	18	17	16	15	14
	chi2	165	160	181	181	181	180	180
Pseudo R-square	r2_p	0.14	0.13	0.14	0.14	0.14	0.14	0.14
	N_cdf	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	N_cds	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Standard errors in brackets							
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								

Beneficiaries respect to applicants of the:		Progressive Housing Program Phase II						
Number of Household Members (Logs)	lmem_h	-0.718*	-0.574	-0.583	-0.575	-0.563	-0.479	-0.467
		[0.43]	[0.38]	[0.37]	[0.37]	[0.35]	[0.35]	[0.35]
Urban areas (Dummy)	durban	1.838***	1.774***	1.754***	1.755***	1.779***	1.897***	1.908***
		[0.48]	[0.47]	[0.46]	[0.46]	[0.45]	[0.45]	[0.45]
Age of the household head (Logs, years)	lage	1.052	0.443	0.417	0.389	0.419	0.396	0.410
		[0.73]	[0.59]	[0.58]	[0.57]	[0.56]	[0.46]	[0.46]
Years of schooling of the head of the household (Logs)	lesc	0.156	0.150	0.153	0.139	0.150		
		[0.33]	[0.32]	[0.32]	[0.32]	[0.31]		
Family income (Logs, monthly income)	lyfam	-0.343	-0.408*	-0.401*	-0.405*	-0.410*	-0.363*	-0.367*
		[0.22]	[0.21]	[0.21]	[0.21]	[0.21]	[0.20]	[0.20]
Gender of the head of the household (Dummy, Male)	dsex	0.126	0.114	0.130	0.139			
		[0.39]	[0.39]	[0.38]	[0.38]			
Region number I	dreg1	1.660**	1.602**	1.587**	1.525**	1.546**	1.518**	1.439**
		[0.80]	[0.76]	[0.75]	[0.71]	[0.71]	[0.70]	[0.69]
Region number II	dreg2	0.409						
		[1.12]						
Region number III	dreg3	0.259	0.259					
		[1.37]	[1.35]					
Region number IV	dreg4	1.218	1.026	1.000	0.947	0.957	0.933	0.850
		[0.88]	[0.82]	[0.81]	[0.79]	[0.79]	[0.78]	[0.78]
Region number V	dreg5	1.521**	1.445**	1.434**	1.378**	1.383**	1.418**	1.333**
		[0.65]	[0.62]	[0.61]	[0.57]	[0.57]	[0.55]	[0.54]
Region number VI	dreg6	0.771	0.762	0.731	0.675	0.683	0.731	0.658
		[0.75]	[0.73]	[0.72]	[0.68]	[0.68]	[0.65]	[0.65]
Region number VII	dreg7	1.318*	1.319**	1.302**	1.244**	1.248**	1.274**	1.191**
		[0.70]	[0.67]	[0.66]	[0.62]	[0.62]	[0.60]	[0.60]
Region number VIII	dreg8	0.648	0.636	0.610	0.551	0.557	0.545	0.460
		[0.59]	[0.56]	[0.55]	[0.50]	[0.50]	[0.48]	[0.47]
Region number IX	dreg9	0.511	0.487	0.473	0.412	0.411	0.453	0.367
		[0.53]	[0.49]	[0.47]	[0.41]	[0.41]	[0.39]	[0.38]
Region number X	dreg10	0.157	0.176	0.163				
		[0.68]	[0.65]	[0.64]				
Region number XI	dreg11	2.149*	1.736	1.713	1.651	1.666	0.777	
		[1.26]	[1.19]	[1.19]	[1.16]	[1.16]	[0.90]	
Region number XII	dreg12	-0.921	-0.789	-0.827	-0.885	-0.869	-1.158	-1.237
		[1.26]	[1.24]	[1.23]	[1.21]	[1.21]	[1.17]	[1.17]
Capital Region	dcap							
Condition of activity of the head of the household (Dummy, Employed)	doc	-0.040	0.101					
		[0.54]	[0.53]					
Occupation category of the head of the household (Dummy, Self-employed)	cat2	0.384	0.298	0.351	0.341	0.407	0.415	0.451
		[0.57]	[0.56]	[0.47]	[0.47]	[0.43]	[0.40]	[0.40]
Occupation category of the head of the household (Dummy, Private wage earners)	cat5	0.332	0.257	0.313	0.303	0.378	0.403	0.386
		[0.50]	[0.49]	[0.39]	[0.39]	[0.33]	[0.32]	[0.32]
Number of children in household (9 years and younger, Logs)	nin	0.045						
		[0.23]						
Number of elderly in household (60 years and older Logs)	vie	-0.703*						
		[0.38]						
Number of female in household (Logs)	muj	0.017						
		[0.18]						
Constant	Constant	-1.148	1.673	1.758	1.984	1.924	1.508	1.571
		[4.00]	[3.48]	[3.46]	[3.34]	[3.34]	[3.06]	[3.04]
Observations	Observations	245	245	245	245	245	264	264
R-Square	R-squared	.	.	.	.	.	.	.
	ll_0	-166	-166	-166	-166	-166	-178	-178
	ll	-143	-145	-145	-145	-145	-155	-155
	df_m	24	20	18	17	16	15	14
	chi2	46	42	42	42	42	46	45
Pseudo R-square	r2_p	0.14	0.13	0.13	0.13	0.13	0.13	0.13
	N_cdf	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	N_cds	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Standard errors in brackets						
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								

ANNEX 4

Sample size for Matching on Cost-Benefit calculations								
	Non beneficiaries of housing programs	General Housing Subsidy	PET (Workers Program)	Rural Subsidy Program	Basic Housing Program	Progressive Housing Program Phase I	Progressive Housing Program Phase II	All households
Sample								
Number of Households								
Applicants		969	151	1,331	1,668	467	108	4,694
Beneficiaries		4,166	617	3,580	3,187	508	175	12,233
All	62,677	5,135	768	4,911	4,855	975	283	79,604
Family monthly Income - Average (Local current Unit, \$)								
Applicants		472,565.7	568,093.1	231,866.8	293,706.2	262,572.3	292,904.4	318,804.8
Beneficiaries		409,038.6	368,148.8	224,821.7	261,880.1	221,522.7	205,736.6	304,031.2
All	341,950.0	421,027.4	408,137.7	226,732.7	272,802.4	241,408.8	240,995.5	334,773.9
Quality of the Dwelling - Composite Index - Average								
Applicants		0.80	0.86	0.54	0.71	0.64	0.71	0.68
Beneficiaries		0.93	0.95	0.69	0.90	0.84	0.86	0.85
All	0.70	0.90	0.93	0.65	0.84	0.74	0.80	0.72



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