

Income Distribution In Chile 1990-1998: Learning from Microeconomic Simulations

David Bravo - Dante Contreras - Tomás Rau - Sergio Urzúa

Department of Economics

Universidad de Chile

May 2000

Abstract

This paper contribute to understand the microeconomic determinants of household income dynamics that explain the sustained level of inequality in Chile. We use a micro-simulation based decomposition of distributional changes, developed by Bourguignon et.al. (1998). We estimate a model of participation and earning equation for each economic agent. We examine how the income distribution would change as a result of a different set of microsimulation. In particular, the distributional structure of 1998 is “imposed” in 1990. As a general conclusion, the micro-simulation exercises suggest that income distribution in Chile is very stable and it is not easily affected by a wide range of simulation. However, in spite of such stability, the most interesting results come from a dynamic perspective. A significant increase in inequality would be observed in 1990 if the 1998 “returns” were used. This result is interesting, the inequality indicators remains at the same level between 1990 and 1998, but if the 1998 prices were observed in 1990, then an increase in inequality would be registered. In addition, the evidence shows that gender “price-effect” has no effect on inequality. The changes in the return to schooling and in its convexity increases inequality too. Finally, changes in income distribution are observed only from a dynamic perspective, but they are limited.

Key Words: Income distribution, education, demographics, micro-simulations

JEL classification: C15, D31, J22, I21, I32

1.- Introduction

Chile has displayed the most successful economy in Latin America since the mid-eighties with an average growth rate of 6% (Hojman, 1996). However, this growth has been attended by an increase in income inequality (Green, 1994, Coleman, 1995, Hojman, 1996, Contreras, 1996, 1997 and 1998, Bravo and Marinovic 1997, Cowan and De Gregorio, 1996). At a world level, Chile has some of the largest income inequality, in 1996 the richest 20% of the population receives 17 times more income than the poorest 20%, compared with the U.S. where the richest 20% receives 8.9 times more income than the poorest 20%, against 10.5 times in Peru, or 5.7 times in South Korea (UNPD, 1995).

This high level of inequality is far from reverting. Between 1990-1996, in spite of the significant increase in social expenditures, economic growth and changes in the labor market legislation (the minimum wage increased around a 44% in real terms between 1989-1996), inequality remained stable at a significant high level.

These three characteristic of the Chilean economy have attracted much attention, since the redistributive effect that they could have, does not necessarily aims in the same direction. The increase in social expenditure and the sustained increases of the minimal wage are targeted to favor the lower deciles of income in the distribution, which suggest a reduction of inequality. On the other hand, economic growth through its impact on labor demand, in particular in skilled labor demand, may induce increases in inequality. Therefore, the net impact of these factors is ambiguous to determine its positive or negative effect on inequality.

Besides the characteristics of the Chilean economy above mentioned, the returns to schooling in Chile are becoming more convex during the decade of the 90s. Bravo, Contreras and Rau (1999) by using a nonparametric approach à la Katz and Murphy (1992), show that this effect may be explained by the increase in the relative demand for skilled workers with respect to the less skilled ones. On the other hand, economic policies oriented to increase female labor participation may have an indirect effect on income distribution. Low female labor force participation has been one of the characteristic traits of the Chilean labor market in the last forty years. A noticeable difference between female participation rates in Chile and OECD or Asian countries has been observed, even when considering the different age structure of the population¹. The statistics seem to show that over the past 15 years female participation in the Chilean labor market has acquired a more accelerated pace. The data for Greater Santiago evidences an increase in the female participation rate from 36 percent to nearly 47 percent in 1997. INE data, at a national level, shows an increase from nearly 28 percent in 1980 to a figure slightly below 35 percent in 1995. Additionally, the pattern of female participation rate is increasing

¹ Which contrasts with the male participation rate that, on the basis of age cohorts, places Chile at the same level of the Asian and OECD countries.

with income. In 1996 the first decile exhibits a female participation rate about 24%, while in the richest decile this rate is 67%.²

This paper contributes to understand the dynamic effects which explain the sustained level of inequality in Chile. We use a micro-simulation based decomposition of distributional changes, developed by Bourguignon et.al. (1998), which follow the line of John, Murphy and Pierce (1993). We estimate earning equations for 1990 and 1996. With this estimation we apply a simulation methodology on the overall income distribution. This decomposition technique has two advantages. In the first place, it not only decomposes a particular inequality indicator, but also the changes in the overall distribution. Second, this decomposition allows us to examine the role of different factors on income inequality, such as: changes in return to schooling, differences in economics sectors, regional effects, participation decisions, etc.

This paper is divided into five sections, the first being this introduction. The second section reviews some stylized facts on Chilean inequality. In the third section, the data and the model is discussed. The fourth section describes the econometric results. Section five presents the micro-simulation exercises. In the fifth section the main conclusions of the research work are presented. Finally, in the appendix a different decomposition on the basis of per capita income is developed. This section aims at supporting the results presented in the micro-simulation.

2.- Inequality in Chile: The Stylized Facts

Inequality indicators are presented in Table N°1. This table contains information on different inequality measures: the coefficient of variation, Gini, Theil, Atkinson, the ratio between the richest 20% of the population and the poorest 20% (Q5/Q1), and the log differences between the percentiles (90-10), (90-50) and (50-10). Additionally, different definitions of per capita income are presented, including household income, self-employment earnings, salaried income for full time workers (with 30 or more hours per week), salaried income for part time workers (with 29 or less hours per week) and other income.

Inequality in Chile during the period 1990-96 can be characterized as high and stable. The only inequality indicator which shows an exception is given by the coefficient of variation, which presents a significant increase in 1994. Through the analysis of three inequality measures and different income definitions, different conclusions are obtained. First, the Gini coefficient for household per capita income is relatively constant between 1990-1996. However, per-capita labor income shows an increase in inequality. A similar pattern is observed by using the Atkinson coefficient. Second, the coefficient of variation (and the Theil index in minor way) shows a fall in inequality between 1990-

² For a complete discussion on this topic see Contreras, Bravo and Puentes (1999).

1996, mainly explained by the inequality reduction on self-employment income and other sources of income. Labor income exhibited an increase in inequality in that period. Finally, the ratio between the average income of the fifth and the first quintile (Q5/ Q1), as well as the difference between the percentile 90 and the percentile 10, show an increase in the inequality between 1990-1996. This effect is mainly explained by self-employment earnings (especially for an increase in the inequality in the lower half of the distribution) and wage income. Again, income from other sources shows a decrease in the inequality.

Table N°1: Inequality Measures for different per capita income definitions

1990					
	Household income	Self-employ. Income	Salaried income (more than 30 hrs.)	Salaried income (less than 29 hrs.)	Other income
Coef. Var.	1.78	2.29	1.50	1.86	1.90
Gini	0.55	0.62	0.50	0.59	0.59
Theil	0.62	0.86	0.51	0.74	0.71
Atkinson	0.42	0.52	0.36	0.48	0.51
Q5/Q1	16.54	10.15	19.43	8.42	18.58
P90-P10	2.41	2.86	2.23	2.71	3.77
P90-P50	1.38	1.61	1.26	1.32	1.65
P50-P10	1.03	1.25	0.97	1.39	2.12
1992					
	Household income	Self-employ. Income	Salaried income (more than 30 hrs.)	Salaried income (less than 29 hrs.)	Other income
Coef. Var.	1.74	2.05	1.47	1.51	1.90
Gini	0.54	0.63	0.50	0.52	0.60
Theil	0.62	0.84	0.51	0.57	0.73
Atkinson	0.41	0.52	0.36	0.49	0.53
Q5/Q1	16.01	10.18	18.34	8.92	16.36
P90-P10	2.33	2.77	2.17	2.54	3.66
P90-P50	1.31	1.57	1.21	1.38	1.76
P50-P10	1.03	1.20	0.97	1.16	1.91
1994					
	Household income	Self-employ. Income	Salaried income (more than 30 hrs.)	Salaried income (less than 29 hrs.)	Other income
Coef. Var.	3.28	4.31	1.41	1.94	3.76
Gini	0.55	0.67	0.51	0.60	0.60
Theil	0.72	1.19	0.51	0.78	0.81
Atkinson	0.42	0.59	0.36	0.49	0.53
Q5/Q1	16.77	10.39	21.36	8.65	15.37
P90-P10	2.36	2.89	2.30	2.70	3.70
P90-P50	1.31	1.57	1.28	1.44	1.70
P50-P10	1.05	1.32	1.02	1.27	2.01
1996					
	Household income	Self-employ. Income	Salaried income (more than 30 hrs.)	Salaried income (less than 29 hrs.)	Other income
Coef. Var.	1.65	1.86	1.64	1.96	1.78
Gini	0.55	0.62	0.52	0.61	0.59
Theil	0.61	0.77	0.48	0.77	0.70
Atkinson	0.42	0.53	0.38	0.51	0.51
Q5/Q1	17.21	11.24	21.58	9.96	13.50
P90-P10	2.44	3.08	2.30	2.93	3.55
P90-P50	1.37	1.61	1.28	1.50	1.66
P50-P10	1.07	1.47	1.02	1.43	1.90

In conclusion, the evidence indicates that an increase in inequality is observed in the labor income both, self-employment and wage income. This point contrasts with the evidence presented by Bravo, Contreras and Rau (1999), in which the inequality for the individual labor income showed a decrease. The reason for this apparent contradiction is that in this paper the analysis of labor income inequality

does not only rely on *individual* labor income, but also on the proportion of household members which are participating in the labor market, unemployment rate inside the households, etc.. Therefore, changes in these last factors could explain the trends mentioned above.

Many other elements contribute to reduce inequality, such as subsidies and transfers from the government to poor households. While social expenditures increase by 75% in real terms between 1990–1996, the expenditure in health and education more than duplicates over the same period. Bravo, Contreras and Millán (1999) present evidence that the total expenditures in social programs have reduced inequality significantly. In 1996, the ratio (Q5/Q1) is reduced from 17 times to 14 times when considering public expenditures. At the same time the minimum wage increased about 44% in real terms in the same period.

3.- Data and Methodology

This study uses the National Socioeconomic Characterization Survey (CASEN). The data consists of a series of household surveys collected in 6 years, including 1987, 1990, 1992, 1994, 1996 and 1998. The survey is designed to describe and analyze the socioeconomic situation of Chilean households. This poll was conceived for the design of social policies. Its periodicity yields a picture over time of the evolution on household welfare. It contains information about 30,000 households and 130,000 individuals. The survey summarizes information on five topics: housing, education, health, employment and income.

The model used in this section follows Bourguignon et. al. (1998). This is the Chilean version of the general semi-reduced form model for household income. We estimate earning equations and a participation decision model for 1990 and 1998. The earning equation estimation was corrected by selectivity bias using the two-step Heckman procedure. The earning equation was estimated in four groups including, salaried males, self-employed males, salaried females and self-employed females.

On the other hand, a multinomial LOGIT was used in the estimation of labor supply (participation decision)³, where the participation decision is modeled by three options: participate in labor market as a salaried worker, participate in the labor market as a self-employed worker and not participate. The model was estimated separately to household heads, spouses and other family members. Both, the earnings equation and the multinomial Logit were estimated for people over 13 years old.

Therefore, at the present stage, our strategy may be summarized as follows. First, earning equations in each year were as was mentioned earlier using the 2-step Heckman procedure. From these estimation,

³In the survey workers report the number of hours they work per week. In a preliminary stage an hour equation was estimated. However, near 70% of the individuals report weekly hours in three identical levels: 40, 48 and 60 hours. Due to this fact, estimation of hour model is unsatisfactory, and therefore we decided to treat the participation decision as a multinomial logic with three option .

a vector of parameters and the error structure are obtained, which are later used in the microsimulations. Second, from the participation decision model a vector of parameters and the probabilities for each agent are captured. This information is useful to model the changes in the participation structure when a variable, parameter, etc. is modified. Finally, we create an error for each model from a double-exponential distribution.⁴

Finally, household income is calculated by adding up the individual incomes estimated earlier, conditional to their occupational status. The other sources of income such as social transfers, are treated as exogenous variables.⁵

⁴ See Bourguignon 1999.

⁵ The next version of this paper will include an analysis of self-employment and female participation.

3.1.- The Model

The monthly household income of the j-family with size t is:

$$Y_j = \sum_{i < T} y_{jt}^{wa} * D_t^{wa} + \sum_{i < T} y_{jt}^{se} * D_t^{se} + \sum_{i < T} \Psi_{jt} \quad (1)$$

where y_{jt}^{wa} e y_{jt}^{se} represents the earning of the main occupation of salaried workers and self-employed respectively. On the other hand, D_t^{wa} and D_t^{se} are dummy variables which take a value equal to 1 when the agent participate in the labor market as salaried or self-employed worker respectively. The last term show the other sources of income considered as exogenous.

The earning equation for the agent of gender l (l=m,f) classified as a worker type h (salaried or self-employed) h (h=as,cp) is specified as:

$$E\{Ln(y_i^h) / y_i^h > 0\} = x_i^h \cdot \mathbf{b} + \mathbf{r} * \mathbf{s} * \left(\frac{\mathbf{f}(z_i^h, \mathbf{x})}{1 - \Phi(z_i^h, \mathbf{x})} \right) \quad (2)$$

where $Ln(y_i^h)$ is the log of monthly income, x_i^h is a matrix of observables individual characteristics. The last term represents the correction for selectivity bias. In other words, the term

$\left(\frac{\mathbf{f}(z_i^h, \mathbf{x})}{1 - \Phi(z_i^h, \mathbf{x})} \right)$ correspond to the inverse Mills ratio. Finally, z_i^h is set of individual characteristics

for each agent, which is independent of x_i^h . Therefore, equation 2 can be write as:

$$Ln(y_i^h) = x_i^h \cdot \mathbf{b} + M_i^h \cdot \mathbf{j} + v_i^h \quad (3)$$

As it was mentioned earlier, it is important to note that each individual in the sample it can be in only one occupational status, and consequently it should have an estimated salary for each occupation alternative. Following Bourguignon, Ferreira y Lustig 1998, we suppose that the error structure might be considered as

$\mathbf{e}_i^h = M_i^h \cdot \mathbf{j} + \mathbf{w}_i^h$ where $M_i^h = -\left(\frac{\mathbf{f}(z_i^h, \mathbf{x})}{1 - \Phi(z_i^h, \mathbf{x})} \right)$ is the probability of not being in the state h, and

\mathbf{w}_i^h is constructed as a normal random variable with mean 0 y standard deviation \mathbf{s}_i^h , from the errors estimates in equation (3).

The participation model for agent q is (q =head, spouse u other family member):

$$P(\mathbf{x}_q = j) = \frac{e^{m_q^j \Omega_q}}{1 + \sum_{j=1}^3 e^{m_q^k \Omega_q}} \text{ for } j=2,3 \quad \text{and} \quad P(\mathbf{x}_q = j) = \frac{1}{1 + \sum_{j=1}^3 e^{m_q^k \Omega_q}} \text{ for } j=1$$

where the options $j=1,2,3$ represents salaried, self-employed and inactive respectively; and m_q is the observable information matrix for each individual. In this case, for the microsimulation perspective, the relevant vector of parameter is given by Ω_q . However, each individual we need to compute it utility: U_q^J , such that $U_q^J > U_q^j$ for each $J \neq j$ and $j = 1,2,3$. This procedure will allow us to create the dummy variables D_t^{wa} y D_t^{se} . Following Bourginon, Ferreira y Lustig 1998, the final selected state is given by:

$J = \text{Argmax}\{U_q^k = m_q^k \Omega_q + \mathbf{m}_q^k, j = 1,2,3\}$, where Ω_q is the element to modify in the microsimulation, which permits to generate a change in the individual decision. However, the problem is that the no observable term is unknown in the case of a chose different to the actual one. In order to solve this problem, we will use a double-exponential distribution conditional to the observed decision.⁶ This allow us to model the necessary structure to the error in order of do not modify the given participation decision.

Therefore, we can re-write (1) as follow:

$$Y_J |_{T_0} = \left[\sum_{t < T} y_{Jt}^{wa} * D_t^{wa} + \sum_{t < T} y_{Jt}^{se} * D_t^{se} + \sum_{t < T} \Psi_{Jt} \right]_{T_0} = \mathfrak{S}_J(x_{T_0}, \mathbf{b}_{T_0}, v_{T_0}, \Omega_{T_0}, \Pi_{T_0}) \quad (4)$$

where Π_{T_0} represents the exogenous variables in the model. Hence, if we define Γ_T as a function which permits characterize the distribution of per capita income of a sample of household with size with N :

$$\Gamma_{T_0} = \Gamma_{T_0}(Y_1, \dots, Y_N) = \Gamma_{T_0}(\mathfrak{S}_1(x_{T_0}, \mathbf{b}_{T_0}, v_{T_0}, \Omega_{T_0}, \Pi_{T_0}), \dots, \mathfrak{S}_N(x_{T_0}, \mathbf{b}_{T_0}, v_{T_0}, \Omega_{T_0}, \Pi_{T_0})) \quad (5)$$

Therefore,

⁶ See Bourdinon 1999

$$\Gamma_{T0} = \Gamma_{T0}(x_{T0}, \mathbf{b}_{T0}, v_{T0}, \Omega_{T0}, \Pi_{T0}) \quad (6)$$

which is the basic structure for the microsimulations.

3.2.- Microsimulations

The microsimulation exercises are done by imposing the model's structure in 1998 over 1990, including observables and no observables.

i.- Participation Effect

The objective is to simulate what would be the impact on the income distribution if the 1998 participation structure were the relevant in 1990. This exercise is done by changing the parameters obtained from the Multinomial Logit model. Given the specification (6) the participation effect is:

$$PaE_{f_{98-90}} = \Gamma_{90}(x_{90}, \mathbf{b}_{90}, v_{90}, \Omega_{98}, \Pi_{90}) - \Gamma_{90}(x_{90}, \mathbf{b}_{90}, v_{90}, \Omega_{90}, \Pi_{90}) \quad (7)$$

ii.- Price effect

This exercise consider how the income distribution vary when the parameters of the earning equation in 1998 are impose on the 1990 model. In other words:

$$PE_{f_{98-90}} = \Gamma_{98}(x_{90}, \mathbf{b}_{98}, v_{90}, \Omega_{90}, \Pi_{90}) - \Gamma_{90}(x_{90}, \mathbf{b}_{90}, v_{90}, \Omega_{90}, \Pi_{90}) \quad (8)$$

In addition, this simulation with the participation effect can be described as:

$$PE_{f_{98-90}} + PaE_{f_{98-90}} = \Gamma_{98}(x_{90}, \mathbf{b}_{98}, v_{90}, \Omega_{98}, \Pi_{90}) - \Gamma_{90}(x_{90}, \mathbf{b}_{90}, v_{90}, \Omega_{90}, \Pi_{90}) \quad (9)$$

Finally, the model structure permits to replace only a set of parameters from the vector \mathbf{b}_T . In particular, is the vector \mathbf{b}_T is partitioned as $\mathbf{b}_T = [\mathbf{b}_T^1 : \mathbf{b}_T^2]$, we could obtain:

$$PE_{f_{98-90}}^1 = \Gamma_{98}(x_{90}, (\mathbf{b}_{98}^1 : \mathbf{b}_{90}^2), v_{90}, \Omega_{90}, \Pi_{90}) - \Gamma_{90}(x_{90}, \mathbf{b}_{90}, v_{90}, \Omega_{90}, \Pi_{90}) \quad (10)$$

Two simulation exercises were done under such strategy: the human capital effect (education and experience) and regional effect.

iii.- No Observable effect

The no-observable effect is simulated by using the errors from the earning equations. The goal is to modify the error structure from the base year, ie:

$$UnEf_{98-90} = \Gamma_{98}(x_{90}, \mathbf{b}_0, v_{90} * (\mathbf{s}_{98} / \mathbf{s}_{90}), \mathbf{\Omega}_{90}, \mathbf{\Pi}_{90}) - \Gamma_{90}(x_{90}, \mathbf{b}_{90}, v_{90}, \mathbf{\Omega}_{90}, \mathbf{\Pi}_{90}) \quad (11)$$

where \mathbf{s}_{98} and \mathbf{s}_{90} represents the standard deviation of the predicted error in equation (3) for the corresponding year. Combining this simulation with the price effect we have:

$$PEf_{98-90} + UnEf_{98-90} = \Gamma_{98}(x_{90}, \mathbf{b}_{98}, v_{90} * (\mathbf{s}_{98} / \mathbf{s}_{90}), \mathbf{\Omega}_{90}, \mathbf{\Pi}_{90}) - \Gamma_{90}(x_{90}, \mathbf{b}_{90}, v_{90}, \mathbf{\Omega}_{90}, \mathbf{\Pi}_{90}) \quad (12)$$

Finally, the last two simulations were combined with the participation effect.

iv.- Endowment Effect

The possible answers with respect to the evolution of the income distribution from 1990 to 1998 closes with a discussion of the endowment effect. The endowment effect keeps relation with the structure of the regresors included in the estimations.

If you define x_k as a vector belonging to matrix x , used in the equation of wages, and x_{-k} as the component matrix of x_k , it is to say $x = [x_k, x_{-k}]$, it is possible to pose, for the year T_0 , the following relationship, which defines the structure of x_k :

$$x_{k,T_0} = x_{-k,T_0} * u_{T_0} + n_{k,T_0} \quad (13)$$

and in the same manner for the year T_1

$$x_{k,T_1} = x_{-k,T_1} * u_{T_1} + n_{k,T_1} \quad (14)$$

In a specification as such, the vector $n_{k,T}$ represents the effect of the unobservable characteristics of $x_{k,T}$ ⁷. In this way, the dependence of the variable of interest x_k on the available information of T is attained at the beginning of u_T . Relative to the unobservable effect, obtaining the standard error of the

⁷ It is supposed that such an effect is ortogonal at conjuncture of the selected regresores.

estimated waste, $\wp_{k,T}$, allows the completion of the modeling of the variable of interest.

Therefore, the values found for $\{u_{T_0}, u_{T_1}, \wp_{T_1}, \wp_{T_1}\}$ allow the alteration of the characteristics of x_{k,T_0} , transforming it to x_{k,T_0}^* , whose form can be obtained as:

$$x_{k,T_0}^* = x_{-k,T_0} * u_{T_1} + n_{k,T_0} * (\wp_{T_1} / \wp_{T_0}) \quad (15)$$

being able to then define $x_T^* = [x_{k,T}^*, x_{-k,T}^*]$.

We will then define the endowment effect as:

$$DotEf_{98-90} = \Gamma_{98}(x_{90}^*, \mathbf{b}_0, v_{90}, \mathbf{\Omega}_{90}, \mathbf{\Pi}_{90}) - \Gamma_{90}(x_{90}, \mathbf{b}_{90}, v_{90}, \mathbf{\Omega}_{90}, \mathbf{\Pi}_{90}) \quad (16)$$

Beginning with the variables we have used, it is anticipated that the endowment effect will attempt to capture the effect of educational structure and demographics over the household per capita income distribution.

In summary, the imposition of the distinct components of the model—which is to say, parameters, errors and regresors—from 1998 toward 1990, will allow the identification and analization which have been the movements inside the structure that define the income distribution in our model, understanding in the best way the process through which $\Gamma_{T_0} = \Gamma_{T_0}(x_{T_0}, \mathbf{b}_{T_0}, v_{T_0}, \mathbf{\Omega}_{T_0}, \mathbf{\Pi}_{T_0})$ has evolved to $\Gamma_{T_1} = \Gamma_{T_1}(x_{T_1}, \mathbf{b}_{T_1}, v_{T_1}, \mathbf{\Omega}_{T_1}, \mathbf{\Pi}_{T_1})$.

3.3.- Empirical strategies

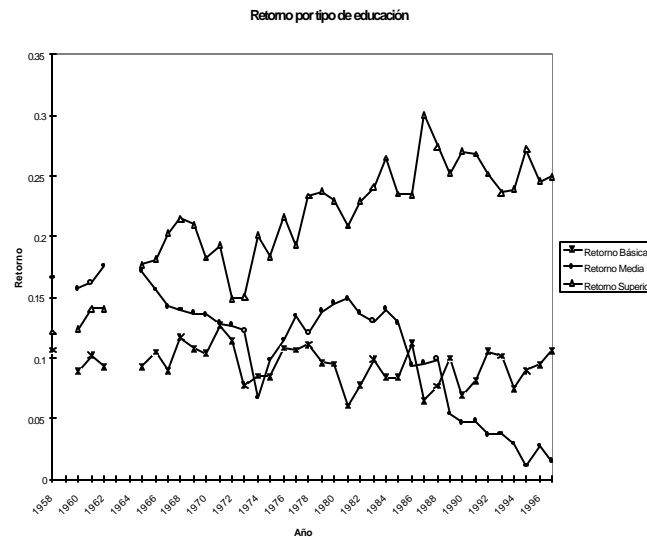
i.- Earning equation

The dependent variable is the natural log of monthly income. The set of explanatory variables includes years of schooling (esc), years of schooling in secondary education (esc8), years of schooling superior education (esc12), a dummy de variable for technical education (tecni), potential experience (exper) and its square (exper2) and regional dummies⁸. The specification used for the educational structure is based on the empirical difference that has been observed in the dynamic of the educational returns in the case of Chile. Figure N°2 shows the return to schooling in the last 40 years for the Metropolitan Region (capital city). The figure presents the private return to the three educational levels⁹: primary, secondary and superior education. The return to primary education exhibit a relatively stable pattern. On the other hand, in the 80s the return to secondary education drops

⁸ Region 12 is taken as a reference.

significantly. Finally, the return to high education exhibits an increasing trend since 1974 until the 90s. This evidence suggests that a convex return to schooling is appropriate for the specification in the wage equation. Thus, we estimate model of wage equation by allowing for different returns are primary, secondary and university levels.

Figure N°1: Return to Education (Santiago 1957-1997)



Source: Contreras, Bravo and Medrano (1999)

In relation to the estimation, the model was corrected for selectivity bias using the 2-step Heckman procedure. The Probit regression included age (edad) and its square (edad2), number of children under 3 year old (nhij1), number of children between 3 and 6 year (nhij2), number of children between 7 and 13 years old (nhij3) and the number of people in working age (14 or older) within the household (n14). This specification was used in both years and for salaried (self-employed) males and females.

ii.- Participation decision

As it was mentioned before a Multinomial Logit model was estimated using three options: to participate as salaried worker, self-employed or inactive. The explanatory variables used in the model were a dummy variable for males (dsex), years of schooling and its square, experience and its square, regional dummies, the number of children in the age categories described above, and the number of people within the household in working age.

⁹ In this estimation only opportunity cost were considered.

iii.- Endowment Effect.

The following variables are considered in the analysis of the endowment effect: number of children ages 0 to 2 years, number of children ages 3 to 6 years, number of children ages 7 to 13 years, number of people of working age, and years of schooling. The selected regressors for such estimations are: age, age squared, gender, and regional dummies.

4 Descriptive Statistics

Table N°2 shows the descriptive statistics for 1990 and 1996. The individual income is measured in constant Chilean pesos from 1996. Schooling and experience are measured in years. Experience is defined as potential experience, ie.: Age-schooling-6.

By comparing 1990 and 1996 we observe an stable economical structure. An increase in real wages is observed, which is equivalent to a annual increase of 8% in real terms. Years of schooling is about 9 years in 1990 and the same reporting in 1996 is about 8.4 years. These figures suggest that in average and considering a large fraction of the working class, the educational level in the nineties is above primary education.

In the sample near to 50% of the workers are females, which may be explained by the considering domestic work. On the other hand, above to 95% are classified as working on a full-time basis. Self-employees represents about 7.5% of the sample, while workers in domestic services represents about 2%. Finally, the last two occupational activities, firm-owner and army, represents 1% and 0.3% respectively in 1990. At regional level, about of 40% of the sample is concentrated in the Metropolitan Region. Regions V and VIII represent 10% and 13% respectively. Among the regions with lower representation are regions XI and XII, which represents 0.5% and 1% respectively.

5 Results of the Estimation

The theoretical model developed in section 3 imposes a structure that consists, in the first place, in the estimation of four equations of Mincer for each of the two years of the analysis, 1990 and 1998. the following cases are considered:

- 1.- Salaried Males
- 2.- Self-employed Males
- 3.- Salaried Females
- 4.- Self-employed Females

In this way, the model determines that with respect to the decision of participation of the agents, this should be estimated considering one of the following three positions of the agent of the home:

- 1.- Head of Household
- 2.- Spouses
- 3.- Other Relatives

In each of them the individual has three distinct alternatives: salaried participant, self-employed participant, and non-participant.

We will consider for the effect of this section the results obtained without the inclusion of the endowment effect since the objective here is to disclose the model without the alteration of the variables considered exogenous, trying in this way to provide vision to the development of the simulation.

i.- Earning Equation (Mincer Equation)

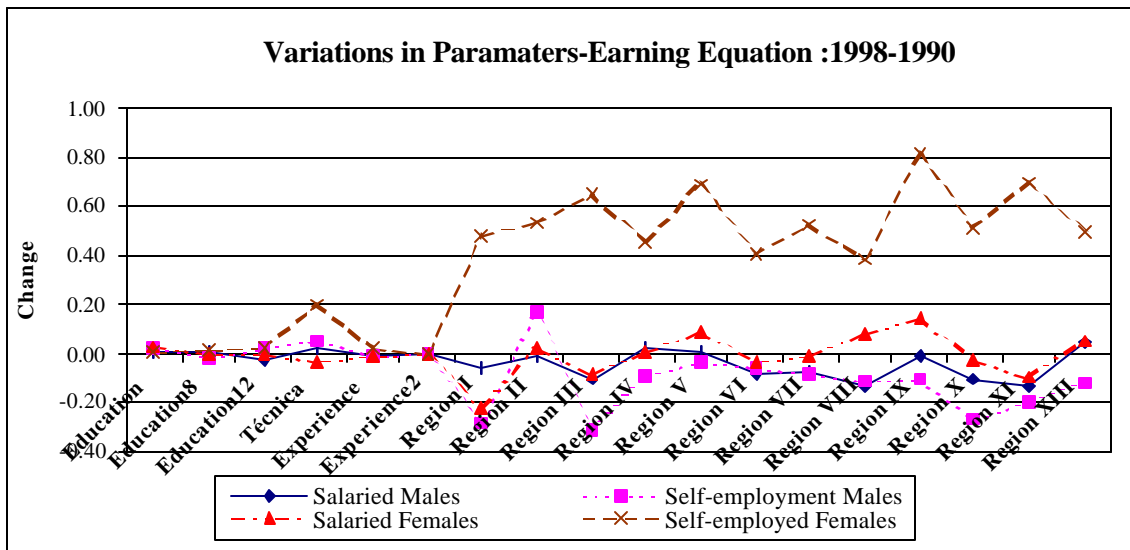
Within the model of income the small variation in aggregate terms of the returns from education is significant.¹⁰ It is in the case of self-employed females that the major variation in the return from education appears, in the group of individuals with more than 12 years of schooling, representing changes of approximately four percentage points. The technical education represents important changes, as the negative signs present in 1990, except for self-employed males, are altered in 1998 in general, reaching returns of about 2% on average.¹¹ As for the estimates of the parameters that accompany variables of experience, we see the expected signs and no variation of importance. It is in the regional returns (parameters from dummy regions) where we see the most important changes. The variations of signs and magnitudes in the said coefficients are significant. As an example it is enough to consider that in the case of self-employed females the variation in all factors was positive from 1990 toward 1998, while in the case of self-employed males we see generally the opposite effect. One can anticipate that this result will impose an unambiguous worsening of the income distribution in the simulation, which is to say that in Chile the effect of this variation of returns signified that in eight years the income distribution was worse.

Graph 1 shows the variations between 1990 and 1998 for the distinct coefficients. Here we can observe the important variations in the parameters for the dummy regions and almost no variation in the parameters of education and experience.

¹⁰ See square VI and Square VII in the Annex for effects of the estimations.

¹¹ Including the negative return in 1990 for the case of self-employed females, although when it is maintained it adds considerable.

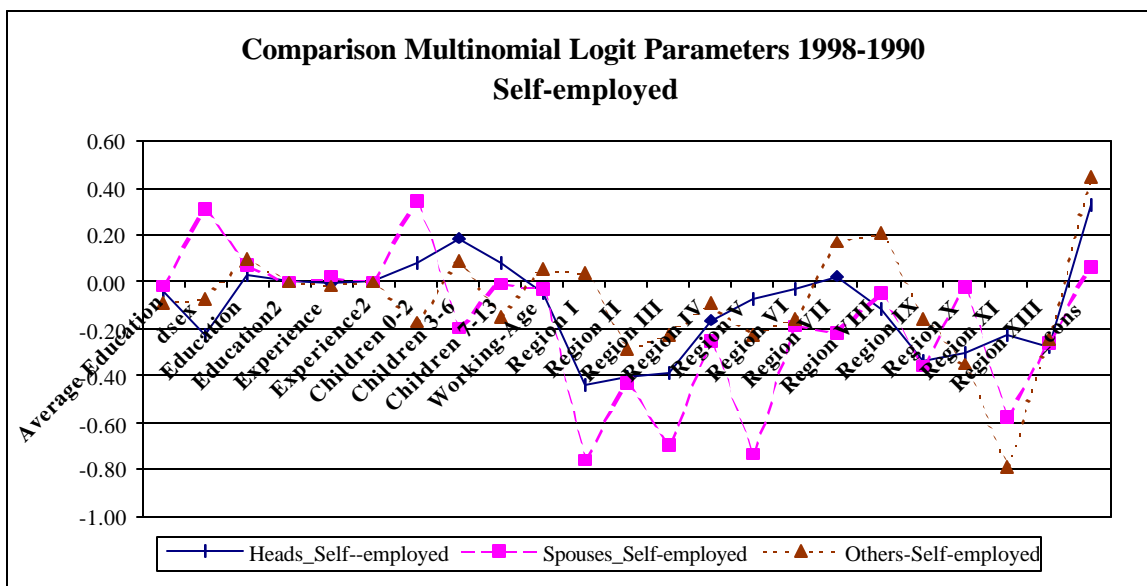
Graph 1



ii.- Labor supply Decision (Multinomial Logit Model).

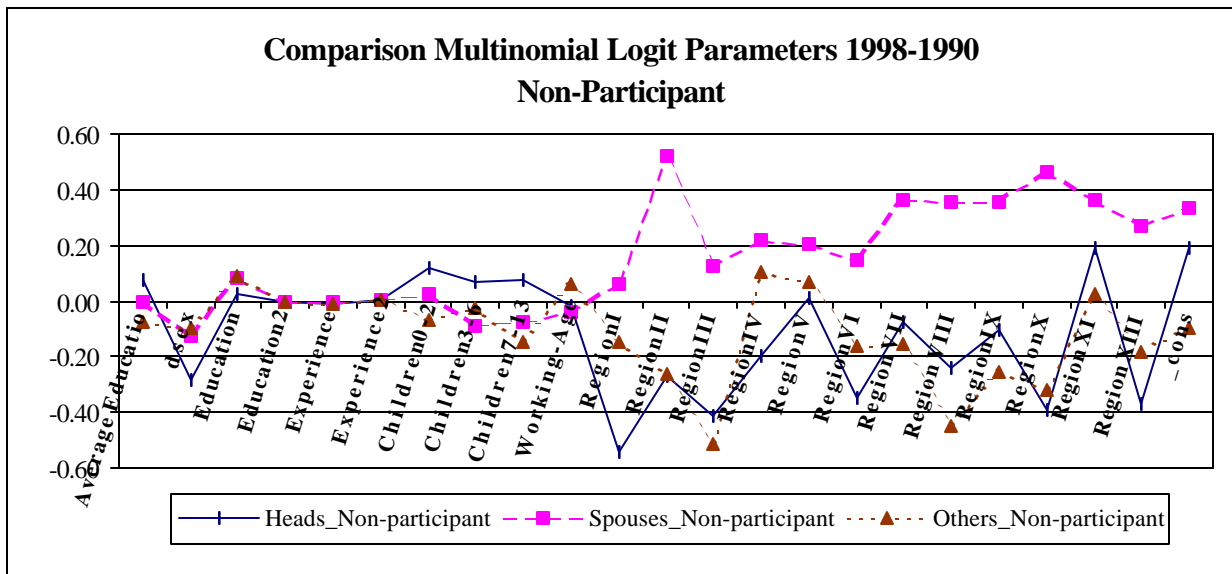
The estimation of the labor supply presents a relative instability in the comparison of the years 1990 and 1998. In particular, if we analyze the estimates for the option to participate as self-employed worker (Graph 2) and as non-participant in the labor market (Graph 3), we see that the largest changes occur in the estimation of the regional parameters and of the demographic structure of the home. In addition, such instability shows differences in the comparison by position in the home, as for example in the case of self-employed spouses we find that the effect is in general a decrease in the regional parameters, while in the case of inactivity we find for the same group that the variation goes in the other direction. Therefore,

Graph 2



it is not possible to identify in advance any systematic change in the estimations that allow us to predict an unambiguous effect in participation or labor supply, and from there then, in the income distribution. What we can conclude, if it is possible, starting from the present results and continuing, is that whatever have been the changes in the structure of the labor supply in Chile during the period 1990 to 1998, it has not altered significantly the income distribution.

Graph 3



the statistic significance of the estimations and its detail are presented in the Annex, as is the detail of the parameters obtained in the application of the endowment effect, which, as presented in section 3, forces a complete re-estimation of the model for the alteration of the structure of the variables considered exogenous.

5 Micro – Simulations

Next, we will study the distinct simulation, starting with the price effects, participation and unobservables without the inclusion of the endowment effect to later give us the steps to completely analyze the model, permitting as such to carry out the objective of observing the distinct answers of the income distribution before the changing of any of its components.

i.- Price Effects, Non-observables and Participation.

In section 3.2 the distinct simulations were analyzed, permitting us in the first stage to observe the effect of the income distribution of 1990 after the alteration of the coefficients of the equations of salary (price effects), on other words, after the imposition of the structure of returns present in 1998 above those in 1990. in this case the result allows us to conclude what may be the reality in 1998 if it is that the said alteration had not been produced, or on the other hand, which had been the reality in 1998 if it is that the effect had been the only one produced. The same objective, searched for under the simulation of the unobservable effect, clearly that in this case the alteration of the structure of error of the salary equation is studied. Table III presents the results for both exercises and their distinct variations.

TABLA III
Microsimulations Price Effects and Non-Observables Effect
1990-1998

	Predicted 1990	First Simulation	Second Simulation	Third Simulation	Fouth Simulation	Fifth Simulation	Real 1998
Relative mean deviation	0.415	0.396	0.430	0.419	0.4201	0.411	0.421
Coefficient of variation	1.866	1.655	1.873	1.849	1.845	1.604	1.891
Standard deviation of logs	0.995	0.963	1.121	1.005	1.013	1.097	1.006
Gini coefficient	0.558	0.535	0.581	0.563	0.564	0.557	0.565
Mehran measure	0.682	0.661	0.710	0.687	0.689	0.691	0.689
Piesch measure	0.497	0.472	0.516	0.501	0.501	0.490	0.503
Kakwani measure	0.259	0.239	0.277	0.262	0.263	0.256	0.265
Theil entropy measure	0.654	0.578	0.699	0.660	0.659	0.614	0.670
Theil mean log deviation measure	0.549	0.500	0.632	0.560	0.564	0.579	0.566
Q(5)/Q(1)							17.53

First Simulation: Non-observables Effect

Second Simulation: Price Effects

Third Simulation: Price Effects – Region

Fourth Simulation: Price Effects – Experience and Education

Fifth Simulation: Price Effects + Non-observables Effect

In that presented under the name “predicted 1990” is the estimation made without the alteration of any factor, as to say, the effective income distribution for Chile in 1990. In the same way, the final column

represents the effective income distribution for 1998. Later, we will try to explain what factors provoked the slight worsening of the income distribution during the period.

In the first place, the results show the significant effect of the unobservable factors in the period in terms of the improvement of the income distribution, whichever index is considered. This can be interpreted as an important change, unconceptualized in advance, if it had been the only effect present during the period, had signified a lessening of the Gini index of almost 2.5 points, been not small given the stable distribution of the observed income in reality.¹² However, such improvement is compensated for completely when it is analyzed together with the price effect, Fifth Simulation.¹³ In this case, it is observed that the indices of inequality do not differ significantly from those in the predicted (effective) 1990, and as such, represent a deterioration of the income distribution with respect to the unobservable effect. This is yet clearer when the case of the price effect is studied by itself, as this produces a rise of 2.3 points in the Gini and a similar effect in the “predicted” in all the other indices. The interesting thing then is the analysis, taking advantage of the methodological possibilities of the theoretical model, the possible decomposition of the price effect after the Second Simulation. In particular, this is seen when observing the third and fourth simulations. In these, the effect of the imposition of the regional returns and of educational experience has been considered, respectively, in the same sense as the forementioned with the total price effect. In these we find that although in general terms both produce a worsening in the income distribution, this is less than is seen in the Fifth Simulation, implying that there exists complementation between the simulations, provoking a deterioration more than relatively proportional to the cases taken individually.

Although this represents the basis of the model, it does not allow us to conclude comprehensively the existing dynamic after the 8 year period. For this it is necessary to compare the simulated case (known as that which includes all the simulation) and the effect from 1998. It is then this that lets us define well the prediction that yields the results.¹⁴ In this sense we observe that, even though the Fifth Simulation, which represents the simulated case, is very similar to the 1990 prediction, still the model gives the tools to achieve a closing of the existing breach between the indices of inequality upon comparison. It is therefore necessary to advance in the incorporation of new simulations, and in particular, the incorporation of the Participation Effect, and to a lesser extent the Endowment Effect, will permit in general to reach a greater similarity between the aforementioned indices.

Table III presented us with an initial and interesting look at the dynamics of the model for the period of study, though this is not considering the alteration of the decision of participation of the agents and its effect under the same five simulations. Table IV goes on to show the aggregation of the effects of participation, non-observability, and price.

¹² See Section 2.

¹³ The Fifth Simulation will show in each of the tables presented in continuation, the situation later to include all the simulations considered.

¹⁴ In theoretical terms, if we impose all and each of the elements from 1998 on 1990, the simulation should give a result exactly equal to the effective 1998 case.

TABLE IV
Microsimulations Price Effects, Non-Observables Effect and Participation
1990-1998

	Predicted 1990	First Simulation	Second Simulation	Third Simulation	Fouth Simulation	Fifth Simulation	Real 1998
Relative mean deviation	0.416	0.398	0.433	0.420	0.420	0.414	0.421
Coefficient of variation	1.864	1.663	1.869	1.845	1.845	1.614	1.891
Standard deviation of logs	1.007	0.977	1.141	1.017	1.024	1.117	1.006
Gini coefficient	0.560	0.538	0.584	0.564	0.565	0.561	0.565
Mehran measure	0.684	0.664	0.714	0.689	0.691	0.696	0.689
Piesch measure	0.498	0.475	0.518	0.502	0.502	0.494	0.503
Kakwani measure	0.260	0.241	0.279	0.264	0.264	0.260	0.265
Theil entropy measure	0.6568	0.583	0.704	0.662	0.661	0.623	0.670
Theil mean log deviation measure	0.553	0.506	0.641	0.564	0.568	0.591	0.566
Q(5)/Q(1)							17.53

First Simulation: Non-observables Effect

Second Simulation: Price Effects

Third Simulation: Price Effects – Region

Fourth Simulation: Price Effects – Experience and Education

Fifth Simulation: Price Effects + Non-observables Effect

A preliminary analysis of the results would permit us to conclude that the final effects in the distinct columns of Table IV continue the same pattern as was presented in the case of not including the participation effect. However, the resulting principle that is obtained from the participation is that its impact on the income distribution goes in the correct direction in terms of the lessening of the existing breach in the analysis of Table I. It is like this that, in the majority of the indices considered, the change permits closing the existing difference between the simulated case (Fifth Simulation) and the prediction for 1998 in comparison with that presented beforehand. Therefore, although in statistical terms the first result can be considered insignificant¹⁵ in terms of the difference with the case where the participation effect was not incorporated (Table III), it permits the performance of our model to improve with regard to the explanation of the dynamic of the income distribution, then show that if the change in the structure of the labor supply (participation decision) had not been produced during the period 1990 to 1998 the income distribution had been less unequal in 1998.

Next, the results of the incorporation of the endowment effect in the simulation is presented.

II.- Price Effects, Non-Observables, Participation and Endowment

In this section a complete simulation of the model is carried out, which will include the modeling of four regresors present in all the estimations previously completed. The results of the estimation in the said process are presented in the Annex. The objective will then be to try to explain in the best way the

¹⁵ Such an affirmation is sustained below the utilization of Bootstraps and specifically in the case of the Gini index, as we observe in general intervals of confidence of +-1 points for such an index, in a random show of 25% of the original and 250 repetitions.

evolution of the income distribution, considering the most flexible structure possible for the model.

Table V is similar to Table III, though considers the endowment effect.

TABLE V
Microsimulations Price Effects, Non-Observables Effect and Endowment
1990-1998

	Predicted 1990	First Simulation	Second Simulation	Third Simulation	Fouth Simulation	Fifth Simulation	Real 1998
Relative mean deviation	0.415	0.396	0.431	0.422	0.420	0.412	0.421
Coefficient of variation	1.866	1.657	1.884	1.887	1.846	1.611	1.891
Standard deviation of logs	0.995	0.963	1.123	1.087	1.016	1.099	1.006
Gini coefficient	0.558	0.535	0.581	0.570	0.565	0.558	0.565
Mehran measure	0.682	0.661	0.711	0.698	0.960	0.692	0.689
Piesch measure	0.497	0.473	0.516	0.507	0.502	0.491	0.503
Kakwani measure	0.259	0.239	0.277	0.268	0.264	0.257	0.265
Theil entropy measure	0.654	0.579	0.702	0.683	0.661	0.616	0.670
Theil mean log deviation measure	0.549	0.500	0.633	0.602	0.566	0.581	0.566
Q(5)/Q(1)							17.53

First Simulation: Non-observables Effect

Second Simulation: Price Effects

Third Simulation: Price Effects – Region

Fourth Simulation: Price Effects – Experience and Education

Fifth Simulation: Price Effects + Non-observables Effect

The results presented in Table V show a great similarity to those obtained beforehand in the incorporation of the participation effect and its comparison with the initial case. Again, no important differences do not exist in the comparison of the distinct simulations, as recurs the deterioration of the income distribution produced by the price effect (Second Simulation) and its variants (Third and Forth Simulations), and the improving of the income distribution produced by the effect of the unobservables. However, in this opportunity the regional price effect¹⁶ produces a worsening of the income distribution—as the majority of the indices show—that is observed in Table III. This is the reflexion of the existance of some type of interaction between the modified parameters and the structure of the variables considered “exogenous” or the endowment in the model. The similarities continue when the object of analisis is the comparison of the simulated distribution (Fifth Simulation) and those effective for 1998, then the effect of the alteration of the structure of the variables of endowment (endowment effect) over the income distribution, it can be concluded that this has suffered a worsening during the period. In this way a diminishing is achieved of the breach existing between the two aforementioned situations, as for the majority of the indices used. In other words, the income distribution in Chile had improved if it is that the change in the demographic structure of the home and the structure of the years of education had not been present.

What happened in this context to the incorporation of the participation effect in the simulations? Table VI gives the answer, including all the effects that have been developed in the past sections.

TABLE VI
Microsimulations Price Effects, Non-Observables Effect, Participation and Endowment
1990-1998

	Predicted 1990	First Simulation	Second Simulation	Third Simulation	Fourth Simulation	Fifth Simulation	Real 1998
Relative mean deviation	0.416	0.398	0.433	0.424	0.421	0.415	0.421
Coefficient of variation	1.884	1.674	1.919	1.924	1.862	1.640	1.891
Standard deviation of logs	1.007	0.976	1.140	1.104	1.027	1.116	1.006
Gini coefficient	0.561	0.538	0.585	0.574	0.566	0.562	0.565
Mehran measure	0.684	0.665	0.714	0.702	0.692	0.696	0.689
Piesch measure	0.499	0.475	0.520	0.510	0.504	0.495	0.503
Kakwani measure	0.261	0.241	0.281	0.271	0.265	0.261	0.265
Theil entropy measure	0.660	0.586	0.714	0.695	0.666	0.628	0.670
Theil mean log deviation measure	0.555	0.507	0.644	0.613	0.572	0.593	0.566
Q(5)/Q(1)							17.53

First Simulation: Non-observables Effect

Second Simulation: Price Effects

Third Simulation: Price Effects – Region

Fourth Simulation: Price Effects – Experience and Education

Fifth Simulation: Price Effects + Non-observables Effect

In Table VI results consistent with the past are obtained. In the first place, the unobservable effect and price in this case do not present differences in the alteration of the income distribution with respect to results obtained in the earlier exercises, this is an improvement in the income distribution (First Simulation) in the case of the first and a worsening in the case of the second (Second, Third and Fourth Simulations). Besides, the result of the utilization of the participation effect, like that in the case of the absence of alteration in the endowment structure, produces a slight worsening in the income distribution, in this way nearing yet more the simulation that in this way is the most complete advance including all the effects to the effective distribution of 1998, and in this way closing the model as for the possibilities that are given for the analysis of the dynamics of the distinct components that have determined the income distribution in Chile for the period 1990 to 1998.

To conclude, the evidence presented permits the conclusion in the first place that in individual form as well as together with the endowment and participation effects have partly been the cause of a worsening of the income distribution in the period 1990 to 1998, and in the second place that the most interesting changes in the distribution have come from the two simulations together nearly perfectly complementary, while the price effect produces a worsening of the distribution, the unobservable effect has been in the opposite direction.¹⁷

¹⁶ It understands as the alteration of the parameters of the dummy regions in the salary equation.

¹⁷ Although when in aggregate it is the first effect that prevails slightly.

6.- Conclusions

In this study, through the realization of microsimulations a more complete vision has been presented of the existing dynamic of the elements that conforms the income distribution in the Chilean case from 1990 to 1998. Table VII briefly reviews what have been the effects of the distinct exercises carried out in this work.

TABLE VII
Final Results from Microsimulation

	EFFECT OVER DISTRIBUTION
Price Effect	-
Price Effect: Region	-
Price Effect: Education and experience	-
Non-observables Effect	-
Participation Effect	-
Endowment Effect	-
Final Effect	-

The existing compensation between the price effect and unobservable effect is of particular importance. The results presented in the past sections show that although the income distribution in Chile should have improved by the circumstance of the factors modeled inside the salary equation¹⁸, this diminishing of the indicators of inequality looked unarrested for the existing changes in the returns or prices if modeled. So, for example, upon analyzing separately the effects of changes in the regional returns and of experience and education, we encounter that in both cases a deterioration of the income distribution is produced. Moreover, this deterioration is greater when both effects are analyzed together, giving then as a result at the start of the more complete simulations, that incorporate all exercises, we find a slight tendency to add to the indices of inequality, and toward the deterioration of the income distribution. This allows the explanation of the dynamics produced in Chile, since effectively the data show that between 1990 and 1998 a slight worsening was produced in the income distribution, that from our analysis is a product of the inequality produced by the changes in the structure of the regional returns, of education, and of experience.

As for the participation effects, the simulation carries out in the environment of the structure of the work force delivered results in the same direction as those previously thought, adding to the indicators of inequality, also present in the modeling of the structure of the endowments, or Endowment Effect. In this way, although it has been posed that in Chile between 1990 and 1998 there

¹⁸ Read habitually from the agents improving the quality of education, etc...

occurred a slight lessening of the total income distribution per capita, as this affirmation hides the compensatory effects that allow analysis with great detail the existing dynamic.

References

Bravo D., Contreras D. and Puentes Esteban: "Female Labor Force Participation In Chile: 1957-1997. A Synthetic Cohort Analysis".

Bravo D., Contreras D. and Medrano Patricia: "Measurement error, unobservables and skill bias in estimating the return to education in Chile".

Bravo D., Contreras D. And Rau Tomás: "Wage Inequality and Labor Market in Chile 1990-1996: A Non Parametric Approach".

Bouillon C, Legovini A. and Lusting N. "Rising Inequality in Mexico: Returns to household characteristics and the "Chiapas Effect"".

Bourguignon F., Ferreira F. and Nora Lustig: "The Macroeconomics Of Income Distribution Dynamics in East Asia And Latin America"

Bourguignon F., Fournier M. and M. Gurgand: " Distribution, development and education: Taiwan, 1979-1992"

Coleman, James S. "Equality and Achievement in Education". Boulder, CO, Westview, 1990.

Cowan, K. And De Gregorio, J. "Distribución y Pobreza en Chile : ¿estamos mal ? ¿ha habido progresos ? ¿hemos retrocedido ?. Centro de Estudios públicos, N° 64 . Spring 1996.

Ferreira, F. and Paes de Barros R. "Climbing a Moving Mountain: Explaining the decline in Income inequality in Brazil from 1976 to 1996".

Green, Duncan. "Chile : The First Latin American Tiger ?" NACLA Report on The Americans, 18(1), 1994, pp. 12-16.

Hojman, David E. "Poverty and Inequality in Chile : Are democratic Politics and Neoliberal Economics Good for You ?". Journal of Interamerican Studies and World Affairs, 1996.

United Nations Development Programme (UNDP), Human Development Report 1995, Oxford University Press, New York, 1995.

ANNEX

WITHOUT ENDOWMENT EFFECT

1.- EARNING EQUATION

TABLE VIII
Earning Equation – 1990

	SALARIED MALES	SALARIED FEMALES	SELF-EMPLOYED MALES	SELF-EMPLOYED FEMALES
Education	0.0445	0.0379	0.0151	0.0343
Education8	0.0927	0.0758	0.1262	0.0857
Education12	0.0661	0.0337	0.0138	0.0272
Technical Edu	-0.0154	-0.0077	0.0700	-0.2126
Experience	0.0503	0.0146	0.0355	0.0028
Experience2	-0.0006	-0.0002	-0.0006	0.0000
Region I	-0.0392	0.2557	0.0492	0.1516
Region II	0.0850	0.0459	0.0265	0.0700
Region III	-0.0344	0.1834	-0.0771	-0.2238
Region IV	-0.2925	-0.1433	-0.2341	-0.2197
Region V	-0.2531	-0.0559	-0.2165	-0.4589
Region VI	-0.1869	-0.0232	-0.1331	-0.1433
Region VII	-0.3382	-0.1285	-0.2051	-0.2889
Region VIII	-0.2171	-0.1221	-0.2936	-0.1703
Region IX	-0.3745	-0.4138	-0.3190	-0.3476
Region X	-0.2441	-0.0500	-0.1512	-0.1729
Region XI	0.0444	0.2986	0.1119	0.0245*
Region XIII	-0.1065	0.1567	0.0468	-0.0497
Cons_	9.6365	11.1688	9.5460	11.0498
Probit:				
Age	0.1825	0.1005	0.1353	0.1001
Age2	-0.0023	-0.0010	-0.0019	-0.0011
Children 0-2	0.1684	0.0406	-0.1757	0.0071
Children 3-6	0.0270	0.0843	-0.1226	-0.0228
Children 7-13	-0.0484	0.0161	-0.1241	-0.0369
Working Age	-0.0457	-0.0148	0.0219	-0.0445
_cons	-2.9297	-3.0770	-2.7483	-3.4894
Lambda	0.1117	-0.5840	0.1207	-0.4458

*: p-value>0.05

TABLE IX
Earning Equation – 1998

	SALARIED MALES	SALARIED FEMALES	SELF-EMPLOYED MALES	SELF-EMPLOYED FEMALES
Education	0.0473	0.0578	0.0417	0.0422
Education8	0.0988	0.0546	0.1197	0.0952
Education12	0.0396	0.0500	0.0069	0.0490
Technical Edu	0.0079	0.0470	0.0360	-0.0126
Experience	0.0385	0.0013	0.0222	0.0190
Experience2	-0.0004	0.0000*	-0.0002	-0.0002
Region I	-0.0945	-0.0300	-0.1708	0.6299
Region II	0.0729	0.2175	0.0471	0.6005
Region III	-0.1388	-0.1313	-0.1551	0.4264
Region IV	-0.2692	-0.2295	-0.2325	0.2354
Region V	-0.2516	-0.0922	-0.1289	0.2318
Region VI	-0.2689	-0.0828	-0.1678	0.2653
Region VII	-0.4152	-0.2101	-0.2186	0.2394
Region VIII	-0.3511	-0.2356	-0.2084	0.2124
Region IX	-0.3865	-0.5166	-0.1733	0.4656
Region X	-0.3505	-0.3203	-0.1764	0.3380
Region XI	-0.0927	0.0972	0.0152*	0.7216
Region XIII	-0.0636	0.0382	0.0995	0.4409
Cons_	10.8226	12.8455	10.6407	10.8257
Probit:				
Age	0.1764	0.1077	0.1488	0.1115
Age2	-0.0021	-0.0010	-0.0020	-0.0012
Children 0-2	0.1954	0.0417	-0.1301	-0.0324
Children 3-6	0.1065	0.0077	-0.1017	0.0216
Children 7-13	-0.0239	-0.0052	-0.1622	-0.0073
Working Age	-0.0623	-0.0074	-0.0142	-0.0536
_cons	-2.9137	-3.4478	-2.8277	-3.7890
Lambda	-0.0527	-0.7072	-0.1334	-0.1487

*: p-value>0.05

2.- MULTINOMIAL LOGIT

TABLE X
Multinomial Logit - 1990

	HEADS OF HOUSEHOLD		SPOUSES		OTHER RELATIVES	
	SELF-EMPLOYED	NON-PARTICIPANT	SELF-EMPLOYED	NON-PARTICIPANT	SELF-EMPLOYED	NON-PARTICIPANT
Average Education	0.0198	0.0696	-0.0309	0.0041	-0.0886	0.0392
D_Gender	-0.0323	-1.7446	0.0976	-2.6577	0.8347	-0.8881
Education	0.0854	0.1801	0.1886	0.2818	0.1114	-0.1048
Education2	-0.0070	-0.0102	-0.0114	-0.0235	-0.0056	-0.0044
Experience	0.0207	-0.0508	0.0582	-0.0570	0.0084	-0.2675
Experience2	0.0003	0.0021	-0.0003	0.0016	0.0007	0.0051
Children 0-2	0.0254	0.1954	0.3744	0.4796	-0.0465	-0.0349
Children 3-6	0.1427	0.1005	0.0100*	0.2404	0.0630	0.0579
Children 7-13	0.0578	0.0419	0.0660	0.1170	-0.0725	0.0302
Working Age	-0.0419	-0.0409	-0.0009*	-0.0589	-0.0198	-0.0014*
Region I	0.2144	-0.1099	-0.2885	-0.0644	0.1792	0.3870
Region II	-0.1327	-0.1024	-0.3407	0.6643	-0.1237	0.2987
Region III	-0.0998	-0.1060	-0.4892	0.1483	0.0896	0.4040
Region IV	0.1901	0.0118*	-0.2295	0.1602	0.2630	0.4625
Region V	0.0756	0.2275	-0.6583	0.0404	-0.0699	0.4418
Region VI	-0.1546	-0.2233	-0.4948	0.0615	-0.4715	0.1242
Region VII	0.3454	0.1140	-0.3923	0.2958	0.2309	0.1085
Region VIII	0.0158*	0.4328	-0.1618	0.5206	0.1038	0.2792
Region IX	0.5544	0.2435	-0.2795	0.4123	0.3442	0.4442
Region X	0.0983	-0.1228	-0.2490	0.3918	0.0550	0.1016
Region XI	0.1064	-0.1369	-0.7544	0.0492*	-0.2558	0.0057*
Region XIII	-0.0061*	-0.1966	-0.3620	-0.1483	-0.2005	0.0696
_cons	-2.0443	-1.5400	-2.3785	1.1930	-2.2190	3.3105

*: p-value>0.05

TABLE XI
Multinomial Logit - 1998

	HEADS OF HOUSEHOLD		SPOUSES		OTHER RELATIVES	
	SELF-EMPLOYED	NON-PARTICIPANT	SELF-EMPLOYED	NON-PARTICIPANT	SELF-EMPLOYED	NON-PARTICIPANT
Average Education	-0.0183	-0.0055	-0.0158	0.0083	0.0036	0.1169
D_Gender	0.1952	-1.4573	-0.2113	-2.5305	0.9129	-0.7939
Education	0.0550	0.1582	0.1189	0.1997	0.0162	-0.1957
Education2	-0.0049	-0.0077	-0.0079	-0.0168	-0.0030	-0.0025
Experience	0.0289	-0.0406	0.0367	-0.0504	0.0291	-0.2580
Experience2	0.0001	0.0018	0.0000*	0.0015	0.0004	0.0050
Children 0-2	-0.0540	0.0759	0.0330	0.4529	0.1243	0.0364
Children 3-6	-0.0406	0.0330	0.2098	0.3276	-0.0268	0.0794
Children 7-13	-0.0198	-0.0344	0.0766	0.1940	0.0782	0.1787
Working Age	0.0103	-0.0224	0.0288	-0.0182	-0.0786	-0.0613
Region I	0.6569	0.4339	0.4711	-0.1274	0.1380	0.5339
Region II	0.2708	0.1690	0.0939	0.1427	0.1652	0.5644
Region III	0.2908	0.3070	0.2059	0.0233*	0.3172	0.9201
Region IV	0.3565	0.2070	0.0235*	-0.0579	0.3509	0.3589
Region V	0.1510	0.2197	0.0721	-0.1617	0.1593	0.3744
Region VI	-0.1215	0.1232	-0.3091	-0.0851	-0.3163	0.2865
Region VII	0.3184	0.1912	-0.1685	-0.0694	0.0646	0.2646
Region VIII	0.1312	0.6727	-0.1096	0.1638	-0.1068	0.7255
Region IX	0.8902	0.3510	0.0784	0.0578	0.5030	0.6965
Region X	0.4032	0.2671	-0.2226	-0.0736	0.4054	0.4237
Region XI	0.3337	-0.3278	-0.1780	-0.3101	0.5303	-0.0167*
Region XIII	0.2671	0.1715	-0.1021	-0.4178	0.0453	0.2512
_cons	-2.3659	-1.7278	-2.4412	0.8595	-2.6623	3.4071

*: p-value>0.05

WITH ENDOWMENT EFFECT

1.- EARNING EQUATION

TABLE XII
Earning Equation - 1990

	SALARIED MALES	SALARIED FEMALES	SELF-EMPLOYED MALES	SELF-EMPLOYED FEMALES
Education	0.0380	0.0345	0.0006*	0.0312
Education8	0.0761	0.0610	0.1240	0.0711
Education12	0.0890	0.0558	0.0329	0.0459
Technical Edu	-0.0125	0.0003*	0.0762	-0.2112
Experience	0.0470	0.0132	0.0323	0.0022
Experience2	-0.0006	-0.0002	-0.0005	0.0001
Region I	0.0153	0.2847	0.0917	0.1834
Region II	0.1218	0.0645	0.0565	0.0980
Region III	-0.0113	0.1995	-0.0601	-0.2053
Region IV	-0.2857	-0.1438	-0.2318	-0.2137
Region V	-0.2696	-0.0711	-0.2319	-0.4632
Region VI	-0.1804	-0.0219	-0.1271	-0.1373
Region VII	-0.3179	-0.1154	-0.1864	-0.2689
Region VIII	-0.2271	-0.1300	-0.3063	-0.1729
Region IX	-0.3861	-0.4222	-0.3355	-0.3553
Region X	-0.2312	-0.0448	-0.1434	-0.1585
Region XI	0.0781	0.3170	0.1401	0.0498*
Region XIII	-0.0874	0.1653	0.0599	-0.0348
Cons_	9.6566	11.1366	9.6240	10.9497
Probit:				
Age	0.1816	0.1004	0.1349	0.0998
Age2	-0.0023	-0.0010	-0.0018	-0.0010
Children 0-2	0.1897	0.0455	-0.1996	0.0070
Children 3-6	0.0320	0.0838	-0.1235	-0.0230
Children 7-13	-0.0493	0.0163	-0.1259	-0.0372
Working Age	-0.0509	-0.0152	0.0201	-0.0497
_cons	-2.8948	-3.0741	-2.7324	-3.4718
Lambda	0.1241	-0.5645	0.1293	-0.4072

*: p-value>0.05

TABLE XIII
Earning Equation - 1998

	SALARIED MALES	SALARIED FEMALES	SELF-EMPLOYED MALES	SELF-EMPLOYED FEMALES
Education	0.0473	0.0578	0.0417	0.0422
Education8	0.0988	0.0546	0.1197	0.0952
Education12	0.0396	0.0500	0.0069	0.0490
Technical Edu	0.0079	0.0470	0.0360	-0.0126
Experience	0.0385	0.0013	0.0222	0.0190
Experience2	-0.0004	0.0000*	-0.0002	-0.0002
Region I	-0.0945	-0.0300	-0.1708	0.6299
Region II	0.0729	0.2175	0.0471	0.6005
Region III	-0.1388	-0.1313	-0.1551	0.4264
Region IV	-0.2692	-0.2295	-0.2325	0.2354
Region V	-0.2516	-0.0922	-0.1289	0.2318
Region VI	-0.2689	-0.0828	-0.1678	0.2653
Region VII	-0.4152	-0.2101	-0.2186	0.2394
Region VIII	-0.3511	-0.2356	-0.2084	0.2124
Region IX	-0.3865	-0.5166	-0.1733	0.4656
Region X	-0.3505	-0.3203	-0.1764	0.3380
Region XI	-0.0927	0.0972	0.0152*	0.7216
Region XIII	-0.0636	0.0382	0.0995	0.4409
Cons_	10.8226	12.8455	10.6407	10.8257
Probit:				
Age	0.1764	0.1077	0.1488	0.1115
Age2	-0.0021	-0.0010	-0.0020	-0.0012
Children 0-2	0.1954	0.0417	-0.1301	-0.0324
Children 3-6	0.1065	0.0077	-0.1017	0.0216
Children 7-13	-0.0239	-0.0052	-0.1622	-0.0073
Working Age	-0.0623	-0.0074	-0.0142	-0.0536
_cons	-2.9137	-3.4478	-2.8277	-3.7890
Lambda	-0.0527	-0.7072	-0.1334	-0.1487

*: p-value>0.05

2.- MULTINOMIAL LOGIT

TABLE XIV
Multinomial Logit – 1990

	HEADS OF HOUSEHOLD		SPOUSES		OTHER RELATIVES	
	SELF-EMPLOYED	NON-PARTICIPANT	SELF-EMPLOYED	NON-PARTICIPANT	SELF-EMPLOYED	NON-PARTICIPANT
Average Education	0.0197	0.0711	-0.0316	0.0043	-0.0888	0.0406
D_Gender	-0.0333	-1.7427	0.1074	-2.6369	0.8328	-0.8971
Education	0.0981	0.2054	0.2131	0.3319	0.1167	-0.0953
Education2	-0.0070	-0.0107	-0.0117	-0.0241	-0.0054	-0.0046
Experience	0.0218	-0.0521	0.0608	-0.0515	0.0085	-0.2608
Experience2	0.0002	0.0021	-0.0003	0.0015	0.0007	0.0050
Children 0-2	0.0274	0.2158	0.4164	0.5321	-0.0516	-0.0388
Children 3-6	0.1507	0.1076	0.0110*	0.2552	0.0669	0.0616
Children 7-13	0.0615	0.0456	0.0701	0.1253	-0.0765	0.0316
Working Age	-0.0446	-0.0436	-0.0014*	-0.0630	-0.0208	-0.0011*
Region I	0.1754	-0.1338	-0.3415	-0.1897	0.1875	0.3083
Region II	-0.1571	-0.1255	-0.4077	0.5449	-0.1069	0.2456
Region III	-0.1179	-0.1089	-0.5054	0.1043	0.1006	0.3669
Region IV	0.1691	-0.0111*	-0.2656	0.0928	0.2760	0.4479
Region V	0.0731	0.2237	-0.6632	0.0423	-0.0556	0.4583
Region VI	-0.1687	-0.2374	-0.5226	0.0104*	-0.4632	0.1094
Region VII	0.3327	0.1158	-0.4128	0.2518	0.2453	0.0679
Region VIII	0.0084*	0.4209	-0.1718	0.5068	0.1112	0.2911
Region IX	0.5516	0.2362	-0.2860	0.4123	0.3572	0.4588
Region X	0.0752	-0.1425	-0.2861	0.3192	0.0721	0.0740
Region XI	0.0835	-0.1386	-0.7782	-0.0188*	-0.2419	-0.0561
Region XIII	-0.0345	-0.2150	-0.3907	-0.2213	-0.1894	0.0330
_cons	-2.1232	-1.6992	-2.5708	0.8833	-2.2999	3.3141

*: p-value>0.05

TABLE XV
Multinomial Logit – 1998

	HEADS OF HOUSEHOLD		SPOUSES		OTHER RELATIVES	
	SELF-EMPLOYED	NON-PARTICIPANT	SELF-EMPLOYED	NON-PARTICIPANT	SELF-EMPLOYED	NON-PARTICIPANT
Average Education	-0.0183	-0.0055	-0.0158	0.0083	0.0036	0.1169
D_Gender	0.1952	-1.4573	-0.2113	-2.5305	0.9129	-0.7939
Education	0.0550	0.1582	0.1189	0.1997	0.0162	-0.1957
Education2	-0.0049	-0.0077	-0.0079	-0.0168	-0.0030	-0.0025
Experience	0.0289	-0.0406	0.0367	-0.0504	0.0291	-0.2580
Experience2	0.0001	0.0018	0.0000*	0.0015	0.0004	0.0050
Children 0-2	-0.0540	0.0759	0.0330	0.4529	0.1243	0.0364
Children 3-6	-0.0406	0.0330	0.2098	0.3276	-0.0268	0.0794
Children 7-13	-0.0198	-0.0344	0.0766	0.1940	0.0782	0.1787
Working Age	0.0103	-0.0224	0.0288	-0.0182	-0.0786	-0.0613
Region I	0.6569	0.4339	0.4711	-0.1274	0.1380	0.5339
Region II	0.2708	0.1690	0.0939	0.1427	0.1652	0.5644
Region III	0.2908	0.3070	0.2059	0.0233*	0.3172	0.9201
Region IV	0.3565	0.2070	0.0235*	-0.0579	0.3509	0.3589
Region V	0.1510	0.2197	0.0721	-0.1617	0.1593	0.3744
Region VI	-0.1215	0.1232	-0.3091	-0.0851	-0.3163	0.2865
Region VII	0.3184	0.1912	-0.1685	-0.0694	0.0646	0.2646
Region VIII	0.1312	0.6727	-0.1096	0.1638	-0.1068	0.7255
Region IX	0.8902	0.3510	0.0784	0.0578	0.5030	0.6965
Region X	0.4032	0.2671	-0.2226	-0.0736	0.4054	0.4237
Region XI	0.3337	-0.3278	-0.1780	-0.3101	0.5303	-0.0167*
Region XIII	0.2671	0.1715	-0.1021	-0.4178	0.0453	0.2512
_cons	-2.3659	-1.7278	-2.4412	0.8595	-2.6623	3.4071

*: p-value>0.05

3.- ENDOWMENT EFFECT ESTIMATION

TABLE XVI
Endowment Effect Equation - 1990

	CHILDREN 0-2	CHILDREN 3-6	CHILDREN 7-13	WORKING AGE	EDUCATION
Age	-0.0155	-0.0153	-0.0099	0.0292	0.4741
Age2	0.0001	0.0001	0.0000	-0.0004	-0.0058
D_Gender	-0.0161	-0.0206	-0.0102	0.0714	0.1181
Region I	0.0570	0.0237	0.0068	0.5292	0.7696
Region II	0.0536	0.0864	0.0707	0.3798	0.5075
Region III	0.0932	0.1031	0.1453	0.4199	-0.0517
Region IV	0.0349	0.0458	0.0629	0.5170	-0.2576
Region V	0.0401	-0.0153	-0.0020*	0.2746	0.2822
Region VI	0.0386	-0.0130	0.0553	0.4046	-0.6719
Region VII	0.0129	-0.0007*	0.0641	0.4010	-0.9100
Region VIII	0.0224	-0.0046	0.0686	0.5279	-0.3530
Region IX	0.0749	0.0546	0.0610	0.4153	-0.6240
Region X	0.0183	0.0240	0.0551	0.4211	-0.7714
Region XI	0.0287	0.0063	0.0484	-0.0258	-0.8271
Region XIII	0.0355	-0.0089	-0.0695	0.4722	0.7475
Cons_	0.5990	0.7416	0.9827	2.6699	0.3820

*: p-value>0.05

TABLE XVII
Endowment Effect Equation - 1998

	CHILDREN 0-2	CHILDREN 3-6	CHILDREN 7-13	WORKING AGE	EDUCATION
Age	-0.0127	-0.0140	-0.0102	0.0230	0.5233
Age2	0.0001	0.0001	0.0000	-0.0003	-0.0063
D_Gender	-0.0189	-0.0204	-0.0198	0.0530	0.0774
Region I	0.0755	0.0159	0.1972	0.2440	0.3893
Region II	0.1224	0.0719	0.2330	0.3023	0.2391
Region III	0.0642	0.0778	0.3025	0.2784	-0.2197
Region IV	0.0821	0.0856	0.2338	0.4817	-0.2984
Region V	0.0419	0.0247	0.1574	0.4553	0.3987
Region VI	0.0744	0.0339	0.1577	0.4605	-0.7132
Region VII	0.0158	-0.0048	0.1959	0.3785	-1.0950
Region VIII	0.0378	0.0138	0.1762	0.5365	-0.2623
Region IX	0.0785	0.0321	0.2141	0.4447	-0.5131
Region X	0.0566	0.0472	0.2587	0.3572	-0.8681
Region XI	0.0295	0.0665	0.2033	0.0531	-1.1037
Region XIII	0.0437	0.0318	0.1335	0.3626	0.5961
Cons_	0.4633	0.6639	0.8613	2.6499	0.2275

*: p-value>0.05