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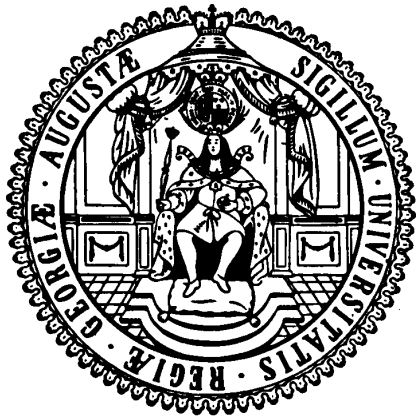

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Characterization of inequality changes through microeconomic decomposition Paraguay 1992-2005

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Paraguay 1992 – 2005

3.1 Introduction

The main economic variables have oscillated widely during the 1992 – 2005 period in Paraguay, in association with some macroeconomic and structural transformations, but also following general growth trends and business cycles in the South American region. This can be separated into three sub-periods; 1992 to 1998, 1999 to 2002 and 2003 to 2005.

During the early eighties, the Paraguayan economy benefited from high public investment rates resulting from the construction of the Itaipu and Yacyreta hydro-electric power plants. The country made its own way of stability and growth during a period of hyperinflations and external debt crisis in many South American countries. Nevertheless, its economy fell into a growth crisis (still avoiding debt crisis and hyperinflation) during the second half of the eighties, once the construction period of the hydroelectric power plants came to an end. During the first half of the nineties, Paraguayan economy recovered from recession, now driven by agricultural production and a re-export business boom, based on special arrangements for duty rates for electric and electronic equipment imported to the MERCOSUR (Mercado Comun del Sur - regional free trade agreement established in 1991 by Argentina, Brazil, Paraguay and Uruguay) region via Paraguay. The agricultural success was based on a recovery of international cotton prices, combined with a successful cotton extension program for small farmers within the country and a quick and widespread expansion of mechanized soybean farming. The commercial success with electric and electronic components was based on re-export. Paraguayan import duty rates from outside MERCOSUR were so low, that Brazilian and Argentine enterprises would prefer to buy these products re-exported from Paraguay, rather than importing themselves from outside MERCOSUR, which would have meant higher duty rates. Before this background, Paraguayan GDP per capita grew until 1995 and then remained relatively stable until 1998. The per capita income[1] Gini coefficient fell from 55.8 to 54.0. Mean per capita growth was 0.63% and poverty dropped from 38.2% to 32.1%.

1 Including all kinds of income, labour income, non-labour income and imputed values for own housing.

The period between 1999 and 2002 saw great political instability. Weak and unconcluded structural reform processes in the economy, which had begun in the nineties, were terminated. Small-scale cotton farming entered a deep crisis due to falling international prices and considerable parasite problems, combined with adverse climatic conditions (El Niño phenomenon), affecting agriculture in general. External shocks such as the Brazilian devaluation during global finance crisis and the Argentine default strongly hit the country. Per capita growth was -2.6% and poverty leaped to more than 46%. Gini coefficient for income inequality ascended to 56.1. As from 2003, political changes brought the country back to a more stable course. A tax reform and institutional improvements in Government provided more and new revenues to the treasury. Public expenditure, including social expenditure went up. Economy was benefited by a regional recovery. In the production sector, this period is marked by an important growth of livestock and meat exports. Per capita GDP grew 2.0% on average, while poverty went down to 38.2% and Gini coefficient to 52.8.

However, the reasons behind these changes in inequality are more varied and complex than just a macroeconomic history could tell. The main purpose of this paper is to assess the relevance of some forces that are believed to have affected income inequality in Paraguay between 1992 and 2005. More specifically, the microeconometric decomposition methodology proposed by Bourguignon, Ferreira and Lustig (1998) has been used to measure the relevance of various factors, which appear to have driven changes in inequality. In particular, this methodology has been used to identify to what extent changes in the returns to education and experience, in the endowments of unobservable factors (such as individual's innate ability) and their returns, in the wage gap between men and women, in labour market participation and hours of work, and in the educational structure of the population contribute to explain the observed changes in income distribution.

The results of this paper suggest that the smaller change in inequality between 1992 and 1997/98 is mainly as a result of employment (including hours of work) and education effects, characterized by a primary schooling expansion. The larger inequality reduction effect after 1997 is due to returns to education, hours of work (since unemployment increased) and unobservable factors.

The rest of the paper is organized as follows. Section 2 presents the decomposition methodology implemented to assess the relevance of those factors. Section 3 shows the basic facts and discusses some factors that may have affected inequality during the last two decades, while section 4 explains the estimation strategy. The main results of the analysis are presented in section 5. The paper concludes with some brief final comments in section 6.

3.2 Methodology

Many different forces exist behind the long-run changes in income distributions or, more generally, distributions of economic welfare, within a population. Some of these forces have to do with changes in the distribution of factor endowments and socio-demographic characteristics, while others have to do with the returns these endowments produce and others with changes in populations' behaviour such as labour supply, consumption patterns or the decision on whether or not to have children. These forces are not independent from each other. This is what makes it difficult to precisely identify fundamental causes and mechanisms behind the dynamics of income distribution. Decomposition techniques are used to identify causes of distributional changes. Traditional techniques explain differences in scalar summary measures of distributions rather than in full distributions. The best known of these techniques is the Oaxaca-Blinder decomposition of differences in mean incomes across population groups with different characteristics (Blinder 1973; Oaxaca 1973) and the variance-like decomposition property of the so-called decomposable summary inequality measures (Bourguignon 1979; Cowell 1980; Shorocks 1980). In both cases, the underlying logic is that the aggregate mean income (or inequality measure) in a population is the result of the aggregation of various socio-demographic groups of income sources. Thus, changes of overall mean or inequality measure can be explained by identifying changes in the means and inequality measures within those groups or income sources, and in their weights in the population or in total income.

The new focus on poverty and inequality reduction, which increasingly drives development policy, currently requires new analysis techniques on the shape of distribution, for example, in the vicinity of and below the poverty line. In terms of the Oaxaca-Blinder approach, the issue is to know not so much whether mean earnings are lower for women then for men, since the former may have less average education, as whether the differences are greater or smaller for the bottom part of the earnings distribution. Answering this kind of questions requires handling the whole distribution rather than summary measures. To assess the relevance of the various factors on income inequality changes, handling whole distributions, a microeconometric decomposition methodology first proposed by Bourguignon, Ferreira and Lustig (1998) was tailored to the Paraguayan case.[2]

2 Variants of the basic methodology have been applied in Altimir, Beccaria and González Rozada (2000), Bourguignon, Gurgand and Fournier (1999), Bouillon, Gasparini, Marchionni and Sosa (2000), Legovini and Lustig (1998) and Ferreira and Paes de Barros (1999), amongst others.

The basic model

The decomposition of a distributional change essentially consists of contrasting representations of the income-generation process (evaluating differences in estimated parameters) for two different distributions (two points in time) on the one hand, and accounting for changes in the joint distribution of endowments, on the other. Bourguignon, Ferreira and Lustig (1998) use parametric representation of inequality changes, because the parameters lead themselves directly to relevant economic interpretations.

More formally, a parametric representation of an income generation process can be defined by a set of variables $X = (V, W)$ where specific combinations of individual characteristics V and the values of these individual characteristics W are defining groups. A general parametric representation of the conditional functions $g^{\tau}(y|V,W)$ and $h^{\tau}(V|W)$ relates y and (V, W) on the one hand, and V and W on the other, according to some predetermined functional form. These relationships can be denoted as follows:

$$y = G[V, W, \varepsilon; \Omega_{\tau}] \tag{3.1}$$

$$V = H[W, \eta; \Phi_{\tau}] \tag{3.2}$$

Where Ω_{τ} and Φ_{τ} are sets of parameters and ε and η are random variables - η is a vector if V is a vector. These random variables play a similar role to the residual term in standard regressions. They are meant to represent the dispersion of income y or individual characteristics V for given values of individual characteristics (V, W), and W, respectively. They are also assumed to be distributed independently of theses characteristics, according to density functions π^{τ} and μ^{τ}. The functions G and H have pre-imposed functional forms.

If this model were to be applied to the distribution of individual earnings, the methodology would be rather simple. Ignoring the partition of X into exogenous characteristics (W) and non-exogenous individual characteristics (V), a simple parametric representation of individual earnings as a function of individual characteristics is given by:

$$\text{Log}\, y_i^{\tau} = X \cdot \Omega + \varepsilon \tag{3.3}$$

In this particular case, the function of G( ) is thus as follows:

$$G(X, \varepsilon; \Omega) = e^{X \cdot \Omega + \varepsilon} \tag{3.4}$$

To obtain estimates for the set of parameters Ω and for the distribution of the random term ε, one may rely on standard econometric techniques. Running a

regression on samples of the observations i available at time τ,

$$\text{Log}\, y_i^\tau = X_i^\tau \cdot \Omega_\tau + \varepsilon_i^\tau \qquad (3.5)$$

yields an estimate of the set of parameters Ω_τ, as well as of the distribution π_τ of the random term. Then, counterfactuals *D* can be computed easily. Without the (*V*, *W*) distinction, a counterfactual is defined as $D(\chi, \pi; \Omega)$, where $\chi(W, \eta)$ is the joint distribution of the exogenous components of (*V*, *W*). In discrete representation $\{y_i\}^\tau = (y_1, y_2, .., y_{N\upsilon})$ of the distribution at time τ, where N_τ is the number of observations in the sample available at time $\tau = t, t'$, it is identically the case that

$$D(\chi_t, \pi_t \Omega_t) = \{y_i\}^t . \qquad (3.6)$$

The counterfactual, $D(\chi_t, \pi_t, \Omega_{t'}) = \{y_i\}_\Omega^{t \to t'}$, is obtained by computing:

$$\text{Log}\,(y_i)_\Omega^{t \to t'} = X_i^t \cdot \hat{\Omega}_{t'} + \hat{\varepsilon}_i^t \qquad \text{for } i = 1, 2, \ldots, N_t \qquad (3.7)$$

where the notation ^ stands for OLS estimates. The counterfactual is thus obtained by simulating the preceding model on the sample of observations available at time *t*. This simulation shows what would have been the earnings of each individual of the sample if the returns to each of the observed characteristics had been those observed at time t' rather than the actual returns at time *t*. The returns to the unobservable characteristics that may be behind the residual term $\hat{\varepsilon}_i^t$ are supposed to be unchanged, nonetheless. This is equivalent to the evaluation of the price effect for observed characteristics of the Oaxaca-Blinder calculation. The difference is that the evaluation is carried out for every individual in the sample. The counterfactual of the distribution of the random term $D(\chi_t, \pi_{t'}, \Omega_t) = \{y_i\}_\Omega^{t \to t'}$ is a little more difficult to construct. Importing the distribution of residuals from time t' to time *t* requires an operation known as *rank-preserving-transformation*, whereby the residual in the n^{th} percentile (of residuals) at time *t* is replaced by the residual in the n^{th} percentile at time t', for all *n*. As the operation is not immediate when the number of observations is not the same in the two samples, an approximate solution is used. It consists of assuming that both distributions of residual terms are the same up to a proportional transformation. An example would be if residuals were normally distributed, with mean zero. The rank-preserving-transformation is then equivalent to multiplying the residual observed at time *t* by the ratio of standard deviation at time t' and *t*. $D(\chi_t, \pi_{t'}, \Omega_t) = \{y_i\}_\Omega^{t \to t'}$ is thus defined by:

$$\text{Log}\,(y_i)_\pi^{t \to t'} = X_i^t \cdot \hat{\Omega}_t + \hat{\varepsilon}_i^t \cdot (\hat{\sigma}_\varepsilon^{t'} / \hat{\sigma}_\varepsilon^t) \qquad \text{for } i = 1, 2, \ldots, N_t \quad (3.8)$$

With those counterfactuals at hand, estimates for the contribution to the observed overall distributional change between t and t' of the change in the Ω parameters, in the distribution of residuals (π), and possibly even of these two changes taken together, may easily be found. The effect of changing the distribution of individual endowments, X, is obtained as the complement of the two previous changes:

$$\{y_i\}^{t'} - D(\chi_t, \pi_{t'}, \Omega_{t'}). \tag{3.9}$$

Adaptation to Paraguayan data

Let *Yit* be individual's *i* labour income at time *t*, which can be written as a function *F* of the vector *Xit* of individual observable characteristics affecting wages and employment, the vector e_{it} of unobservable characteristics, the vector b_t of parameters that determine market hourly wages and the vector l_t of parameters that affect employment outcomes (participation and hours of work).

$$Y_{it} = F(X_{it}, \varepsilon_{it}, \beta_t, \lambda_t) \; i=1, ..., N \tag{3.10}$$

The distribution of individual labour income can be represented as:

$$D_t = \{Y_{1t}, ..., Y_{Nt}\} \tag{3.11}$$

We can simulate individual labour incomes by changing one or more arguments in equation (3.10). For instance, the following expression represents labour income that individual's *i* would have earned in time *t* if the parameters determining wages had been those of time *t'*, keeping all other things constant.

$$Y_{it}(\beta_{t'}) = \mathrm{F}(\mathrm{X}_{it}, \varepsilon_{it}, \beta_{t'}, \lambda_t) \; i=1, ..., N \tag{3.12}$$

More generally, we can define *Yit*(*kt*') where *k* is any set of arguments in (3.10). Hence, the simulated distribution will be:

$$D_t(k_t') = \{Y_t(k_t'), ..., Y_{Nt}(k_t')\} \tag{3.13}$$

The contribution to the overall change in the distribution of a change in *k* between *t* and *t'*, holding all else constant, can be obtained by comparing (3.11) and (3.13). Although we can make the comparisons in terms of the whole distributions, in this paper we only compare inequality indices *I*(*D*). Therefore, the effect of a change in argument *k* is defined by:

$$I[(D_t(k_t')] - I(D_t)^3 \qquad (3.14)$$

This paper is devoted to discuss the following effects:

- *Returns to education* ($k = \beta^{ed}$) measures the effect of changes in the parameters that relate education to hourly wages (β^{ed}) on inequality.
- *Gender wage gap* ($k = \beta^{g}$) measures the effect of changes in the parameters that relate gender to hourly wages (β^{g}) on inequality.
- *Returns to experience* ($k = \beta^{ex}$) measures the effect of changes in the parameters that relate experience (or age) to hourly wages (β^{ex}) on inequality.
- *Endowment and returns to unobservable factors* ($k=e^{w}$) measures the effect of changes in the unobservable factors and their remunerations affecting hourly wages (e^{w}) on inequality.
- *Hours of work and employment* ($k = \lambda$) measures the effect of changes in the parameters that determine hours of work and labour market participation (λ) on inequality.
- *Education* ($k = X^{ed}$) measures the effect of changes in the educational levels of the population (X^{ed}) on inequality.

The previous discussion refers to the distribution of individual earnings. However, it is more relevant from a social point of view to study the distribution of household income since a person's utility usually depends not on their own earnings, but on their household income and demographic composition. Following Buhmann et al. (1988), equivalent household income is given by:

$$Y^q_{iht} = \sum_{jeh}(Y_{jy} + Y^0_{jy}) \Big/ \left(\sum_{jeh} a_j\right)^{\Theta} \qquad i = 1, \ldots, N \quad (3.15)$$

where Y^q stands for equivalent household income, h is the household, Y^0 is the income from other sources, a is the equivalent adult and q captures household economies of scale. The distribution of equivalent household income can be expressed as:

$$D_t = \{Y^q 1t, \ldots, Y^q Nt\} \qquad (3.16)$$

Changing argument k to its value in t' yields the following simulated equivalent household income in year t:

$$Y_{iht}(k_{t'}) = \sum_{jeh}(Y_{jt}(k_{t'}) + Y^0_{jt}) / (\sum_{jeh} a_j)^{\Theta} \qquad i = 1, \ldots, N \qquad (3.17)$$

Hence, the simulated distribution is:

$$D^q t(k_t') = \{Y^q 1t(k_t'), \ldots, Y^q Nt\, k_t')\} \qquad (3.18)$$

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3 In the empirical implementation labour income distribution only is computed for those individuals such that $Yit > 0$ and $Yit(kt') > 0$.

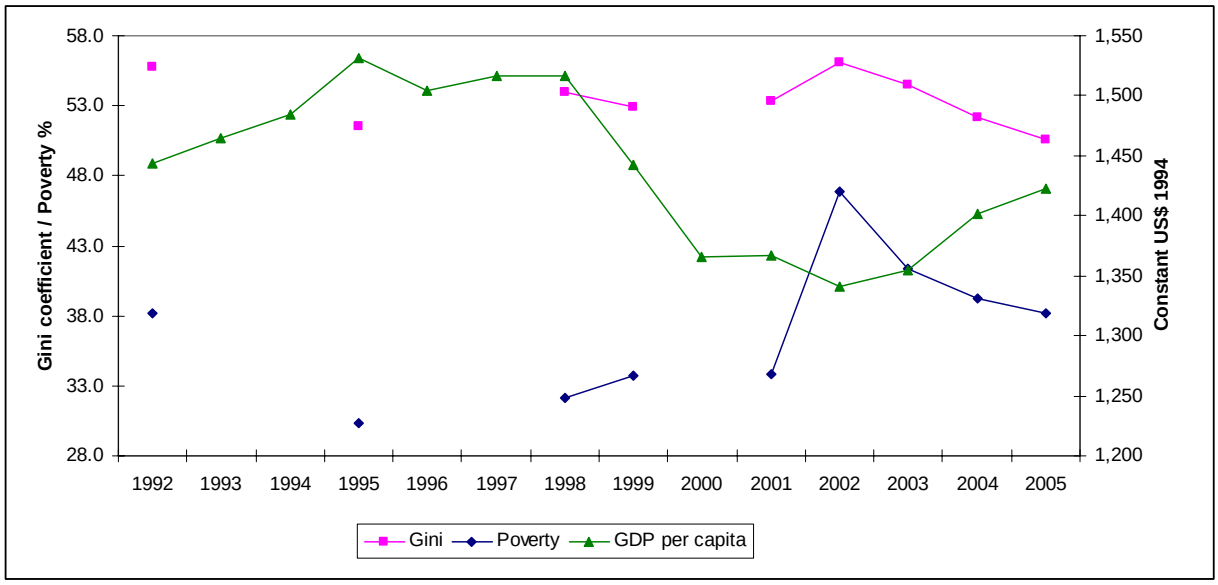
The effect of a change in argument *k*, holding all else constant, on equivalent household inequality is given by[4]:

$$I[(D^q_t(k_t')] - I(D^q_t). \qquad (3.19)$$

3.3 Income inequality in Paraguay: basic facts and sources of change

Per capita income inequality in Paraguay during the nineties has a generally negative tendency, rising during economic and political crisis between 1999 and 2002 and then recovering its path towards reduction. Figure 3.1 shows the Gini coefficient of per capita household income between 1992 and 2005 in Paraguay, combined with poverty headcount measures and GDP per capita.[5] Only since 2001 is there a yearly update of poverty and inequality measures in Paraguay.

Figure 3.1 Gini coefficient of Per Capita Household Income Distribution, Poverty and GDP per capita in Paraguay, 1992 - 2005



Source: Author's calculations based on EPH and EIH of National University and DGEEC for poverty and inequality. GDP data from the Banco Central del Paraguay.

For simplicity, this study focuses on three years of relative macroeconomic

4 In the empirical implementation we ignore income from other than labour sources Yjt and we consider all individuals such that $Y^q_{it} \geq 0$ and $Y^q_{it}(k_{t'}) \geq 0$.

5 The 1992 survey was carried out by the Universidad Nacional de Asuncion, while the 1995 to 2005 surveys are Encuestas Permanentes de Hogares (EPH) or Encuestas Integrales de Hogares (EIH, only 1997/98 and 2000/01) carried out by the National Statistical Office (Direccion General de Estadistica, Encuestas y Censo - DGEEC).

stability separated by almost equal intervals: 1992, 1997/98 and 2005[6]. The analysis was restricted to labour income mainly for two reasons. (i) Permanent Household Surveys (EPH) and Integrated Household Surveys (EIH) have various deficiencies in capturing capital income, and (ii) modelling capital income and retirement payments is not an easy task, especially considering the scarce information included in the surveys. Households whose heads or spouses are older than 64, or receive retirement payments, were ignored. The following analysis concentrates on the distribution of individual labour income[7] and on the distribution of equivalent[8] household labour income.

Table 3.1 Income Distribution in Paraguay, Selected Years (Gini coefficient)

Type of distribution	1992	1997/98	2005
Labour income	0.589	0.553	0.490
Equivalent household labour income	0.606	0.584	0.528

Source: Author's calculations based on EPH and EIH of National University and DGEEC.

Table 3.1 shows the basic facts to be characterized in the paper: inequality in individual labour income and in equivalent household labour income, as measured by the Gini, dropped almost ten percentage points between 1992 and 2005. Interestingly, labour income inequality reduction is stronger than equivalent household labour income reduction. Reduction between 1997/98 and 2005 is much stronger than between 1992 and 1997/98, even if the first period contains a sub-period of economic, political and social crisis where inequality grew. One possible reason for the stronger decrease of inequality in labour income, compared with inequality in household income, may lie in changes in non-labour income sources. Main non-labour income sources in Paraguayan income survey measures are the imputed value on own housing and transfers from family members inside and outside the country. Mainly the poor are benefited from imputed values for own housing, no matter how precarious their housing might be. There is an underdeveloped market for renting houses or apartments. It is nearly exclusively an urban phenomenon, restricted to rich

6 1992 and 1995 surveys report income for September, EIH 1997/98 for February of 1998, 1999 for September, 2000/01 for March 2001 and starting from 2002 all incomes for November.

7 Labour income comprises wage earnings and self-employed earnings.

8 Following Buhmann et al. (1988) the equivalent household income is obtained by dividing household income by the number of equivalent adults raised to 0.8, a parameter which implies mild household economies of scale. Since there is no official measurement of equivalent adult scales from DGEEC in Paraguay, general scales with 0.4 for children < 5 years of age, 0.5 for children > 5 years of age, and < 16 years of age and 1.0 for all individuals > 14 years of age were applied.

households that can afford to pay rent. Cash transfer from private sector to Paraguayan households came mainly from Argentina during the nineties and since 2003 with an increasing degree from Spain and the US. Private sector cash transfers are distributed all over society, from very poor to very rich. In 1992 private cash transfers were 1.8% of total household income, 4.3% in 1997/98 and 4.7% in 2005. Other possible sources for differences in changes between labour and household income are changes in marriage markets or changes in household composition (total number of individuals per household). Regression results in the next chapter will give some hints on these points. There are almost no public cash transfers, apart from very small pension payments, but pension recipients were excluded from the analysis by definition. An innumerable number of factors may have caused the changes in inequality documented in Table 3.1. We will concentrate on seven of these: (i) returns to education, (ii) the gender wage gap,[9] (iii) returns to experience, (iv) the dispersion in the endowment of unobservable factors and their returns, (v) hours of work, (vi) labour market participation, and (vii) the education of the working-able population.

3.3.1 Returns to education

An increase in the returns to education implies a widening of the wage gap between high and low educated workers, which in turn would imply a more unequal distribution of individual earnings and probably a more unequal distribution of household income. Table 3.2 shows hourly earnings in constant Guaranies (Gs.) in 2005 for workers between 12 and 64 with valid and complete answers. The average wage increased 5.3% between 1992 and 1997/98 and dropped 7.8% during the next seven years. Changes were not consistent among educational groups. In the first period of the analysis we had winners and losers. While incomes for workers who had not finished primary education increased slightly, the wages for the next two groups, complete primary education and incomplete secondary education, dropped considerably. Dramatic increases were observed for complete secondary and complete or incomplete college education. In the 1997/98 – 2005 period the losses of income were generalized for all income groups except for primary incomplete education. Losses for higher education are stronger than for lower education. Table 3.2 is a first piece of evidence that changes in relative wages among schooling groups implied an increase in earnings inequality between 1992 and 1997/98 and a decrease thereafter.

9 Throughout this paper "wage" refers to hourly labour income earned by wage-workers and self-employed workers.

Table 3.2 Hourly Earnings by Educational Level in Paraguay, Selected Years

	Means (Gs. 2005)			Changes (percent)		
Educational Level	1992	1997/98	2005	1992-1998	1998-2005	1992-2005
Primary incomplete	3,000.6	3,131.7	3,207.5	4.4	2.4	6.9
Primary complete	4,635.7	4,276.3	3,547.7	-7.8	-17.0	-23.5
Secondary incopl.	6,035.0	5,477.5	3,998.4	-9.2	-27.0	-33.7
Secondary complete	8,145.8	10,226.9	6,525.8	25.5	-36.2	-19.9
College incomplete	11,763.0	16,081.3	10,040.8	36.7	-37.6	-14.6
College complete	20,957.6	28,811.8	18,594.8	37.5	-35.5	-11.3
Total	5,746.9	6,051.1	5,580.1	5.3	-7.8	-2.9

Source: Author's calculations based on EPH and EIH of National University and DGEEC.

Table 3.3 shows the results of Mincerian log hourly earning functions estimated using the Heckman procedure to correct for sample selection. The first three columns refer to household heads (mostly men) and the rest to spouses (nearly all women) and other members of the family (roughly half men and half women), respectively. A gender dummy, age and age squared and a dummy for youngsters less than 18 years old (only relevant for other members) are included in the regression. In addition to these variables, the selection equation includes marital status, number of children and a dummy that takes the value "1" when the individual attends school. Following Bourguignon et al. (1999) it is assumed that labour market participation choices are made within the household in a sequential fashion. Spouses take the head's labour market status into consideration to decide whether to enter the labour market or not. Other members of the family consider both the head and the spouse labour market status.

The coefficients for years of education are positive and returns to education are always positive. For family heads in 1992, one additional year of schooling increases in the mean hourly wages in 11.3%, keeping all other factors constant. The same figure for 1997/98 and 2005 is 15.4% and 10.9%, respectively. It is interesting to observe that spouses hourly wage determination follows the same path of the heads hourly wage. It also increases (from 7.5% to 13.2%) between 1992 and 1997/98 and then drops again (to 10.7%) in 2005, but there is no such path for other family members who lose income in each period. Figure 3.2 shows the predicted hourly earnings for all different years of education. The first panel refers to male heads and the second to other male members, both with age kept constant at 40.

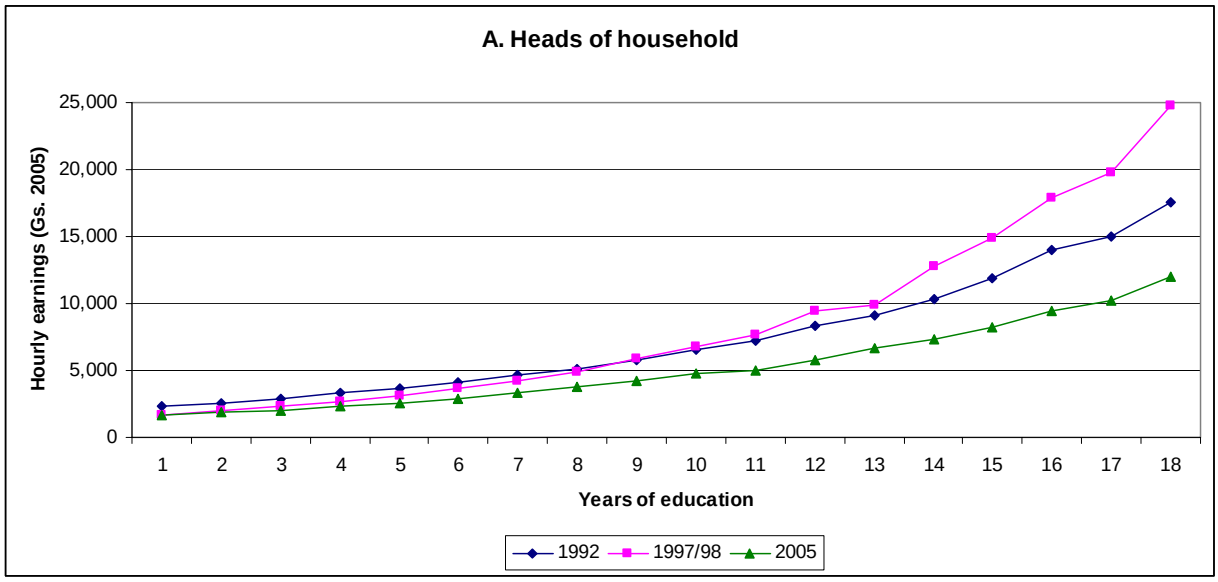
Table 3.3 Log-Hourly Earnings Equation Applied to Paraguay, Selected Years

	Head of household			Spouse			Other family members		
	1992	1997/98	2005	1992	1997/98	2005	1992	1997/98	2005
Dependent variable: log (ln) hourly earnings equation									
Years of education	0.1136	0.1543	0.1085	0.0752	0.1321	0.1073	0.1284	0.0772	0.0768
	(32.26) ***	(34.51)***	(24.8)***	(8.99) ***	(11.15)***	(9.15)***	(27.04) ***	(12.9)***	(14.77)***
Male	0.0256	0.1405	0.1199	-0.1386	-0.0924	0.0241	0.3447	-0.3199	-0.1713
	(0.37)	(1.93)*	(2.21)**	(-0.94)	(-0.51)	(0.16)	(7.15) ***	(-7.64)***	(-4.75)***
Age	0.0505	0.0649	0.0522	-0.0203	0.0167	-0.0041	0.0720	-0.0654	-0.0055
	(4.73) ***	(5.11)***	(4.17)***	(-0.94)	(0.59)	(-0.14)	(5.99) ***	(-4.27)***	(-0.4)
Age squared	-0.0005	-0.0007	-0.0005	0.0003	0.0000	0.0001	-0.0008	0.0010	0.0002
	(-3.82) ***	(-4.65)***	(-3.34)***	(1.24)	(- 0.08)	(0.36)	(-4.81) ***	(4.44)***	(1.04)
Married	0.0499	0.0614	0.1747						
	(0.94)	(0.99)	(3.21)***						
Number of children	-0.0249	-0.0480	-0.0131	0.0329	0.0207	0.0301			
	(-2.85) **	(-4.85)***	(-1.26)	(1.72) *	(1.02)	(1.61)			
Younger than 18							-0.0421	-0.1258	0.0225
							(-0.65)	(-1.75)*	(0.35)
Attending school	0.4617	-0.3056	0.2641	0.3160	0.0185	0.1834	-0.6561	0.4409	0.2816
	(3.45) **	(-1.87)*	(2.69)***	(1.51)	(0.09)	(1.35)	(-4.69) ***	(7.66)***	(5.8)***
Head employed					-0.0024	-0.0131			
					(-0.02)	(-0.15)			
Spouse employed		0.1101	-0.1526						
		(2.69)***	(-3.74)***						
Constant	6.5217	5.7516	6.0895	8.5570	6.9314	7.3270	5.4475	9.3568	7.8517
	(27.84) ***	(21.8)***	(23.09)***	(16.95) ***	(9.87)***	(9.64)***	(25.07) ***	(35.93)***	(32.46)***
Selection equation: dependent variable = 1 if hourly earnings > 0									
Years of education	0.0397	0.0322	0.0416	0.0632	0.0627	0.0625	0.0856	0.0313	0.0351
	(5.66) ***	(3.6)***	(6.63)***	(10.6) ***	(7.89)***	(9.21)***	(13.36) ***	(5.32)***	(6.46)***
Male	0.8162	1.1582	0.6800	0.8226	1.5301	1.0532	1.0269	0.4591	0.3073
	(8.99) ***	(13.01)***	(10.3)***	(5.31) ***	(9.29)***	(9.95)***	(22.64) ***	(12.46)***	(8.5)***

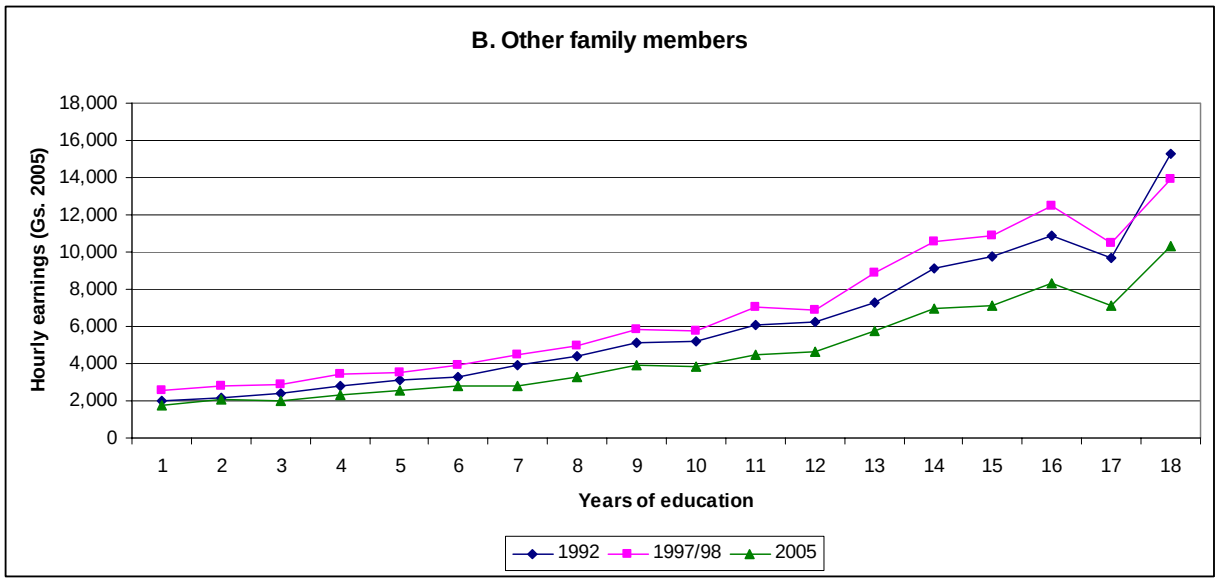
Age	0.0827	0.1137	0.0920	0.1263	0.1470	0.1446	0.1208	0.1703	0.1588
	(4.6) ***	(5.54)***	(5.78)***	(7.8) ***	(-8.45)***	(-8.15)***	(8.83) ***	(12.52)***	(12.03)***
Age squared	-0.0012	-0.0015	-0.0013	-0.0016	-0.0017	-0.0017	-0.0017	-0.0023	-0.0021
	(-5.82) ***	(-6.29)***	(-7.05)***	(-8.02) ***	(-8.45)***	(-8.15)***	(-9.29) ***	(-11.79)***	(-11.44)***
Married	0.2360	0.1988	-0.0662						
	(2.65) *	(1.83)*	(-0.89)						
Number of children	0.0023	-0.0427	-0.0265	-0.0786	-0.0845	-0.0442			
	(0.14)	(-2.52)**	(-2.03)**	(-4.97) ***	(-6.1)***	(-2.9)***			
Younger than 18							-0.1873	0.0021	-0.0453
							(-2.44) **	(0.03)	(-0.7)
Attending school	-0.6388	-0.4046	-0.0641	-0.3678	0.2566	0.4632	-2.3547	-0.6566	-0.5385
	(-3.35) **	(-1.66)*	(-0.4)	(-1.91)	(1.14)	(2.99)***	(-32.67) ***	(-13.59)***	(-11.4)***
Head employed					-0.2269	-0.0389			
					(-2.3)**	(-0.42)			
Spouse employed		-0.2405	-0.0763						
		(-2.8)***	(-1.33)						
Urban area	0.2152	-0.2547	0.7286	0.5563	0.2263	0.4028	-0.2762	0.4805	0.5439
	(2.62) *	(-3.19)***	(14.37)***	(8.06) ***	(3.55)***	(7.4)***	(-4.51) ***	(13.85)***	(15.37)***
Constant	-1.2408	-1.4395	-1.8780	-3.5590	-3.1358	-3.6446	-2.2127	-3.2267	-3.1761
	(-3.43) **	(-3.49)***	(-5.72)***	(-11.88) ***	(-10)***	(-10.75)***	(-9.88) ***	(-14.84)***	(-15)***
Number of observations	4,158	3,690	3,792	3,260	2,925	2,787	6,143	6,116	6,356
Censored observations	544	391	1,107	2,257	1,609	1,646	3,657	3,839	4,081
Uncensored observations	3,614	3,299	2,685	1,003	1,316	1,141	2,486	2,277	2,275
Chi squared	1,319.1	1,482.7	714.1	136.1	277.1	217.9	1,070.1	470.8	425.8
Log likelihood	-5,886.8	-5,651.1	-5,352.3	-2,955.3	-3,645.9	-3,077.5	-5,077.8	-5,789.3	-5,773.4
Rho	-0.2797	0.3074	-0.3532	-0.5951	-0.3101	-0.4089	0.5197	-0.8431	-0.7718
Sigma	0.8643	1.0072	0.8864	0.8852	1.0301	0.9115	0.8478	1.0756	0.9290
Lambda	-0.2417	0.3096	-0.3130	-0.5267	-0.3194	-0.3728	0.4406	-0.9068	-0.7171

Note: Data represent Heckman maximum likelihood estimation; z values are in parentheses. Data cover all individuals between 12 and 64 with valid answers.
Source: Author's calculations based on EPH and EIH of National University and DGEEC.

Figure 3.2 Hourly Earnings-Education Profiles for Men (Heads of Household and Other Family Members), Age 40



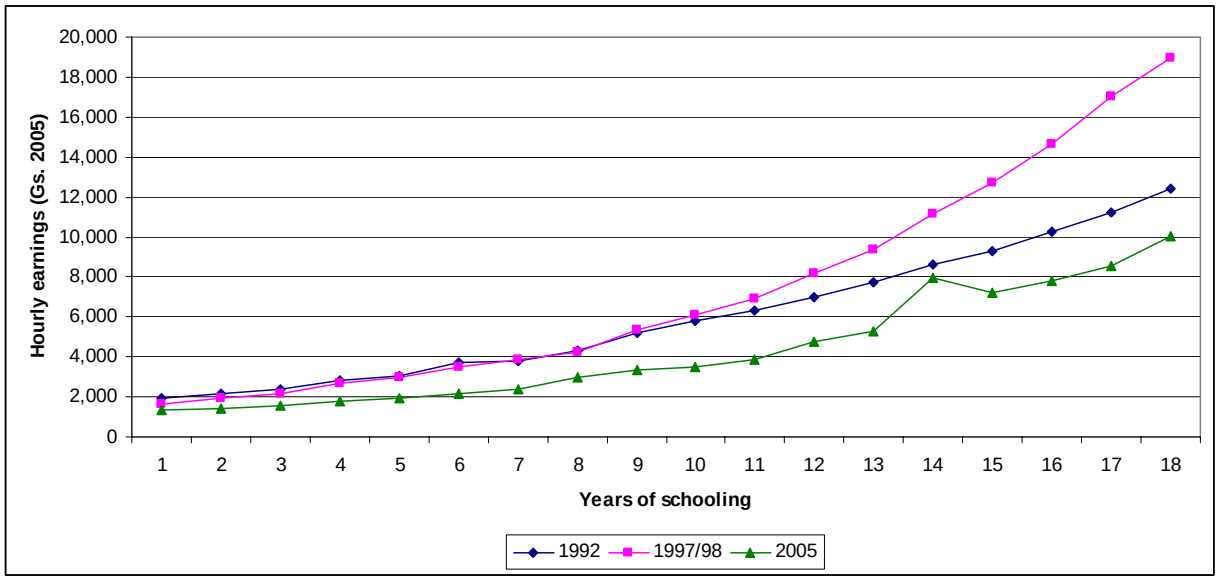
Source: Predicted hourly earnings from models on table 3.3.



Source: Predicted hourly earnings from models on table 3.3.

The wage-education profiles for family heads have a marked positive slope and are almost parallel everywhere, except for the substantial increase in the slope of 1997/98 in the highest levels, as from 13 years of education. This certainly contributes to increase earnings inequality among household heads with different educational levels. For male other-members the wage-education profile we have almost parallel slopes for all periods with some differences only for 17 and 18 years of education. So the changes in earnings of other family members could contribute only for high levels to widen inequality.

Figure 3.3 Hourly Earnings-Education Profiles for Women (Spouses), Age 40



Source: Predicted hourly earnings from models on table 3.3.

Figure 3.3 shows the profiles for 40 year old females. As in the case for men, the wage-education profiles show an increasing slope between 1992 and 1997/98, and an opposite movement between 1997/98 and 2005. It is interesting to see that for all three groups (household heads, spouses and other family members) there is a strong increase in returns for higher education in the 1992 – 1997/98 period. This is a real observation and unbiased by model specification, since years of education did not enter the model in its squared from. The reason for high returns for higher education might lie in pure market effects. Even if the Paraguayan economy and its industry are not very sophisticated, there is still a need for highly qualified human resources in any managerial post. As Table 3.10 will show further ahead, the percentage of the working force which completed college education did not exceed 2.4% over the whole observation period. Incomplete college education increased from 4.6% in 1992 to 9.4% in 2005, but nevertheless, these levels still remain low, and in a way, can explain why 2005 return profiles are much "smoother" than in previous years.

Summarizing, there is evidence of a positive relationship between hourly earnings and education which induces differences in incomes among individuals with different education. According to the evidence presented these differences, along with inequality, have increased between 1992 and 1997/98, and decreased in the next seven years. During this last period the wage-education profile has become smoother and less convex, which implies inequality reduction. Although this phenomenon seems widespread across groups, it appears to be more relevant for the groups of household heads and spouses.

3.3.2 Gender wage gap

Table 3.4 presents mean hourly wages by gender. Wages were higher for males in every year. Nevertheless, there are interesting dynamics within the gender wage gap which decreased from more than 16% in 1992 to less than 2% in 1997/98, and then increased again to some 6% in 2005. Over the whole period, female mean wage gain was about 6.9%, while male wages increased only in 0.6%. This implies inequality reduction over the whole observation period.

Table 3.4 Hourly Earnings by Gender in Paraguay, Selected Years

	Means (Gs. 2005)			Changes (percent)		
Gender	1992	1997/98	2005	1992-1997/98	1997/98-2005	1992-2005
Female	5,679	7,390	6,072	30.1	-17.8	6.9
Male	6,443	7,472	6,484	16.0	-13.2	0.6
Total	6,046	7,411	6,318	22.6	-14.8	4.5

Source: Author's calculations based on EPH and EIH of National University and DGEEC.

A conditional analysis also shows a shrinking gap for household heads. From Table 3.3 the coefficient for the male dummy is not always positive and significant, but clearly decreasing over time. Surprisingly, for other members we observe an important male income loss in 1997/98. However, since the number of working individuals in this group is considerably less than in the household heads group, the global conclusion of a narrowing gender wage gap holds. This shrinking gap has undoubtedly been an equalizing factor on the individual earnings distribution. The effect of this phenomenon on the equivalent household labour income distribution will basically depend on the position of working women in that distribution. Section 5 will expand on this further ahead.

3.3.3 Returns to experience

Age is used in this paper as a proxy for experience in the labour market. Table 3.5 shows average hourly earnings for different age groups. In general the wage-age profile has an inverted U shape. Between 1992 and 2005, hourly wages only increased for labour force younger than 30 years of age, which is the worst paid group of workers. In principle, this would imply an equalizing effect on the earnings distribution. However, the main benefit is for men and women less than 20 years of age. In 1992 they represented less than 13% of the total working population. During the 1997/98 to 2005 period these gains were lost again. All age groups lost income considerably in the 1997/98 to 2005 period, with a stronger loss for young workers. Once more, since this group is small, its effect is not big on the overall distribution. Since all other age groups lost more or less similar percentages of their wage there seems to be only a very small, but in the end positive equalizing effect.

Table 3.5 Hourly Earnings by Age Groups, Paraguay, Selected Years

	Means (Gs. 2005)			Changes (percent)		
Age	1992	1997/98	2005	1992-1997/98	1997/98-2005	1992-2005
12 to 19	2,726	3,431	2,019	25.9	-41.1	-25.9
20 to 29	5,026	5,128	4,198	2.0	-18.1	-16.5
30 to 39	6,671	6,096	4,942	-8.6	-18.9	-25.9
40 to 49	6,769	5,943	4,818	-12.2	-18.9	-28.8
50 to 59	6,940	6,034	4,652	-13.1	-22.9	-33.0
60 to 64	6,155	5,351	4,381	-13.1	-18.1	-28.8

Source: Author's calculations based on EPH and EIH of National University and DGEEC.

Throughout the whole observation period, the age group between 20 and 29 years of age is the less affected one. This implies certain equalizing effects, since in 2005 this group represented almost 40% of the working force. More negatively affected groups are those for working force older than 40 years of age. Nevertheless, in 2005 all three of these groups together represented less than half of the working force (48%). Since their mean wages are lower than the mean wages of the largest age group (20 to 29), their inequality increasing effects should be lower than the equalizing effects of the 20 to 29 year old group. Summing up, there are some reasons to believe that changes in the returns to experience have led to higher inequality and some reasons to believe the opposite. The analysis of Section 5 will help us to assess the quantitative relevance of each argument.

3.3.4 Unobservable factors

Earnings equations allow the estimation of returns to observable factors like education and experience. The error term is usually interpreted as capturing the joint effect of the endowment of non-observable factors (like individual ability) and its market value on earnings. In general terms, the variance of this error term captures the contribution of dispersion in unobservable factors to general inequality. Table 3.3 reports the standard deviation of the error terms of each log hourly earnings equation (labelled as "sigma"). For instance, for household heads the standard deviation took a value of 0.86 in 1992, 1.01 in 1997/98, and 0.89 in 2005. The substantial increase between 1992 and 1997/98 is also present in the spouses and other members' equations, as well as the reduction towards 2005. According to these results, the effect of changes in unobservable factors would have been strongly unequalizing between 1992 and 1997/98, reducing some of this additional inequality in the 1997/98 to 2005 period.

3.3.5 Hours of work

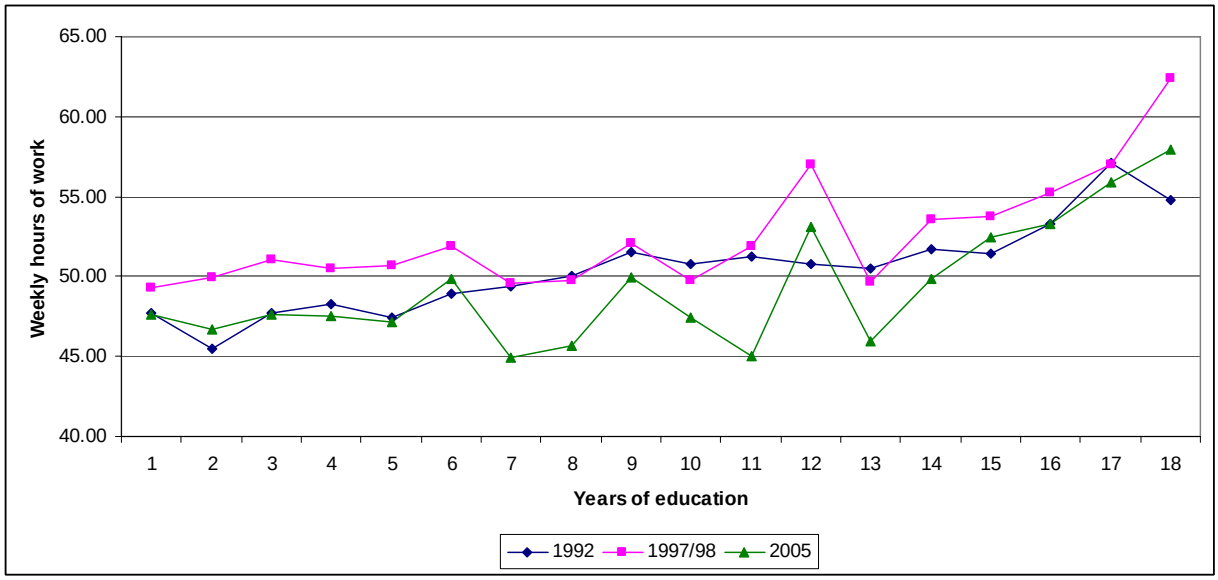
During the period under analysis there has been an increase in weekly hours of work between 1992 and 1997/98 and a decrease in the next seven years, almost to the same overall level observed in 1992. Table 3.6 classifies workers by educational level and records the average hours of work of each group. While there are clear gains for completed cycles in the 1992 to 1997/98 period, which deepens inequality, losses in 1997/98 to 2005 are more equally distributed. So, over the whole period we still observe important gains for completed cycles of secondary and college education, but at the same time important losses for groups who did not complete an education cycle. Since gains are larger for higher educational groups, this change would have a non-negligible unequalizing effect in the individual earnings distribution. A conditional analysis yields similar results. Figure 3.4 shows predicted weekly hours of work for male heads from the Tobit censored data model presented in Table 3.7. While hours clearly increased between 1992 and 1997/98 for less-educated (1 to 6 years of education) and for well educated (more than 13 years of education) male heads workers, changes in hours for the rest of the educational groups were only marginal between 1992 and 1997/98. In the

Table 3.6 Weekly Hours of Work by Educational Levels in Paraguay, Selected Years

	Means			Changes (percent)		
Educational Level	1992	1997/98	2005	1992-1997/98	1997/98-2005	1992-2005
Primary incomplete	47.9	51.0	45.4	6.0	-12.3	-5.5
Primary complete	50.3	51.3	49.3	2.0	-4.0	-1.9
Secondary incomplete	50.1	51.9	49.6	3.4	-4.7	-1.1
Secondary complete	50.0	48.7	50.6	-2.6	3.8	1.2
College incomplete	45.5	46.5	44.8	2.2	-3.8	-1.5
College complete	45.6	48.1	48.0	5.2	-0.3	4.9
Total	49.0	50.4	47.9	2.8	-5.2	-2.2

Source: Author's calculations based on EPH and EIH of National University and DGEEC.

Figure 3.4 Weekly Hours of Work by Educational Level for Men (Heads of Household), Age 40



Source: Predicted hourly earnings from models on table 3.7.

following seven years, the reduction of weekly hours of work is generalized for levels above six years of education. Consequently, we have evidence over the whole observation period for an equalizing effect for workers between 1 and 6 years of education, an unequalizing effect for workers between 7 and 15 years of education and a nearly neutral effect for the highest education levels.

3.3.6 Labour market participation

Household income inequality can change, not only after changes in hours of work but also as a result of changes in labour market participation. In Table 3.7 individuals are grouped according to whether they are employed, unemployed or inactive. The percentage of unemployed individuals dropped from 4.4% in 1992 to 3.4% en 1997/98 and rose again to 3.8% in 2005. However, notice that the increase in unemployment between 1997/98 and 2005 in 0.4 percentage points was accompanied by a decrease in inactivity in 3.2 percentage points. Notice that for inequality measures it is irrelevant whether an individual has zero income as a result of unemployment or due to not looking for a job. Hence the important indicator for possible inequality changes is the overall employment rate which increased from 57% to 61% and 63% during the observation period. These changes might have played a role in inequality changes depending on the distribution of wage levels and hours of work obtained by the additional working force.

Table 3.7 Labour Status by Household Role, Paraguay, Selected Years

	Proportions by group (percent)		
	1992	1997/98	2005
All			
Employed	56.96	60.55	63.36
Unemployed	4.40	3.35	3.75
Inactive	38.64	36.10	32.89
Head			
Employed	89.75	88.73	87.11
Unemployed	2.02	2.33	2.61
Inactive	8.23	8.94	10.28
Spouse			
Employed	23.80	47.38	57.10
Unemployed	6.76	2.15	2.44
Inactive	69.44	50.46	40.46
Other			
Employed	41.92	49.84	51.93
Unemployed	5.60	4.54	5.00
Inactive	52.48	45.61	43.06

Source: Author's calculations based on EPH and EIH of National University and DGEEC.

Table 3.8 Hours of Work Equation for Paraguay, Selected Years

	Head of household			Spouse			Other family members		
	1992	1997/98	2005	1992	1997/98	2005	1992	1997/98	2005
Years of schooling	0.0270	0.0575	0.2827	3.8209	2.2727	1.7095	1.3522	1.1323	0.7832
	(0.34)	(0.55)	(2.71)***	(12.59)***	(9.67)***	(8.15)***	(9.44)***	(7.1)***	(5.01)***
Male	16.6394	25.3464	21.1308	51.5352	43.5240	39.9850	27.9596	23.0687	21.6306
	(12.43)***	(18.32)***	(16.46)***	(7)***	(10.77)***	(12.71)***	(24.45)***	(22.24)***	(20.34)***
Age	1.4114	1.2101	2.2679	6.9762	5.4225	5.3229	3.2107	4.6314	4.8489
	(5.91)***	(4.25)***	(7.4)***	(8.06)***	(8.84)***	(9.05)***	(9.05)***	(11.92)***	(12.46)***
Age squared	-0.0215	-0.0194	-0.0297	-0.0883	-0.0651	-0.0604	-0.0478	-0.0695	-0.0673
	(-7.69)***	(-5.82)***	(-8.34)***	(-8.23)***	(-8.62)***	(-8.45)***	(-9.6)***	(-12.54)***	(-12.28)***
Married	4.7894	0.5888	2.0695						
	(3.9)***	(0.41)	(1.47)						
Children	-0.4056	-0.2636	-0.7328	-5.0412	-3.7189	-1.1558			
	(-1.94)*	(-1.15)	(-2.85)***	(-6.16)***	(-7.31)***	(-2.29)**			
Younger than 18							-9.1676	-1.5339	-1.3841
							(-4.56)***	(-0.81)	(-0.72)
Attending school	-10.9443	-13.5369	-7.2588	-15.8972	1.4317	4.9718	-76.3365	-32.0246	-27.2135
	(-3.69)***	(-3.65)***	(-2.64)***	(-1.55)	(0.19)	(1)	(-36.2)***	(-23.68)***	(-19.72)***
Head employed					-6.4897	4.5380			
					(-1.89)*	(1.45)			
Spouse employed		1.0494	0.9154						
		(1.09)	(0.86)						
Constant	7.4928	12.8926	-13.0795	-173.7523	-97.1573	-113.2848	-46.9400	-53.7711	-63.1164
	(1.59)	(2.27)**	(-2.1)**	(-10.72)***	(-8.38)***	(-9.87)***	(-8.22)***	(-8.75)***	(-10.17)***
Number of observations	4,158	3,690	3,792	3,260	2,925	2,786	6,143	6,116	6,356
Censored	574	279	490	1,027	1,396	1,196	2,551	2,716	3,056
Chi squared	804.59	791.28	658.02	367.25	396.83	366.26	4,469.86	2,572.47	2,364.31
Log likelihood	-17,603.9	-16,081.6	-16,078.0	-6,770.5	-8,921.5	-9,078.8	-13,919.3	-18,632.4	-18,414.9
Pseudo R squared	0.0223	0.024	0.0201	0.0264	0.0218	0.0198	0.1383	0.0646	0.0603
Sigma	22.40	24.60	26.61	59.36	44.08	41.85	33.79	35.26	36.42

Note: Data represent Tobit maximum likelihood estimation; t ratios are in parentheses. Data cover all individuals between 12 and 64 with valid answers.
Source: Author's calculations based on EPH and EIH of National University and DGEEC.

Table 3.7 suggests three different stories in the labour market for heads, spouses and other members. Some household heads lost or quit their jobs, especially during the last seven years, becoming either unemployed or leaving the labour force. In contrast, many (30 percentage points) of the spouses left their homes in search of a job: most of them found one between 1992 and 1997/98, however, some did not during the 1997/98 to 2005 period. The other members of the family were less fortunate: even if the participation rate also increased dramatically (10 percentage points), their unemployment rate remained nearly unchanged, doubling spouses unemployment during the last period.

Table 3.9 Labour Status and Education, Paraguay, Selected Years

	Proportions by group (percent)		
	1992	1997/98	2005
Primary incomplete			
Employed	47.09	55.55	61.54
Unemployed	5.57	2.26	2.25
Inactive	47.35	42.19	36.20
Primary complete			
Employed	52.26	62.87	64.65
Unemployed	5.59	2.82	3.22
Inactive	42.16	34.31	32.13
Secondary incomplete			
Employed	44.99	54.30	51.97
Unemployed	4.21	4.72	4.34
Inactive	50.80	40.98	43.70
Secondary complete			
Employed	57.67	73.40	73.65
Unemployed	4.28	5.45	6.61
Inactive	38.04	21.15	19.75
College incomplete			
Employed	65.76	82.53	79.31
Unemployed	1.73	4.80	4.60
Inactive	32.52	12.66	16.09
College complete			
Employed	88.57	89.50	92.42
Unemployed	1.71	1.66	2.89
Inactive	9.71	8.84	4.69
All			
Employed	56.96	60.55	63.36
Unemployed	4.40	3.35	3.75
Inactive	38.64	36.10	32.89

Source: Author's calculations based on EPH and EIH of National University and DGEEC.

Table 3.9 presents the proportion of employed, unemployed and inactive individuals by educational group. In the 1992 to 1997/98 period, data show a strong increase in employment rates, jointly with a decrease in inactivity rate, for

all educational levels but college complete group. Employment increases and inactivity decreases are stronger for higher educational levels. This should imply an increase in inequality. In the 1997/98 to 2005 period, employment only keeps growing (and inactivity shrinking) for primary education and for complete university education. Overall, for this period we should expect an equalizing effect on income inequality. Over the whole period the unequalizing effect of the first period is expected to be stronger than its compensation in the next period.

3.3.7 Education

In Paraguay, as in many developing countries, substantial changes in the educational composition of the population have been taking place during the nineties. Table 3.10 presents the proportion of individuals between 12 and 64 years of age by educational level. Between 1992 and 1997/98 there was a contraction in the proportion of youngsters and adults with incomplete primary education and an expansion for incomplete secondary education. Both are groups with low or up to medium wages. In the 1997/98 to 2005 period the participation of incomplete primary education kept falling, primary complete remained almost unchanged and larger changes were observed in the higher income groups with secondary and college education.

Table 3.10 Composition of Sample by Educational Level in Paraguay, Selected Years

	1992	1997/98	2005
Primary incomplete	44.43	36.86	27.46
Primary complete	23.18	25.32	23.05
Secondary incomplete	12.27	22.64	26.93
Secondary complete	13.18	8.36	11.00
College incomplete	4.60	5.40	9.42
College complete	2.35	1.42	2.14

Note: Data cover individuals between 12 and 64 with valid answers.
Source: Author's calculations based on EPH and EIH of National University and DGEEC.

Education is usually viewed as an equalizing force. The traditional argument points out that income disparities in one generation can be reduced in the next, if poor children have access to more and better education, so that the educational gap with rich-families' children decreases. However, following Kuznets (1955), one can tell a different story if the high-educated rich are a minority and only some poor children manage to make it all the way up to the highest educational (and income) levels. In that case, it is likely that inequality grows as the average education of the population increases; at least until the high education group is relatively large. With multiple educational levels, a similar unequalizing outcome emerges if there is a net outflow from the lowest educational levels and a similar net inflow to the highest levels, with minor changes in the intermediate

levels. Changes in the educational structure from 1997/98 to 2005 have more or less taken this form, which feeds the assumption of an unequalizing education effect for this period and a more equalizing effect for the 1992 to 1997/98 period. Between 1992 y 1997/98, 5% of working age population left the primary education group. Almost all of these entered the secondary education group. In the 1997/98 to 2005 period, 12% left primary education. Seven percent entered in secondary education but the other 5% passed on to college level.

So far we have analyzed several factors that might have affected inequality. Although we have offered some evidence to argue about each effect, we still do not have a consistent framework to confirm the sign of each effect and where to assess its quantitative relevance. Were changes in the returns to education really an unequalizing force? Were they really a significant force? What about gender, employment or education effects? The next section presents a framework to tackle these issues.

3.4 Estimation strategy

To compute expressions (3.14) and (3.19) in section two, we need to have estimates of parameters β and λ and the residual terms e. Also, since we do not have panels, we need a mechanism to assign observable and unobservable individual characteristics in period t' to individuals in t. This section is dedicated to explain the strategies to deal with these problems.

Estimation of β and λ
Let Li denote the number of hours worked by person i, and with wi the hourly wage perceived. Total labour income is given by $Yi = Li.wi$. The number of hours of work Li comes from a utility maximization process which determines optimal participation in the labour market, whereas wages are determined by market forces. The estimation stage specifies models for wages and hours of work which are used in the simulation stage described above.

The econometric specification of the model is similar to the one used by Bourguignon Fournier and Gurgand (2001), which corresponds to the reduced form of the labour decisions model originally proposed by Heckman (1974). Heckman shows how it is possible to derive an estimable reduced form starting from a structural system obtained from a utility maximization problem of labour - consumption decisions. Leaving technical details aside, the scheme proposed by Heckman has the following structure. Individuals allocate hours to work and domestic activities (or leisure) so as to maximize their utility subject to time, wealth, wages and other constraints. As usual, the solution to this optimization problem can be characterized as demand relations for goods and leisure as

functions of the relevant prices. Under general conditions it is possible to invert these functions to obtain prices and wages as functions of quantities of goods and leisure consumed (or its counterpart, hours of work). In particular, the wages obtained in this manner (denoted as w^*) are to be interpreted as marginal valuations of labour, which will be a function of hours of work and other personal characteristics, and represent the minimum wage for which the individual would accept to work a determined number of hours. In equilibrium, if the individual decides to work, the number of hours devoted to labour should equate their marginal value w^* with the wage effectively perceived. On the contrary, if the individual decides not to work, it is because this marginal value is greater than the wage offered, given the individual's personal characteristics.

This discussion suggests how to determine wages as of which individuals are willing to work. On the same note, it is possible to model market determinants of wages offered (w) as a function of characteristics such as years of education, experience and age as a standard Mincer equation (Mincer, 1974). In equilibrium it is assumed that the number of hours of work adjusts to make $w=w^*$.

The demand-supply relations discussed so far are structural forms in the sense that they reflect relevant economic behaviour in which wages offered and asked depend on the number of hours of work, which equate in equilibrium. Under general conditions it is possible to derive a reduced form for the equilibrium relations, in which wages and hours of work are expressed as functions of the variables taken as exogenous. In this way, the model has two equations, one for wages (w^*) and one for the number of hours of work (L^*), both as function of factors taken as given which affect wages ($X1$) and hours ($X2$) which may or may not have elements in common. The error terms $e1$ and $e2$ will represent non-observable factors affecting the determination of endogenous variables. According to the characteristics of the problem, for a particular individual we observe positive values of w^* and L^* if and only if the individual actually works. If the person does not work, we only know that the wage offered is less than the salary asked. Consequently, the reduced form model for wages and hours of work is specified as:

$$w_i^* = X1_i b + e1_i \quad i = 1, ..., N \tag{3.20}$$

$$L_i^* = X2_i l + e2_i \tag{3.21}$$

with

$$w_i = w_i^* \text{ if } L_i^* > 0$$
$$w_i = 0 \text{ if } L_i^* \leq 0$$
$$L_i = L_i^* \text{ if } L_i^* > 0$$
$$L_i = 0 \text{ if } L_i^* \leq 0$$

where *wi* and *Li* correspond to observed wages and hours of work, respectively. This notation emphasizes that, consistently with the data used for the estimation, observed wages for a non-working individual are zero.

Following Heckman (1979), for estimation purposes we will assume that ei_1 and ei_2 have a bivariate normal distribution with $E(e_{1i}) = E(e_{2i}) = 0$, variances s_{12} and s_{22} and correlation coefficient *r*. This particular specification corresponds to the "Tobit type III" model in Amemiya's (1985) classification.

Although it is possible to estimate all the parameters using a full information maximum likelihood method, the implemented methodology adopted a limited information approach, which has notorious computational advantages. If instead of hours of work we only had information about whether the individual works or not, the model would correspond to the "Type II" model in Amemiya's classification, whose parameters can be estimated based on a simple selectivity model. More specifically, the regression equation would be the wage equation and the selection equation would be a censored version of the labour supply equation, simply indicating whether the individual works or not. Table 3.3 shows the estimation results of these equations.

On the other hand, the hours of work equation corresponds to the "Tobit type I" model in Amemiya's classification where the variable is observed only if it is positive. In this case, the parameters of interest could be estimated using a standard censored regression Tobit model. This strategy is consistent though not fully efficient. In any case, the efficiency loss is not necessarily significant for a small sample. The results of the estimation are shown in Table 3.7.

Unobservable Factors

Unobservable characteristics affecting wages are modelled as regression error terms of the wage equation (3.20). Their mean is trivially normalized to zero and their variance is estimated as an extra parameter in the Heckman procedure. In order to simulate the effect of changes in those unobservable factors between *t* to *t'* on inequality, the estimated residuals of the wage equation of year *t* are rescaled by *st'*/*st*, where *s* is the estimated standard deviation of the wage equation. This captures the effect of differences between years in dispersion in the unobservable factor affecting wages, which include non-observable factors and their market value.[10]

10 It is important to mention that under bivariate normal assumption implicit in the Heckman model, once the correlation between unobservables affecting wages and hours worked is kept constant, all remaining effects on unobservables on wages come through the variance. Machado and Mata (1998) allow for heterogeneous behavior of the error term using quantile regression methods.

To study employment effects the decomposition methodology requires simulating earnings for people who do not work. Since we do not observe wages we cannot apply equations (3.20) and (3.21) to estimate the unobservable factors. For each individual in that situation, we assign as "error term" a random draw from the bivariate normal distribution implicit in the wage - labour supply model (3.20) and (3.21), whose parameters are consistently estimated by the Heckman procedure. Residuals are sampled from the distribution of unobservable factors but conditional to the fact that the behaviour of the individual is observed. That is, error terms are drawn from the bivariate normal distribution and a prediction (based on observable characteristics, estimated parameters and sampled errors) is computed for wages and hours worked. If the resulting prediction yields positive hours worked (so the prediction is inconsistent with the observed behaviour in this group), the error term is sampled again until non-positive hours of work are predicted.

Individual characteristics

For the estimation of the education effect it is necessary to simulate the educational structure of year *t´* on year *t* population since we do not have the same individuals in both years. Instead of following Bourguignon, Fournier and Gurgand (2001) and estimating a parametric equation that relates individual educational level to other individual characteristics (age and gender), a rough non-parametric mechanism was applied. Adult population was divided in ten homogeneous groups by gender and age and then the educational structure of a given cell in year *t*' was replicated into the corresponding cell in year *t*.

Poverty

Poverty, measured officially by income, summing all kind of income, decreased in Paraguay between 1992 and 1997/98, increased until 2002 and turned back to a slight reduction as from 2003. Poverty and inequality are not the same, but they are closely related. A higher level of inequality reduces poverty reduction driven by economic growth, since the additional income and benefits from growth are not equally distributed amongst the population. Inequality reduction is not a poverty reduction tool in itself, but it can improve performance and impact of poverty reduction processes. So, it would be interesting to figure out which could be the effects the simulated inequality changes on poverty levels. Since the simulations of changes of inequality are based on labour income, we need a labour income poverty line. There is no such line officially fixed for Paraguay. As a proxy, the mean equivalent household labour income of all households classified as poor by the official per capita income poverty line, was taken as an income poverty line to check on poverty reduction effects of simulated inequality changes. Since this is only a very rough proxy, measurement results should not be taken as real changes in poverty, related to

inequality changes, because there are other kinds of income and many more factors related to poverty change as a whole. Anyway, the simulated poverty changes could be understood as a proxy for the sign of poverty reduction impact of an observed change in inequality, and to identify which kind of inequality change would have a stronger effect on poverty and which would not.

3.5 Results

This section reports the results of performing the decomposition described in Section 2 using the estimation strategy outlined in Section 4. The objective is to shed light over the quantitative relevance of the various phenomena discussed in Section 3 on inequality changes during the 1992 - 2005 period.

Before showing the results two points must be clarified. First, the decompositions are path dependent. Hence, results are reported using alternatively *t* and *t'* as the base year. Second, the simulations are carried out for the whole distribution.

Tables 3.11 to 3.13 show the results both with *t* and *t´* as base years. Table 3.14 reports the average of these results. A positive number indicates an unequalizing effect. A large number compared to the other figures in the column suggests a significant effect. For instance, the returns-to-education effect on the individual earnings distribution in the 1992 to 1997/98 period is -2.1. This roughly means that the Gini would have decreased -2.1 points, if only the returns to education (*i.e.* the coefficients of the educational dummies in the wage equation) had changed between those years. The number -2.1 tells us two things: (i) since it is a negative number, it implies that the returns-to-education effect was inequality-decreasing, and (ii) since it is large compared to the other numbers in the column, it indicates that the change in returns to education was economically a significant factor affecting inequality. Its effect on equivalent household income distribution is also inequality decreasing, but to a minor degree. Nevertheless, returns to education seem to have a poverty increasing effect. The story here is that changes in return to education are related to income losses, which certainly make income distribution more equal. At the same time, however, lower income groups suffer stronger losses, so some of them fall below the poverty line.

Table 3.11 Decomposition of the Change in Gini coefficient for Earnings and Equivalent Household Labour Income and Equivalent Labour Household Income Poverty, Paraguay 1992 – 1997/98

Using 1997/98 coefficients

	Earnings		Equivalent income		Poverty	
Indicator	Level	Change	Level	Change	Level	Change
1992 observed	58.9		60.6		35.4	
1997/98 observed	55.3	-3.6	58.4	-2.2	27.5	-7.9
Effect						
Returns to education	59.6	0.7	60.2	0.4	37.1	1.7
Gender wage gap	58.4	-0.5	59.5	-1.1	33.6	-1.8
Returns to experience	59.7	0.8	61.0	-0.4	34.6	-0.8
Unobservable factors	61.0	2.1	61.8	1.2	35.1	-0.3
Hours of work	57.6	-1.3	60.2	-0.4	33.9	-1.5
Employment	56.4	-2.5	59.5	-1.1	32.3	-3.1
Education	56.8	-2.1	59.0	-1.6	33.8	-1.6
Other factors	58.1	-0.8		0.8		-0.5

Using 1992 coefficients

	Earnings		Equivalent income		Poverty	
Indicator	Level	Change	Level	Change	Level	Change
1992 observed	58.9		60.6		35.4	
1997/98 observed	55.3	-3.6	58.4	-2.2	27.5	-7.9
Effect						
Returns to education	59.0	0.1	60.7	0.1	36.2	0.8
Gender wage gap	58.6	-0.3	60.1	-0.5	34.4	-1.0
Returns to experience	58.4	-0.5	60.4	-0.2	34.4	-1.0
Unobservable factors	59.7	0.8	61.1	0.5	34.7	-0.7
Hours of work	58.0	-0.9	60.1	-0.5	33.6	-1.8
Employment	58.2	-0.7	60.3	-0.3	34.4	-1.0
Education	57.3	-1.6	59.7	-0.9	34.0	-1.4
Other factors	58.4	-0.5		-0.4		-1.8

Average changes

Indicator	Earnings	Equivalent income	Poverty
1992 - 1997/98 observed	-3.6	-2.2	-7.9
Effect			
Returns to education	0.4	-0.1	1.3
Gender wage gap	-0.4	-0.8	-1.4
Returns to experience	0.2	0.1	-0.9
Unobservable factors	1.5	0.8	-0.5
Hours of work	-1.1	-0.4	-1.7
Employment	-1.6	-0.7	-2.1
Education	-1.9	-1.3	-1.5
Other factors	-0.7	0.2	-1.2

Note: The earnings distribution includes those individuals with $Yit > 0$ and $Yit(kt') > 0$. The equivalent household labour income distribution includes those individuals with $Y^q it >= 0$ and $Y^q it(kt') >= 0$. Non-labour income is not considered.

Source: Author's calculations based on EPH and EIH of National University and DGEEC.

Table 3.12 Decomposition of the Change in Gini coefficient for Earnings and Equivalent Household Labour Income and Equivalent Labour Household Income Poverty, Paraguay 1997/98 – 2005

Using 2005 coefficients

	Earnings		Equivalent income		Poverty	
Indicator	Level	Change	Level	Change	Level	Change
1997/98 observed	55.3		58.4		27.5	
2005 observed	49.0	-6.3	52.8	-5.6	32.6	5.1
Effect						
Returns to education	52.6	-2.7	57.2	-1.2	29.3	1.8
Gender wage gap	55.2	-0.1	58.1	-0.3	27.1	-0.4
Returns to experience	53.9	-1.4	57.6	-0.8	27.7	0.2
Unobservable factors	53.2	-2.1	56.6	-1.8	28.7	1.2
Hours of work	54.3	-1.0	58.0	-0.4	27.8	0.3
Employment	55.4	0.1	57.7	-0.7	28.1	0.6
Education	54.8	-0.5	58.4	0.0	27.3	-0.2
Other factors		1.4		-0.4		1.6

Using 1997/98 coefficients

	Earnings		Equivalent income		Poverty	
Indicator	Level	Change	Level	Change	Level	Change
1997/98 observed	55.3		58.4		27.5	
2005 observed	49.0	-6.3	52.8	-5.6	32.6	5.1
Effect						
Returns to education	53.1	-2.2	56.6	-1.8	28.9	1.4
Gender wage gap	55.0	-0.3	57.8	-0.6	27.3	-0.2
Returns to experience	54.8	-0.5	58.1	-0.3	28.5	1.0
Unobservable factors	53.9	-1.4	57.3	-1.1	28.5	1.0
Hours of work	53.4	-1.9	57.4	-1.0	28.2	0.7
Employment	55.6	0.3	58.1	-0.3	28.3	0.8
Education	55.5	0.2	58.8	0.4	28.2	0.7
Other factors		-0.5		-0.9		-0.3

Average changes

Indicator	Earnings	Equivalent income	Poverty
1997/98 – 2005 observed	-6.3	-5.6	5.1
Effect			
Returns to education	-2.5	-1.5	1.6
Gender wage gap	-0.2	-0.4	-0.3
Returns to experience	-1.0	-0.5	0.6
Unobservable factors	-1.8	-1.4	1.1
Hours of work	-1.5	-0.7	0.5
Employment	0.2	-0.5	0.7
Education	-0.1	0.2	0.3
Other factors	0.5	-0.7	0.7

Note: The earnings distribution includes those individuals with $Yit > 0$ and $Yit(kt') > 0$. The equivalent household labour income distribution includes those individuals with $Y^q it >= 0$ and $Y^q it(kt') >= 0$. Non-labour income is not considered.

Source: Author's calculations based on EPH and EIH of National University and DGEEC.

Table 3.13 Decomposition of the Change in Gini coefficient for Earnings and Equivalent Household Labour Income and Equivalent Labour Household Income Poverty, Paraguay 1992 – 2005

Using 2005 coefficients

	Earnings		Equivalent income		Poverty	
Indicator	Level	Change	Level	Change	Level	Change
1992 observed	58.9		60.6		35.4	
2005 observed	49.0	-9.9	52.8	-7.8	32.6	-2.8
Effect						
Returns to education	56.9	-2.0	59.0	-1.6	38.9	3.5
Gender wage gap	58.3	-0.6	59.2	-1.4	33.2	-2.2
Returns to experience	58.3	-0.6	60.2	-0.4	34.8	-0.6
Unobservable factors	58.9	0.0	60.0	-0.6	36.3	0.9
Hours of work	56.6	-2.3	59.8	-0.8	34.2	-1.2
Employment	56.5	-2.4	58.8	-1.8	32.9	-2.5
Education	56.3	-2.6	59.0	-1.6	33.6	-1.8
Other factors		0.6		0.4		1.1

Using 1992 coefficients

	Earnings		Equivalent income		Poverty	
Indicator	Level	Change	Level	Change	Level	Change
1992 observed	58.9		60.6		35.4	
2005 observed	49.0	-9.9	52.8	-7.8	32.6	-2.8
Effect						
Returns to education	56.8	-2.1	58.9	-1.7	37.6	2.2
Gender wage gap	58.3	-0.6	59.5	-1.1	34.2	-1.2
Returns to experience	57.9	-1.0	60.1	-0.5	35.4	0.0
Unobservable factors	58.3	-0.6	60.0	-0.6	35.7	0.3
Hours of work	56.1	-2.8	59.1	-1.5	34.3	-1.1
Employment	58.5	-0.4	60.0	-0.6	35.2	-0.2
Education	57.5	-1.4	60.1	-0.5	34.7	-0.7
Other factors		-1.0		-1.3		-2.1

Average changes

Indicator	Earnings	Equivalent income	Poverty
1992 - 2005 observed	-9.9	-7.8	-2.8
Effect			
Returns to education	-2.1	-1.7	2.9
Gender wage gap	-0.6	-1.3	-1.7
Returns to experience	-0.8	-0.5	-0.3
Unobservable factors	-0.3	-0.6	0.6
Hours of work	-2.6	-1.2	-1.2
Employment	-1.4	-1.2	-1.4
Education	-2.0	-1.1	-1.2
Other factors	-0.2	-0.5	-0.5

Note: The earnings distribution includes those individuals with Yit > 0 and $Yit(kt') > 0$. The equivalent household labour income distribution includes those individuals with $Y^{q}it >= 0$ and $Y^{q}it(kt') >= 0$. Non-labour income is not considered.

Source: Author's calculations based on EPH and EIH of National University and DGEEC.

Table 3.14 Decomposition of the Change in the Gini Coefficient and Equivalent Household Income Poverty Rates Changing the Base Year, Paraguay, Selected Periods

	Earnings			Equivalent household income			Poverty		
	1992 - 1997/98	1997/98 - 2005	1992 - 2005	1992 - 1997/98	1997/98 - 2005	1992 - 2005	1992 - 1997/98	1997/98 – 2005	1992 - 2005
Observed	-3.6	-6.3	-9.9	-2.2	-5.6	-7.8	-7.9	5.1	-2.8
Effect									
Returns to education	0.4	-2.5	-2.1	-0.1	-1.5	-1.7	1.3	1.6	2.9
Gender wage gap	-0.4	-0.2	-0.6	-0.8	-0.4	-1.2	-1.4	-0.3	-1.7
Returns to experience	0.2	-0.9	-0.7	0.1	-0.5	-0.4	-0.9	0.6	-0.3
Unobservable factors	1.5	-1.8	-0.3	0.8	-1.4	-0.6	-0.5	1.1	0.6
Hours of work	-1.1	-1.5	-2.6	-0.4	-0.7	-1.2	-1.7	0.5	-1.2
Employment	-1.5	0.2	-1.3	-0.7	-0.5	-1.2	-2.1	0.7	-1.4
Education	-1.9	-0.1	-2.0	-1.3	0.2	-1.1	-1.5	0.3	-1.2
Other factors	-0.8	0.5	-0.3	0.3	-0.8	-0.5	-1.1	0.6	-0.5

Note: The earnings distribution includes those individuals with $Yit > 0$ and $Yit(kt') > 0$. The equivalent household labour income distribution includes those individuals with $Y^{q}it >= 0$ and $Y^{q}it(kt') >= 0$. Non-labour income is not considered.

Source: Author's calculations based on EPH and EIH of National University and DGEEC.

Returns to education

Table 3.14 confirms the assumption of Section 3. Changes in the returns to education had an unequalizing effect on the individual earnings distribution between 1992 and 1997/98 and a strong equalizing effect in the next seven years. The effects on the equivalent income distribution were similar. Over the whole period 1992-2005, changes in the returns to education (in terms of hourly wages) represented an important inequality-decreasing factor.

Gender wage gap

As expected, changes in the gender parameter of the wage equation implied an equalizing effect on the individual earnings distribution. During the last decade the gender gap has substantially reduced in size. Given that women earn less than men, that movement had an unambiguous inequality - decreasing effect on the earnings distribution. It is interesting to notice that the gender effect becomes more important in the equivalent household labour income distribution. Two factors combine to generate this result. First, female workers are more concentrated in the lower part of the distribution than men (mainly in rural area) and therefore a relative wage change implies a decrease in household income inequality. Second, a proportional wage increase for all females is more relevant in low-income families since women's earnings are a more significant part of the

total resources in those households than in rich families. A great example is the disproportionate number of poor households headed by working women. Consequently, its effect on poverty is a reduction.

Returns to experience
Changes in the returns to experience (age) implied an unequalizing effect on the earnings distribution during the period 1992-1997/98 and an equalizing effect in the next seven years. A brief explanation follows. The effects of changes in the returns to experience did not have direction and impact for all education levels. There was a clear equalizing effect for low education levels, unclear effects for medium education levels and an inequalizing effect for high educational levels. The empirical evidence shows that the increase of inequality in higher education levels outpaced equalizing effects for lower levels. Nevertheless, the equalizing effects for lower education levels do exist and are associated to higher incomes, so that poverty tends to reduce. Between 1997/98 and 2005 there is a more generalized equalizing effect, however, associated with income losses. So inequality decreased meanwhile poverty increased. Results for equivalent household income show the same patterns.

Unobservable Factors
Changes in endowments and returns to unobservable factors have implied unequalizing changes in wages in the 1992 – 1997/98 period, associated with poverty reduction and opposite effects over the next seven years, for both, earnings and equivalent household income.

Hours of Work
We carried out three simulations to assess the relevance of employment changes on inequality. In all of these the distribution in the base year is simulated using the parameters of the Tobit employment equation of the other year. In the *employment* and *participation* effects, people with non-positive simulated hours of work are assigned zero earnings, so they remain included in the data set. People who work in the simulation are assigned the actual base year wage and the simulated worked hours in the *employment* effect and the actual worked hours in the *participation* effect. The third simulation is intended to single out the impact of changes in hours worked. People who change labour status (*i.e*. we kept their current earnings) and change hours of work to individuals who work both in the base year and in the simulation, were ignored.

An equalizing employment effect shows up in the individual earnings and equivalent household income distribution for the whole period. Nevertheless, in the first period it is associated with poverty reduction (income increase for lower

earnings) and with a poverty increase in the second period. Notice that since we exclude those individuals with zero earnings from that distribution, the employment effect is basically the result of relative changes in the number of hours of work. The figures for the hours-of-work and participation effects confirm this assertion. As discussed in Section 3, the nineties witnessed a substantial increase in hours of work in general.

Employment
Labour participation grew fast after 1992, a period of economic growth and creation of new and additional labour opportunities. Consequently, inequality and poverty decreased during the first period, for earnings and equivalent household income. Part of these gains were lost after 1998, when the economy entered a period of recession. Middle classes rank first regarding income losses, so inequality and poverty increased after 1998, for both, earnings and equivalent household income. Nevertheless, losses of the second period were not as strong as the gains of the first, so the overall effect was an inequality and poverty reduction.

Education
Paraguay has witnessed important changes in the educational composition of its population since the implementation of educational reform was started in 1994. An inequality and poverty reduction for earnings and households, together with poverty reduction was the result for the first period. In the second period earnings distribution keeps getting better for labour income, but equivalent household income distribution unequalizes and poverty increases. This might be the result of the increase in workers with university level education at the same time as income losses for primary education.

Other factors and Interactions
The last row in Table 3.14 is calculated as a residual. It encompasses the effects of interaction terms and many factors not considered in the analysis. According to Table 3.14, in general, this term is lower than the mean of the other terms in the decomposition, implying either that the factors not considered in the analysis are not extremely important or that they tend to compensate each other.

3.6 Discussion

The results of the paper suggest that the smaller change in inequality between 1992 and 1997/98 is mainly the result of employment (including hours of work) and education effects, characterized by a primary schooling expansion. The stronger inequality reduction effect after 1997 is due to returns to education, hours of work (since unemployment increased) and unobservable factors. Maybe

the most interesting finding of the paper is, that the general trend of an inequality decrease (interrupted by the 2000 – 2002 economic crises) held over the observation period, finding a way to reduce inequality even during periods of poverty increase. Comparing the post-2002 period with 1997/98, we can see that in 2005, even if poverty was higher, inequality was lower. As shown above, labour market conditions in a mix-up of participation rates, unemployment, hours of work and returns to education are the mechanisms which helped to decrease inequality, as well as unobservable factors in the 1997/98 to 2005 period, however, poverty increased at the same time. Labour income in 2005, in general, was lower than in 1992 and income was lost over the whole distribution and, in a higher level for higher income groups, this is why inequality decreased. However, since income also decreased for the poor, some former non-poor workers of households fell below the poverty line, and are now what are known as "new-poor" households. Good inequality reduction policies should search the opposite output, inequality and poverty reduction at the same time.

One of the surprising findings of this paper is the extremely high returns to education in 1997/98. Education reform started in 1994 with primary education, so education reform results could not yet have had impact labour market in 1997/98. However, the decrease of returns to education after 1998 can be observed in relation to education reform, at least for secondary education. As labour force increases its human capital at a massive rate, returns to education tend to decrease. We checked for returns to education in 1999 and 2000/01 surveys. In both cases, returns to education are surprisingly high, although slightly lower than 1997/98 results. Consequently, there seems to be no measurement error. Returns to education fall sharply in 2002, just at the time of a deepening in the economic crisis. Thus, decreasing returns to education seem to be a mix of lower remuneration levels in all the economy and the results of education reform.

Changes of inequality at the equivalent household income level are difficult to understand. Nevertheless, they are included in this paper just to show that even if inequality changes related, for instance to labour participation, could be important at an individual level, their impact at the household level does not necessarily have to be the same. Interestingly, gender wage gap reductions have a strong poverty reduction impact at a household level. The chain of effects seems to be that the additional income for women, leaving everything else constant, also benefits female headed households, most of which live below the poverty line.

The same factor which explained inequality changes, employment, hours of work and education factors have the main impact on changes on income poverty

levels, as should be expected. Once more, the signs and the "rank" of these poverty estimates should be considered and not necessarily the magnitude of simulated changes in poverty, since their estimation method was not very sophisticated.

3.7 Conclusions

The decomposition methodology used in this paper can describe more completely the reasons for changes in aggregate income inequality within particular economies. A country may experience relatively little change in the overall level of income inequality despite significant changes in the composition of that inequality. Analyzing several countries during the same period of time, using this kind of inequality decomposition will produce more detailed results than cross country comparisons and might show how despite similar economic crisis and common trends in a given region and period of time, overall levels of and changes in income inequality remain distinct by country (Bourguignon, Ferreira, Lustig, 2005). Dion (2007) concludes from their comparison of several countries show that it seems likely that differences in inequality outcomes may reflect differences not only in endowments, prices and occupation effects, but also in policy decisions and priorities of different governments.

This paper contributes to an upcoming political discussion in Paraguayan development politics, which are starting to shift their focus somewhat away from poverty reduction politics towards inequality reduction politics, now understanding poverty in part, as a consequence of inequality. This contribution is appreciated by showing the results of a microeconometric decompositions methodology. This technique allows the assessment of the relevance of various factors that affected inequality during a period of 13 years, between 1992 and 2005.

This paper is not on Paraguayan poverty or inequality reduction politics. Nevertheless, some concluding comments on these can help to better understand the acquired results. The story we can tell, knowing Paraguayan politics, is that the impacts of market forces and business cycles have a stronger impact on Paraguayan inequality and poverty, than special policies do. This is, on the one hand, because there are very few of such policies and, on the other hand, most of these lack scale, so even if the political concept is adequate, impact cannot be created for problems of scale. Educational politics is one of the exceptions.

There are also structural problems in Paraguayan economy, with an informal sector of about 50% of the labour force, so any initiative taken by the government, for instance on legal minimum wage, will not have any impact on

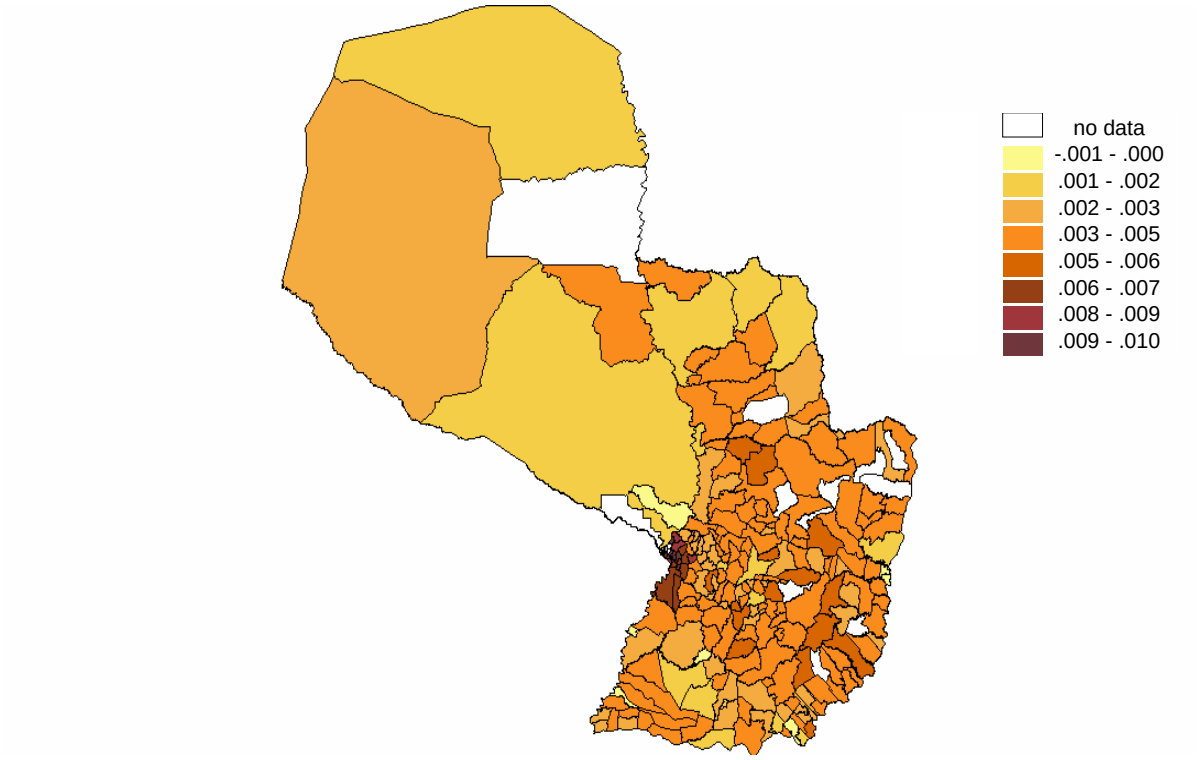
half of the labour force. These kinds of problems are strongly limiting possibilities for policies impact; just an example to better understand the importance of these kinds of phenomenon. In 2005, only 10% of the labour force had a labour income equal or above the legal minimum wage.

Consequently, if regional market forces and business cycles tell almost the whole story of inequality and poverty changes, we should better understand how this works. Labour income in Paraguay is much more than monetary income. It includes monetarized values for self consumption of agricultural products cultivated by farmers. In 1997, agricultural GDP growth was 2.2 times bigger than overall GDP growth. More than 35% of the labour force works in the agricultural sector. Cultivating land is almost the same amount of work (in hours) year after year, but if the harvest is good and prices are even better, for a small period of years, the returns to education (even for low educated small farmers) will be high for these years. Returns to education level benefit from an open economy in “good times”, but in “bad times” external shocks such as the Brazilian devaluation and the Argentine default strike even harder.

Thus, if social politics are necessary to reduce inequality, but economic and market forces are stronger in their negative impacts than positive impacts that could be generated by social politics, maybe protection mechanisms for vulnerable groups would be the necessary complement to social politics and research should focus on these issues.

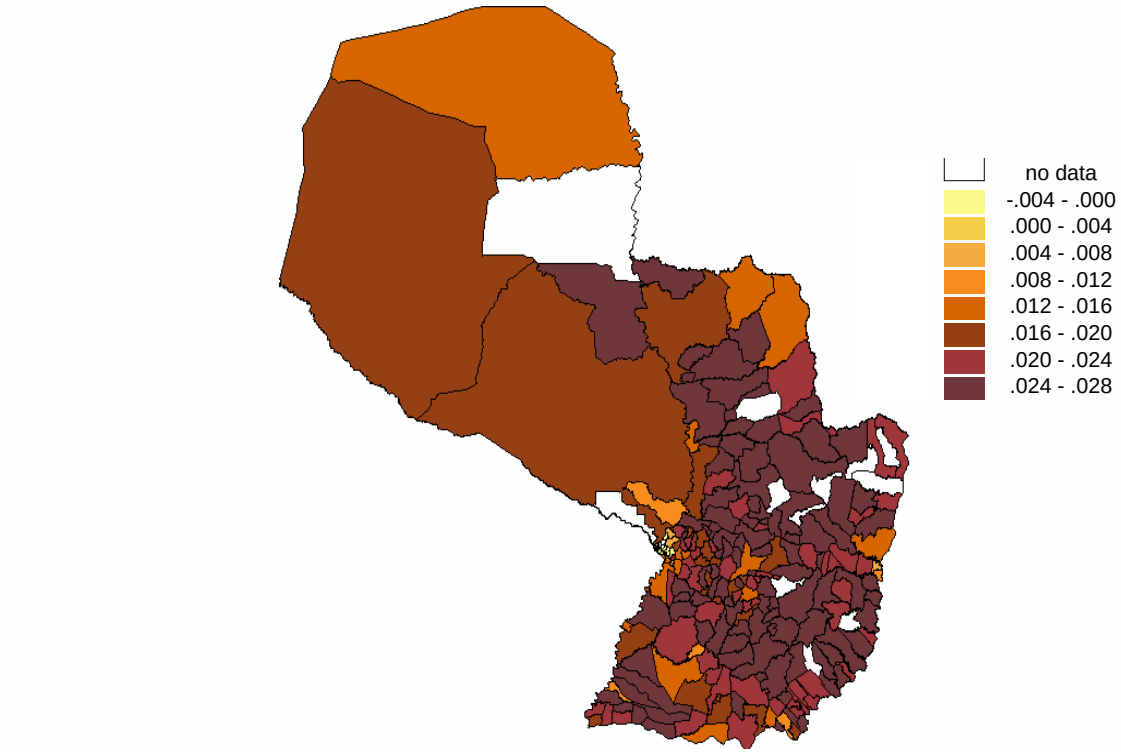
A - Annex to Chapter 1

Figure A1 Structured error per capita income estimates 1992 at district level



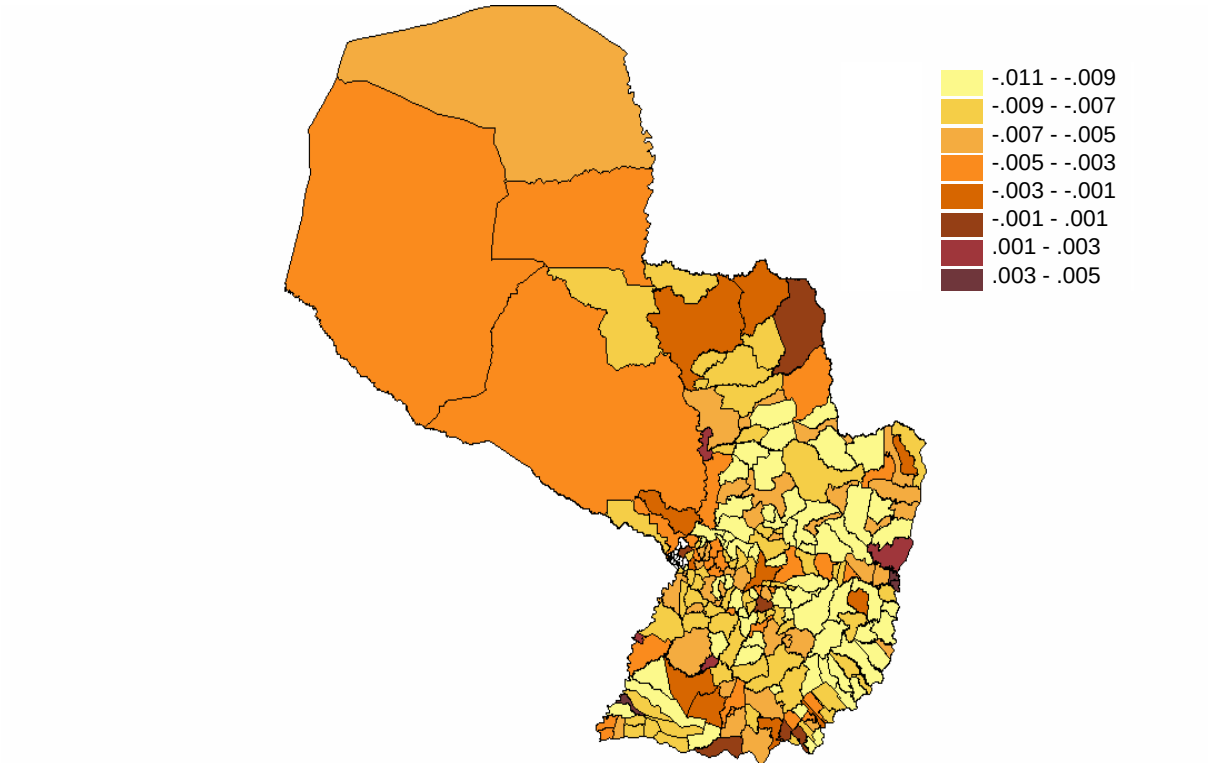
Source: Author's calculations based on ECV 1992 and CNPV 1992

Figure A2 Unstructured error per capita income estimates 1992 at district level



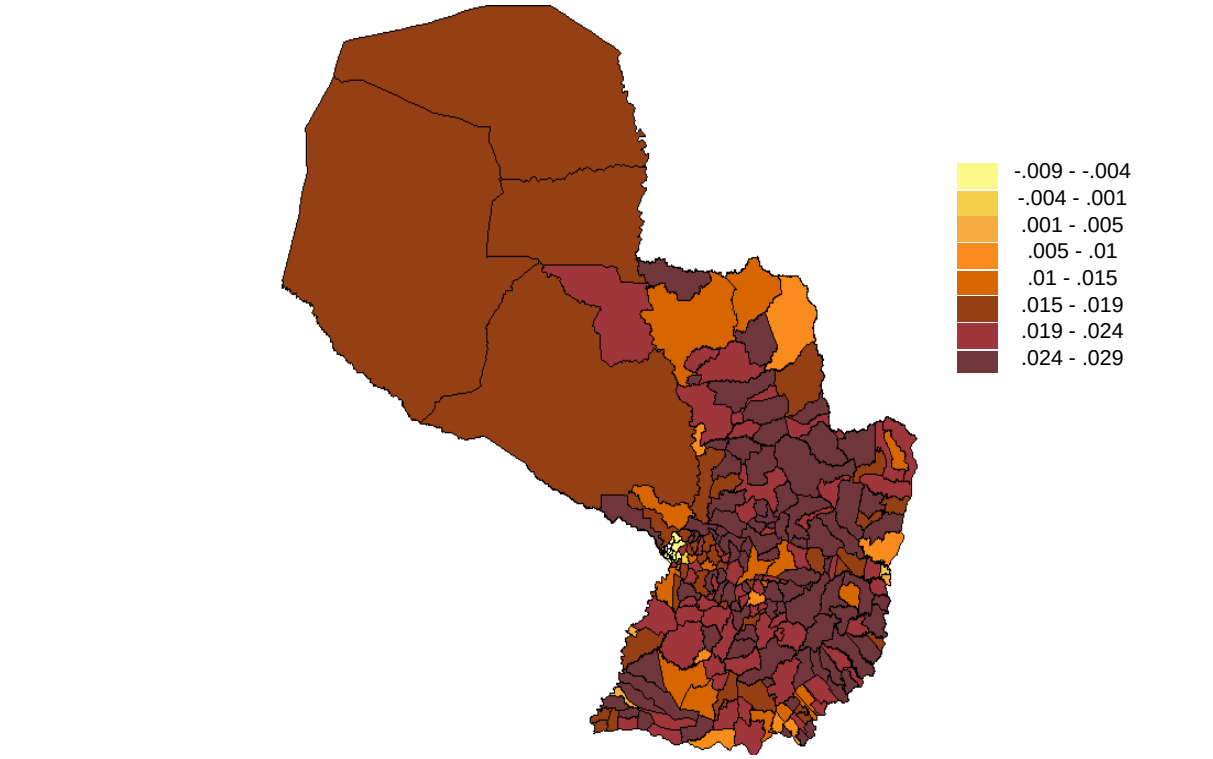
Source: Author's calculations based on ECV 1992 and CNPV 1992

Figure A3 Structured error per capita income estimates 2002 at district level



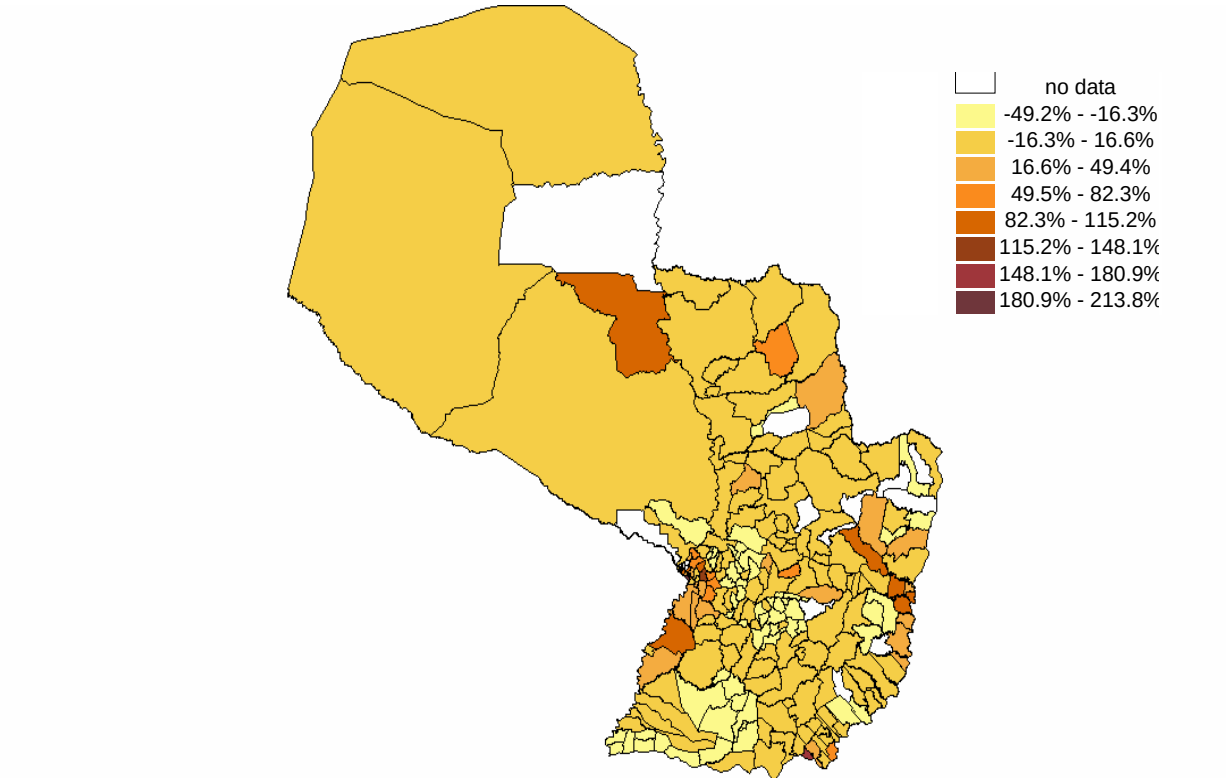
Source: Author's calculations based on EPH 2002 and CNPV 2002

Figure A4 Unstructured error per capita income estimates 2002 at district level



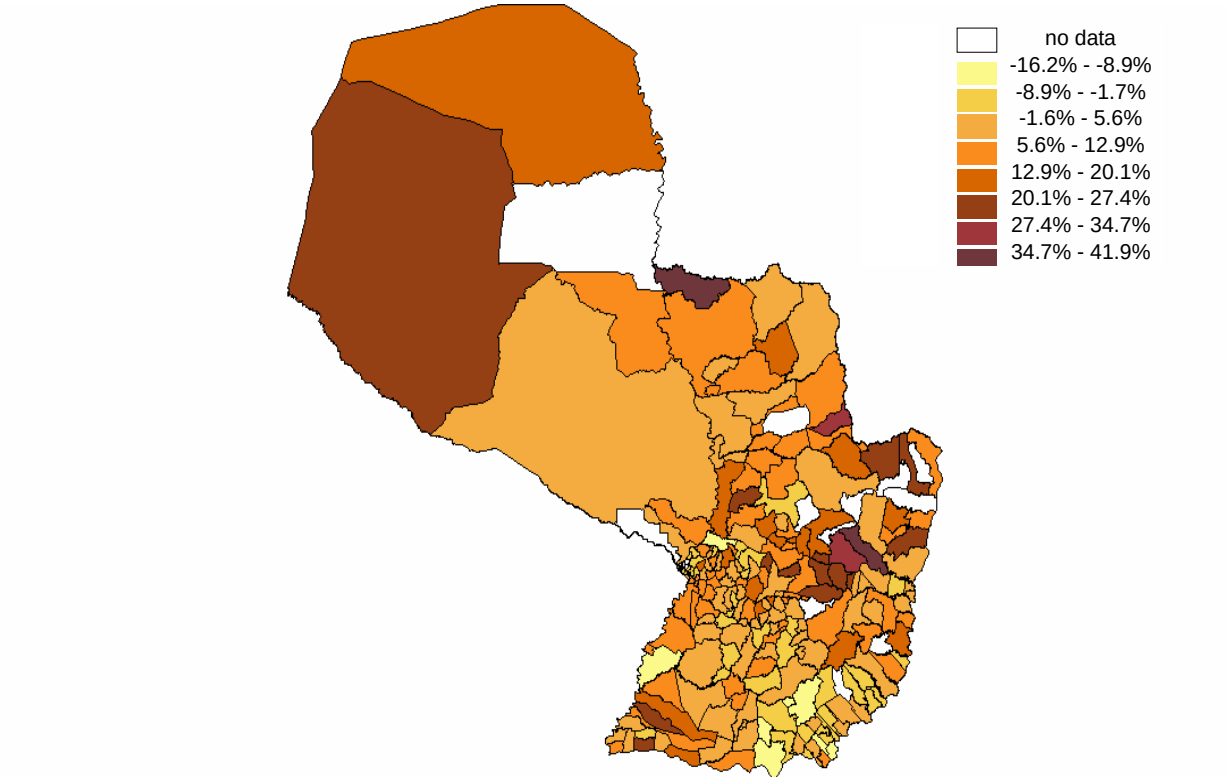
Source: Author's calculations based on EPH 2002 and CNPV 2002

Figure A5 Relative change in FGT0 per capita income – period 1992 – 2002 at district level



Source: Author's calculations based on ECV 1992, CNPV 1992, EPH 2002 and CNPV 2002

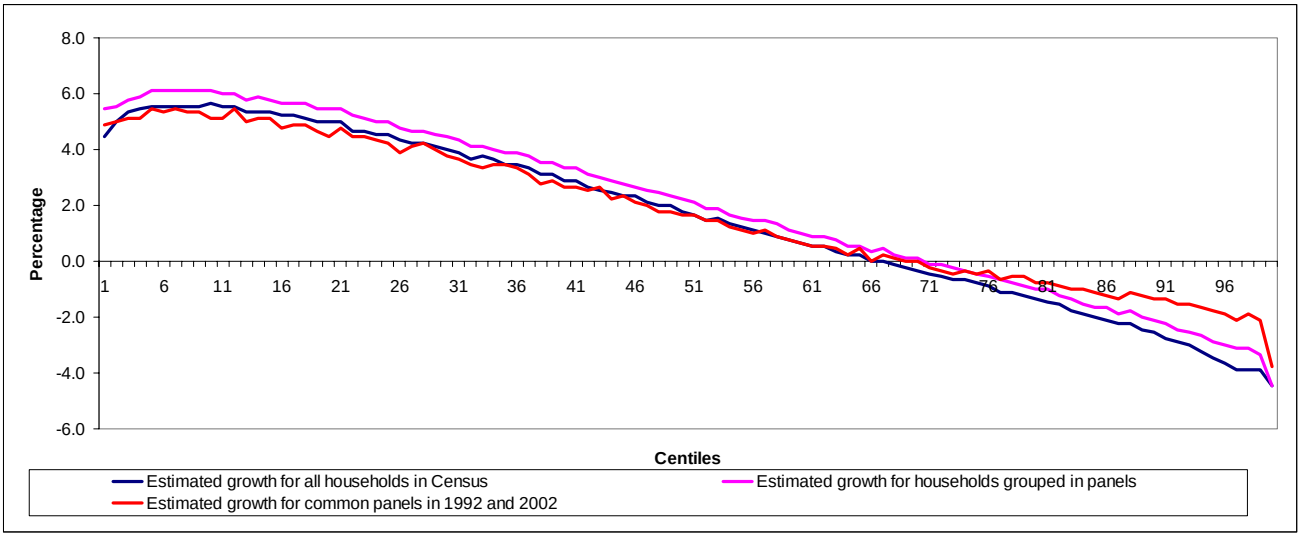
Figure A6 Relative change in Gini per capita income – period 1992 – 2002 at district level



Source: Author's calculations based on ECV 1992, CNPV 1992, EPH 2002 and CNPV 2002

B – Annex to Chapter 2

Figure A.1 Growth Incidence Curves Paraguay 1992 – 2002



Source: Author's calculations based on results in Chapter 1

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