

# Characterization of inequality changes through microeconomic decompositions

The case of Greater Buenos Aires \*

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This version: January 17, 2002

## Abstract

We apply a variant of the microeconomic decomposition methodology proposed in Bourguignon *et al.* (1998) to assess the relevance of various factors that affected inequality in the period 1986-1998 in the Greater Buenos Aires area. The results of the paper suggest that the small change in inequality between 1986 and 1992 was the result of mild forces that compensated each other. In contrast, between 1992 and 1998 nearly all factors had some role in increasing inequality to unprecedented levels. The increase in the returns to education, changes in endowments of unobservable factors and their remunerations, and the fall in hours of work by low-income people are particularly important to explain the growth in inequality in the nineties. In contrast, although Argentina witnessed dramatic changes in the gender wage gap, the unemployment rate and the educational structure, these factors appear to have had only a mild effect on the household income distribution.

*Keywords:* inequality, decomposition, education, earnings, unemployment, Argentina.

*JEL Classification:* C15, D31, I21, J23, J31

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\* This article is part of a project on income distribution financed by Convenio Ministerio de Economía de la Provincia de Buenos Aires - Facultad de Ciencias Económicas de la Universidad Nacional de La Plata. We thank the financial support of these institutions. We are grateful to the editors of this volume and seminar participants at Universidad Nacional de La Plata, Universidad T. Di Tella, the LACEA meetings in Rio de Janeiro, the meetings of the Asociación Argentina de Economía Política in Córdoba and the Hewlett Foundation Conference at UCLA for helpful comments and suggestions. We also thank Verónica Fossati and Alvaro Mezza for efficient research assistance. All opinions and remaining errors are responsibility of the authors.

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## 1. Introduction

The main economic variables have widely oscillated in the last two decades in Argentina in association with deep macroeconomic and structural transformations. After reaching a peak of 172% monthly in 1989, the inflation rate decreased to less than 1% yearly in a few years; GDP drastically fell at the end of the eighties and then grew at unprecedented rates in the first half of the nineties; unemployment rose steadily from around 5% to 14% in a short period of time. Income inequality was not an exception in this turbulent period. The Gini coefficient increased from 41.9 to 46.7 between 1986 and 1989, fell to 40.0 towards 1991, and rose steadily in the following 7 years, reaching a record level of 47.4 in 1998.<sup>1</sup> It is difficult to find in recent economic history periods with such marked changes in inequality, in Argentina as well as in the rest of the world.

The reasons of these changes in inequality are varied and complex. The main aim of this paper is to assess the relevance of some forces that are believed to have affected income inequality in the Greater Buenos Aires area between 1986 and 1998. More specifically, the microeconomic decomposition methodology proposed by Bourguignon, Ferreira and Lustig (1998) is used to measure the relevance of various factors that appear to have driven changes in inequality. In particular, this methodology is used to identify to what extent changes in the returns to education and experience, in endowments of unobservable factors and their returns, in the wage gap between men and women, in labor 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 the paper suggest that the observed similarity between the inequality indices of 1986 and 1992 is in fact the consequence of mild forces that operated in different directions, but compensated each other in the aggregate. On the contrary, between 1992 and 1998 nearly all the determinants under study have contributed to increase inequality. The increase in the returns to education, a higher dispersion in the endowments and/or the returns to unobservable factors and the dramatic fall in the hours of work of less-skilled low-income people appear to be the dominating forces. Perhaps surprisingly, neither the narrowing of the gender wage gap nor the increase in average education of the population were significant equalizing factors. Also, the dramatic jump in unemployment in the nineties does not appear to have had a very significant direct effect on household income inequality.

The rest of the paper is organized as follows. Section 2 shows the basic facts and discusses some factors that might have affected inequality in the last two decades. Section 3 presents the decomposition methodology implemented to assess the relevance of those factors,

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<sup>1</sup> These values correspond to the distribution of the equivalent household income in Greater Buenos Aires. All figures in this paper are calculated from the Permanent Household Survey (Encuesta Permanente de Hogares, EPH) for the Greater Buenos Aires area, since data for the rest of urban Argentina is available only from the beginning of the nineties. Following Buhmann *et al.* (1988) the equivalent household income is obtained by dividing household income by the number of equivalent adults (taken from the National Institute of Statistics and Census (INDEC)) raised to .8, a parameter which implies mild household economies of scale.

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.

## 2. Income inequality: basic facts and sources of changes

Income inequality in Argentina has fluctuated considerably around an increasing trend initiated in the mid-seventies. Figure 2.1 shows the Gini coefficient of equivalent household income between 1985 and 1998 in the Greater Buenos Aires area.<sup>2</sup> After a substantial increase in the late eighties, inequality plunged in the first two years of the nineties. A new stage of rising inequality started in 1992 and has not stopped yet. The Greater Buenos Aires has never experienced the level of income inequality reached in 1998, at least since reliable household data sets are available.<sup>3</sup>

For simplicity this study is focused on three years of relative macroeconomic stability separated by equal intervals: 1986, 1992 and 1998. Also, we restrict the analysis to labor income mainly for two reasons.<sup>4</sup> (i) The Permanent Household Survey (EPH) has various deficiencies in capturing capital income, and (ii) modeling capital income and retirement payments is not an easy task, especially considering the scarce information contained in the EPH. We also ignore those households whose heads or spouses are older than 65 or receive retirement payments.

Table 2.1 shows the basic facts to be characterized in the paper: inequality in individual labor income and in equivalent household labor income, as measured by the Gini, did not change very much between 1986 and 1992; on the contrary, both measures rose dramatically in the next six years.<sup>5,6</sup>

A countless number of factors may have caused the changes in inequality documented in table 2.1. We will concentrate in seven of them: (i) returns to education, (ii) the gender wage gap, (iii) returns to experience, (iv) the dispersion in the endowment of unobservable factors and their returns, (v) hours of work, (vi) employment, and (vii) the education of the working-able population. The objective of this paper is to estimate the sign and the relative magnitude of the effect of these factors on the earnings and equivalent household labor income distributions. Although microeconomic decompositions will be used to that aim, we

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<sup>2</sup> The use of other indices do not change the main conclusions driven from the graph. See Gasparini and Sosa Escudero (2001).

<sup>3</sup> These broad trends are also reported by other authors. See Altimir, Beccaria and González Rozada (2001), Gasparini, Marchionni and Sosa Escudero (2001), Lee (2000) and Llach and Montoya (1999).

<sup>4</sup> Labor income comprises wage earnings and self-employed earnings.

<sup>5</sup> All households with valid incomes (including those with no income) are considered in the equivalent household labor income statistics. Ignoring those with zero income does not alter the main results (see our companion paper, Gasparini, Marchionni and Sosa Escudero (2000)). As usual, only workers with positive earnings are included in the individual labor income statistics. Results in table 2.1 are robust to changes in inequality indices (see our companion paper).

<sup>6</sup> Gasparini and Sosa Escudero (2001) use bootstrap methods to show that it is possible to reject the null hypothesis that the Gini coefficients of 1986 and 1998 are equal. While the same is true for 1992 and 1998, one cannot reject the null hypothesis that the Gini coefficients of 1986 and 1992 are equal.

start the analysis in this section with basic statistics and regressions to get some intuitions about the results, and to understand the need and usefulness of a microsimulation decomposition technique.

### 2.1. 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 earnings and probably a more unequal distribution of household income.<sup>7</sup> Table 2.2 shows hourly earnings in real pesos for workers between 14 and 65 years old. The average wage fell 19% between 1986 and 1992 and increased 9.3% in the next six years. Changes were not uniform among educational groups. While in the first period of the analysis the most dramatic drop in hourly earnings was for the *college complete* group, that group enjoyed the greatest increase in wages during period 1992-1998. Table 2.2 is a first piece of evidence that changes in relative wages among schooling groups implied a decrease in earnings inequality between 1986 and 1992 and an increase thereafter.

Table 2.3 shows the results of Mincerian log hourly earnings 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. Since the EPH does not record years of education we include dummies that capture the maximum educational level achieved. The omitted category is primary incomplete. A gender dummy, age and age squared and a dummy for youths less than 18 years old (only relevant for other members) are also included in the regression. In addition to those 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.* (2001) it is assumed that labor market participation choices are made within the household in a sequential fashion. Spouses take the heads labor market status into consideration to decide whether to enter the labor market or not. Other members of the family consider both the head and the spouse labor market status.

The coefficients of most educational levels are positive, significant and increasing with the educational level, that is, the returns to education are always positive.<sup>8</sup> For family heads in 1998, an individual with complete elementary school had an hourly wage 18% greater than an individual with incomplete elementary education, keeping all other factors constant. The same figure for incomplete high school, complete high school, incomplete college and complete college education is 36%, 65%, 94% and 146%, respectively, all with respect to the base category. It is interesting to observe that in many cases returns to education are increasing,

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<sup>7</sup> Throughout the paper *wage* refers to hourly labor income earned by wage-workers and self-employed workers.

<sup>8</sup> We refer as *returns to education* the change in hourly wages due to a change in the educational level (and not in years of education). It takes around 7 years to complete the primary school, 5 or 6 additional years to complete high-school and around 5 years to complete college.

that is, the hourly wage gap between educational levels increases with education.<sup>9</sup> For the case of family heads in 1998 the difference in wages between an individual with complete elementary school and one with incomplete high school is 18%, whereas the difference between this level and complete high school is 29%. The greatest jump is between incomplete and complete college: 52%.

Figure 2.2 shows predicted hourly earnings for all different educational levels. The first panel refers to male heads and the second to other male members, both with age kept constant at 40. 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 between 1992 and 1998 in the highest educational levels. This certainly contributes to increase earnings inequality among household heads. For male other-members the wage-education profile became flatter between 1986 and 1992 and substantially more steeper and convex in the next 6 years. The latter movement could imply a dramatic widening of the earnings gap by educational level.

Figure 2.3 shows the profiles for 40 years old females. As in the case of men the wage-education profiles show a decreasing slope between 1986 and 1992, and an opposite movement between 1992 and 1998. The increase in convexity in 1998 is particularly evident for other members.

Summarizing, changes in the returns to education seems to have been mildly inequality-reducing between 1986 and 1992 and strongly inequality-increasing in the next 6 years. That is nearly all we can say with basic statistics and regressions. To get a more complete assessment of the relative relevance of these effects on the income distribution we need to go beyond this simple analysis. Sections 3 to 5 present a microsimulation methodology that building from the results of this section allows a richer analysis.

## 2.2. Gender wage gap

Table 2.4 presents mean hourly wages by gender. Wages were higher for males in every year. In 1986 males' hourly wages were on average 16% higher than females'. The gender gap narrowed to 3% in 1998. A conditional analysis also shows a shrinking wage gap for household heads. From table 2.3 the coefficients of the male dummy in the regression for household heads are always positive and significant, but clearly decreasing over time.<sup>10</sup> This narrowing gender wage gap has undoubtedly been an equalizing factor on the earnings distribution.

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<sup>9</sup> The increasing returns to education could be due to a selectivity bias in the schooling decision. High-ability people have less costs of acquiring knowledge, and hence are more prone to make a higher human capital investment.

<sup>10</sup> Surprisingly, the time pattern is the opposite for other members of the household. However, since the number of working individuals in this group is much smaller than in the household heads group, the global conclusion of a narrowing gender wage gap holds.

The effect of that phenomenon on the equivalent household labor income distribution basically depends on the relative position of working women in that distribution. Two factors play in different directions. On the one hand female workers are more concentrated in the upper part of the distribution than men (partly because of their own labor decisions), and hence a relative wage change in favor of women implies an increase in household income inequality.<sup>11</sup> On the other hand, a proportional wage increase for all females is more relevant in low-income families since women's earnings are a more significant part of total resources in those households than in rich families. An extreme example is the disproportionate number of poor households headed by working women. The total effect of a shrinking gender wage gap on the household income distribution is then ambiguous. We need a more powerful methodology to get a more precise assessment of that effect.

### *2.3 Returns to experience (age)*

Age is used as a proxy for experience in the labor market. The coefficients of age and age squared in the log hourly earnings equation of table 2.3 suggest an inverted-U shaped wage-age profile. The comparison between 1986 and 1998 reveals no major changes in the returns to experience. In contrast, the relevant coefficients did change in sub-periods 86-92 and 92-98. For instance, between 1992 and 1998 the wage-age profile for heads and spouses changed in favor of workers older than 50. Since the mean hourly wage of this group is somewhat lower than the overall mean, in principle we expect a mild equalizing effect on the earnings distribution.<sup>12</sup> Older workers are better located in the equivalent household income distribution than in the earnings distribution, perhaps due to smaller families, so the effect of the change in the returns to experience on that distribution is not clear.<sup>13</sup> The results of the section 5 will help us to assess the quantitative relevance of these arguments.

### *2.4 Unobservables*

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 2.3 reports the standard deviation of the error terms of each log hourly earnings equation (labeled as "sigma"). For instance, for household heads the

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<sup>11</sup> While 44% of working women are in the highest-income quintile of the equivalent household labor income distribution, only 25% of men are in that quintile (GBA, 1998). On the other extreme 6% of working women are in the lowest-income quintile while 9% of men are there.

<sup>12</sup> In 1998 mean wage for workers between 50 and 60 was 86% of the overall mean.

<sup>13</sup> For instance, while 22% of working household heads in their fifties are in the richest quintile of the earnings distribution, 28% are in the top quintile of the equivalent household labor income distribution (GBA, 1998). Instead, for working household heads in their thirties the figures are 36% and 28%.

standard deviation took a value of .56 in 1986, .57 in 1992, and .64 in 1998. The substantial increase between 1992 and 1998 is also present in the spouses and other members equations. According to these results the effect of changes in unobservable factors would have been mildly unequalizing between 1986 and 1992, and substantially unequalizing in the next 6 years period.

### *2.5. Hours of work*

The period under analysis has witnessed a slight fall in weekly hours of work: 1 hour between 1986 and 1992 and less than half an hour in the next six years. That fall was not uniform across workers. Table 2.5 classifies workers by educational level and records the average hours of work of each group. While there is not a clear pattern of changes between 1986 and 1992, the nineties have witnessed a dramatic fall in hours of work by low-education workers. This change would have a non-negligible unequalizing effect on the earnings and income distributions.

A conditional analysis yields similar results. Figure 2.4 shows predicted weekly hours of work for male heads and female spouses from the Tobit censored data model presented in table 2.6. While hours clearly decreased between 1986 and 1998 for the less-educated male heads workers, changes in hours for the rest of the educational groups were only marginal. The fall in hours of work for low-educated female spouses was also greater than for the rest of the groups.

### *2.6. Employment*

Household income inequality can change not only after changes in hours of work but also as a result of changes on the extensive margin of the labor market. This is a particularly interesting point to study in the Argentinean case, since the dramatic jump in the unemployment rate in the nineties is thought to be the main responsible of the increase in inequality by many analysts.

In table 2.7 adults are grouped according to whether they are employed, unemployed or out of the labor force (inactive). The percentage of unemployed individuals rose from 2.3% in 1986 to 6.5% in 1998.<sup>14</sup> The major increase took place between 1992 and 1998. However, notice that the increase in unemployment was accompanied by a decrease in inactivity of roughly the same magnitude. Despite the jump in the unemployment rate, the proportion of working-able people with zero income remained roughly unchanged between 1986 and 1998. Notice that for inequality measures it is irrelevant whether the individual has zero income because she is unemployed or because she is not looking for a job. Hence, it is likely that

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<sup>14</sup> This implies an unemployment rate of 3.8% in 1986 and 9.9% in 1998. These figures refer to our restricted sample. The unemployment rates reported by INDEC for the whole country are somewhat higher.

aggregate changes in labor market participation might not have played a significant role on inequality changes.<sup>15</sup>

Table 2.7 suggests three different stories in the labor market for heads, spouses and other members. Some household heads lost or quit their jobs, especially in the last 6 years, becoming either unemployed or out of the labor force. In contrast many of the spouses left their homes in search of a job: most of them found one between 1986 and 1992, but some of them did not in the 1992-1998 period. The other members of the family were less lucky: nearly all of them who started to look for a job became unemployed (or displaced another individual in that category).

Summing up, while differential changes in hours of work seem to have had a significant unequalizing effect on the earnings distribution, and hence probably on the household labor income distribution, the effect of changes in the employment rates seems to have been minor.

## 2.7. Education

In Argentina, as in many developing countries, substantial changes in the educational composition of the population have been taking place in the last decades. Table 2.8 presents the proportion of individuals between 14 and 65 years old by educational level. Between 1986 and 1998 there was a strong contraction in the proportion of youths and adults with elementary education (both complete and incomplete). Simultaneously, the share of individuals in all other educational groups increased, particularly in the secondary group between 1986 and 1992, and in the college group between 1992 and 1998.

To understand the effects of these changes it is useful to think overall inequality as a function of inequality between educational groups and a weighted average of inequality within educational groups. An increase in the share of a given educational group in the population can be inequality-increasing (i) if the mean income of that group is far from the overall mean (or median), so between inequality grows, and (ii) if within inequality for that group is high, so the weighted average of within inequalities goes up. In Argentina the educational structure has changed in the nineties in favor of a group with an earnings distribution with a relatively high mean and dispersion - the college group -, which feeds the presumption of an unequalizing education effect on the earnings and income distribution, operating through both of the mentioned channels.<sup>16</sup> The first channel is linked to Kuznets (1955): 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, it is likely that inequality grows as the average

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<sup>15</sup> Furthermore, there are no signs that the strong increase in unemployment has translated into a disproportionately increase in adults with no income in any of the educational groups. The results of the selection equations in table 2.3 are in line with this conclusion. See Gasparini *et al.* (2000) for more on that.

<sup>16</sup> Between 1986 and 1992 the greatest increase in share was for adults with complete or incomplete secondary school, a group with wages close to the mean and with relative low dispersion, so we expect an equalizing education effect on the earnings distribution.

education of the population increases, at least until the high education group is relatively large. The second channel lies on the convexity of the returns to education, which implies higher wage dispersion for the group of highly educated people.

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 where 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 compared to other factors? The next section presents a framework to tackle these questions.

### 3. The methodology

To assess the relevance of the various factors discussed in the previous section on income inequality changes, we adapt the microeconomic decomposition methodology first proposed by Bourguignon, Ferreira and Lustig (1998) to our case.<sup>17</sup>

Let  $Y_{it}$  be individual's  $i$  labor income at time  $t$ , which can be written as a function  $F$  of the vector  $X_{it}$  of individual observable characteristics affecting wages and employment, the vector  $\varepsilon_{it}$  of unobservable characteristics, the vector  $\beta_t$  of parameters that determine market hourly wages and the vector  $\lambda_t$  of parameters that affect employment outcomes (participation and hours of work).

$$(1) \quad Y_{it} = F(X_{it}, \varepsilon_{it}, \beta_t, \lambda_t) \quad i=1, \dots, N$$

where  $N$  is total population. The distribution of individual labor income can be represented as<sup>18</sup>

$$(2) \quad D_t = \{Y_{1t}, \dots, Y_{Nt}\}$$

We can simulate individual labor incomes by changing one or some arguments in equation (1). For instance, the following expression represents labor 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.

$$(3) \quad Y_{it}(\beta_{t'}) = F(X_{it}, \varepsilon_{it}, \beta_{t'}, \lambda_t) \quad i=1, \dots, N$$

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<sup>17</sup> See also Altimir *et al.* (2001), Bourguignon *et al.* (2001) and the contributions to this volume.

<sup>18</sup> It is usual to restrict this distribution to those individual with  $Y_{it} > 0$ . We follow that practice in the empirical implementation.

More generally, we can define  $Y_{it}(k_{t'})$  where  $k$  is any set of arguments in (1). Hence, the simulated distribution will be

$$(4) \quad D_t(k_{t'}) = \{Y_{1t}(k_{t'}), \dots, Y_{Nt}(k_{t'})\}$$

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 (2) and (4). Although we can make the comparisons in terms of the whole distributions, in this paper we compare inequality indices  $I(D)$ . Therefore, the effect of a change in argument  $k$  on the earnings distribution is given by

$$(5) \quad I(D_t(k_{t'})) - I(D_t)$$

As it was discussed in the previous section this paper is devoted to discuss the following effects:

- (i) *Returns to education* ( $k = \beta^{ed}$ ): it measures the effect of changes in the parameters that relate education to hourly wages ( $\beta^{ed}$ ) on inequality.
- (ii) *Gender wage gap* ( $k = \beta^g$ ): the same as (i) but with gender instead of education.
- (iii) *Returns to experience* ( $k = \beta^{ex}$ ): the same as (i) but with experience (age).
- (iv) *Endowment and returns to unobservable factors* ( $k = \varepsilon^w$ ): it measures the effect of changes in the unobservable factors and their remunerations affecting hourly wages ( $\varepsilon^w$ ) on inequality.
- (v) *Hours of work and employment* ( $k = \lambda$ ): it measures the effect of changes in the parameters that determine hours of work and labor market participation ( $\lambda$ ) on inequality.
- (vi) *Education* ( $k = X^{ed}$ ): it measures the effect of changes in the educational levels of the population ( $X^{ed}$ ) on inequality.

The previous discussion refers to the distribution of 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 her own earnings but on her household income and demographic composition. Equivalent household income for each individual in household  $h$  in time  $t$  is defined as

$$(6) \quad Y_{ht}^q = \sum_{j \in ht} (Y_{jt} + Y_{jt}^0) / \left( \sum_{j \in ht} a_{jt} \right)^\theta \quad h=1, \dots, H$$

where  $Y^q$  stands for equivalent household income,  $h$  indexes households,  $Y^0$  is income from other sources,  $a$  stands for the equivalent adult of each individual and  $\theta$  is a parameter that

captures household economies of scale. The distribution of equivalent household income for the population of  $N$  individuals can be expressed as

$$(7) \quad D_t^q = \{Y_{1t}^q, \dots, Y_{Nt}^q\}$$

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

$$(8) \quad Y_{ht}^q(k_{t'}) = \sum_{j \in ht} (Y_{jt}(k_{t'}) + Y_{jt}^0) / \left( \sum_{j \in ht} a_{jt} \right)^\theta \quad h=1, \dots, H$$

Hence, the simulated distribution is

$$(9) \quad D_t^q(k_{t'}) = \{Y_{1t}^q(k_{t'}), \dots, Y_{Nt}^q(k_{t'})\}$$

The effect of a change in argument  $k$ , holding all else constant, on equivalent household income inequality is given by

$$(10) \quad I(D_t^q(k_{t'})) - I(D_t^q)$$

#### 4. Estimation strategy

In order to compute expressions (5) and (10) we need to have estimates of parameters  $\beta$  and  $\lambda$  and the residual terms  $\varepsilon$ . Also, since we do not have panels we need a mechanism to replicate the structure of observable and unobservable individual characteristics of one year into the population of another year. This section is devoted to explain the strategies to deal with these problems.

##### *Estimation of $\beta$ and $\lambda$*

Let's denote with  $L_i$  the number of hours worked by person  $i$ , and with  $w_i$  the hourly wage perceived. Total labor income is given by  $Y_i = L_i \cdot w_i$ . The number of hours of work  $L_i$  comes from a utility maximization process, which determines optimal participation in the labor 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 *et al.* (2001), which corresponds to the reduced form of the labor decisions model originally proposed by Heckman (1974). In this work, Heckman shows how it is possible to derive an estimable reduced form starting from a structural system obtained from a utility maximization

problem of labor-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 fashion (denoted as  $w^*$ ) are to be interpreted as marginal valuations of labor, 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 labor 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 her personal characteristics.

This discussion suggests how to determine wages asked by individuals. In parallel it is possible to model market determinants of wages offered ( $w$ ) as 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 behavior in which wages offered and asked depend on the number of hours of work. 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 ( $X_1$ ) and hours ( $X_2$ ), which may or may not have elements in common. The error terms  $\varepsilon_1$  and  $\varepsilon_2$  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 offered wage is smaller than the salary asked. Consequently, the reduced form model for wages and hours of work is specified as:

$$(11) \quad w_i^* = X_{1i}\beta + \varepsilon_{1i} \quad i = 1, \dots, N$$

$$(12) \quad L_i^* = X_{2i}\lambda + \varepsilon_{2i}$$

with

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

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

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

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

where  $w_i$  and  $L_i$  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  $\varepsilon_{i1}$  and  $\varepsilon_{i2}$  have a bivariate normal distribution with  $E(\varepsilon_{i1})=E(\varepsilon_{i2})=0$ , variances  $\sigma_{12}$  and  $\sigma_{22}$  and correlation coefficient  $\rho$ . This particular specification corresponds to the ‘‘Tobit type III’’ model in Amemiya’s (1985) classification.

Even though it is possible to estimate all the parameters using a full information maximum likelihood method, we adopted a limited information approach, which has notorious computational advantages. If instead of hours of work we had only 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 labor supply equation, simply indicating whether the individual works or not. Table 2.3 shows the estimation results of these equations for our case.

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 (see table 2.6). This strategy is consistent though not fully efficient. In any case, the efficiency loss is not necessarily significant for a small sample.

### *Unobservables*

Unobservable characteristics affecting wages are modeled as regression error terms of the wage equation (11). 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 unobservables between  $t$  to  $t'$  on inequality, the estimated residuals of the wage equation of year  $t$  are rescaled by  $\sigma_{t'}/\sigma_t$ , where  $\sigma$  is the estimated standard deviation of the wage equation.<sup>19</sup>

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 (11)-(12) to estimate the unobservables. For each individual in that situation we assign as ‘‘error term’’ a random draw from the bivariate normal distribution implicit in the wage-labor supply model (11)-(12), whose parameters are consistently estimated by the

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<sup>19</sup> It is important to remark 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 of unobservables on wages come through the variance. Machado and Mata (1998) allow for heterogeneous behavior of the error term using quantile regression methods.

Heckman procedure. 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 of work (so the prediction is inconsistent with observed behavior 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. Instead of following Bourguignon *et al.* (2001) and estimating a parametric equation that relates individual educational level to other individual characteristics (basically age and gender), we apply a rough non-parametric mechanism. We divide the adult population in ten homogeneous groups by gender and age and then we replicate the educational structure of a given cell in year  $t'$  into the corresponding cell in year  $t$ .

## **5. Results**

This section reports the results of performing the decompositions described in section 3 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 2 on inequality changes in period 1986-1998.

Before showing the results two explanations are in order. First, the decompositions are path dependent. Hence, we report the results using alternatively  $t$  and  $t'$  as the base year. Second, the simulations are carried out for the whole distribution. To save space we only show the results for the Gini coefficient. There are not significant variations when other indices are used.<sup>20</sup>

Tables 5.1 to 5.3 show the results both with  $t$  and  $t'$  as base years. Table 5.4 reports the average of these results.<sup>21</sup> 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 earnings distribution in the 1992-1998 period (column (ii)) is 2.9. This roughly means that the Gini would have increased 2.9 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 2.9 tells us two things: (i) since it is a positive number, it implies that the returns-to-education effect was inequality-increasing, and (ii) since it is large

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<sup>20</sup> See Gasparini *et al.* (2000).

<sup>21</sup> According to table 5.4, the observed Gini coefficient of the individual earnings distribution grew 7.2 points between 1992 and 1998. The returns-to-education in column (ii) is 2.9. This is the average over two numbers: (i) the difference between the Gini that results from applying 1998 vector  $\beta^{ed}$  of educational dummies to the 1992 distribution and the actual Gini in 1992, and (ii) the difference between the actual Gini in 1998 and the Gini that results from applying 1992 vector  $\beta^{ed}$  to the 1998 distribution.

compared to the other numbers in the column, it indicates that the change in returns to education was a very significant factor affecting inequality in the distribution of earnings.

*Table 5.4*  
*Decomposition of the change in the Gini coefficient*  
*Average results changing the base year*  
*Greater Buenos Aires, 1986, 1992 and 1998*

	<i>Earnings</i>			<i>Equivalent household income</i>		
	86-92	92-98	86-98	86-92	92-98	86-98
	(i)	(ii)	(iii)	(iv)	(v)	(vi)
<i>Observed</i>	-1.7	7.2	5.5	0.7	8.5	9.2
<i>Effects</i>						
1. Returns to education	-1.0	2.9	1.8	-0.9	2.8	1.8
2. Gender wage gap	-1.0	-0.4	-1.4	0.1	-0.1	0.0
3. Returns to experience	1.7	-0.9	0.4	-0.5	0.7	0.3
4. Unobservables	0.5	2.0	2.5	0.4	1.7	2.1
5. Hours of work	-0.4	2.5	2.2	1.0	1.8	3.0
6. Employment	0.0	-0.1	0.0	-0.1	0.1	-0.1
7. Education	-0.6	0.3	-0.2	0.2	0.5	0.9
8. Rest	-0.9	0.9	0.2	0.5	0.8	1.2

Source: Author's calculations based on the EPH, GBA, October.

Note: The earnings distribution includes those individuals with  $Y_{it} > 0$  and  $Y_{it}(k_t) > 0$ . The equivalent household labor income distribution includes those individuals with  $Y_{it}^q \geq 0$  and  $Y_{it}^q(k_t) \geq 0$ . Non-labor income is not considered.

The rest of this section is devoted to study the effects on the earnings and equivalent household labor income distributions of the seven factors that were isolated in section 2, with the help of tables 5.1 to 5.4.

### *1. Returns to education*

Table 5.4 confirms the presumptions of section 2. Changes in the returns to education had an equalizing effect on the individual labor income distribution between 1986 and 1992 and a strong unequalizing effect in the next six years. The effects on the equivalent income distribution were similar. Over the whole period 1986-1998, changes in the returns to education (in terms of hourly wages) represented an important inequality-increasing factor.

### *2. Gender wage gap*

As it was expected, changes in the gender parameter of the wage equation implied an equalizing effect on the earnings distribution. During the last decade the gender wage gap has substantially shrunk. Given that women earn less than men, that movement had an unambiguous inequality-decreasing effect on the earnings distribution.

However, it is interesting to notice that the gender effect becomes negligible in the equivalent household labor income distribution. In section 2 we argued that on the one hand the shrinking gender wage gap could be inequality-increasing on the household income distribution due to the concentration of female workers in the upper part of that distribution, but on the other hand it could be inequality-decreasing since women's earnings are a more significant part of total resources in low-income households. It seems that these two factors cancelled out.

### 3. *Returns to experience (age)*

The age coefficients in the wage equations of 1986 and 1998 are not substantially different. This fact is translated into a small value for the returns-to-experience effect in columns (iii) and (vi). Changes were greater in the two sub-periods. For instance, the relative increase in earnings for people older than 50 between 1992 and 1998 implies a sizeable equalizing effect on the earnings distribution. Instead, the sign of the returns-to-experience effect in column (v) is positive, perhaps due to the different location of the age groups in the earnings and household income distributions, as it was argued in section 2.

### 4. *Unobservables*

Changes in endowments and returns to unobservable factors have implied unequalizing changes in wages, which have translated into unequalizing changes in the earnings and equivalent household labor income distributions. These effects were particularly strong in the 1992-1998 period. The results of the decompositions suggest that the increase in the dispersion of unobservables was one of the main factors affecting earnings and household inequality over the period under analysis.

### 5. *Hours of work*

To assess the relevance of changes in hours of work and employment status on inequality the distribution in a base year is simulated using the parameters of the Tobit employment equations of table 2.6 of other year. In order to single out the impact of changes in hours worked we ignore people who change labor status between the base year and the simulation (*i.e.* we keep their actual earnings) and change hours of work only to individuals who work both in the base year and in the simulation. As it was discussed in section 2 the nineties witnessed a substantial fall in hours of work by low-income workers and an increase for the rest. From columns (ii) and (v) it seems that this fact has had a very significant impact on the earnings and household income distributions.

### 6. *Employment*

In order to assess the effect of changes in individual employment status, people with non-positive simulated hours of work are assigned zero earnings, while people who work in the simulation are assigned the actual base year earnings.<sup>22</sup>

Unemployment rate skyrocketed in mid-nineties and has remained very high since then. It is a widespread belief that changes in labor market participation are the main cause of the strong increase in household inequality. Results in column (v) of table 5.4 suggest to scale down those conclusions, as the employment effect is positive but negligible.<sup>23</sup> A couple of reasons contribute to reduce the effect of the great increase in unemployment on household inequality. The first one was mentioned in section 2: during 1992-1998 the unemployment rate jumped but the employment rate did not change very much, implying a minor change in the number of individuals without earnings. As it was stressed before, this is the relevant number for household inequality, not the number of unemployed people. The second point is that the new unemployed (those who did not work in 1998 but that would have worked with the 1992 parameters) had extremely low individual labor incomes in 1992 (just 10% of the rest), but equivalent household incomes not so far from the median (75% of the median). This implies that in the simulation using the 1992 parameters the change in labor status (from unemployed to employed) of some individuals would not have a very strong effect on household inequality since (i) anyway those individuals had very low incomes, and (ii) they were not very concentrated in the lower tail of the household income distribution.

## 7. *Education*

Argentina has witnessed a dramatic change in the educational composition of its population in the last two decades. According to the results shown in table 5.4 that change had a mild inequality-increasing effect on the earnings and equivalent household income distributions in the nineties. This is not a surprising result according to our discussion in section 2.

## 8. *Other factors and interactions*

The last row in table 5.4 is calculated as a residual. It encompasses the effects of interactions terms and of many factors not considered in the analysis. According to table 5.4 these terms are not too large, implying either that the factors not considered in the analysis are not extremely important or that they tend to compensate each other.

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<sup>22</sup> Some people do not work in the base year but do work in the simulation. For those individuals we simulate the base year hours of work and wages using the base year parameters of equations (11) and (12) and adding error terms obtained by following the procedure described in section 4.

<sup>23</sup> Naturally, the role of unemployment as the main source of the increase in inequality can be stressed again if it is argued that the fall in the relative wages of the poorest workers was generated by a relative increase in the unemployment rate of that group. However, the evidence on this point is far from being conclusive.

## 6. Concluding remarks

This paper contributes to a highly discussed topic in Argentina -the increase in income inequality- by using a microeconomic decomposition methodology. This technique allows us to assess the relevance of various factors that affected inequality between 1986 and 1998.

The results of the paper suggest that the small change in inequality between 1986 and 1992 is the result of mild forces that tend to compensate each other. In contrast, between 1992 and 1998 nearly all effects played in the same direction. Changes in the returns to education and experience, changes in the endowments of unobservable factors and their remunerations, changes in hours of work and employment status, and the transformation of the educational structure of the population have all had some role in increasing inequality in Argentina to unprecedented levels. Even the decrease in the wage gap between men and women, which is a potential force for reducing inequality, has not induced a significant decrease in household income inequality.

The increase in the returns to education and to unobservable factors and the relative fall in hours of work by low-income people are particularly important to characterize the growth in inequality. Perhaps surprisingly, although Argentina witnessed dramatic changes in the gender wage gap, the unemployment rate and the educational structure, these factors appear to have had only a mild effect on the household income distribution.

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*Table 2.1*  
*Gini coefficient*  
*Earnings and equivalent household labor income distributions*  
*Greater Buenos Aires, 1986, 1992 and 1998*

	1986	1992	1998
Earnings	39.4	37.7	44.9
Equivalent household labor income	40.3	41.0	49.5

Source: Author's calculations based on the EPH, GBA, October.

*Table 2.2*  
*Hourly earnings by educational levels*  
*Greater Buenos Aires, 1986, 1992 and 1998*

	Means (\$ 1998)			Changes (%)		
	1986	1992	1998	86-92	92-98	86-98
Primary incomplete	6.6	5.7	5.3	-13.6	-6.8	-19.5
Primary complete	7.7	6.3	5.9	-18.1	-6.0	-23.0
Secondary incomplete	9.2	6.8	6.6	-26.1	-2.8	-28.1
Secondary complete	11.6	9.1	9.1	-21.2	-0.4	-21.5
College incomplete	14.5	11.9	10.6	-17.5	-11.1	-26.7
College complete	24.1	16.3	19.4	-32.3	19.1	-19.4
Total	10.4	8.4	9.2	-19.0	9.3	-11.4

Source: Author's calculations based on the EPH, GBA, October. Note: Workers between 14 and 65 with valid answers.

*Table 2.3*  
*Log hourly earnings equation*  
*Greater Buenos Aires, 1986, 1992 and 1998*

Variables	Heads			Spouses			Others		
	1986	1992	1998	1986	1992	1998	1986	1992	1998
<i>Log hourly earnings equation</i>									
primary complete	0.2150 (5.496)	0.2162 (4.011)	0.1828 (2.978)	0.0393 (0.496)	-0.1731 (-1.695)	0.0575 (0.462)	0.0407 (0.441)	0.3349 (2.884)	0.0417 (0.287)
secondary incomplete	0.3994 (9.206)	0.3367 (5.661)	0.3630 (5.620)	0.2241 (2.342)	-0.0243 (-0.211)	0.2306 (1.848)	0.2278 (2.400)	0.4361 (3.795)	0.1366 (0.953)
secondary complete	0.6219 (12.649)	0.6229 (10.185)	0.6534 (9.664)	0.5595 (6.720)	0.2652 (2.445)	0.4841 (3.861)	0.4053 (3.927)	0.5726 (4.546)	0.3646 (2.447)
college incomplete	0.9121 (15.469)	0.9516 (12.713)	0.9382 (12.714)	0.6446 (5.210)	0.5173 (3.666)	0.6579 (4.347)	0.5646 (5.289)	0.7100 (5.919)	0.6699 (4.592)
college complete	1.3079 (22.778)	1.2607 (18.242)	1.4634 (20.282)	0.8607 (7.824)	0.5764 (4.183)	0.9607 (5.600)	0.7439 (5.577)	0.8109 (5.432)	0.9456 (5.830)
male	0.2915 (5.106)	0.1834 (3.707)	0.1675 (3.474)	-0.1865 (-0.774)	0.2626 (1.280)	0.2859 (1.706)	0.0454 (0.827)	0.0701 (1.405)	0.1678 (3.250)
age	0.0401 (3.969)	0.0546 (4.882)	0.0452 (3.951)	0.0413 (2.120)	0.0343 (1.533)	0.0454 (2.028)	0.0766 (4.351)	0.0797 (4.267)	0.0846 (4.138)
age2	-0.0004 (-3.295)	-0.0006 (-4.661)	-0.0004 (-3.155)	-0.0005 (-2.057)	-0.0004 (-1.393)	-0.0005 (-1.813)	-0.0009 (-3.646)	-0.0009 (-3.545)	-0.0011 (-3.735)
younger 18							-0.0218 (-0.250)	-0.0338 (-0.406)	-0.3601 (-2.811)
constant	0.5599 (2.400)	0.1959 (0.806)	0.2051 (0.792)	1.0778 (2.554)	1.1095 (2.283)	0.6169 (1.178)	0.1849 (0.577)	-0.2793 (-0.749)	-0.3190 (-0.799)
<i>Selection equation (dep. var.=1 if hourly earnings&gt;0)</i>									
primary complete	0.2931 (2.240)	0.2212 (1.429)	0.3955 (3.052)	-0.3295 (-3.289)	-0.0513 (-0.381)	-0.1975 (-1.346)	0.2137 (1.203)	0.5917 (2.874)	0.2573 (1.126)
secondary incomplete	0.3494 (2.238)	0.5737 (2.987)	0.4556 (3.234)	-0.1980 (-1.612)	0.0129 (0.083)	0.0398 (0.258)	0.2258 (1.215)	0.8538 (4.015)	0.2308 (1.021)
secondary complete	0.4875 (2.580)	0.5575 (2.827)	0.5866 (3.736)	-0.0736 (-0.639)	0.1556 (1.066)	0.2299 (1.489)	0.4315 (1.901)	0.7899 (3.296)	0.4376 (1.829)
college incomplete	0.4760 (1.827)	1.0563 (3.318)	0.4125 (2.177)	0.4776 (2.355)	0.5239 (2.433)	0.4153 (2.102)	0.8123 (3.441)	1.5396 (5.794)	0.5657 (2.284)
college complete	1.2176 (3.085)	1.0181 (3.750)	0.8111 (4.537)	0.7033 (4.467)	1.0577 (5.620)	1.3115 (7.588)	0.8274 (2.101)	1.3888 (3.766)	0.8389 (2.752)
male	0.8594 (5.175)	0.7840 (4.001)	0.6528 (5.263)	1.2982 (2.235)	1.7185 (2.970)	1.3967 (5.353)	0.8164 (8.451)	0.4630 (4.703)	0.5007 (6.182)
age	0.1099 (3.160)	0.1141 (3.012)	0.1045 (3.748)	0.1288 (4.907)	0.1757 (5.577)	0.1203 (4.279)	0.1960 (5.682)	0.1686 (4.836)	0.2719 (9.111)
age2	-0.0014 (-3.541)	-0.0016 (-3.589)	-0.0014 (-4.269)	-0.0017 (-5.117)	-0.0023 (-5.668)	-0.0015 (-4.353)	-0.0029 (-6.385)	-0.0022 (-4.832)	-0.0036 (-8.656)
married	0.1986 (1.204)	0.1559 (0.841)	0.0588 (0.477)				-0.7813 (-4.386)	-0.4060 (-2.373)	-0.4761 (-3.360)
children	-0.0087 (-0.202)	-0.0178 (-0.442)	-0.0464 (-1.387)	-0.1929 (-6.496)	-0.1797 (-5.460)	-0.1768 (-5.477)			
younger 18							-0.5983 (-3.823)	-0.3063 (-1.925)	-0.5995 (-4.087)
attend school	-0.8669 (-2.850)	-1.0407 (-3.280)	-0.5569 (-2.509)	-0.3036 (-0.963)	0.3501 (1.040)	0.2020 (0.900)	-1.6477 (-11.458)	-1.7389 (-11.237)	-0.9050 (-7.556)
head employed				-0.7922 (-3.982)	-0.6382 (-3.314)	-0.6148 (-4.386)	-0.0351 (-0.212)	-0.1624 (-1.112)	-0.2210 (-1.951)
spouse employed							-0.0763 (-0.706)	-0.0005 (-0.005)	0.0488 (0.547)
constant	-1.3555 (-1.892)	-1.3567 (-1.682)	-1.3239 (-2.296)	-1.5356 (-3.015)	-2.7184 (-4.571)	-1.8346 (-3.390)	-2.6080 (-4.233)	-2.6912 (-4.358)	-4.0987 (-8.127)
N° Obs.	1961	1404	1967	1575	1116	1413	1292	1090	1631
Chi 2	153.77	124.61	148.96	164.62	154.13	303.14	767.13	590.80	861.41
Log Lik.	-1888.35	-1368.31	-2281.71	-1311.55	998.04	-1354.19	-841.52	-769.56	-1191.27
Rho	0.2179	0.6786	0.1247	-0.1691	0.0379	-0.1035	0.1705	0.3726	0.3600
Sigma	0.5562	0.5747	0.6361	0.5603	0.5492	0.6434	0.4848	0.4770	0.5569
Lambda	0.1212	0.3900	0.0793	-0.0948	0.0208	-0.0666	0.0827	0.1777	0.2005

Source: Author's calculations based on the EPH, GBA, October.

Note: Heckman maximum likelihood estimation. z values in parenthesis. All individuals between 14 and

65 with valid answers.

*Table 2.4*  
*Hourly earnings by gender*  
*Greater Buenos Aires, 1986, 1992 and 1998*

	Means (\$ 1998)			Changes (%)		
	1986	1992	1998	86-92	92-98	86-98
Female	9.3	8.1	9.0	-12.6	10.2	-3.7
Male	10.8	8.5	9.3	-21.2	9.0	-14.1
Total	10.4	8.4	9.2	-18.9	9.3	-11.4

Source: Author's calculations based on the EPH, GBA, October. Note: Workers between 14 and 65 with valid answers.

*Table 2.5*  
*Weekly hours of work by educational levels*  
*Greater Buenos Aires, 1986, 1992 and 1998*

	Means			Changes (%)		
	1986	1992	1998	86-92	92-98	86-98
Primary incomplete	45.7	45.6	40.2	-0.3	-11.7	-12.0
Primary complete	48.5	46.8	46.5	-3.3	-0.8	-4.1
Secondary incomplete	47.0	47.0	47.5	0.1	1.0	1.1
Secondary complete	46.9	45.1	46.7	-3.9	3.5	-0.5
College incomplete	42.7	41.9	41.8	-1.9	-0.1	-2.0
College complete	42.6	42.3	42.8	-0.5	1.1	0.5
Total	46.5	45.5	45.2	-2.1	-0.8	-2.9

Source: Author's calculations based on the EPH, GBA, October. Note: Workers between 14 and 65 with valid answers.

*Table 2.6*  
*Hours of work equation*  
*Greater Buenos Aires, 1986, 1992 and 1998*

Variables	Heads			Spouses			Others		
	1986	1992	1998	1986	1992	1998	1986	1992	1998
primary complete	3.6994 (3.059)	2.9998 (1.690)	9.1412 (4.416)	-12.8134 (-3.047)	-0.8331 (-0.158)	-3.7478 (-0.694)	9.5376 (2.186)	16.5169 (3.094)	9.4156 (1.467)
secondary incomplete	3.6777 (2.722)	7.4547 (3.780)	13.2170 (6.057)	-8.1969 (-1.583)	1.6344 (0.270)	5.4827 (0.973)	6.1322 (1.352)	19.4012 (3.583)	9.4008 (1.484)
secondary complete	4.6707 (3.075)	3.7789 (1.853)	13.1584 (5.770)	-1.4443 (-0.301)	8.1426 (1.432)	12.0399 (2.135)	8.5914 (1.686)	17.9790 (3.009)	12.4789 (1.890)
college incomplete	3.1701 (1.552)	5.7436 (2.149)	10.8928 (3.979)	16.6182 (2.095)	18.4916 (2.277)	20.2824 (2.858)	24.1386 (4.185)	39.7456 (5.859)	21.8096 (3.152)
college complete	1.7271 (0.985)	5.2378 (2.255)	13.2734 (5.535)	21.8548 (3.546)	32.6159 (4.806)	36.5539 (6.181)	8.2748 (1.156)	23.1498 (3.108)	13.3421 (1.777)
male	13.0310 (7.291)	11.0772 (4.845)	15.1987 (8.093)	45.2329 (2.677)	44.9860 (3.380)	43.9907 (6.512)	21.8135 (9.650)	14.8407 (6.134)	15.2718 (7.018)
age	1.5803 (4.980)	0.9534 (2.468)	1.3565 (3.351)	5.4816 (4.942)	6.5939 (5.414)	4.4250 (4.335)	4.7870 (6.111)	3.4066 (4.049)	7.5266 (9.468)
age2	-0.0212 (-5.620)	-0.0150 (-3.248)	-0.0186 (-3.895)	-0.0722 (-5.098)	-0.0850 (-5.455)	-0.0562 (-4.368)	-0.0714 (-6.934)	-0.0468 (-4.130)	-0.1020 (-8.948)
married	2.7919 (1.826)	3.3768 (1.652)	4.4988 (2.608)				-15.8565 (-3.813)	-7.6537 (-1.818)	-12.1374 (-3.241)
children	0.2807 (0.835)	0.0064 (0.015)	-0.4745 (-1.036)	-8.7386 (-7.070)	-7.3819 (-5.847)	-7.3587 (-6.414)			
younger 18							-18.8104 (-4.861)	-14.6823 (-3.618)	-23.3702 (-5.426)
attend school	-14.2282 (-4.665)	-16.2041 (-4.315)	-13.1575 (-3.902)	-13.9652 (-1.077)	9.0871 (0.772)	2.5146 (0.330)	-51.2882 (-14.003)	-54.3772 (-13.539)	-33.9044 (-10.203)
head employed				-28.5008 (-3.686)	-25.8924 (-3.669)	-19.6188 (-4.138)	-4.0485 (-1.095)	-5.6771 (-1.619)	-3.6361 (-1.224)
spouse employed							-3.5146 (-1.327)	1.2688 (0.478)	0.0257 (0.011)
constant	3.5987 (0.559)	17.5783 (2.193)	-3.6110 (-0.435)	-70.2406 (-3.282)	-99.8388 (-4.321)	-70.4622 (-3.570)	-51.8461 (-3.641)	-43.2795 (-2.895)	-108.5699 (-7.913)
N° Obs.	1961	1404	1967	1575	1116	1413	1292	1090	1631
Censored	112	97	201	81	705	848	780	609	982
Chi 2	279.96	174.00	292.40	143.34	129.49	252.91	877.47	658.90	941.1300
Log Lik	-8148.67	-5880.39	-8369.46	-3111.35	-2502.00	-3352.46	-2769.37	-2602.48	-3576.4700
Pseudo R2	0.0169	0.0146	0.0172	0.0225	0.0252	0.0363	0.1368	0.1124	0.1163
Sigma	18.2014	19.6320	24.0450	45.6327	42.6309	40.6468	30.5604	31.4037	33.2833

Source: Author's calculations based on the EPH, GBA, October.

Tobit maximum likelihood estimation. *t* ratios in parenthesis. All individuals between 14 and 65 with valid answers.

*Table 2.7*  
*Labor status by role in the household*  
*Greater Buenos Aires, 1986, 1992 and 1998*

	Proportions by group (%)		
	1986	1992	1998
<i>All</i>			
Employed	59.4	60.9	59.5
Unemployed	2.3	3.5	6.5
Inactive	38.3	35.6	34.0
<i>Heads</i>			
Employed	94.6	93.1	89.8
Unemployed	2.0	3.1	5.2
Inactive	3.4	3.8	5.0
<i>Spouses</i>			
Employed	31.7	36.8	40.1
Unemployed	1.4	1.7	5.6
Inactive	66.9	61.5	54.3
<i>Others</i>			
Employed	39.6	44.1	39.8
Unemployed	4.0	5.9	8.8
Inactive	56.3	50.0	51.4

Source: Author's calculations based on the EPH, GBA, October.

Note: Individuals between 14 and 65 with valid answers.

*Table 2.8*  
*Sample composition by educational level*  
*Greater Buenos Aires, 1986, 1992 and 1998*

	1986	1992	1998
Primary incomplete	15.4	11.0	7.3
Primary complete	32.0	31.1	25.2
Secondary incomplete	26.0	26.8	30.6
Secondary complete	13.5	15.8	15.2
College incomplete	7.1	8.1	11.7
College complete	6.0	7.3	10.0

Source: Author's calculations based on the EPH, GBA, October.

Note: Individuals between 14 and 65 with valid answers.

*Table 5.1*  
*Decompositions of the change in the Gini coefficient*  
*Earnings and equivalent household labor income*  
*Greater Buenos Aires, 1986-1992*

*Using 1992 coefficients*

	<i>Earnings</i>		<i>Equivalent income</i>	
	Level	Change	Level	Change
<i>1986 observed</i>	39.4		40.3	
<i>1992 observed</i>	37.7	-1.7	41.0	0.7
<i>Effects</i>				
1. Returns to education	38.9	-0.5	39.7	-0.6
2. Gender wage gap	38.4	-1.0	40.4	0.1
3. Returns to experience	41.5	2.1	40.0	-0.3
4. Unobservables	39.9	0.5	40.7	0.4
5. Hours of work	39.8	0.4	41.7	1.4
6. Employment	39.4	0.0	40.1	-0.3
7. Education	39.2	-0.2	40.5	0.1
8. Rest		-3.1		-0.1

*Using 1986 coefficients*

	<i>Earnings</i>		<i>Equivalent income</i>	
	Level	Change	Level	Change
<i>1986 observed</i>	39.4	-1.7	40.3	0.7
<i>1992 observed</i>	37.7		41.0	
<i>Effects</i>				
1. Returns to education	39.2	-1.5	42.2	-1.2
2. Gender wage gap	38.8	-1.1	40.9	0.1
3. Returns to experience	36.4	1.3	41.7	-0.7
4. Unobservables	37.2	0.5	40.7	0.3
5. Hours of work	38.8	-1.2	40.4	0.6
6. Employment	37.6	0.1	41.0	0.0
7. Education	38.6	-1.0	40.8	0.2
8. Rest		1.2		1.2

*Average changes*

	<i>Earnings</i>	<i>Equivalent income</i>
<i>Observed 86-92</i>	-1.7	0.7
<i>Effects</i>		
1. Returns to education	-1.0	-0.9
2. Gender wage gap	-1.0	0.1
3. Returns to experience	1.7	-0.5
4. Unobservables	0.5	0.4
5. Hours of work	-0.4	1.0
6. Employment	0.0	-0.1
7. Education	-0.6	0.2
8. Rest	-0.9	0.5

Source: Author's calculations based on the EPH, GBA, October. Note: The earnings distribution includes those individuals with  $Y_{it} > 0$  and  $Y_{it}(k_t) > 0$ . The equivalent household labor income distribution includes those individuals with  $Y_{it}^q \geq 0$  and  $Y_{it}^q(k_t) \geq 0$ . Non-labor income is not considered.

*Table 5.2*  
*Decompositions of the change in the Gini coefficient*  
*Earnings and equivalent household labor income*  
*Greater Buenos Aires, 1992-1998*

*Using 1998 coefficients*

	<i>Earnings</i>		<i>Equivalent income</i>	
	Level	Change	Level	Change
<i>1992 observed</i>	37.7		41.0	
<i>1998 observed</i>	44.9	7.2	49.5	8.5
<i>Effects</i>				
1. Returns to education	40.8	3.2	43.8	2.7
2. Gender wage gap	37.3	-0.4	41.0	0.0
3. Returns to experience	36.8	-0.9	41.9	0.8
4. Unobservables	39.9	2.2	42.8	1.8
5. Hours of work	40.7	3.0	42.9	1.9
6. Employment	37.5	-0.2	41.0	0.0
7. Education	38.2	0.5	41.3	0.2
8. Rest		-0.2		1.0

*Using 1992 coefficients*

	<i>Earnings</i>		<i>Equivalent income</i>	
	Level	Change	Level	Change
<i>1992 observed</i>	37.7	7.2	41.0	8.5
<i>1998 observed</i>	44.9		49.5	
<i>Effects</i>				
1. Returns to education	42.2	2.7	46.5	3.0
2. Gender wage gap	45.3	-0.4	49.6	-0.1
3. Returns to experience	45.9	-1.0	48.8	0.7
4. Unobservables	43.1	1.8	48.0	1.5
5. Hours of work	43.0	1.9	47.8	1.7
6. Employment	44.8	0.1	49.2	0.3
7. Education	44.8	0.1	48.7	0.8
8. Rest		2.0		0.6

*Average changes*

	<i>Earnings</i>	<i>Equivalent income</i>
<i>Observed 92-98</i>	7.2	8.5
<i>Effects</i>		
1. Returns to education	2.9	2.8
2. Gender wage gap	-0.4	-0.1
3. Returns to experience	-0.9	0.7
4. Unobservables	2.0	1.7
5. Hours of work	2.5	1.8
6. Employment	-0.1	0.1
7. Education	0.3	0.5
8. Rest	0.9	0.8

Source: Author's calculations based on the EPH, GBA, October. Note: The earnings distribution includes those individuals with  $Y_{it} > 0$  and  $Y_{it}(k_t) > 0$ . The equivalent household labor income distribution includes those individuals with  $Y_{it}^q \geq 0$  and  $Y_{it}^q(k_t) \geq 0$ . Non-labor income

is not considered.

*Table 5.3*  
*Decompositions of the change in the Gini coefficient*  
*Earnings and equivalent household labor income*  
*Greater Buenos Aires, 1986-1998*

<i>Using 1998 coefficients</i>				
	<i>Earnings</i>		<i>Equivalent income</i>	
	Level	Change	Level	Change
<i>1986 observed</i>	39.4		40.3	
<i>1998 observed</i>	44.9	5.5	49.5	9.2
<i>Effects</i>				
1. Returns to education	41.1	1.7	42.0	1.7
2. Gender wage gap	38.1	-1.3	40.5	0.1
3. Returns to experience	39.8	0.4	40.6	0.2
4. Unobservables	42.2	2.8	42.7	2.4
5. Hours of work	42.3	3.0	43.5	3.2
6. Employment	39.2	-0.2	40.1	-0.2
7. Education	39.8	0.4	41.2	0.9
8. Rest		-1.3		0.9

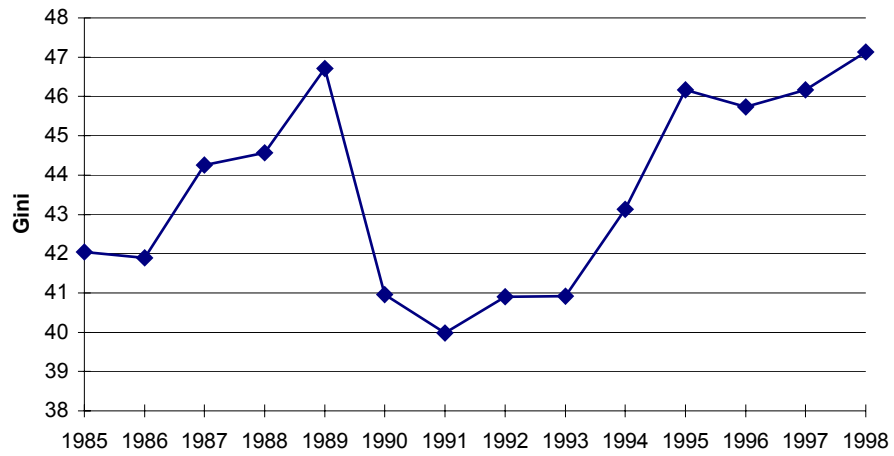
<i>Using 1986 coefficients</i>				
	<i>Earnings</i>		<i>Equivalent income</i>	
	Level	Change	Level	Change
<i>1986 observed</i>	39.4	5.5	40.3	9.2
<i>1998 observed</i>	44.9		49.5	
<i>Effects</i>				
1. Returns to education	43.0	1.9	47.6	1.9
2. Gender wage gap	46.4	-1.5	49.7	-0.2
3. Returns to experience	44.5	0.4	49.2	0.3
4. Unobservables	42.7	2.2	47.7	1.8
5. Hours of work	43.5	1.4	46.7	2.8
6. Employment	44.7	0.2	49.4	0.1
7. Education	45.7	-0.8	48.5	1.0
8. Rest		1.7		1.6

<i>Average changes</i>		
	<i>Earnings</i>	<i>Equivalent income</i>
<i>Observed 86-98</i>	5.5	9.2
<i>Effects</i>		
1. Returns to education	1.8	1.8
2. Gender wage gap	-1.4	0.0
3. Returns to experience	0.4	0.3
4. Unobservables	2.5	2.1
5. Hours of work	2.2	3.0
6. Employment	0.0	-0.1
7. Education	-0.2	0.9
8. Rest	0.2	1.2

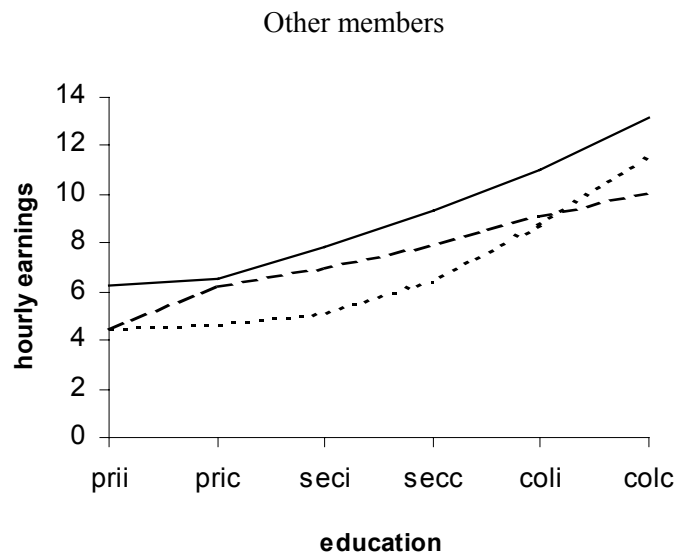
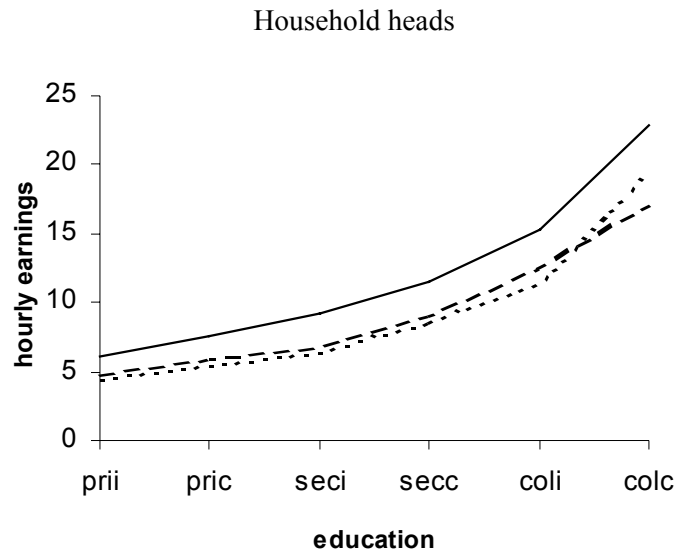
Source: Author's calculations based on the EPH, GBA, October. Note: The earnings distribution includes those individuals with  $Y_{it} > 0$  and  $Y_{it}(k_t) > 0$ . The equivalent household labor income distribution includes those individuals with  $Y_{it}^q \geq 0$  and  $Y_{it}^q(k_t) \geq 0$ . Non-labor income is not considered.

*Figure 2.1*  
*Gini coefficient*  
*Equivalent household income distribution*  
*Greater Buenos Aires, 1985-1998*



Source: Author's calculations based on the EPH, GBA, October.

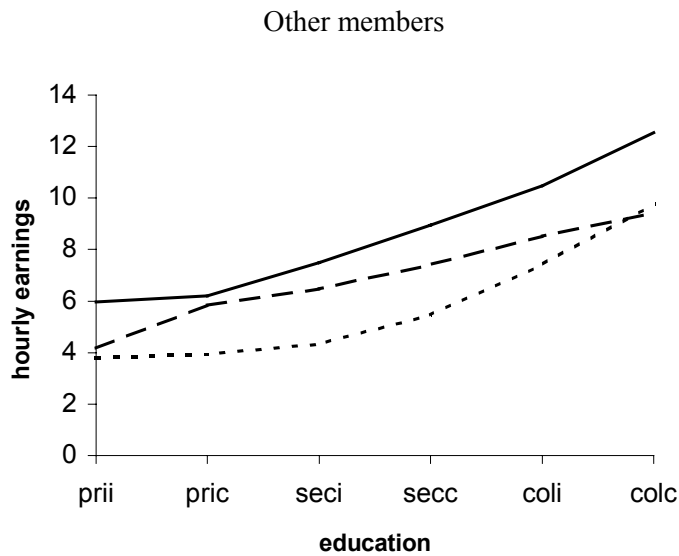
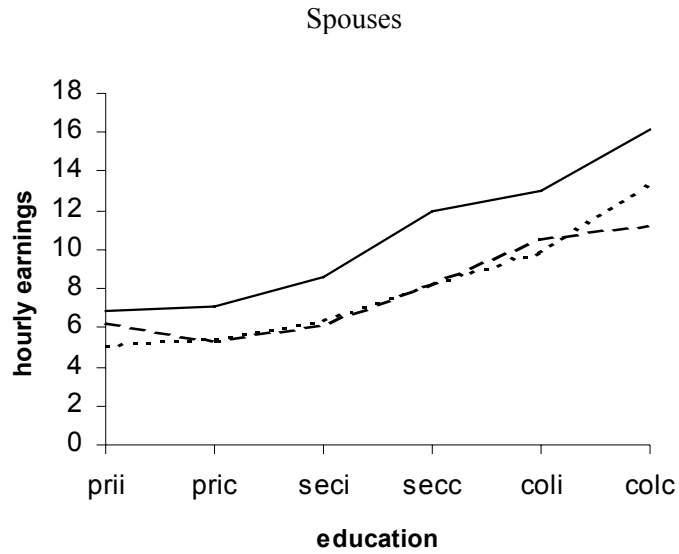
Figure 2.2  
 Hourly earnings-education profiles  
 Men 40 years old



\_\_\_\_\_ 1986    - - - - 1992    \_ \_ \_ 1998

Source: Predicted hourly earnings from models in table 2.3.  
 Note: *prii*=primary incomplete, *pric*=primary complete, *seci*=secondary incomplete  
*secc*=secondary complete, *coli*=college incomplete, *colc*=college complete

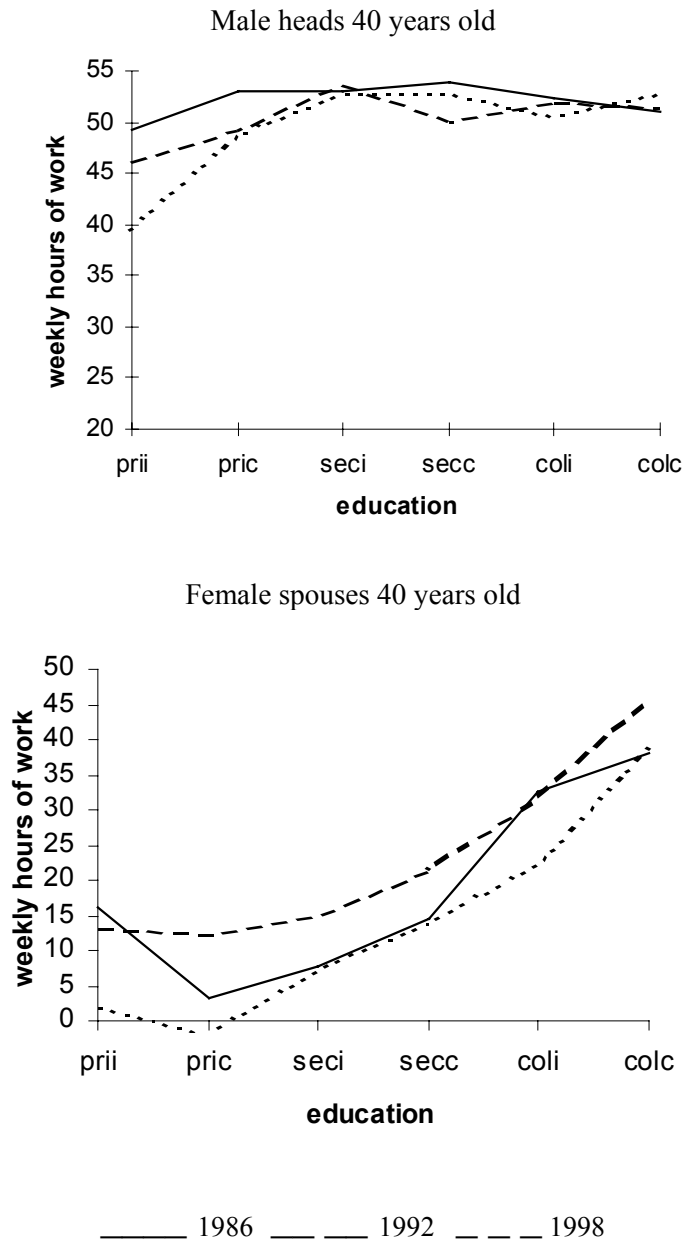
Figure 2.3  
 Hourly earnings-education profiles  
 Women 40 years old



1986  
  1992  
  1998

Source: Predicted hourly earnings from models in table 2.3.  
 Note: *prii*=primary incomplete, *pric*=primary complete, *seci*=secondary incomplete  
*secc*=secondary complete, *coli*=college incomplete, *colc*=college complete

Figure 2.4  
Weekly hours of work by educational level



Source: Predicted weekly hours of work from models in table 2.6.  
 Note: *prij*=primary incomplete, *pric*=primary complete, *seci*=secondary incomplete  
*secc*=secondary complete, *coli*=college incomplete, *colc*=college complete