

Geographic Concentration and Structure of Wages in Developing Countries: the case of Uruguay^α

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Abstract

In this paper we are concerned with how the geographic concentration of population and economic activities in a particular city, which is common in most developing countries, affects the wage structure of the Uruguayan labor market. First, we find that the usual explanations given in developed countries to the observed increase in wage dispersion are suitable for the Uruguayan labor market, although they have a different impact depending on whether workers are employed in the metropolitan city or in the rest of the urban country. Second, based on quantile regression we find that the geographic concentration increases returns to schooling in the metropolitan area with respect to the rest of the urban country, while experience returns for low earning workers are higher in the rest of the urban country than in the metropolitan area.

Keywords: wage dispersion; returns to schooling; quantile regression.

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1.-INTRODUCTION

In most countries labor earnings are by far the most important component of income for individuals working in urban areas. Therefore, the level of wage inequality generated by the labor market is fundamental for those interested in understanding poverty, internal migrations, social stratification, or economic incentives facing workers (Blau, 1996). In developed countries the evolution of wages has attracted a large amount of interest recently, mainly because of the observed increase in wage dispersion. However, as pointed out by Harrison and Leamer (1997), there are not too many studies analyzing the wage structure of developing countries (see also Maclsaac and Rama, 1997 and references therein).

In this paper we are concerned with studying the wage structure of the Uruguayan labor market from 1986, the end of the military regime, until 1997, the last year of available data. In particular, we are concerned with whether the geographical concentration of population and economic activity in a single city, which characterizes most developing countries, is an important factor explaining the observed wage structure¹. The different explanations usually given to discuss wage dispersion have not considered the problem of geographical concentration and this is the novelty of this paper. In Uruguay, half of its total urban population and nearly two thirds of its economic activity are carried on in the metropolitan area of Montevideo. The other half of its population and one third of its economic activity are dispersed in the rest of the urban country (RUC), which is composed of cities generally not larger than thirty thousand inhabitants².

¹The proportion of total population living in the main metropolitan areas in the south cone countries in Latin America is nearly 40 percent in Gran Buenos Aires, Argentina; Santiago, Chile; Asunción, Paraguay; Lima, Perú (CEPAL, 1997).

²Uruguayan total population is of 3.2 million people, with 90 percent living in the urban country: 45% in Montevideo; ...ve of the biggest cities, with generally less than one hundred thousand

On the one hand, we are interested in studying whether the explanations given in developed countries to the increase in wage dispersion are appropriate for the Uruguayan labor market, taking into consideration the geographic concentration of population and economic activities in Montevideo. Although there is no consensus concerning the fundamental causes of wage dispersion, several explanations have received much attention: decline in manufacturing employment and a shift towards educational intensive sectors; shifts in relative demand for labor favoring more-educated, skilled and flexible workers; changes in wage-setting institutions or pay norms; fall of the legal minimum wage; increased openness of the economies, are among the most common explanations (see Bound and Johnson, 1992; Murphy et al., 1992; Katz and Murphy, 1992; Juhn et al., 1993; Freeman, 1995; Wood, 1995; Meghir and Whitehouse, 1996 ; Topel, 1997; Fortin and Lemieux, 1997; Moane and Wallerstein, 1997 or Suen, 1997, among others). Here we find that some of these potential causes could help to explain the increase in wage inequality observed in the last decade in the Uruguayan labor market.

On the other hand, following the ideas of some papers related with urban economics, such as Simon (1998), Simon and Nardinelli (1996) and Rauch (1993), we analyze the impact of the geographic concentration of population and economic activities on returns to skills and experience using a quantile regression approach. We find that returns to schooling are higher for Montevidean workers than for those in the RUC. Contrary, low earning workers enjoy higher returns to experience in the rest of the urban country than in Montevideo.

The paper is divided in five sections. In the next section we discuss the data used. In section three we study the changes in the wage structure following a descriptive approach. In section four we discuss the possible determinants of the observed increase

inhabitants, sum up to a 10% of total urban population; the rest lives dispersed in cities generally smaller than 30.000 inhabitants (Instituto Nacional de Estadística, Censo 1996 Uruguay).

in wage inequality. In section ...ve we conclude.

2.-DATA

This study is based on data from the Household Survey of Uruguay from 1986 through 1997 (Encuesta de Hogares, Instituto Nacional de Estadística, Uruguay). The survey frame is the civilian population of Uruguay living in housing units, decomposed in a survey for Montevideo and another for the rest of the urban country. This survey contains individual data on monthly labor earnings, non labor earnings, age, sex, educational level, hours worked per week, marital status, occupation characteristics, and other relevant variables.

The sample used here is composed by all the males older than 13 years old, given that this is the legal working age in Uruguay and also : a) who worked during the week prior the interview; b) whose current job were either in the private or in the public sector (excluded are persons who were self-employed, working without pay, entrepreneurs, or who had never worked) and c) who earn a positive wage in that period of reference. The variable of interest is the real hourly wage (see DiNardo et al. 1996 for a justi...cation of the use of real hourly wages).

3.-REAL HOURLY WAGE CHANGES 1986-1997

Between 1986 and 1997, the median real hourly wage (rhw) increased by about 40% in the metropolitan area of Montevideo while only a 15% in the RUC. Within the metropolitan area of Montevideo, the least skilled workers, measured by the tenth percentile of the wage distribution, experienced an rhw increase of about 20 percent, while for most skilled workers, measured by the ninetieth percentile, rhw increased by 70 percent. Within the RUC, least skilled workers did not enjoy any rhw increase while for most skilled the rhw increased by 30 percent. The net result of this divergence

in wages increments could be a movement towards a greater wage inequality both, within workers in each region and between workers in both regions.

Tables 1 and 2 and Figures 1 to 3 describes the changes in real hourly wages (rhw) for working men in Montevideo and the rest of the urban country (RUC) for the 1986-97 period and three subperiods, 1986-1989, 1989-1994 and 1994-1997, corresponding with different democratic administrations after the military regime ended in 1985. In first place, with the end of the military regime workers unions recovered its legitimacy. In second place, economic instruments as well as wage-setting institutions changed substantially between each of the administrations that followed the military regime.

In Table 1 we present the percentage increase of the rhw at different points of wage distribution. The first six rows show the rhw rate of increase between the first and last year of the subperiod considered. Rows seven to twelve present the rate of rhw increase needed to jump from a given percentile at the beginning of a subperiod to a higher percentile at the end of that subperiod.

Insert Table 1

Table 1 illustrates important differences in the rhw structure within each region and between both regions. In Montevideo, workers at upper end of the wage distribution experienced an increase in their rhw of 50 percentage points higher than those workers at the lower tail; in the RUC this difference was of about 25 percentage points. Between both regions, workers at the same points of the rhw distribution experienced substantially different rhw movements, in detriment of those workers in the RUC, i.e. tenth percentile workers experienced in Montevideo a rhw increases of 15 percentage points higher than RUC workers at the same percentile, while for those in the ninetieth percentile this difference was of 40 percentage points.

To simplify the exposition, in what follows we divide the discussion of the wage structure first, studying the wage structure within each region, Montevideo and the

RUC, and second, between both of these regions.

3.1-Wage inequality within each region.

In Figure 1 we present the median, tenth and ninetieth percentile of the hourly real wage distribution of working men for 1986-97. For ease of comparison, wages are indexed to 100 in 1986. At a first glance, this figure illustrates an increase in rhw dispersion within both regions.

Looking first at the graph corresponding to Montevideo, we observe that the median rhw has been increasing relatively steadily during the entire period, i.e. an increment of 38 percent over the full period (see Table 1). The timing of these rhw movements is basically explained by the gains obtained during the first democratic administration, of nearly 30 percent. During the two subsequent administrations it increased by a 10 percent and decreased a 3 percent respectively. As will be observed later, the rhw increase during the first administration following the military regime explains mostly all of its increase during the entire period.

Despite of the fact that the rhw has increased in the entire period for all Montevidean workers at different percentiles of the wage distribution, these gains were not equally spread across workers. For least skilled workers, as measured by the tenth percentile of the wage distribution, the rhw increased by only a 17 percent during the entire period, but again essentially explained by the 30 percent gains obtained during the 1986-89 administration. Notice that for these workers the rhw was the same in 1994 as in 1989 and a 10 percent smaller in 1997 than in 1989. On the other hand, most skilled Montevidean workers, as measured by the ninetieth percentile of the wage distribution, experienced a steadily significant rhw increased during the entire period, ending with an increment of nearly a 70 percent.

Insert Figure 1

The median rhw of RUC workers grew only by 15 percent over the entire period (see Figure 1 and Table 1). As in Montevideo, this increment is basically explained by a 33 increase during the ...rst democratic administration, falling by 15 percent during the two subsequent administrations. In what respect to distribution of the gains between workers, the least skilled workers, as measured by the tenth percentile, only experienced a rhw increase of 3 percent over the full period while most skilled workers experienced a relatively steady rhw increase.

Notice that from the discussion above we could infer that the Uruguayan labour market has moved towards a greater wage inequality within each of the regions considered. Additional insight of this phenomena is illustrated from rows seven to twelve in Table 1 and in Figure 2, where we present the ratio between the different percentiles of the rhw distribution for each year.

Insert Figure 2

The ...gure above shows that, for Montevidean workers, the rhw of ...erentia between the ninetieth to tenth percen ... h he in

The increase in rhw dispersion for RUC workers was much less severe than for Montevidean workers. As observed from Figure 2 and Table 1, this increase in rhw inequality was equally distributed for workers above or below the median rhw. The ratio between the ninetieth-median percentile increased 13 percent over the full period while the median-tenth percentile increased by 12 percent. Similarly, the seventy-...fth percentile-median ratio increased by 7 percent and the median-twenty-...fth percentile ratio increased by 8 percent.

This equally distributed inequality increase between percentiles of the rhw distribution for RUC workers is also observed from rows seven to twelve of Table 1. While the 1986 rhw median percentile should have increased by 164 percent so as to reach the ninetieth rhw percentile in 1997, the tenth percentile should have increase by 141 percent so as to reach the median for the same period.

3.2-Inequality between both regions

In Figure 3 we present the ratios between the rhw percentile of Montevideo and the RUC for each year, indexed in 1986 to 100.

Insert Figure 3

This ...gure illustrates the increase rhw divergence between workers in the metropolitan area of Montevideo and the rest of the urban country, been larger above the median than below it. These fact is clearly observed either from the ...rst graph of Figure 3 or Table 2, where we present the rhw rate increase needed for a RUC worker at a given percentile at the beginning of a subperiod to reach the earnings of a Montevidean worker at the same or different percentile at the end of that subperiod.

Insert Table 2

Most skilled workers, as measured by the ninetieth or seventy-...fth percentile, have receive substantially larger wage increases in Montevideo than in the RUC, which

explains the increment in divergence. The ratio of these percentiles have increased by 30 and 25 percent respectively. From Table 2 we see that the ninetieth or seventy-fifth percentile RUC workers needed a 160 or 100 percent increase in their 1986 rhw to reach the same 1997 percentile rhw of Montevidean workers. However, these RUC workers only experienced an increase of 31 and 23 percent respectively.

On the other hand, for least skilled workers, as measured by the tenth or twenty-fifth percentile, there has been an increase rhw divergence, although much smaller than for those in the upper tail. The ratio between these percentiles increased by less than 15 percent (Figure 3). Also, the rhw rate of increase needed by these RUC workers to reach the same Montevidean rhw percentile is of about 60 percent for the overall periods.

Notice that to define wages in real terms we had used the same consumer price index for Montevideo and the RUC, given that it is the only one available from the Uruguayan statistical bureau. Although this way of defining real wages does not necessarily affect within region analysis of wage structure it could affect its between region comparison, i.e. some food products are cheaper in the RUC than in Montevideo, hence using the same price index could downward biased the real wage evolution of RUC workers and increase between region wage inequality. However, we believe that the conclusions derived above are not substantially affected by the fact of using a unique price index, given that consumer services and some type of consumer goods, such as durables, are more expensive in the RUC than in Montevideo.

The discussion above suggests that wage dispersion has increased within and between both regions. On the one hand, most skilled workers have experienced important wage increments, in particular in Montevideo, while salaries of least skilled workers practically remained the same over the full period. This fact implies that the observed increase in inequality could be attributed to changes in the upper tail of the wage distribution. On the other hand, Montevidean workers had enjoyed higher

wage increments than RUC workers on all points of the wage distribution. This could suggest some type of positive externality of being employed in Montevideo.

4.-DETERMINANTS OF WAGE INEQUALITY

Clearly, there is no unique nor exclusive cause that could explain the observed increase in wage inequality discussed in the previous sections. In what follows we analyze some potential causes that have been used to explain wage inequality in developed countries, such as minimum wage effects, changes in wage-setting institutions and deunionization of the labor force, increased openness of the economy, shifts of labor demand toward and differences in returns to skills.

4.1- Effect of Changes in the Real Value of the Minimum Wage

The minimum wage sets an explicit floor on the wage distribution, i.e. acting as a backstop for the bottom end of the wage distribution, it should tend to reduce wage dispersion. In Figure 4 we present the nonparametric density estimate of the log rhw together with the log of the legal minimum rhw for the years 1986 and 1997.

Insert Figure 4

The fact that visually impacts from these graphs is the dramatic fall of the legal minimum real hourly wage during the whole period. Over the full period it fell ...fty-...ve percent which is basically explained by a substantial drop of 50 percent between 1990 and 1997.

However, as observed from Figure 4, the rhw distribution was not pushed downward following the fall of the minimum rhw, i.e., the lower tail of the rhw distribution did not collapse towards the new the minimum wage, as happened, for example, in the American labour market (see Fortin and Lemieux, 1997 and Dinardo et al., 1996). Notice that, while for the American labour market the downward shifts of the lower

tail of the wage distribution due to the fall of the minimum wage explains some of the increase in wage inequality, this explanation does not seem to be adequate for the Uruguayan case. In fact, the share of 1997 workers earning less than the 1986 minimum rhw fell. In 1986, 13 percent of workers with the less than twelve years of education in Montevideo and 24 percent in the RUC earned less than the hourly minimum wage. In 1997, only a 1 and a 3 percent, respectively, earned less than the corresponding rhw minimum. Also, in Figure A1 in the appendix, we present the counterfactual rhw density applying DiNardo et al. (1996) results. As observed, there is no clear evidence that the fall in the minimum rhw explains the increase in wage dispersion.

Instead, as observed from the figure above, the increase in wage dispersion seem to respond to shifts of the upper part of the rhw distribution over the full period, as mentioned in the latter sections. That is, the increase in wage dispersion could be attributed to the important wage increments of the most skilled workers, as defined by those on the upper tail of the wage distribution. This evidence was more severe in Montevideo than in the RUC, suggesting higher returns to skills. in Montevideo.

4.2- Collective bargaining and deunionization

During the military regime, unions were declared illegal and wages were adjusted based on price stabilization criteria without any type of bargaining between workers and employers. As a consequence, real wages decreased by nearly 50 percent during the dictatorial period.

Unions were legalized and collective bargaining was reestablished by the first democratic government, in 1986. Until 1990, wage increments were decided in bargaining councils by unions, employers and government representatives, adjusted three times a year and for the entire economic sectors and uniformly for Montevidean and RUC workers. A decentralization process begun in 1990, with wage increments been de-

cided at a firm level and bargaining councils practically disappearing.

These changes in wage settings bargaining institutions have affected the timing of rhw movements, as observed from Figure 5, where we present the percentage change in rhw by percentile for the full period and for the three different democratic administrations.

Insert Figure 5

Over the full period real hourly wages have increased for workers at all points of the wage distribution, behaving as an exponential functional form for Montevidean workers, i.e. it increased substantially more for the upper tail than for those in the lower tail, while it is almost linear for the RUC workers.

The timing of the rhw movements are clearly different between administrations. Between 1986 and 1989, rhw increased for all workers, more in the RUC than in Montevideo and with increments drawing an U-shape functional form. On the one hand, the rhw reached a very low level at the end of the military regime, implying higher marginal increases during this administration. On the other hand, centralized collective bargaining helped pushing up salaries of those in the lower tail of the wage distribution. Finally, the economic policy during this period was concerned with diminishing social conflict and adjusting the economy after the debt crisis of the beginning of the eighties.

>From 1990 on, rhw movements were substantially different for workers at distinct points of the wage distribution and for those in Montevideo or in the RUC. Decentralization of wage-setting institutions and the change in the macroeconomic policy targets focusing on an increasing openness of the economy and price stabilization could help to explain these downward movements (see Gottschalk, 1997, pg. 34).

Finally, there has been an important deunionization process in the Uruguayan work force, where membership is not compulsory. While in 1986, four of every ten workers

were members of labor unions, in 1997 only one of every ten were. Two facts could explain the observed deunionization process: the fall in the industry employment, where unions have had more preponderance and the null role of wage bargaining councils beginning in 1990 (Cassoni et al. 1999)³.

4.3- Increasing openness

During the nineties the Uruguayan economy has experienced an openness process that has seriously affected the rhw. From 1990 to 1997 imports of manufactured goods multiplied nearly by 3 while exports only by 1.5. With the signature of the Mercosur commerce treaty in 1990 the increase in flow trades was reoriented towards Mercosur countries, i.e., these flows passed from 40 to 50 percent and were basically concentrated in Argentina and Brazil. This openness policy had several consequences in the Uruguayan labor market.

First, the manufacturing production share on the GDP fell drastically during these years, i.e., from 26 percent to less than a 20 percent. Clearly, Argentinian and Brazilian industries are much more competitive in the manufactured products. One of the policies followed by the Uruguayan manufacturing industry to gain international competitiveness, given the stabilization target of the exchange policies of Mercosur countries, was to diminish the rhw increments.

Second, there has been a reorientation of the production structure. The fall of the manufacturing share in the GDP was compensated with an increment of the share of service and tourism sector, i.e. the share of retail trade, restaurants, hotels and transport on the GDP increased from a 16 percent to a 21 percent while the number of tourist multiplied by two during the whole period.

³The Household Survey used in this work has no information about union membership.

4.4- Changes in relative demand for labor

Clearly, the changes in production structure previously described had affected the labour demand workers in the urban cities. Although the period considered is relatively small for observing important demand shifts, in Tables 3 we illustrate the changes occurred in the distribution of total employment over the entire period and by education.

Insert Table 3

Manufacturing employment has fallen in both regions with a substantial increment in retail trade and banking in Montevideo and agricultural and mining in the RUC. Distinguishing by years of education, the shifts in employment out of manufacturing was into retail trade for least educated and towards banking for most educated.

In Table 4 we present the changes in occupations, where we can observe an increase in professionals, technical and administratives in Montevideo while basically of sales and clerical in the RUC.

Insert Table 4

Less educated workers have increased their occupation in administratives and sales and clerical while most educated in professionals and technicals and managers.

In general terms, these tables suggest that there has been a shift in demand towards more educated workers for those activities and occupations with a higher expected earning, i.e. professionals, managers or banking.

4.5-Human Capital Returns in Montevideo

In the discussion above we observed that most skilled workers had enjoyed much higher wage increments than least skilled workers. Also, more educated workers are in

industries or occupations with a higher expected earning. Given that in Montevideo there is a concentration of two thirds of total economic activity and nearly one half of its total urban population, we can expect higher returns to skills in Montevideo than in the RUC. Following the ideas of some works in urban economics, such as Simon (1998), Simon and Nardinelli (1996) and Rauch (1993), we analyze the impact of this concentration on returns to skills and experience to explain the increase in wage inequality between both regions using a quantile regression approach.

We use a quantile regression approach to identify the nature of the changes at the different points of the rhw distribution. Since the quantile regression allows one to characterize the entire conditional distribution of the dependent variable given a set of covariates, it becomes possible to investigate issues related to changes in wage inequalities, returns to skills or experience.

The quantile regression of Koenker and Bassett (1978) can be written as

$$y_i = x_i' \beta_{\tau} + u_{\tau i} \quad \text{with } Q_{\tau}(y_i | x_i) = x_i' \beta_{\tau}$$

for $i = 1, \dots, n$; where β_{τ} and x_i are $K \times 1$ vectors and $x_{i1} = 1$; $Q_{\tau}(y_i | x_i)$ denotes the τ th conditional quantile of y given x ; that is, $Q_{\tau}(y_i | x_i) = \inf \{ y_i : F_{Y|X}(y_i | x_i) \geq \tau \}$; where $F_{Y|X}$ is the conditional distribution of Y given X : Therefore, the quantile regression model allows one to estimate the entire conditional distribution of y given x : While more quantile regressions can potentially be more informative, estimation is restricted here to ...ve quantiles: 0.1, 0.25, 0.50, 0.75 and 0.90.

If the distribution of the covariate vector x has finite support, with $\Pr(x = x^j) = \Delta_j$; for $j = 1, \dots, J$; then it is possible to obtain a minimum distance (MD) estimator for β_{τ} (Chamberlain, 1994; see appendix for econometric formulation).

Here we use the standard model relating education, experience and earnings, based on works of Mincer (1974). The dependent variable is the logarithm of real hourly wages while the explanatory variables are a constant, education, experience and ex-

perience squared (see Mwabu and Schultz, 1996; Buchinsky, 1995, 1994; Rupert et al. 1992, among others, for similar specifications).

Following Bushinsky (1994) and Abadie (1997) we have estimated a one-group model using the Minimum Distance framework, for the log of hourly wages (see appendix). In this model, the explanatory variables are: a constant, education, experience and experience squared and each quantile regression is estimated for each of the samples years, 1986 to 1997. Results of these estimations are presented in Figures 6 to 8 and Tables A.2 to A.3 in the appendix.

Notice that returns to education and experience refers merely to the effect of education or experience on the conditional quantile of log of real hourly wages. The term "return to education" used in this section refers to the derivative of the conditional quantile with respect to education (or experience). These "return" should not be interpreted as the expected change in earnings of any individual due to an additional year of education. Rather, these return is the increase in log real hourly wage which would keep an individual with an additional year of education at the same quantile (Bushinsky, 1998).

Returns to skills.—

The results of the returns to education are presented in Figure 6 and Table A.1, both for Montevidean and RUC workers.

As illustrated in Figure 6, returns to education are higher in the metropolitan area of Montevideo than in the rest of the urban country.

Insert Figure 6

Notice that while in the RUC nearly 40 percent of the workers have six or less years of education, in Montevideo this percentage is only of 25 percent. Also, in Montevideo nearly 20 percent of the workers have more than thirteen years of education, while in the RUC less than 10 percent. On the other hand, most of the migration movement

during this period was towards the metropolitan area of Montevideo and of workers less than 35 years old.

The results presented in Figure 6 are in the same line as those derived in urban literature, arguing that geographical concentration increases the productivity of human capital. From Table A.1, the most striking result is the similarity of the changes in the returns due to education across the ...ve quantiles. However, although returns present similar patterns, they are significantly different in magnitude across quantiles and in reference to the year-to-year variation.

Return to Experience.—

Given that the returns are understood as the derivative of the conditional quantile with respect to the independent variable being considered, in the case of experience we have that this returns are given by $\beta_2 + 2\beta_3 \text{exp}$; given that we include experience and experience squared in the reduced form of the quantile regression. We have considered two levels of experience, 5 and 15 years, being the ...rst the entrants while the latter are veterans workers.

Results are presented in Figures 7 and 8. First, in general for entrants the returns are higher than for veterans, which could be compatible with a life cycle interpretation of wages or working incentive contracts. That is, newly entrant workers, although in the bottom tail of the distribution of wages have a marginal higher return to experience than veterans workers. Second, observe that returns to experience are higher in the rest of the urban country than in Montevideo. Noting that for returns to education just the opposite, this fact could be interpreted as if in the rest of the urban country the demand in the men's labour force is focused on unskilled workers.

Insert Figure 7 and 8

At last, the change pattern through time is similar in Montevideo and the rest of the urban country.

CONCLUSIONS

In this paper we analyze the wage structure of the Uruguayan labour market, distinguishing between the metropolitan area of Montevideo and the rest of the urban country. We observe that during the period 1986-97 there has been an increase in real hourly wage inequality for workers within Montevideo and the RUC and between both regions. Some of the reasons that could be associated to this increase in wage dispersion are the changes in the wage-setting institutions and deunionization, increasing openness, changes in labor demand and the different returns to skills and experience between both regions.

REFERENCES

- [1] Abadie, Alberto (1997): "Changes in Spanish labor income structure during the 1980's: a quantile regression approach", *Investigaciones Economicas*, vol. XXI(2).
- [2] Blau, Francine (1998): "Trends in the well-being of american women, 1970-1995", *Journal of Economic Literature*, Vol. XXXVI, march.
- [3] Bound, J. and Johnson, G. (1992) "Changes in the Structure of Wages in the 1980s: an evaluation of alternative explanations" *American Economic Review*, 20. 487-528.
- [4] Buchinsky, Moshe (1994): "Changes in the U.S. structure 1963- 1987: application of quantile regression", *Econometrica*, Vol. 62, No. 2, march.
- [5] Buchinsky, Moshe (1998): "The dynamics of changes in the female wage distribution in the USA: a quantile regression approach", *Journal of Applied Econometrics*, Vol.13.
- [6] Buchinsky, Moshe (1995): "Womens return to education in the U.S.: exploration by quantile regression with nonparametric sample selection correction", Yale University and NBER.
- [7] Buchinsky, Moshe (1996): "Recent advances in quantile regression models: a practical guideline for empirical research", Yale University and NBER.
- [8] Bell, L. (1997) "The impact of minimum wages in Mexico and Colombia" *Journal of Labor Economics*, 15, S102-S135.
- [9] Calvo, J.J. (1999) "Movimientos Migratorios del Periodo 1991-96" Fac. de Ciencias Sociales, Uruguay, manuscript.

- [10] Cassoni, A., Allen, S. and Labadie, G. (1999) "Unions and Employment in Uruguay" forthcoming in *Labor Market Regulation and Employment in Latin America*, ed. by D. Hamermesh, J. Heckman and C. Pages-Serra.
- [11] Fortin N. and Lemieux, T. (1997) "Institutional changes and the rising wage inequality: is there a linkage?" *The J. of Economic Perspectives*, 11, 75-96.
- [12] Freeman, R. (1995) "Are your wages set in Beijing?" *The J. of Economic Perspectives*, 9, 15-32.
- [13] Gottschalk, P. (1997) "Inequality, Income Growth and Mobility: the basic facts" *The J. of Economic Perspectives*, 11, 21-40.
- [14] Harrison, A. and Leamer E. (1997) "Labor markets in developing countries: an agenda for research" *Journal of Labor Economics*, 15, S1-S19.
- [15] Juhn, C. Murphy, K. and Pierce, B. (1993) "Wage inequality and the rise in returns to skill" *Journal of Political Economy*, 101, 410-42.
- [16] Katz, L. and Murphy, K. (1992) "Changes in Relative Wages 1963-1987: Supply and Demand Factors" *Quarterly Journal of Economics*, 107, 35-78.
- [17] Koenker, Roger and Bassett, Gilbert (1978): "Regression quantiles", *Econometrica*, Vol. 46, No.1, January.
- [18] Maclsaac, D. and Rama, M. (1997) "Determinants of Hourly Earnings in Ecuador: the role of labor market regulations" *Journal of Labor Economics*, 15, S136-S165.
- [19] Topel, R. (1997) "Factor proportion and relative wages: the supply-side determinants of wage inequality" *The J. of Economic Perspectives*, 11, 55-74.
- [20] Wood, A. (1995) "How trade hurt unskilled workers" *The J. of Economic Perspectives*, 9, 57-81.

APPENDIX

The quantile estimator we use follows Buchinsky (1994,) based on the MD estimator, which solves

$$\min \mathbf{b}_{\zeta}^{\prime} \mathbf{G}_{\zeta}^{-1} \mathbf{A} \mathbf{b}_{\zeta} \mathbf{G}_{\zeta}^{-1}$$

and is given by

$$\mathbf{b}_{\zeta \text{ MD}} = \mathbf{G}_{\zeta}^{\prime} \mathbf{A}^{-1} \mathbf{G}_{\zeta} \mathbf{b}_{\zeta}$$

where $\mathbf{Q}_{\zeta}^0 = (\mathbf{Q}_{\zeta}^1, \dots, \mathbf{Q}_{\zeta}^J)^{\prime}$; $\mathbf{Q}_{\zeta}^j = \text{Quant}_{\zeta}(y | x = x^j)$; \mathbf{b}_{ζ} is the estimate of \mathbf{Q}_{ζ} ; \mathbf{G} is a $J \times K$ matrix ($J \leq K$) with rows $x^{j0}, j = 1, \dots, J$ and \mathbf{A} is a positive definite matrix. A standard MD result is that $\sqrt{N}(\mathbf{b}_{\zeta \text{ MD}} - \mathbf{Q}_{\zeta}^0) \rightarrow_d N(\mathbf{0}, \mathbf{\Sigma}_{\zeta}^{\text{MD}})$; where

$$\mathbf{\Sigma}_{\zeta}^{\text{MD}} = \mathbf{G}_{\zeta}^{\prime} \mathbf{G}_{\zeta}^{-1} \mathbf{G}_{\zeta} \mathbf{\Sigma}_{\zeta} \mathbf{G}_{\zeta}^{-1} \mathbf{G}_{\zeta} \mathbf{G}_{\zeta}^{\prime}$$

and

$$\mathbf{\Sigma}_{\zeta} = \text{diag}(\sigma_{\zeta 1}^2 = \mathbf{A}_1, \dots, \sigma_{\zeta J}^2 = \mathbf{A}_J)$$

is the asymptotic covariance of \mathbf{b}_{ζ} and $\sigma_{\zeta j}^2 = \text{var}(y | x = x^j)$:

Denoting the conditional quantile as the solution to

$$E \{ (y_i - Q_{\zeta}(y_i | x_i) < 0) | x_i = x^j \}$$

and letting $\mathbf{Q}_{\zeta}^0 = \mathbf{G}_{\zeta}^{-1}$ denote the population linear predictor of the conditional quantile \mathbf{Q}_{ζ} ; it follows that for this misspecification case we have

$$\sqrt{N}(\mathbf{b}_{\zeta \text{ MD}} - \mathbf{Q}_{\zeta}^0) = \mathbf{G}_{\zeta}^{\prime} \mathbf{A}^{-1} \mathbf{G}_{\zeta} \sqrt{N}(\mathbf{b}_{\zeta} - \mathbf{Q}_{\zeta}^0) + \sqrt{N} \mathbf{G}_{\zeta}^{\prime} \mathbf{A}^{-1} \mathbf{G}_{\zeta} (\mathbf{Q}_{\zeta} - \mathbf{G}_{\zeta}^{-1})$$

Chamberlain (1994) shows that for $\mathbf{A}^{-1} = \text{diag}(N_1=N, \dots, N_J=N)$; where N_j is the number of observations $x = x^j$; $\sqrt{N}(\mathbf{b}_{\zeta \text{ MD}} - \mathbf{Q}_{\zeta}^0) \rightarrow_d N(\mathbf{0}, \mathbf{\Sigma}_{\zeta}^{\text{MD}} + \mathbf{\Sigma}_{\zeta}^{\text{M}})$ where

$$\mathbf{\Sigma}_{\zeta}^{\text{M}} = \mathbf{G}_{\zeta}^{\prime} \mathbf{G}_{\zeta}^{-1} \mathbf{G}_{\zeta} \mathbf{\Sigma}_{\zeta} \mathbf{G}_{\zeta}^{-1} \mathbf{G}_{\zeta} \mathbf{G}_{\zeta}^{\prime}$$

$$S = \text{diag} \{ \pm_{\ell 1}^2 = \hat{A}_1; \dots; \pm_{\ell J}^2 = \hat{A}_J \} \text{ with } \pm_{\ell j} = Q_{\ell j} i^{-0} x^j:$$

For the estimation of the asymptotic covariance two approaches are possible (Bushinsky 1994, 1996). The first approach implies assuming $f_{u_\ell}(0 | x = x^j) = f_{u_\ell}(0)$; and, in this case following Chamberlain (1994) it is possible to derive a consistent estimation for the asymptotic covariance matrix. The second approach does not assume independence, in the sense that $f_{u_\ell}(0 | x = x^j) \neq f_{u_\ell}(0)$; and is based in the bootstrap estimator of the covariance matrix.

Bootstrap Approximation

For the general case, where $f_{u_\ell}(0 | x = x^j) \neq f_{u_\ell}(0)$; the bootstrap estimator can be employed. Following Bushinsky (1994; 1996), let B samples drawn, each of size m (m need not be equal to N); from $(x_i; y_i)$ pairs. For each of the B samples an estimator \mathbf{b}_ℓ is computed to obtain B bootstrap estimates, $\mathbf{b}_\ell^1; \dots; \mathbf{b}_\ell^B$: The estimate of α_ℓ is then computed by

$$\hat{\alpha}_\ell = N \frac{m}{N} \frac{1}{B} \sum_{b=1}^B \mathbf{b}_\ell^b i \mathbf{b}_\ell^b i \mathbf{b}_\ell^b i \mathbf{b}_\ell^0:$$

Bushinsky (1994) argues that the bootstrap approximation has a good small sample behaviour.

TABLE 1: Percentage Real Hourly Wages Changes

Montevideo					Rest Urban Country			
Groups	1986-97	1986-89	1989-94	1994-97	1986-97	1986-89	1989-94	1994-97
Mean	53.2	29.9	16.9	-1.2	24.5	30.2	0.8	-5.1
Median	37.8	29.3	10.2	-3.4	14.9	33.2	-7.2	-7.1
Q10	17.0	29.7	0.4	-10.2	2.5	37.9	-19.1	-8.1
Q25	24.5	28.7	4.4	-7.3	6.8	31.4	-11.4	-8.4
Q75	53.9	28.6	16.9	1.8	22.8	29.9	0.1	-5.5
Q90	72.0	31.6	23.2	5.0	30.9	31.7	4.6	-5.0
Increase to reach a higher percentile								
Q9010	726.9	532.6	502.4	530.0	455.7	459.1	324.1	398.2
Q9050	316.5	218.6	204.2	189.8	164.5	166.1	109.0	113.9
Q9075	177.0	111.9	103.5	82.7	84.2	85.4	49.3	41.7
Q7550	131.4	93.4	74.8	61.5	76.4	86.4	40.2	42.6
Q5025	96.1	84.0	57.8	45.9	63.9	90.0	34.2	40.7
Q5010	173.5	156.7	118.3	110.0	141.4	179.8	88.4	116.4

Note: Q_i measures the rhw increase of percentile i between the beginning and end of a subperiod. Q_{ij} measures the rhw increase needed for a worker at percentile j at the beginning of the period to reach the earnings of a worker at percentile i at the end of the subperiod considered.

TABLE 2: Percentage Real Hourly Wages Increase needed for RUC percentil to reach Montevidean percentil

Same Percentile				
Groups	1986-97	1986-89	1989-94	1994-97
Mean	116.4	84.6	68.3	65.1
Median	75.1	64.4	36.0	41.5
Q10	57.4	74.6	26.9	40.9
Q25	58.5	63.8	30.1	36.0
Q75	103.9	71.2	54.2	56.7
Q90	159.9	100.4	88.1	88.6
Different Percentile				
Q9010	1000.0	751.4	661.9	887.9
Q9050	425.4	305.1	276.4	325.6
Q9075	265.5	181.8	168.6	181.2
Q7550	160.9	145.8	115.7	110.8
Q5025	149.7	134.4	96.6	114.3
Q5010	268.1	245.6	176.1	229.6

Note: Q_i measures the rhw increase of percentile i between the beginning and end of a subperiod. Q_{ij} measures the rhw increase needed for a worker at percentile j at the begining of the period to reach the earnings of a worker at percentile i at the end of the subperiod considered.