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DEMANDA DE TRABAJO, IMPUESTOS A LA NÓMINA Y DESEMPLEO EN COLOMBIA

INFORME FINAL
COMENTARIOS INCLUIDOS

MAURICIO CÁRDENAS
RAQUEL BERNAL
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1. INTRODUCTION

Colombia is one of the five Latin American countries that have engaged in significant labor reforms during the 1990s[2]. A new labor law was enacted in 1990, as part of a comprehensive reform package that liberalized the economy in many dimensions. Under the new regime, labor contracts were made more flexible and job security provisions were substantially modified. Both the level and the uncertainty of costs of dismissal and severance payments were reduced. A crucial element of the reform aimed to reduce dismissal costs tied to tenure. Prior to 1990, legislation on severance payments may have induced firms to strategically layoff workers who attained certain tenure substituting them for new entrants. Thus, this legislation may have diminished firms' willingness to provide training.

However, the reform did not alter the 9% payroll tax earmarked for labor training by *SENA* (2%), social welfare programs for the unprotected childhood by *ICBF* (3%), and family subsidies provided by the privately managed *Cajas de Compensación* (4%). Moreover, the 1993 Social Security reform increased employers' mandatory contributions for health and pension programs. The combined effect of both reforms resulted in an overall increase in payroll taxation. Meanwhile, unemployment rates increased from 8% during 1994 to 14.5% during the first quarter of 1998.

Thus, Colombia's reform of labor market legislation provides a useful source of temporal variability to study the effects of payroll taxation on labor demand, and of dismissal costs on turnover. Apart from a complete description of the institutional and regulatory changes, this paper analyzes the effects of overall payroll taxation on labor demand. Kugler (1998) discusses the effects of changes in job security provisions, such as severance payments and other dismissal

costs, on labor turnover.

The paper starts by describing and measuring the costs implied by the regulation. It then estimates labor demand equations in order to measure the relevant short and long run price and output elasticities. More specifically, the econometric exercise is aimed at responding two key questions: First, did the relevant elasticities change after the 1991 reforms? Second, what would happen to labor demand if payroll taxes are reduced? In addition to these issues, we place special emphasis on changes in the elasticities of substitution between skilled and unskilled labor. The estimations are based on two types of data. First, we use quarterly time series on aggregate and sectorial employment for the period 1982:1-1996:4. Second, we use a balanced panel of 2570 manufacturing firms available for the period 1978-1991, and a panel of 91 manufacturing sectors for the period 1976-1994. The results indicate that own wage elasticities are relatively low in absolute terms so the expected gains in terms of employment of a further reduction in payroll taxes are no significant. The paper also finds that the skilled and unskilled labor are substitutes in production, while capital and skilled labor are complements. Moreover, the corresponding degrees of substitutability and complementarity have increased in recent years. Finally, output elasticities are low, particularly in the case of the manufacturing sector. Therefore, the reduction in unemployment does not depend alone on higher output growth.

The paper proceeds as follows. Section 1 discusses the institutional and regulatory framework, with special attention to the changes introduced in the 1990 labor reform. Section 2 shows the stylized facts in the labor market during the 1976-1996 period. The discussion of the data is useful in order to lay out the main hypotheses of the paper. Section 3 presents the analytical framework in order to estimate static labor demand equations with time series data. Section 4 presents the results of a labor demand estimation based on two panels of

[2] The other countries are Argentina (1991), Guatemala (1990), Panama (1995), and Peru (1991). See Lora (1997).

manufacturing data. The first panel uses establishment data for the period 1978-1991. The second panel uses aggregated data for 93 manufacturing sectors for the period 1978-1995. Section 5 presents the results of estimating the determinants of labor demand in a dynamic framework that considers explicitly the impact of the regulations of the path of employment adjustment. Section 6 concludes with a brief summary of the main results.

2. INSTITUTIONAL FRAMEWORK: RECENT CHANGES

As mentioned in the introduction, the regulation of the labor market in Colombia has registered important changes during the 1990s. This section summarizes key aspects of the 1990 labor reform and the reform to the social security system that was enacted in 1993[3].

- Severance pay was the highest non-wage labor cost under the previous regime. The worker was entitled to one-month salary per year of work, based on the current salary at the time of exit. Partial withdrawals were allowed and deducted in nominal terms from the final payment, implying a form of "double retroactivity" (with an estimated cost of 4.2% of the total wage bill)[4]. The new legislation eliminated this extra cost in all new labor contracts and introduced a monthly contribution (9.3% of the basic salary[5]) to a capitalized fund in the workers' name accessible in the event of separation or retirement. Thus, the reform effectively reduced the level of severance payments. It also eliminated the employers' uncertainty about the cost of severance payments.

- In addition to severance pay, workers dismissed without "just cause" receive now a higher indemnity, between 15 and 40 days' wages per year of tenure on the job[6], with a minimum payment equal to 45 days' wages. Although the legal definition of "just cause" was widened, the reform increased the costs of dismissal.

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[3] See Lora and Henao (1995), Cárdenas and Gutiérrez (1996a), Lora and Pagés (1997), and Guash (1997).
[4] Apart from tenure, the real cost of termination of employment increased with the frequency of partial withdrawals, uncertain to the employer.
[5] Equal to a month's salary (plus interest) per year.
[6] Based on the highest salary during the last year of employment.

- The right of workers with more than 10 years tenure to sue for reinstatement was eliminated. Successful plaintiffs could oblige firms to rehire them with back pay.

- Workers earning more than 10 minimum wages were allowed to opt for a new contract ("integral salaries") with higher wages instead of severance pay and other benefits (such as a mandatory bonus equal to 15 days' wages). In a survey conducted by Fedesarrollo in 1994, firms reported that less than 2% of the employees had this type of contract.

- Labor contracts for less than one year were allowed (renewable up to three times under the same terms[7]), provided that all benefits are paid in proportion to the duration of the contract, so that labor costs are the same.

- Legal restrictions on the creation of labor unions were lifted. In particular, the Ministry of Labor lost discretionary powers in this regard. Also, it is now unlawful for employers to discourage the creation of labor unions. A minimum of 25 workers is still necessary to form a union.

- As mentioned above, the reform did not alter the 9% payroll tax earmarked for labor training, social welfare programs for the unprotected childhood and other privately provided subsidies. It is likely that, in this case, distortions in the labor market arise as a result of weak linkages between benefit entitlements and payroll taxes paid by the individual worker[8].

- The 1993 social security and health reform (Law 100) increased total contributions for health from 7% of the basic salary (until 1994) to 8% in 1995 and 12% afterwards. As before, one-third of the total contribution has to be paid be paid by the employer.

- The same Law increased pension contributions from 8% of the basic salary to 11.5% in 1994 (April), 12.5% in 1995, and 13.5% in 1996 and after. Workers earning more than four

[7] The fourth renovation has to be made for at least one year. See Farné and Nupia (1996).

minimum wages pay an additional percentage point. Much of the contribution is levied on firms which now pay 10.1 percentage points, as opposed 4.3 before the reform[9].

Table 1 and Figure 1 summarize the effects of labor and social security reform on non-wage labor costs. For workers with a contract signed prior to 1990, the total non-wage labor cost paid by the firm (as a percentage of the basic salary) raised from 47.1% in 1990 to 56.2% in 1996 (and thereafter). For workers with contracts signed after 1990, employers now pay 52% of the basic salary in contributions. In exchange for higher salaries, these contributions are substantially lower (33.8%) in the case of employees hired under the "integral salary" contract.

We divide non-wage costs into two relatively arbitrary categories: 1. Differed wages (vacations, extra bonuses, pension and health contributions and severance payments); 2. Payroll taxes paid by the employer with unclear benefits for the employee (e.g., *ICBF*, *SENA*, and *Cajas*). The economic response to these two types of non-wage costs may be different. In the case of differed wages the employee can offset part of the cost by adjusting the wage. This may not be the case of payroll taxes earmarked for the provision of public goods. In this case, the substitutability of wage and non-wage labor costs is diminished.

The upper panel of Figure 1 shows the evolution of severance payments, as well as health and pension contributions for an average worker as percentage of the basic wage between 1976 and 1996[10]. The middle panel shows the evolution of payroll taxes. These taxes increased by one percentage point in 1982 (earmarked to *SENA*) and again by an equal amount in 1989 (earmarked for *ICBF*). Vacations and extra bonuses have remained constant throughout the

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[8] Of course, if the linkage between payroll taxes is weak or if the external benefits of social security programs are significant, then partial or complete finance by general revenues may be appropriate. See Kesselman (1995).

[9] Law 100 (1993) eliminated the monopoly of the Social Security Institute (ISS) in the provision of health and pensions. The coverage of health services was extended to the whole family and to low income groups that were unattended under the previous system. In relation to the pension system, employees were given the option of choosing between the old pay-as-you-go system or the new fully funded system provided by private pension funds.

[10] Workers under "integral salaries" are excluded. After 1991 we ignore workers under pre-1990 contractual terms.

period. The bottom panel adds all these costs together. The cumulative effect shows an increasing trend until 1990. After the 1990 labor reform non-wage labor costs fell as a result of the changes introduced to the legislation related to severance payments. However, since 1994 these costs have increased sharply as a result of the 1993 health and pension reforms.

3. Time Series Data: Stylized Facts

Figure 2 displays the unemployment rate for the period 1976-1998. After reaching a peak in March 1986 (14.6%), unemployment rates declined steadily until 1994 when they were under 8%. Unemployment rates have increased sharply since 1995. The figure for March 1998 (14.5%) is the second highest since 1976. Although part of the surge in unemployment can be attributed to the business cycle, it is plausible that increases in the relative cost of labor combined with greater (in absolute value) price elasticity have resulted in lower labor demand. The increase in the relative price of labor has been the result, among other things, of changes in labor market regulation.

This paper assesses the role of these factors by using information on output, employment (skilled and unskilled) and wages for Colombia's seven largest cities. The information is available for seven sectors: (1) manufacturing, (2) electricity and gas, (3) construction, (4) retail, restaurants and hotels, (5) transportation and communications, (6) financial services, and (7) personal and government services. The data come from the quarterly National Household Survey (NHS), which has been conducted uninterruptedly since 1976. Output data come from the quarterly GDP series processed by DNP.

Employment and Production

Table 2 displays some basic descriptive statistics on urban employment for the period 1976-1996. Manufacturing and personal and governmental services provide 29% and 25% of the urban jobs, respectively. We use information only for wage earners classified as *empleados* (white-collar workers) and *obreros* (blue-collar workers). Although there are sharp differences across sectors, only 62% of urban workers were wage earners before the 1990 labor reform (64% afterwards). There are sharp differences across sectors. In manufacturing, 76% of the workers earn a monetary wage, while in retail and restaurants only 50% of the workers do.

We use a measure of skill that includes college graduates plus all of those with some university education (all workers with 12 or more years of schooling). By using this definition, the group of more educated workers represented 23% of urban employment on average between 1992 and 1996. According to Figure 3, their share in total urban employment has increased steadily since 1976, reflecting the greater educational attainment of the population. Indeed, average years of schooling have increased continuously during the past two decades. As can be seen in Table 2, skilled workers represent more than 30% of total employment in public utilities, financial services, and personal and government services. These shares have increased significantly after 1992.

For the manufacturing sector we also use data from the Monthly Manufacturing Survey (MMS) for the period 1980:01 to 1996:12. In this case, employment is available for production (blue-collar) and non-production (white-collar) number of workers. Strictly speaking, this distinction accounts for occupational position and not for educational differences. Information on imports of capital goods at the sectorial level is available for manufacturing (machinery and equipment) as well as transportation and communication services (transportation equipment).

Based on this data we constructed a measure of the capital stock for these two sectors using the perpetual inventory methodology and assuming a 15% depreciation rate. The corresponding user cost of capital was measure according to a standard methodology described in Cárdenas y Gutiérrez (1996)[11].

Figure 4 describes the evolution of employment and production in the Colombian urban sector. It is interesting to note that after 1991 skilled employment has been more dynamic than unskilled employment is most sectors. This has been particularly true in the case of manufacturing, where employment of unskilled workers has fallen in absolute terms since 1993. The same trend is observed in the construction sector after 1994. These two sectors combined employ approximately 35% of the unskilled wage earners in the urban regions. Capital stocks have experienced a major expansion in manufacturing and transportation services, especially after 1993. In fact, Cárdenas y Gutiérrez (1996) have found that in the case of manufacturing much of the reduction in unskilled employment is the result of its increasing substitutability with capital services.

Factor Prices

Information about wages of skilled and unskilled workers also comes from the National Household Survey. It is well known that this survey suffers from several methodological problems[12]. The main difficulties with the raw data are related to i. Top-coding problems in reported incomes; ii. Measurement errors on the part of the surveyors[13]. Top coding problems are

[11] Our measure of the user cost of capital is higher than the one obtained by Pombo (1997), who estimates the depreciation rates (and the corresponding tax deductions) for different asset types in the manufacturing sector.

[12] Cárdenas and Gutiérrez (1996) and Núñez and Jiménez (1997) describe in detail these problems and survey the alternative solutions that have been proposed in the literature.

[13] These errors refer to the fact that many workers report a weekly (or by-weekly) payment of their salary, but express their salary in monthly terms. We found that in 10 surveys the monthly incomes of some workers had been

present in most of the surveys. Until September 1993 the questionnaire allowed up to six digits for monthly incomes, so that higher end incomes were increasingly underestimated[14]. Since September 1993 seven digit incomes were allowed, but even then a fraction of the surveyed individuals reported the top coded income. This problem was finally solved in March 1996 (the surveys no longer have limits on the maximum income reported). In order to correct for truncated incomes we used a procedure based on the estimation of the maximum level of income for the individuals whose incomes are truncated. Once that level is estimated we fit an exponential function to distribute the incomes of the truncated population[15].

It is important to mention that wage information in the NHS corresponds to the income received by the worker, and not to the total labor cost paid by the employer. Since the latter is the relevant concept in the estimation of labor demand it is necessary to adjust the information on wages derived from the NHS. In particular, it is necessary to quantify non-wage labor costs.

As indicated above, Figure 1 summarizes all non-wage labor costs, expressed as a percentage of the basic salary. This includes severance payments, payroll taxes, and contributions for health and pensions on the part of the employer. It is not entirely clear whether income reported by the individuals surveyed in the NHS includes benefits such as vacations, mandatory bonuses and severance payments. Nonetheless, it is probably safe to assume that individuals report their basic pre-tax salary, without benefits. Consequently, in order to obtain the total labor cost we added the non-wage labor costs measured in Figure 1 to the basic salary

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overestimated due to the fact that a monthly salary had been (wrongly) multiplied by the frequency of payment. We dealt with this problem by identifying outliers in groups with similar socioeconomic characteristics.

[14] At the 1993 exchange rate, the maximum allowed monthly income (Col$999.998) was equal to US$1,200.

[15] See Núñez and Jiménez (1997) for details.

reported in the NHS. Wages were deflated using the PPI. The same procedure was applied for skilled and unskilled workers[16].

Figure 5 shows the evolution of real factor costs by sector. There are two key insights: First, the real cost of skilled labor has increased faster than the real cost of unskilled labor; Second, the cost of labor has increased faster than the cost of capital since the early 1990s. In fact, the user cost of capital decreased considerably during the period 1992-1994 as a result of the reduction in the interest rate and the real currency appreciation. As shown in Table 3 the average annual growth in labor costs between 1992 and 1996 was 11.4% for skilled workers and 8.4% for unskilled workers. These rates are substantially higher than the average for the pre-reform period. In sum, labor costs increased in an unprecedented way after 1990, especially in the case of skilled workers.

3. STATIC LABOR DEMAND: TIME SERIES

The purpose of this section is to measure the own wage elasticities of the demand for labor, as well as the elasticities of substitution between different factors of production[17]. The literature is rich in terms of functional forms that can be used for the estimation. If changes in the elasticity of substitution are of interest, the Generalized Leontief (GL) function is a common choice. The GL specification is also normally used when information is available for more than two factors of production[18].

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[16] As mentioned in Section 2, workers with high remuneration (over 10 minimum wages) under 'integral salaries' contracts have much lower non-wage costs (33.8% of the basic salary vs. 52% in contracts with full benefits). However, the NHS survey does not provide information on the contract type so we assume that all workers are paid full benefits. This is probably a correct assumption due to the fact that less than 2% of workers in manufacturing had this type of contract in 1994 (according to a survey conducted by Fedesarrollo).

[17] Defined as the effect of a change in relative factor prices on relative input use of the two factors, holding output and other factor prices constant.

[18] See Hamermesh (1986).

The derived factor demands from a GL cost function (see Appendix 1) can be written as:

$$\frac{x_{it}}{y_t} = \sum_j b_{ij}\left(\frac{p_{jt}}{p_{it}}\right)^{\frac{1}{2}} + \alpha_i y_t + \gamma_i t \,. \qquad (1)$$

where x_{it} is the quantity of factor i used in period t, y_t is output in period t, p_{it} is the price of input i in period t, and t is a time trend. Changes in the input-output ratio can be the result of: (a) changes in relative factor prices; (b) changes in the scale of production (if the production function is not homothetic); and (c) technological change. Diewert (1971) has shown that the GL cost function corresponds to a fixed coefficients technology (no factor substitution) if $b_{ij} = 0$ for all $i \neq j$. Also, the production function exhibits constant returns to scale if $\alpha_i = 0$ for all i (i.e., the function is homothetic). Clearly, factor-augmenting technological change does not occur if $\gamma_i = 0$ for all i. Based on the estimated b_{ij}'s, we then calculate the own wage elasticity for factor i (η_{ii}) as:

$$\eta_{ij} = -\frac{y\sum_{j\neq i} b_{ij}\left(p_j / p_i\right)^{1/2}}{2x_i} \,. \qquad (2)$$

In turn, the Hicks-Allen partial elasticities of substitution between input i and input j ($\sigma_{ij} = \sigma_{ji}$) can be easily calculated. The appropriate expressions in the case of the GL technology are (s_j is the cost share of input j):

$$\sigma_{ij} = \frac{\frac{y}{2x_i} b_{ij}\left(\frac{p_j}{p_i}\right)^{\frac{1}{2}}}{s_j} \,, \qquad (3)$$

for all $i \neq j$. In this case, the elasticity of substitution is not constant across time. In fact, as can be observed in equation (3), its value depends on the inputs quantities and prices. Finally, the elasticity of input i with respect to output is given by:

$$\varepsilon_i = 1 + \frac{\alpha_i y^2}{x_i}. \qquad (4)$$

Thus, when the technology exhibits constant returns to scale the output elasticity is equal to one.

RESULTS

This section summarizes the main results of the estimation of static labor demand equations. The system of equations (1) are estimated with two types of data. First, we use the Monthly Manufacturing Survey and estimate the own wage elasticities as well as the elasticities of substitution in the manufacturing sector. In this case we consider three factors of production: blue-collar labor, white-collar labor, and capital. Consequently, the results are based on the estimation of a system conformed by three equations. In the case of manufacturing the index of the number of workers is used as the dependent variable. Second, we use the National Household Survey in order to estimate a system of two equations for the demand of skilled and unskilled labor in the seven largest metropolitan areas. The equations use the number of hours worked as the dependent variable.

MANUFACTURING

Table 4 presents the results on the factor demands for skilled and unskilled labor, plus capital services. According to the GL specification, a system of 3 equations describing the behavior of the input-output ratios was estimated using a (Gauss) Full Information Maximum Likelihood Procedure (FIML). In order to correct for first order serial autocorrelation of the error the lagged residuals were added to each equation (AR1).

The system was estimated with and without the symmetry restrictions ($b_{ij} = b_{ji}$). Conveniently, Theil has shown that minus twice the log of the likelihood ratio (i.e. maximum of

the likelihood function imposing symmetry over the maximum of the likelihood function in the unconstrained case) has a Chi-square (χ^2) distribution (with degrees of freedom equal to the number of restrictions imposed)[19]. The test failed to reject the null hypothesis of symmetry. Also, in the estimations the coefficient γ_i came out not significantly different from zero rejecting the hypothesis of factor-augmenting technological progress.

The estimated b_{ij}'s (under symmetry and excluding the trend term from the equations) are significantly different from zero, rejecting the existence of a fixed proportion technology (a Leontief production function). Importantly, the signs of the coefficients indicate that the two types of labor are substitutes, while capital and skilled labor are complements. The hypothesis of constant returns to scale is also rejected at high levels of significance. The estimated α_i coefficients are all negative and significant. This implies that there are efficiency gains as the scale of production is expanded (i.e. the production function is nonhomothetic).

Based on the estimated b_{ij}'s we then compute the relevant elasticities that, according to the formulae, are time dependent. We report the elasticities for three periods: 1980-1985, 1986-1991, and 1992-1996. The two types of labor show an increasing degree of substitutability. The same is true between capital and unskilled labor. Skilled labor and capital seem to have an increasing degree of complementarity in production. Own wage elasticities are negative and low in absolute terms, although their magnitude has increased with time. For the 1992-1996 period their value is around –0.1, for both types of workers. This means that a 10% reduction in wages is related to a 1-percent increase in the demand for both skilled and unskilled labor[20].

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[19] See López (1980).

[20] The results using a CES function are quite similar. In this case, a 10% decrease in wages is related to a 0.8% increase in skilled labor demand and a 1.7% increase in unskilled labor demand respectively. Again, the two types of labor show increasing substitutability, just as in the case of capital and unskilled labor. On the other hand skilled labor and capital are complements. These results are available upon request.

Output elasticities are negative for the post-reform period for the three factors of production. In particular a 10% increase in production is related to a 3% reduction in both skilled and unskilled labor demands. On the other hand, a 10% increase in production is related to a 2% decrease in the capital stock in the manufacturing sector. These are puzzling results that suggest large gains in technological progress after 1992[21].

SEVEN METROPOLITAN AREAS

Table 5 shows the results of the estimation in the case of the demand for hours worked by skilled and unskilled labor (without capital) in the seven largest metropolitan areas. Besides changes in relative prices, we added a demand shifter in the equation. In particular we introduced the investment rate for the urban economy into equation (1), in order to assess any possible changes in labor demand holding constant relative prices.

In this case, the Wald test rejected the null hypothesis so we estimated the b_{ij}'s without symmetry restrictions. Again, the coefficients turned out significantly different from zero, rejecting the existence of a fixed proportion technology. The estimated α_i coefficient for skilled employment is positive and significant. This implies that skilled employment/output ratio increases as the scale of production is expanded (i.e. the production function is non-homothetic). Based on the estimated b_{ij}'s we computed the relevant elasticities. The two types of labor show a decreasing degree of substitutability as can be seen in Figure 6. On average, the elasticity of substitution between skilled and unskilled employment was 0.93 between 1976 and 1996.

Own-wage elasticities are higher in this case than in the manufacturing sector. In particular, a 10% decrease in wages is related to a 4.5% increase in skilled labor demand and a

[21] The results when splitting up into two subsamples (after and before the reform) are statistically insignificant.

5.1% increase in unskilled labor demand. In the case of unskilled labor, the own-wage elasticity has increased in absolute value during the post-reform period from 4.6% to 5.1%. On the other hand, output elasticities are positive. A one-percent increase in output is related to a 1,8% increase in skilled labor demand and a one-percent increase in unskilled labor demand. Higher investment rates increase both skilled and unskilled labor demand. Yet, this effect has been slightly higher in the case of skilled employment.

Finally, we estimated equation (1) adding a dummy for the post reform period (alone and interacted with the relative prices). The coefficients on these variables did not tun out significant. This means that the effects of the reforms are already captured in the changes in relative prices or in the demand shifter that was added to the equation. The results (not reported) on these regressions are available upon request.

4. Static Labor Demand: Panel Data Results

This section presents some preliminary results of the estimation of a homogeneous labor demand equation with a balanced panel of Colombian manufacturing firms. The panel was obtained from the Manufacturing Annual Survey (MAS) and includes 2570 firms throughout the period 1978-1991. The total labor cost was obtained by adding the non-wage labor costs measured in Figure 1 to the basic real salary (constant pesos of 1990) reported in the Survey. In the specification of the model we follow Bentolila and Saint Paul (1992). In particular, we estimate:

$$n_{it} = \alpha_0 + \alpha_1 n_{i,t-1} + \alpha_2 w_{it} + \alpha_3 p_{it} + \alpha_4 k_{it} + \alpha_5 dy_{it} + \alpha_6 t + \varepsilon_{it} \qquad (5)$$

where n_{it} is the log total employment by firm i at time t, w_{it} is the log of wage paid by the firm deflated by the producers' price index, p_{it} is the log of the price of intermediate goods consumed

by the firm (also deflated by the producers' price index), k_{it} is the log of stock of capital, dy_{it} is the growth rate in gross production by the firm, and t is a time trend.

The results are reported in Table 6. The first and second columns show the results of the estimation with least squares and instrumental variables, respectively. In the latter, we use the lagged values of employment and intermediate goods' prices as instruments (both at time *t-2*), as well as the contemporaneous growth rate in government consumption and the stock of capital. The results confirm the negative but low value (in absolute terms) of the short-run wage elasticity of labor demand in the manufacturing sector (around -0.05). However, the long-run value of this elasticity is substantially higher in absolute terms (-2.27). The long-run elasticity with respect to other inputs' prices is positive (1.36), suggesting labor and intermediate goods are substitutes in production.

Growth in gross output seems to have a statistically significant effect on employment. Indeed, the results of the estimation indicate that a one-percentage point increase in the rate of output growth results in a 0,24-percentage growth in employment. This result is in line with the time series evidence of the previous section. In order to correct heteroskedasticity problems we controlled for fixed effects by adding 28 sectorial dummy variables to the equation. The results remained virtually unchanged.

Finally, we interacted the list of regressors with a dummy variable that captures differential responses to the business cycle. The dummy variable takes a unitary value when output growth is over 4% and zero when growth is below 2%. If the growth rate is between 2% and 4%, the assigned value at time t depends on growth at *t-1*. If growth accelerated, then the dummy variable takes a unitary value. Conversely when growth decelerates.

The results suggest that the wage elasticity of labor demand decreases (in absolute terms) during expansions, while the elasticity with respect to the price of intermediate inputs increases. Thus, an increase in the cost of intermediate goods induces greater substitutability *vis-à-vis* labor during expansions than during recessions. Lastly, the results suggest an asymmetric labor demand response to the business cycle conditions. The impact of output growth on employment is larger during recessions than during expansions.

We also estimated equation (5) using data from 92 industrial sectors (corresponding to the 4-digit CIIU classification) from 1978 to 1995. The results are presented in Table 7 were all the variables are in logs. The first column presents the basic equation estimated by ordinary least squares. The second column corrects fixed effects and the third column uses instrumental variables, where lagged values of employment, intermediate goods' prices (both at time *t-2*) and the stock of capital (at time *t-1*) as well as the contemporaneous values of the stock of capital and of wages are the instruments. We also introduced time dummies trying to capture macroeconomic cycles affecting all sectors.

The estimated real wage elasticity during the pre-reform period is smaller in absolute terms than the value estimated with the firm-level data. Using IV the long-run wage elasticity is –1.43. The elasticity with respect to input prices is on average -1.2 depending on the method of estimation. Contrary to the firm-level results, the negative sign suggests that labor and intermediate goods are complements in production. Value added has a small but statistically significant effect on employment. According to these results, a one-percent increase in added value results in a 1.05 percentage growth in employment.

Again, we interacted the regressors with a dummy variable that captures the differential responses to the business cycle. Lagged employment shows the expected result, lower inertia in

expansion, and the coefficient is highly significant. All variables show changing coefficients. During expansions, for example, the wage elasticity is higher in absolute terms. The value-added elasticity is also higher during expansions as shown in column (5).

Finally, the last three columns in Table 7 show the results when the basic equation is interacted with a dummy variable equal to 1 from 1991 to 1995 (and 0 elsewhere) in order to assess for possible changes in the coefficients after the implementation of the labor reform. The coefficient on lagged employment indicates that employment has been more flexible since 1991 (lower inertia). This could be the result of more flexible contracts and, presumably, lower adjustment costs.

On the other hand, the elasticity with respect to total wage seems to have decreased after 1991. Similarly, the response of employment to changes in added value virtually disappeared during the post-reform period. The elasticity with respect to material prices turns out to be positive if we include the dummy indicating that labor and intermediate goods are substitutes in production during the post-reform period. Interestingly, the response of employment to changes in the capital stock increased significantly after the new labor regulation was implemented.

Table 8 shows two-year windows estimations of equation (5). Interestingly, the results indicate that while own-wage elasticity has been declining since 1979, the value-added elasticity has increased.

5. Dynamic Labor Demand: Time Series Results

The existence of adjustment costs of changing employment (net changes) and changes in firing and hiring (gross changes) implies that firms do not adjust instantly to changes in the

variables mentioned in the previous sections. We estimated a dynamic labor demand equation that is derived in Appendix 2:

$$E_t = c + \alpha_0 Y_t + \alpha\, Y_{t-1} + \beta_0 [W_t + NW_t] + \beta_1 [W_{t-1} + NW_{t-1}] + \gamma_t\, E_{t-1} + u_t \quad (6)$$

where E is employment, Y is a rolling autoregression forecast of production, W is a rolling autoregression forecast of basic wages, NW are non-wage labor costs that do not affect the path of employment adjustment, and u is an error term. Non-wage labor costs include vacations, bonuses, health and pension contributions and payroll taxes (all added as % of basic wage). In turn, γ_t is a measure of the costs of adjustment, which depends on the regulations that affect the path of employment. Following Burgess and Dolado (1989) we interact different types of regulation with E_{t-1}. In particular, we assume that:

$$\gamma_t = \gamma_0 + \gamma_1 R1_t + \gamma_2 R2_t \quad (7)$$

where $R1$ denotes severance payments (expressed as a percentage of the basic salary) and $R2$ denotes dismissal costs (indemnity for dismissal without just cause expressed in terms of the number of monthly wages for workers with 10 years in the firm). As mentioned in Section 2, severance payments fell as a result of the 1990 labor reform, while firing costs increased. These two changes in the regulation should have had opposite effects on the costs of adjustment. The reduction in severance payments should have reduced the costs of adjustment (a reduction in γ_t). The increase in dismissal costs should have worked in the opposite direction. Importantly, the 1993 pension and health reform increased labor costs but should not have affected the costs of adjustment.

This formulation useful in order to asses the impact of a one-unit increase in the costs of regulations on the level of employment (the β's) and that of this increase in the cost per worker on the path of employment adjustment (the γ's). In the former case, we can infer the impact or

short-run multiplier coefficient (β_0) and the long or equilibrium multiplier ($\beta_0 + \beta_1$). Moreover, we can test whether these multipliers changed as a result of the 1990 and 1993 labor reforms. This can be done as a quasi-natural experiment by including a post-reform dummy interacted with wages and the lagged employment measure.

Table 9 presents the results of the estimation of equation (6) with quarterly data from the household surveys. In order to avoid potential endogeneity in the shocking variables, we used rolling-regression (i.e. continuously updated) forecasts of the product demand and wages instead of their actual values. In the case of output, the forecast is based on fourth order autoregression. Wages are forecasted with a third order autoregression.

The first four columns show the results of estimating (6) for total urban employment. Unfortunately, we cannot include R1 and R2 in the same regression due to collinearity of the variables. The results are of interest. The first three columns indicate that the product elasticity of employment is 0.57, while the wage elasticity is zero in the short run (impact) but –0.16 in the long run. The results also suggest that the changes in the regulations did not have an impact on adjustment costs. In fact, the coefficient on lagged employment indicates that quarterly changes in employment are on average only 40% of the desired adjustment, irrespective of the changes in the regulation.

In column 4 we omitted the constant in equation 7. This implies that adjustment costs arise only from the type of regulations implied by R1 and R2. In this case, the coefficients on the lagged values of employment interacted with R1 and R2, respectively, are positive and significant. Thus, according to this specification, the changes in severance payments and dismissal costs that took place in 1990 had an effect on adjustment costs. The positive value of

the coefficient indicates that higher the costs of the regulation the higher the costs of adjusting employment.

The remaining regressions separate skilled and unskilled employment. The results suggest that output and price (in absolute value) elasticities are larger for skilled workers. The costs of adjustment were not affected by changes in the regulations regarding severance payments and dismissal costs for either type of worker.

6. CONCLUSIONS

This paper has analyzed the determinants of the demand for labor in Colombia using data for the manufacturing sector and for urban economy (seven largest metropolitan areas). The paper places special emphasis on the measurement of own wage elasticity in order to estimate the effects of payroll taxation on employment generation. The paper also analyses the impact of changes in labor regulations, through their direct impact on the costs of employment as well as through their effect on the relevant elasticities.

The results of the paper indicate that short-run wage elasticties are relatively low. In the case of manufacturing they range from –0.05 (estimated with a panel of establishments), to –0.1 (estimated with monthly time series from the Monthly Manufacturing Surveys), and to –0.6 (estimated with a panel of manufacturing subsectors). For the overall urban economy the estimated price elasticities are somewhat larger: -0.45 for skilled workers (12 or more years of schooling) and –0.52 for unskilled workers. In the long run the elasticities are higher: –1.42 using the panel of manufacturing subsectors.

The paper also analyszes the impact of changes in the regualtions on adjustement costs using a dynamic labor demand framework. The conclusion here is that changes in severance

payments and costs of dismissal, associated with the 1990 labor reform, have not afected the path of employment adjustment. Using this framework, we also conclude that labor reforms did not change the relevant elasticities. The product demand elasticity is 0.6 while the own wage elasticity is –0,16. This means that the main effect of regulatory changes affected labor demand though their direct impact on labor costs. Since these costs have increased it is likely that the net effect of labor, health and pension reforms has been a reduction in employment generation. According to the estimated elasticities in the dynamic framework, an elimination of the 9% payroll taxes could result in a 1,44% increase in employment in the urban areas.

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Appendix 1. Generalized Leontief (GL) Cost Function

The GL cost function can be written as:

(A1) $$C(P,Q,t) = Q\sum_i \sum_j b_{ij} p_i^{1/2} p_j^{1/2} + Q^2 \sum_i \alpha_i p_i + Qt \sum_i \gamma_i p_i$$

where Q denotes output and p_i is the price of input i (t is time). The function is homogeneous of degree one in prices and does not impose symmetry, concavity or homotheticity. Assuming price-taking behavior in factor prices and using Shephard's Lemma one can derive cost-minimizing input demand functions:

(A2) $$X_i = \frac{\partial C}{\partial P_i} = \sum_j b_{ij} \left[p_j / p_i \right]^{1/2} Q + \alpha_i Q^2 + \gamma_i Qt$$

where X_i is the quantity demanded of input i. Factor demands can be expressed in terms of input-output ratios:

(A3) $$\frac{X_{it}}{Q_t} = \sum_j b_{ij} \left[p_{jt} / p_{it} \right]^{1/2} + \alpha_i Q_t + \gamma_i t + \mu_{it}.$$

Appendix 2. Analytical Framework for the Dynamic Labor Demand Estimations

A Cobb-Douglas production function can be written as:

(A4) $$Y_t = A L_t^{*\alpha} K_t^{(1-\alpha)}$$

where A denotes technological change, L^* the optimal level of total employment, K the capital stock and α the proportion of employment in production.

First order conditions can be written as:

(A5) $$W_t = \frac{\delta Y_t}{\delta L_t} = \alpha A L_t^{*\alpha-1} K_t^{1-\alpha}$$

Expressing equation (A5) in logarithms:

(A6) $$\ln W_t = \ln \alpha A - (1-\alpha)\ln L_t^* + (1-\alpha)\ln K_t$$

Rearranging terms:

(A7) $$\ln W_t = \ln Y_t + \ln \alpha A + \ln A + \alpha \ln L_t^* - (1-\alpha)\ln L_t$$

(A8) $$\ln L_t^* = \frac{\ln C + \ln Y_t + \ln W_t}{(1-\alpha)}$$

If lowercase letters denote logs, then (A8) is equivalent to:

(A9) $$e_t^* = c + \alpha y_t + \beta w_t$$

An adjustment equation satisfies:

(A10) $$e_t - e_{t-1} = (1-\lambda)(e_t^* - e_{t-1}) + \varepsilon_{t-1}$$

Rearranging terms:

(A11) $$e_t^* = \frac{e_t - e_{t-1}}{(1-\lambda)} + e_{t-1} - \frac{\varepsilon_{t-1}}{(1-\lambda)}$$

Substituting (A9) into (A11):

(A12) $$\frac{e_t - e_{t-1}}{(1-\lambda)} + e_{t-1} - \frac{\varepsilon_t}{(1-\lambda)} = c + \alpha y_t + \beta w_t$$

Rearranging terms:

(A13) $$e_t = (1-\lambda)c + \alpha(1-\lambda)y_t + (1-\lambda)\beta w_t + \lambda e_{t-1} + \varepsilon_t$$

We now suppose firms have rational expectations and e_t^e satisfying the following condition:

(A14) $$e_t^e = (1-\lambda)e_t + \lambda e_{t-1}^e$$

where superscript e denotes expectations. Substituting recursively for e_{t-s}^e, we can obtain:

(A15) $$e_t^e = \frac{(1-\lambda)}{(1-\lambda L)} e_t$$

where L is the lag operator. Then (A13) can be rewritten as:

(A16)

$$e_t = (1-\lambda)c + \alpha y_t - \alpha\lambda y_{t-1} + \beta w_t - \lambda\beta w_{t-1} + \lambda e_{t-1} - \lambda^2 e_{t-2} + \varepsilon_t - \lambda\varepsilon_{t-1}$$

which is the estimated equation.

Table 1

	NON WAGE COSTS (as % of basic wage)			
	Contratcs before 1990		New Contracts	
	in 1990	after 1990	with full benefits	integral salary
Severance Payments				
Nominal rate	9.3	9.3	9.3	...
Double Retroactivity	4.2	4.2	...	...
Other benefits				
Vacations (15 days a year)	6.7	6.7	6.7	6.7
Mandatory Bonuses (1/2 month a y	8.9	8.9	8.9	...
Social Security Contributions				
Pensions	6.5	13.5	13.5	14.5
(paid by the worker)	(2.2)	(3.4)	(3.4)	(4.4)
Health	7	12	12	12
(paid by the worker)	(2.3)	(4.0)	(4.0)	(4.0)
Payroll Taxes	9.0	9.0	9.0	9.0
SENA	2.0	2.0	2.0	2.0
ICBF	3.0	3.0	3.0	3.0
Cajas de Compensación	4.0	4.0	4.0	4.0
Total	51.6	63.6	59.4	42.2
Total paid by firm	47.1	56.2	52.0	33.8
Total paid by worker	4.5	7.4	7.4	8.4
Memo: shares in total employment in 1994				
manufacturing	na	20.7	53.6	1.5
commerce	na	14.5	71	0.6

Source: Before 1990 Ocampo(1987)

Sena Contributions were increased from 1% until 1982 to 2% afterwards. ICBF contributions were increased from 2% until 1989 to 3% afterwards.

Increases in health contributions have been gradual (7% until 1994, 8% in 1995 and 12% afterwards). Contributions for pensions increased from 4.5% to 6.5% in 1985, to 8% in 1992, to 11.5% in 1994, to 12,5% in 1995. Since 1996 the contributions for workers earning more than 4 minimum wages is 13.5% and for workers earning less than 4 minimum wages is 14.5%.

Table 2

DESCRIPTIVE STATISTICS BY SECTOR

Sector	Participation in total employment		Participation of wage-earners in total employment		Skilled / Total employment 12 years or more		Skilled / Unskilled employment		Skilled workers' wages / Unskilled workers' wages	
	pre	post	pre	post	pre	post	pre	post	pre	post
Manufacturing	29.75	27.57	76.10	76.53	10.45	13.96	0.118	0.162	3.095	2.937
Electricity and gas	1.08	0.97	98.90	98.81	23.87	33.62	0.329	0.514	2.330	2.282
Construction	6.46	6.31	64.21	58.84	9.46	12.45	0.106	0.143	3.493	3.375
Retail, restaurants and hotels	19.65	21.15	50.35	52.80	10.96	15.81	0.126	0.188	2.621	2.431
Transportation and Communications	7.12	7.03	70.03	68.12	11.09	14.69	0.127	0.173	2.333	2.321
Financial services	8.48	9.47	77.36	79.23	30.10	37.95	0.443	0.615	2.238	2.487
Personal and Gubernamental services	25.83	25.73	56.14	59.41	30.17	38.27	0.441	0.622	2.432	2.376
Total urban	98.36	98.23	62.66	64.06	17.63	23.28	0.218	0.304	2.658	2.626

Pre-reform: 1976-1991; post-reform: 1992-1996.
Source: NHS

Table 3

Annual Average Growth in Total Real Labor Cost (%)

Sector	Unskilled Employment (12 years of education or more)			
	1977-1985	1986-1991	1992-1996	1977-1996
Manufacturing	1.80	-1.45	8.09	2.40
Electricity and gas	1.73	-0.20	10.93	3.45
Construction	3.03	-1.16	9.89	3.49
Retail, restaurants and hotels	2.03	-1.08	8.08	2.61
Transportation and Communications	2.23	-0.97	8.28	2.78
Financial services	1.11	-1.84	7.49	1.82
Personal and Gubernamental services	1.58	-1.38	8.85	2.51
Total urban	1.65	-1.34	8.36	2.43

Sector	Skilled Employment (11 years of education or less)			
	1977-1985	1986-1991	1992-1996	1977-1996
Manufacturing	-1.96	-2.78	11.85	1.25
Electricity and gas	3.58	-2.34	15.58	4.81
Construction	-0.32	0.55	13.41	3.37
Retail, restaurants and hotels	-1.68	-0.59	10.04	1.58
Transportation and Communications	0.73	-0.11	10.79	3.00
Financial services	-1.38	-0.56	12.83	2.42
Personal and Gubernamental services	-1.14	-1.61	11.81	1.95
Total urban	-1.63	-1.71	11.36	1.59

Table 4

FACTOR DEMANDS: GL Specification
MANUFACTURING SECTOR
1980:01 - 1996:12

	Skilled		Unskilled		Capital		Production		R^2	D.W.
Skilled employment	77.61						-0.010		0.97	2.2
	(9.59)	***					(-38.96)	***		
Unskilled employment	10.47		145.4				-0.020		0.97	2.17
	(5.31)	***	(8.40)	***			(-24.52)	***		
Capital	-0.006		0.008		1.48		-0.0002		0.98	2.16
	(-1.72)	*	(1.81)	*	(8.27)	***	(-52.05)	***		

PRICE, INCOME AND SUBSTITUTION ELASTICITIES

	1980-85	1986-91	1992-96	
Own-wage elasticities				
η_{ee}	-0.079	-0.095	-0.098	-0.091
η_{oo}	-0.063	-0.083	-0.105	-0.084
η_{kk}	-0.005	-0.006	0.000	-0.004
Elasticity of substitution				
σ_{eo}	0.581	0.833	0.973	0.796
σ_{ek}	-0.706	-0.869	-0.934	-0.836
σ_{ko}	0.591	0.811	0.988	0.797
Output elasticities				
ε_{ey}	0.333	-0.012	-0.353	-0.011
ε_{oy}	0.450	0.077	-0.323	0.068
ε_{ky}	0.202	-0.184	-0.222	-0.068

o-unskilled employment, *e*-skilled employment, *y*-production
Employment in number of workers.

Table 5

FACTOR DEMANDS: GL Specification
TOTAL
1977:1-1996:4

	Constant		Relative prices		Production		Demand Shifter		R^2	D.W.
Skilled employment	-0.8864		0.9243		0.7152		0.0882		0.92	2.24
	(-3.41)	***	(3.80)	***	(11.57)	***	(2.68)	***		
Unskilled employment	1.3739		-0.485		-0.026		0.0665			
	(8.27)	***	(-3.43)	***	(-0.62)		(2.66)	**	0.50	2.11

PRICE, INCOME AND SUBSTITUTION ELASTICITIES

	1976-1981	1982-1985	1986-1991	1992-1996
Own-wage elasticities				
η_{ee}	-0.755	-0.642	-0.507	-0.445
η_{oo}	-0.573	-0.497	-0.461	-0.515
Elasticity of substitution				
σ_{eo}	1.147	0.982	0.822	0.798
Output elasticities				
ε_{ey}	1.873	1.772	1.714	1.839
ε_{oy}	0.979	0.978	0.975	0.966

o-unskilled employment, *e*-skilled employment, *y*-production
Employment in number of hours.

Table 6

Labor demand estimation results
Firm level

	Basic Model			Cycle	
	[1] OLS	[2] IV	[3] OLS + Di	[3] IV	[3] IV+Di
Employment (t-1)	0.964	0.978	0.965	0.987	0.988
	(526.20)	(492.76)	(476.46)	(349.27)	(331),.77)
Labor cost	-0.050	-0.051	-0.062	-0.054	-0.070
	(-18.19)	(-17.76)	(-19.08)	(-17.86)	(-20.13)
Price of materials	0.024	0.030	0.047	0.024	0.051
	(3.78)	(4.27)	(5.15)	(2.43)	(3.83)
Capital Stock	0.025	0.018	0.027	0.015	0.018
	(20.99)	(14.38)	(19.49)	(8.60)	(9.19)
Growth in production	0.245	0.243	0.242	0.262	0.263
	(58.45)	(56.22)	(56.18)	(40.88)	(41.02)
Year	-0.001	0.000		0.001	0.001
	(-2.24)	(1.19)		(1.91)	(2.06)
Employment (t-1)				-0.022	-0.022
				(-5.51)	(-5.66)
Labor cost				0.003	0.003
				(2.06)	(1.99)
Price of materials				0.013	0.011
				(0.99)	(0.85)
Capital Stock				0.009	0.009
				(3.29)	(3.44)
Growth in production				-0.063	-0.065
				(-6.84)	(-7.05)
Adj. R2	0.965	0.966	0.966	0.966	0.966

Table 7
Industrial Panel Estimations

	Basic Equation			Cycle		Structural Change		
	OLS (1)	Fixed Eff. (2)	IV (3)	(4)	IV (5)	OLS (6)	Fixed Eff. (7)	IV (8)
Employment (t-1)	0.7476	0.4417	0.5767	0.8478	1.0941	0.7791	0.5165	0.6119
	(52.31)	(21.48)	(6.00)	(40.46)	(35.37)	(62.47)	(28.36)	(7.48)
Total wage	-0.2903	-0.1413	-0.6056	-0.1281	-0.1100	-0.2432	-0.2029	-0.4746
	(-11.57)	(-3.57)	(-4.04)	(-4.26)	(-2.92)	(-11.84)	(-6.02)	(-4.38)
Input prices	-0.2208	-0.3755	-0.5197	-0.2884	-0.0321	-0.3068	-0.4986	-0.777
	(-5.59)	(-7.81)	(-3.90)	(-5.33)	(-0.33)	(-6.84)	(-9.68)	(-3.69)
Capital stock	0.0289	0.0212	-0.0198	-0.0400	-0.1247	0.0351	0.0595	0.0118
	(2.85)	(0.69)	(-1.58)	(-2.88)	(-7.54)	(4.52)	(2.55)	(0.93)
VA	0.2154	0.2953	0.4465	0.1998	0.0595	0.1777	0.2593	0.3683
	(18.94)	(22.12)	(4.52)	(12.97)	(2.67)	(17.77)	(21.45)	(4.71)
Year	-0.0007	-0.0021	0.0001					
	(-0.48)	(-1.25)	(0.07)					
D*Employment (t-1)				-0.1398	-0.3803	-0.8045	-0.6102	-0.5939
				(-5.05)	(-10.50)	(-26.50)	(-20.28)	(-5.77)
D*Total wage				-0.26112	-0.4765	0.1721	0.1424	0.4223
				(-8.35)	(-12.41)	(5.29)	(4.37)	(1.75)
D*Input prices				0.1422	-0.1186	0.3620	0.4321	0.9379
				(1.98)	(-1.10)	(5.97)	(7.12)	(3.24)
D*Capital stock				0.1296	0.2105	0.9964	0.7764	1.0687
				(7.08)	(10.25)	(29.64)	(22.33)	(5.73)
D*VA				-0.0219	0.1122	-0.1720	-0.1513	-0.4244
				(-1.01)	(4.07)	(-7.64)	(-6.60)	(-1.94)
R2	0.9705	0.9763	0.9622	0.9735	0.9706	0.9825	0.9833	0.9778

Total number of observations: 1502

Table 8
Industrial Panel Estimations

FIXED EFFECTS

	79-80	80-81	81-82	82-83	83-84	84-85	85-86	86-87	87-88	88-89	89-90	90-91	91-93	93-94	94-95
Employment (t-1)	-0.0743	-0.0587	-0.0474	-0.1223	-0.5305	-0.0053	0.1023	-0.2507	-0.4161	-0.1744	-0.1829	0.0320	0.5637	-0.0120	0.0627
	(-0.76)	(-0.85)	(-0.59)	(-0.98)	(-8.77) **	(-0.16)	(1.07)	(-3.28) **	(-2.93) ***	(-3.22) **	(-2.27) **	(0.19)	(9.22)	(-0.18)	(0.71)
Own wage	-0.3102	-0.4793	0.4777	-0.1414	-0.4180	-0.3545	-0.2664	-0.2871	-0.3061	-0.0021	0.5378	-0.1070	0.1341	-0.2255	-0.2581
	(-1.59)	(-3.62) **	(3.82) ***	(-0.92)	(-3.33) **	(-2.80) **	(-2.31) **	(-2.76) **	(-1.26)	(-0.01)	(3.19) ***	(-0.44)	(0.96)	(-1.66) *	(-2.41) **
Input prices	-0.6272	-0.9954	-1.5175	-1.3491	-0.0841	-0.7394	-0.9773	-0.7716	-0.2241	-0.7389	-0.7355	-0.8290	-0.2397	-0.7893	-0.1840
	(-2.21) **	(-2.79) **	(-3.73) ***	(-2.70) **	(-0.32)	(-2.34) **	(-2.73) **	(-2.31) **	(-1.55)	(-2.01) **	(-3.49) ***	(-1.01)	(-1.13)	(-2.56) **	(-1.53)
Capital Stock	0.0051	0.1403	0.0052	0.1485	-0.1801	-0.0050	0.2655	0.1969	0.4015	0.3025	0.6909	-0.2166	0.2560	0.0928	0.1445
	(0.03)	(1.44)	(0.08)	(0.92)	(-0.61)	(-0.02)	(1.45)	(1.23)	(0.90)	(1.26)	(4.02) ***	(-0.67)	(1.26)	(0.67)	(1.44)
VA	0.4758	0.5247	0.1640	0.5604	0.4948	0.4379	0.2597	0.4479	0.1858	0.1807	0.0479	0.8550	0.1837	0.3229	0.3429
	(6.63) ***	(9.97) **	(4.99) ***	(12.23) **	(7.76) **	(7.97) **	(5.19) **	(10.29)	(5.66) ***	(3.20) **	(1.97) *	(14.28) **	(4.51) ***	(6.00) ***	(7.76) ***
R2	0.996	0.9977	0.9946	0.9909	0.9953	0.9962	0.9948	0.9964	0.9834	0.9933	0.9963	0.9876	0.9899	0.9962	0.9961
F-stat	2.8068	5.0424	3.8057	5.0680	14.9600	13.3410	3.3128	6.1009	2.0772	7.1935	6.1854	5.6651	7.2999	10.2770	13.5270
P-value	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

EAM 92 sectors

Table 9

DYNAMIC LABOR DEMAND ESTIMATIONS

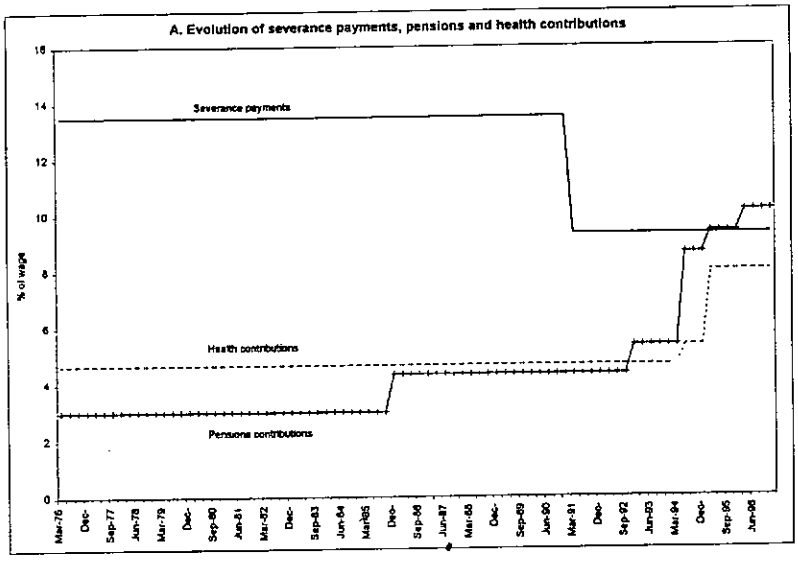
	Total E (1)	Total E (2)	Total E (3)	Total E (4)	Skilled E (5)	Unskilled E (6)	Skilled E (7)	Unskilled E (8)
Constant	0.0156	0.0156	0.0156	0.0254	-0.0364	0.2143	-0.1005	0.2143
	(0.44)	(0.44)	(0.44)	(0.66)	(-0.36)	(4.18)	(-1.96)	(4.18)
Production $_t$	0.5666	0.5666	0.5666	0.6238	1.0237	0.6041	1.0250	0.6041
	(2.84)	(2.84)	(2.84)	(3.00)	(4.17)	(2.95)	(4.17)	(2.95)
Production $_{t-1}$	-0.0342	-0.0342	-0.0342	-0.1065	-0.1125	0.0365	-0.1123	0.0365
	(-0.17)	(-0.17)	(-0.17)	(-0.52)	(-0.44)	(0.18)	(-0.43)	(0.18)
Own Wages $_t$	0.0175	0.0175	0.0175	0.0296	0.0877	0.1224	0.0880	0.1224
	(0.18)	(0.18)	(0.18)	(0.30)	(0.74)	(1.22)	(0.74)	(1.22)
Own Wages $_{t-1}$	-0.1636	-0.1636	-0.1636	-0.1766	-0.2237	-0.0385	-0.2254	-0.0385
	(-1.70)	(-1.70)	(-1.70)	(-1.79)	(-1.81)	(-0.38)	(-1.81)	(-0.38)
Other type of E Wages $_t$					0.1215	0.1222	0.1211	0.1222
					(0.98)	(1.24)	(0.98)	(1.24)
Other type of E Wages $_{t-1}$					-0.2538	-0.3684	-0.2563	-0.3684
					(-2.05)	(-3.70)	(-2.07)	(-3.70)
$R1_t * E_{t-1}$	0.0334			0.3085	-0.0680	0.0089		
	(0.73)			(5.20)	(-0.92)	(0.17)		
$R2_t * E_{t-1}$		-0.0364		0.3059			0.0607	-0.0097
		(-0.73)		(5.05)			(0.82)	(-0.17)
$Dum91 * E_{t-1}$			-0.0104					
			(-0.73)					
E_{t-1}	0.5760	0.6459	0.6095		0.4679	0.3025	0.4070	0.3211
	(4.95)	(5.39)	(5.64)		(4.11)	(2.52)	(2.43)	(2.46)
R2	0.9790	0.9790	0.9790	0.9777	0.9847	0.9699	0.9847	0.9699
DW	2.63	2.63	2.63	2.60	1.96	2.42	1.98	2.42

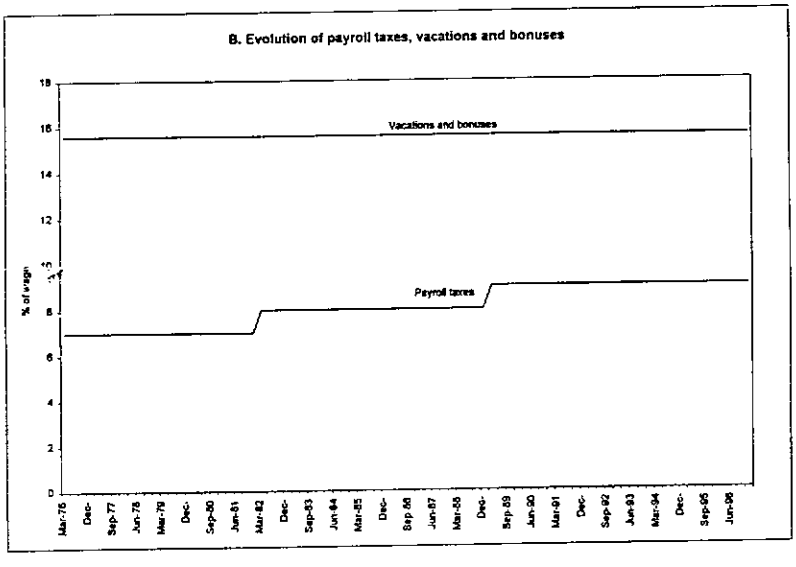
Number of observations: 75

R1: Severance Payments

R2: Dismissal Costs

Figure 1
Non-labor costs
(as % of wage)





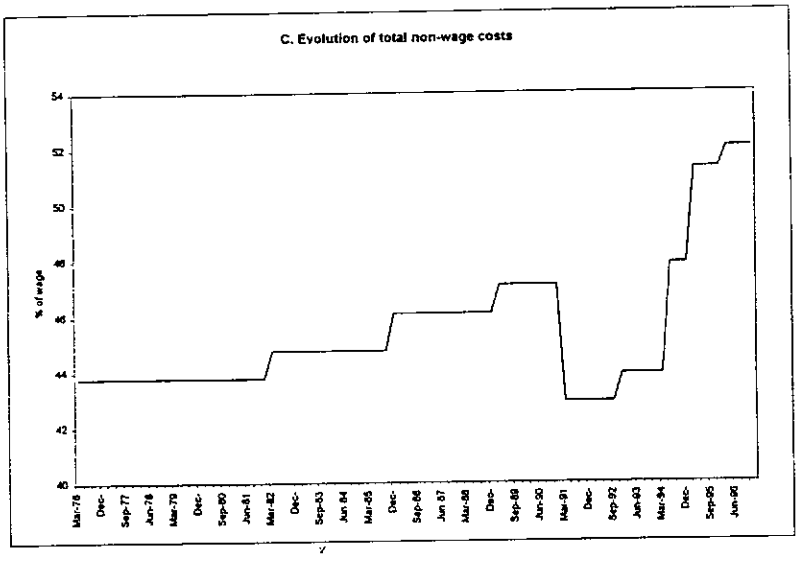


Figure 2

Urban unemployment rate

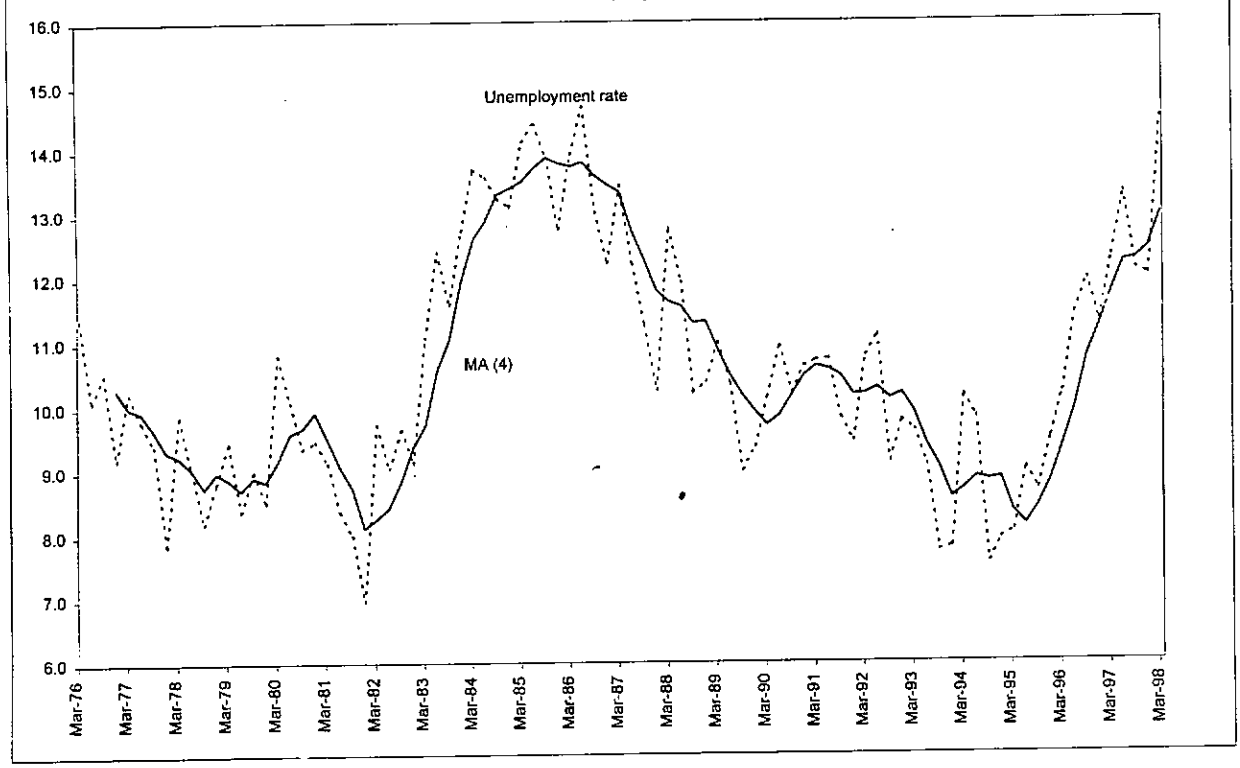


Figure 3

Skilled to Total Employment Ratio and Average Years of Schooling

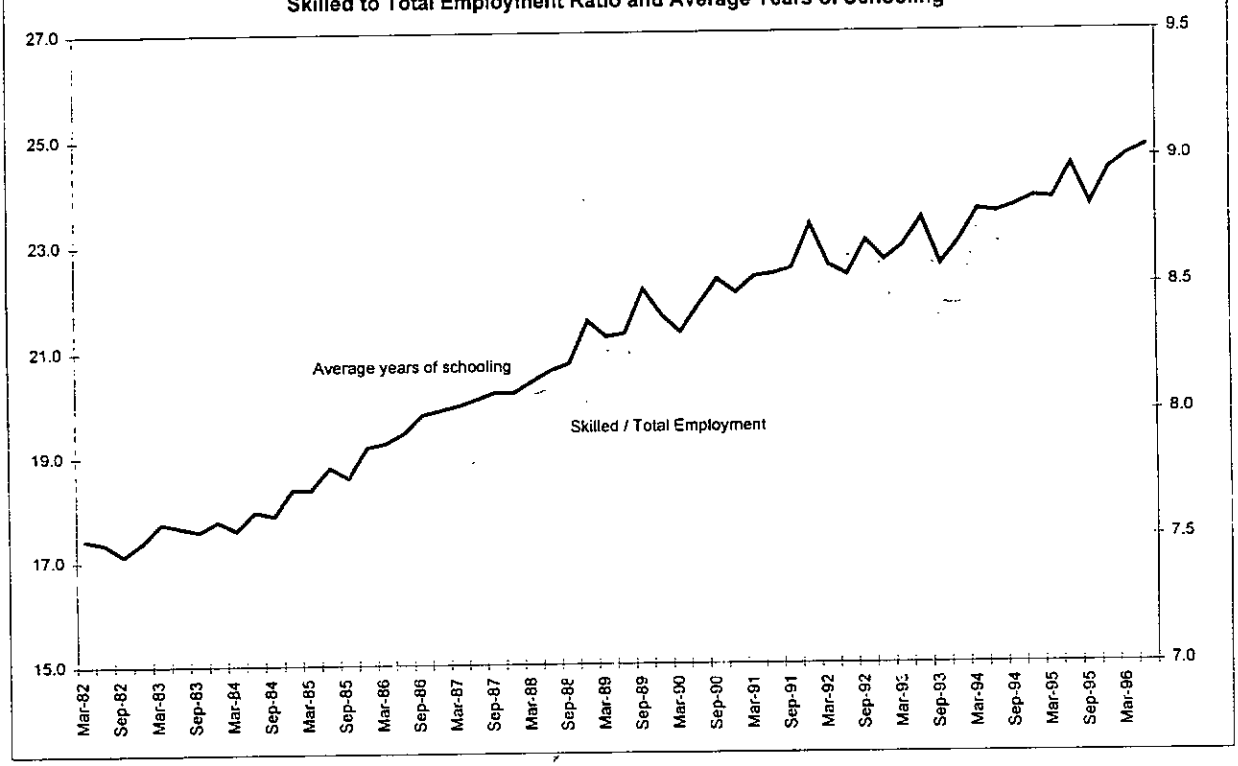
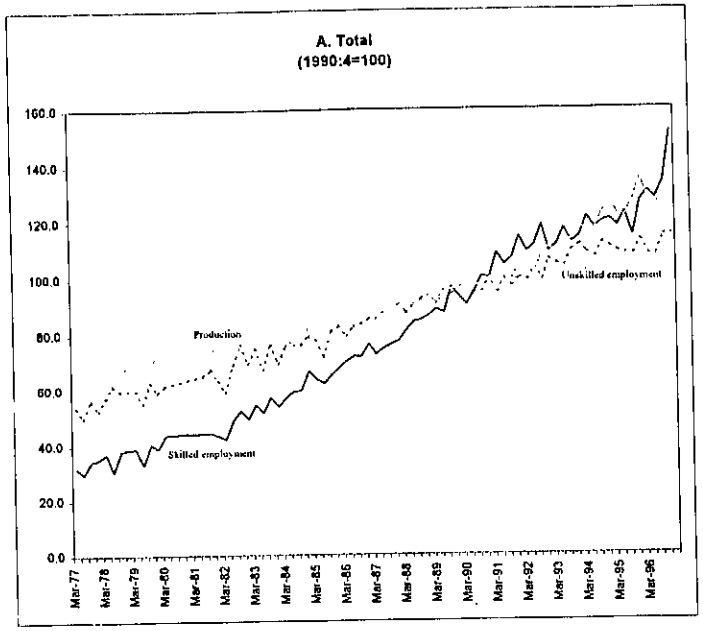
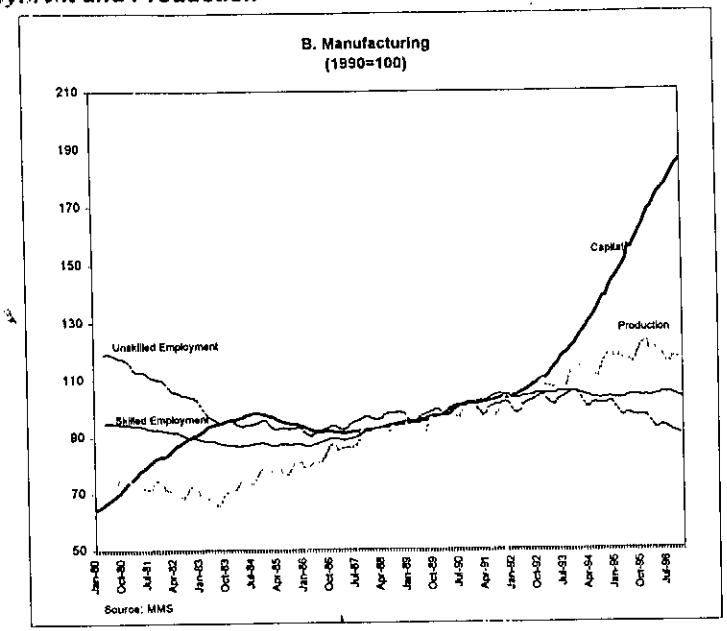
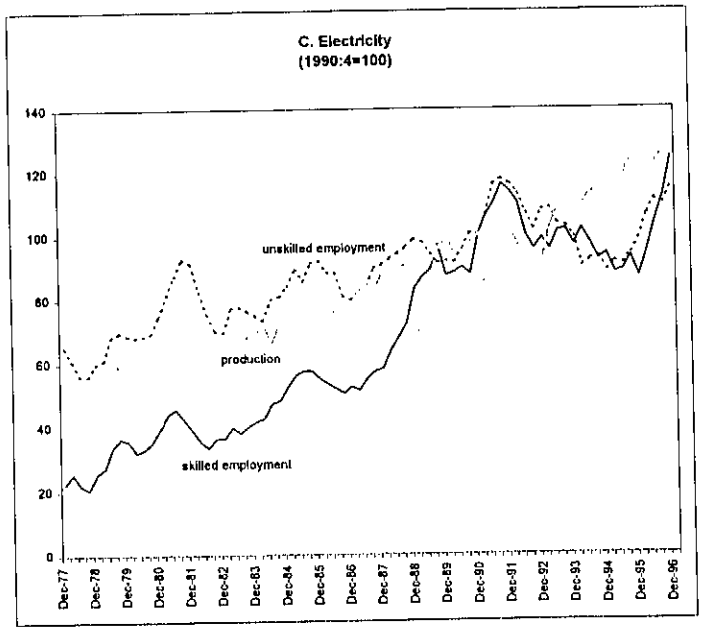


Figure 4

Colombia: Urban Employment and Production







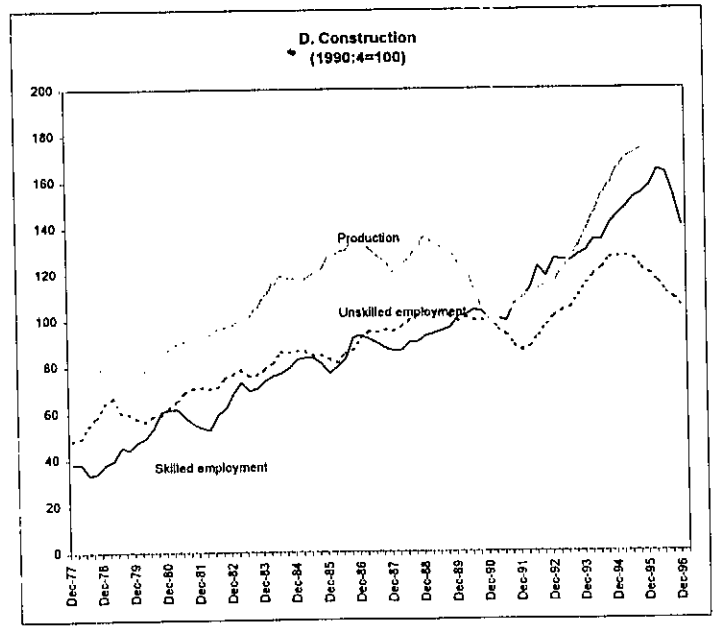
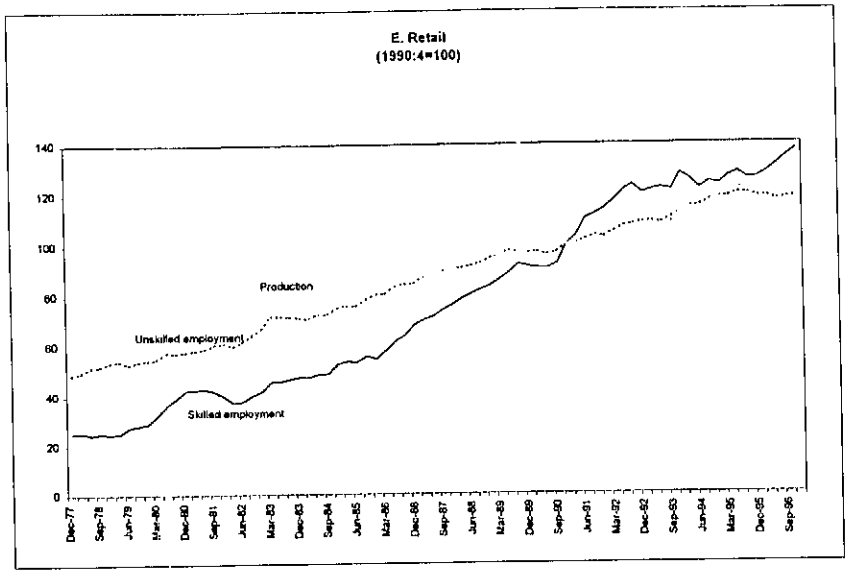
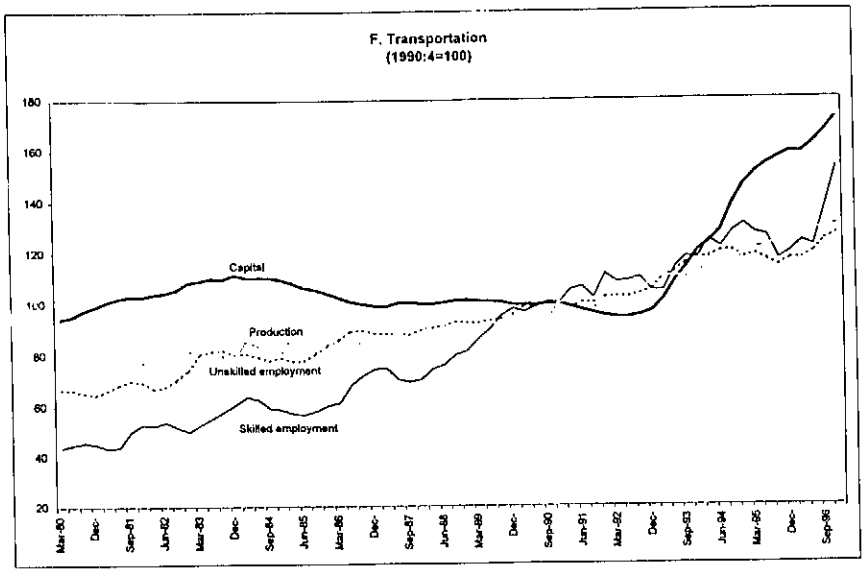
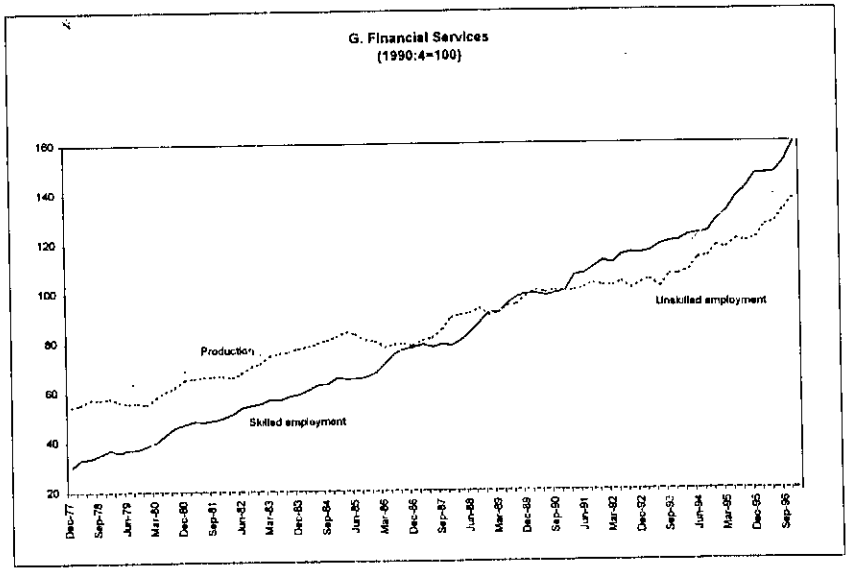


Figure 4 (cont.)







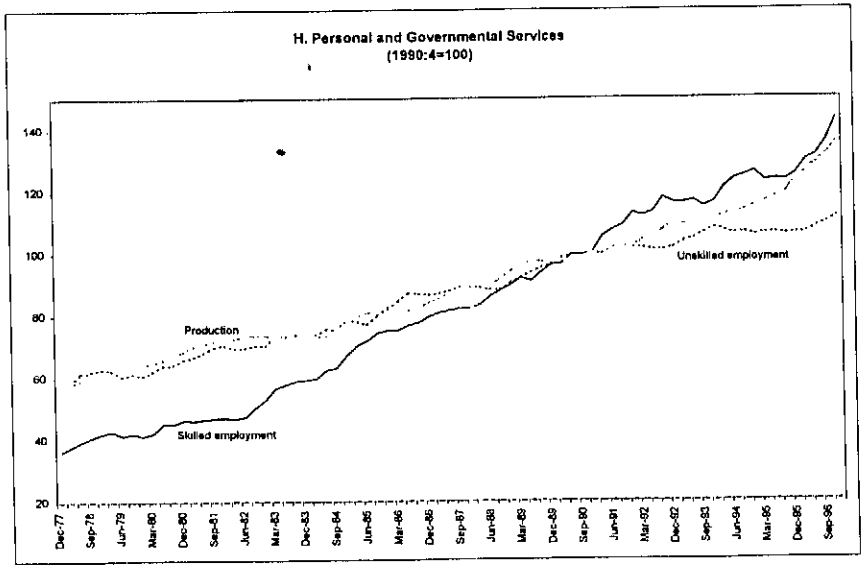
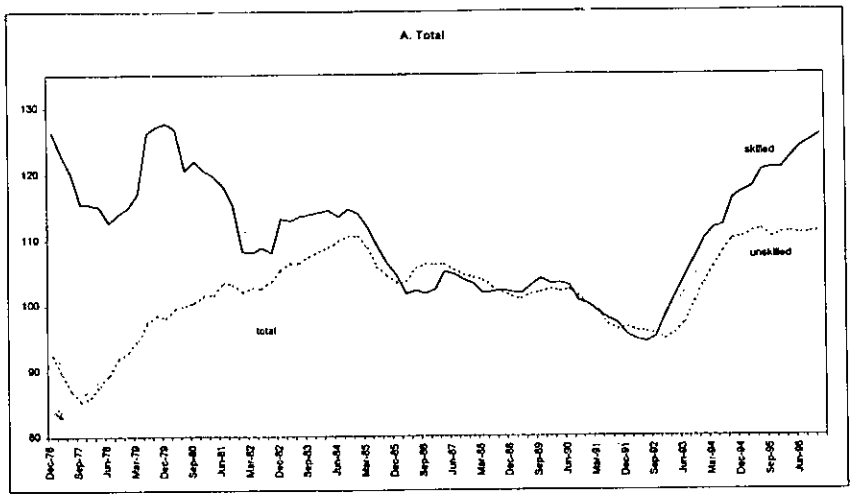
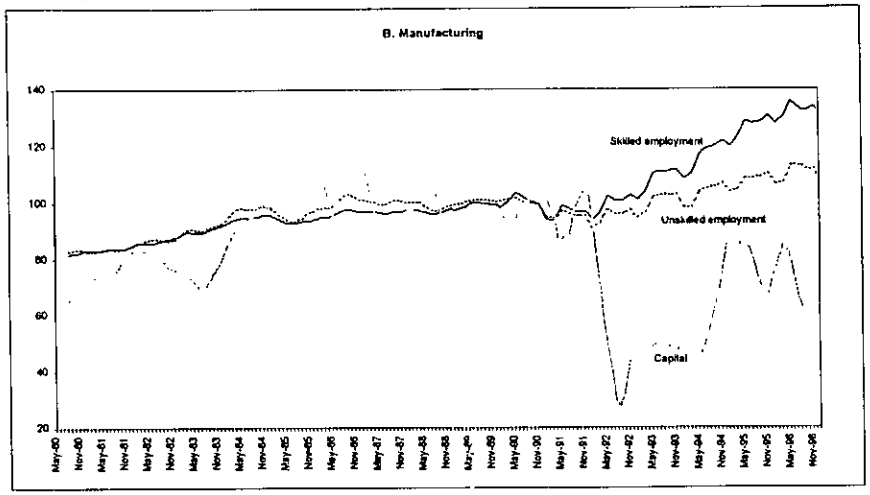
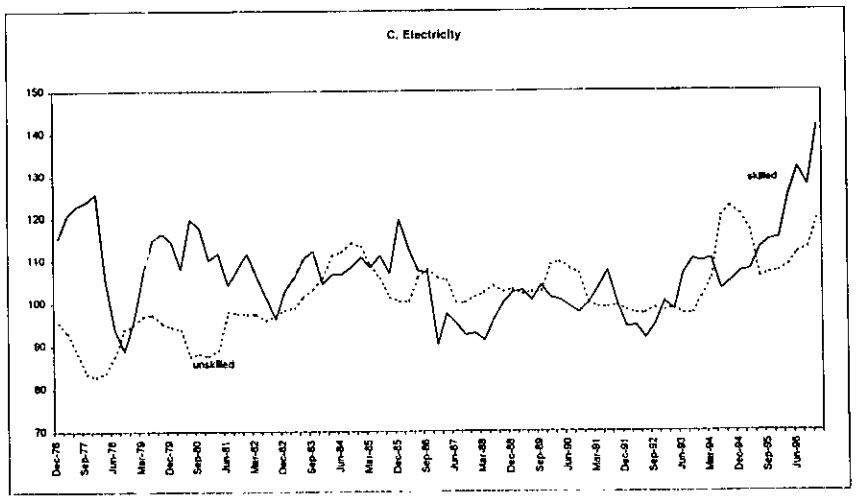


Figure 5
Colombia: Real Factor Costs in the Urban Sector







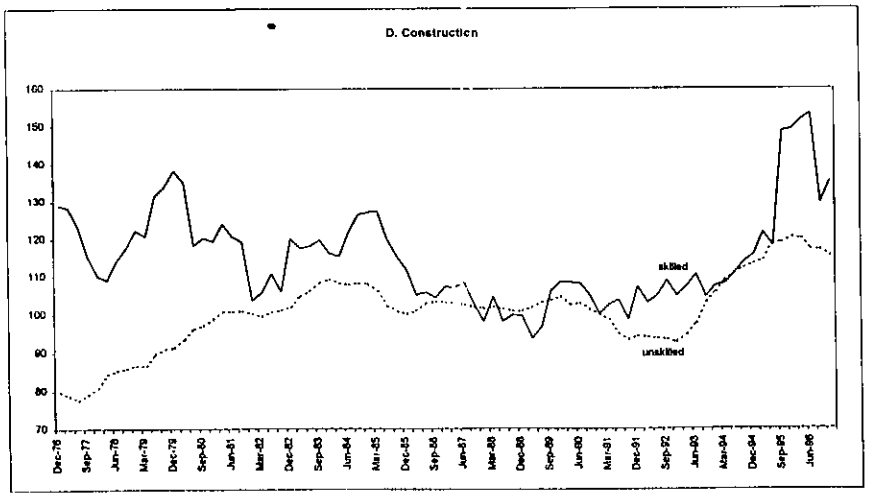
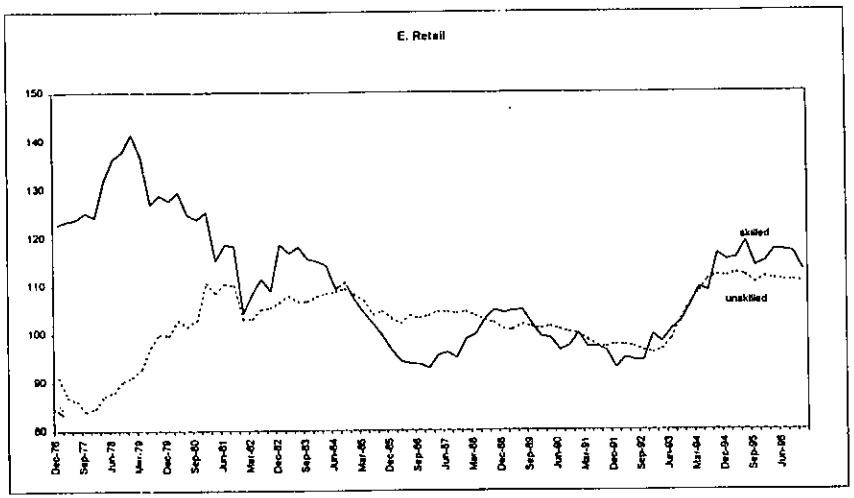
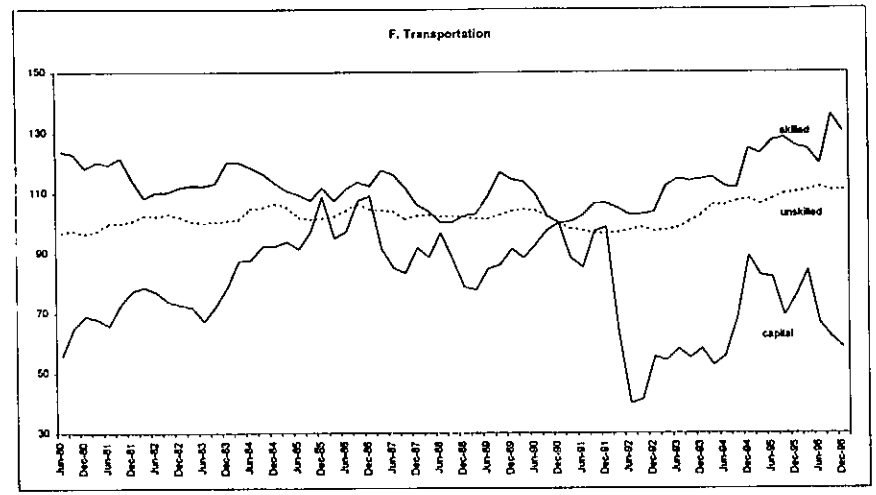
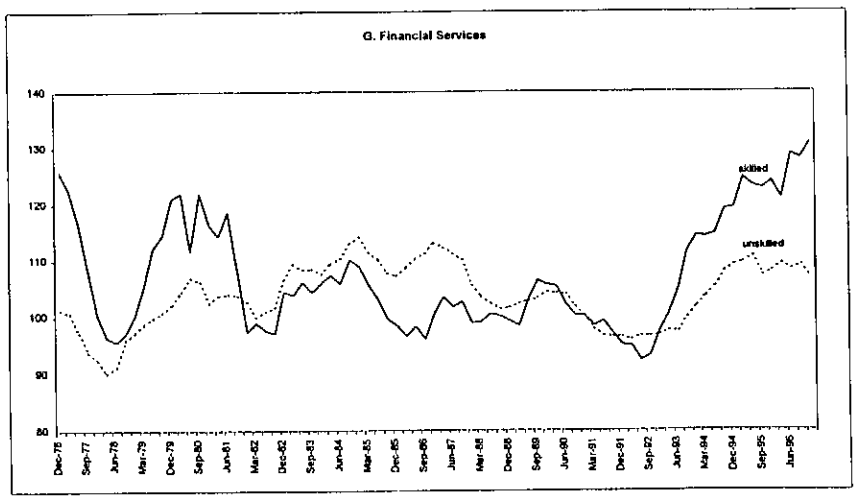


Figure 5 (cont.)







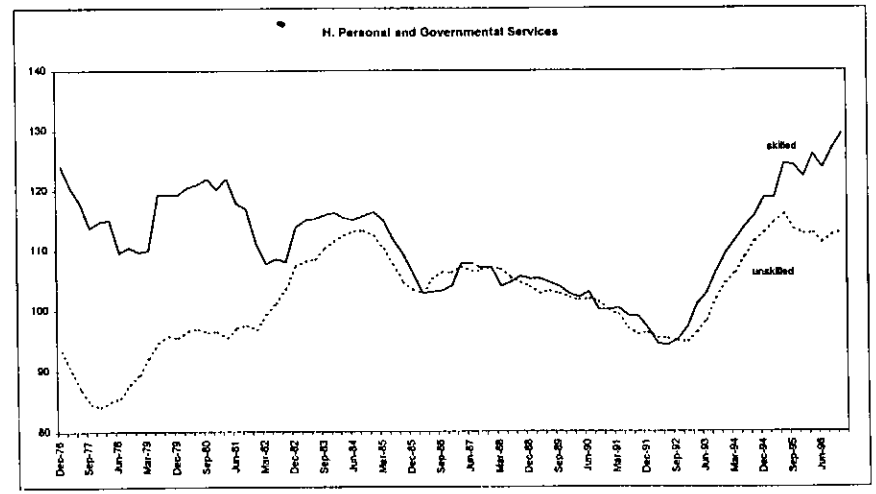
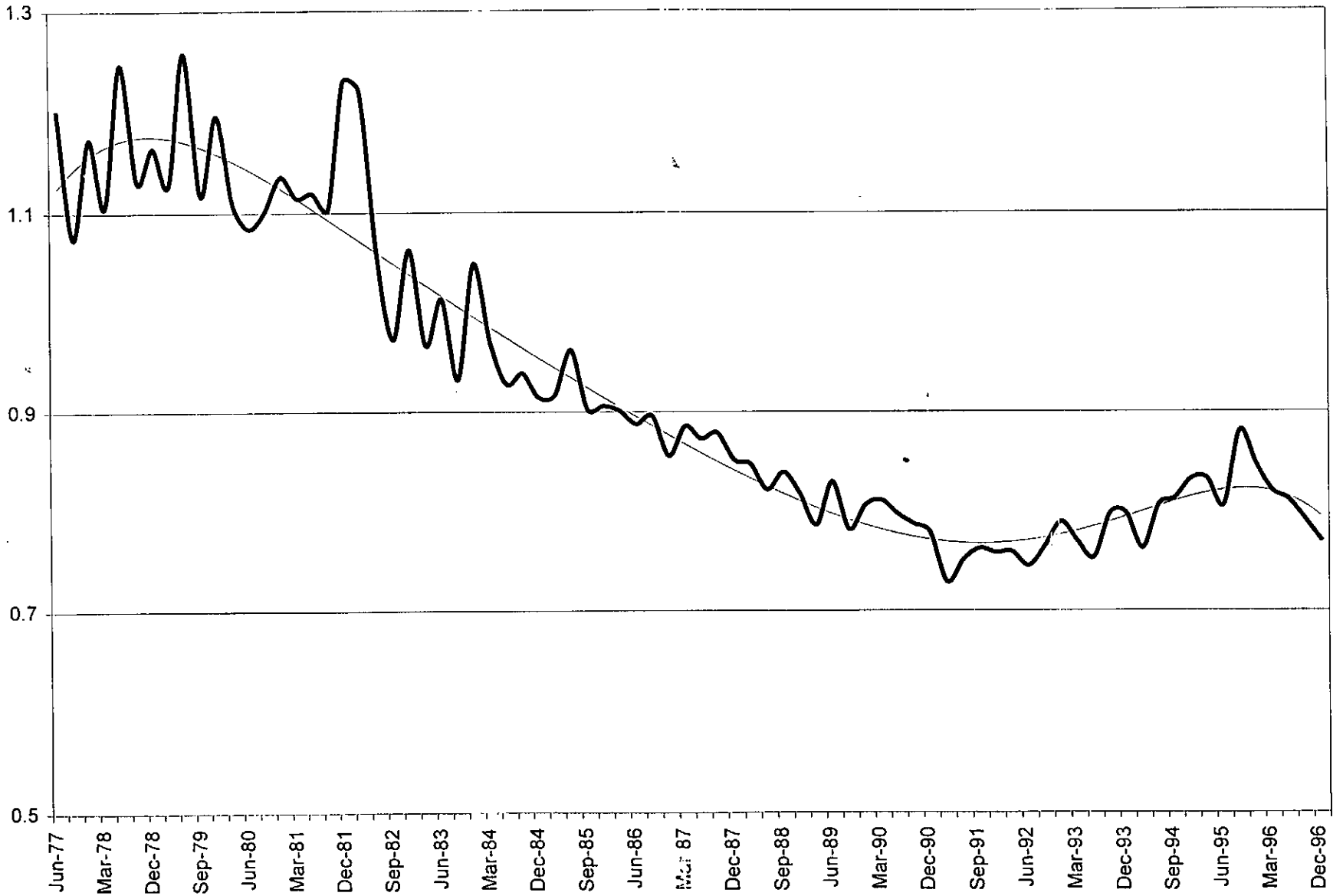


Figure 6

Elasticity of Substitution (Standard GL function, 7 metropolitan areas)



FEDESARROLLO

FUNDACION PARA LA EDUCACION SUPERIOR Y EL DESARROLLO

FEDESARROLLO es una entidad colombiana, sin ánimo de lucro dedicada a promover el adelanto científico y cultural y la educación superior, orientándolos hacia el desarrollo económico y social del país.

Para el cumplimiento de sus objetivos, adelantará directamente o con la colaboración de universidades y centros académicos, proyectos de investigación sobre problemas de interés nacional.

Entre los temas de investigación que han sido considerados de alta prioridad están la planeación económica y social, el diseño de una política industrial para Colombia, las implicaciones del crecimiento demográfico, el proceso de integración latinoamericana, el desarrollo urbano y la formulación de una política petrolera para el país.

FEDESARROLLO se propone además crear una conciencia dentro de la comunidad acerca de la necesidad de apoyar a las Universidades colombianas con el fin de elevar su nivel académico y permitirles desempeñar el papel que les corresponde en la modernización de nuestra sociedad.