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Effects of Payroll Taxes on Employment and Wages: Evidence from the Colombian Social Security Reform

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1. Introduction

Payroll taxes, in the form of mandatory contributions by employers, are used in most developed and developing countries to finance the provision of pensions, healthcare benefits for disability and maternity, and compensation for work injuries for employees. In Europe, payroll taxes and other mandated contributions are as high as 30% of the payroll in countries such as Sweden, Belgium, France, and Italy. In contrast, in the less-regulated British and North American labor markets these contributions are between 15% and 20%. The contrast in payroll taxes and other mandated contributions and unemployment rates between continental Europe and the United Kingdom and North America has lead many to believe that these contributions generate higher unemployment by raising labor costs. For this reason, European countries have been repeatedly recommended to lower payroll taxes. For example, one of the 1994 OECD Jobs Study policy recommendations is to “reduce non-wage labor costs, especially in Europe, by reducing the taxes on labor.” Similar recommendations have been received by developing countries, many of which have even higher mandated contributions compared to developed countries.

Nonetheless, both the theory and empirical evidence on payroll taxation suggest ambiguous effects on employment and unemployment. When wages are flexible and workers value the benefits financed through payroll taxes as much as the contributions cost employers, changes in payroll taxes are fully shifted from firms to employees in the form of lower wages. In this case, payroll taxes have no disemployment effects. However, if wages are rigid or payroll taxes finance benefits not completely accrued by employees, there would only be partial shifting and employment would be affected by payroll taxes. In
addition, the extent of shifting is also likely to depend on labor demand and labor supply elasticities.

Empirical evidence on payroll taxation using cross-section data and time-series data for individual countries also suggests ambiguous effects. This may reflect the fact that the effect of payroll taxation is likely to depend on labor market structure and institutions. However, it may also reflect problems of omitted variables and simultaneity biases with many studies. The studies by Gruber (1994, 1997), which rely instead on cross-section and time-series variation within a country, are less likely to be affected by these biases and find full shifting of employer contributions onto wages and no disemployment effects.

Like Gruber (1997), in this paper we examine the effects of a sharp change in payroll taxes on wages and employment in Latin America. The Social Security Reform of 1993 in Colombia increased payroll taxes for pensions and health by about 10.5% between 1994 and 1996. In contrast to Gruber (1997), who considers the effects of a large reduction of payroll taxes in Chile after the privatization of Social Security in 1981, we consider instead the effects of the large increase in payroll taxes following the Colombian reform. It is interesting to contrast the Colombian to the Chilean case because the effects of payroll taxes may be asymmetric. In particular, if wages can increase flexibly but they are downwardly rigid, there could be full shifting in response to a reduction in payroll taxes but not in response to a large increase. Recent studies, indeed, show that the minimum wage is binding in Colombia (Bell, 1997; Maloney and Núñez, 2001), suggesting one possible source of downward wage rigidities.

We use the survey of manufacturing plants in Colombia over the period 1982-96 to study the effects of the large increase in payroll taxes. The data set has information on total mandated contributions as well as on wages and employment. Following Gruber (1997),
we construct the tax rates for each plant by dividing total contributions by wages rather than imputing the tax rates based on time and sectoral variation as other studies do. In addition to the temporal variation in payroll taxes, we also find substantial variation in tax rates across plants coming partly from differences in compliance and use of temporary contracts across plants. Moreover, cross-section variation in tax rates in the Colombian context also comes from variation in the amount of paid vacations offered by different plants and from variation in the degree of risk across plants, which determines the tax rate applied to different employers for work injury. We examine the effects of payroll taxes on wages and employment before and after the policy change, controlling for plant effects as well as for plant and sector trends.

Our results using basic differences and differences-in-differences (or differences-in-differences-in-differences when both production and non-production workers are included) show partial shifting of payroll taxes onto wages and, consequently, a negative effect of payroll taxes on employment. We find partial shifting and disemployment effects both before and after the Social Security Reform of 1993, although there is slightly less shifting and more disemployment effects after the reform. This is surprising given that trade liberalization implemented in 1992 would be expected to have increased labor demand elasticity inducing more shifting. Nonetheless, the evidence provided by Fajnzylber and Maloney (2000) on the impact of openness in Colombia suggests only a mild increase in the labor demand elasticity for blue-collar workers. On the other hand, this could be due to the weaker linkage between benefits and costs generated by the cross-subsidization introduced by the Social Security Reform. However, this effect would have to be strong enough to compensate for the tighter tax-benefit linkage in pensions generated by the change from a pay-as-you-go system to a fully-funded system of individual accounts.
Moreover, we estimate the differential impact of payroll taxes on production and non-production workers for the 1982-91 period, since data is not disaggregated by worker type after 1992. We find only slightly more shifting and less disemployment effects for non-production than for production workers. Given that minimum wages are much more likely to bind for production than for non-production workers, the gap seems small at first glance. However, this is probably due to the stronger link between benefits and costs for production than for non-production workers and to the higher elasticity of labor demand for production workers, factors which push towards greater shifting for production workers. These results are of important policy relevance since reductions in payroll taxes for low earnings workers have often been proposed as a way to boost the relative demand of low-skill workers. In Colombia, where the unemployment rate of less-skilled workers is twice as high as that of high-skill workers, this may be a reasonable policy proposal since payroll taxes have precisely a marginally larger effect on the employment of less-skilled workers. Moreover, changes in the composition of mandates on employers that strengthen the link between benefits to employees and costs can induce a larger increase in employment across the board for a given reduction of payroll taxes.

The paper is organized as follows. Section 2 reviews the related literature. Section 3 describes the Colombian institutional background and the Colombian Social Security Reform of 1993. Section 4 describes the data and presents the results. Section 5 concludes.

2. Related Literature

Mandates on employers might be an alternative to public expenditure in financing the provision of benefits. Summers (1989) and Gruber (1994) point out that payroll taxes can lead to lower deadweight losses than other types of taxation. When wages are flexible
and workers value the benefits financed through payroll taxes as much as the contributions
cost employers, changes in payroll taxes are fully shifted from the firms’ non-wage labor
costs onto the employees’ wages. This is because the increase in payroll taxes raises labor
costs for employers and reduces labor demand, but at the same time it increases benefits for
workers and raises labor supply. If there are no wage rigidities and workers value the
benefits as much as they cost workers, the demand and supply shifts lower wages but are neutral for the determination of employment and there is no efficiency loss. However, if there are wage rigidities or payroll tax revenue partly finances benefits not directly accrued by employees, only some fraction of the payroll tax would be shifted to workers’ wages and employment would be affected by payroll taxes.

As described above, the effect of changes in payroll taxes depends on the specific characteristics of labor demand, labor supply and the structure of the payroll taxes. Given that the incidence of payroll taxes on employment depends on other institutional features of labor markets, it is not so surprising to find mixed evidence on this relationship. While some studies provide evidence showing that payroll taxes have no effect on unemployment, others find that payroll taxes and other forms of taxation increase unemployment. Even for the same country, there is conflicting evidence depending on the period of study. For example, while Gordon (1972) estimates an aggregate wage equation for the U.S. and finds that payroll tax rises are fully shifted onto real wages, Vroman (1974a) uses aggregate manufacturing data from the U.S. and finds partial shifting of about 40% onto wages.

Like Vroman (1974a), studies for other countries that also exploit time-series variation find partial shifting. Holmlund (1983) examines the effects of a large increase in payroll taxes from 6% in 1950’s to 40% in 1970’s in Sweden using a reduced form equation and finds some shifting but not full shifting. In particular, he finds that a 1% rise
in the statutory wage cost increased actual cost to employers by 0.5%. Weitenberg (1969) finds that in the Netherlands the introduction of payroll taxes led to partial shifting to consumers in the form of higher prices and this, in turn, reduced labor demand. Finally, Beach and Balfour (1983) provide time series evidence using aggregate data for the U.K. and conclude that there is partial shifting with 50% to 65% of payroll tax increases being passed onto wages.

Cross-country studies also report mixed findings of the effect of payroll taxes on employment. In contrast to the studies reviewed so far, Tullio (1987) and Daveri and Tabellini (2000) analyze whether taxes on workers are shifted to employers as workers reservation wages increase. This can reduce employment through standard scale and substitution effects. The main finding in these studies is that higher taxes are, indeed, associated with lower growth, higher unemployment and lower investment. In contrast, Vroman (1974b) concludes that there is full shifting in OECD countries because the capital share does not change in response to rising payroll taxes. In another cross-country OECD analysis, Nickell and Bell (1996) find no effects of payroll taxes on unemployment among unskilled workers and interpret this result as evidence of full shifting.

Even more disaggregated studies, which are less likely to suffer from omitted variables and simultaneity biases than time-series and cross-country studies, find mixed evidence of the effects of payroll taxes on wages and employment. Hamermesh (1979) examines reduced form effect of OASDHI (i.e., the payroll tax for social security in the U.S.) on wages and finds that at most a third of the payroll tax on employers is shifted onto wages, thus implying an effect of payroll taxes on employment. Gruber and Krueger (1991) and Gruber (1994) find much higher degrees of shifting. The former study examines the effect of mandated workers’ compensation insurance differences across states
in the U.S.. They find that a 1% increase in workers’ compensation rates is associated with only a 0.11% decline in employment. Gruber (1994) assesses the impact of mandated health insurance benefits for maternity in the U.S. and finds substantial shifting of the costs to the wages of the targeted group, namely young women and their husbands, and a very small effect on employment.

Finally, Gruber (1997) provides a careful analysis of the impact of the payroll tax reduction in Chile following the privatization of the social security system and finds complete backward shifting and no effect on employment. However, as Gruber point out, one important limitation in applying his results beyond the Chilean setting, is that if “wages are rigid downward, they may react more flexibly to tax cuts than to tax increases.” This implies that the effects of payroll taxes may be asymmetric. In the present paper, we analyze the impact of the change in payroll taxes in Colombia to assess whether there is full shifting when taxes are increased substantially rather than decreased as in the Chilean case. In addition, in contrast to the Chilean case, the structure of payroll taxes in Colombia is less likely to produce full shifting because there is a weaker link between the valuation of mandated benefits by employees and the costs to employers.

3. Institutional Background

Colombia’s recent Social Security Reform provides a good opportunity to assess the impact of payroll taxes on the labor market. Although there have been rises in payroll taxes in Colombia starting in 1982, the 1993 Social Security Reform (SSR) sharply increased employers’ payroll contributions for pensions and health.

Table 1 presents the evolution of payroll taxes starting in 1980. Since around the 1950’s, Colombia’s legislation has required employers’ contributions to finance pensions
for the old, disabled, and survivors; health benefits for sickness and maternity; work injury benefits in manufacturing and commerce; family allowances and in-kind transfers for low-income households; training, and paid vacations.\footnote{In addition, while there is no established unemployment insurance system in Colombia, labor legislation requires employers to pay a severance of one month per year worked to employees at the time of separation. After the Labor Market Reform of 1990, the standard system of severance payments which required payments at the time of separation was transformed into a system of severance payments individual savings accounts. For a description and analysis of the Labor Market Reform see Kugler (1999) and Kugler (2001). Note that while this severance payments are part of non-wage labor costs they are fixed costs rather than recurrent labor.} Moreover, since the initial set-up of these programs, the generosity of benefits has increased and so have the payroll taxes required to finance them. Mandated payroll contributions increased by 1% in 1982 as a result of the increase in payroll contributions for training from 1% to 2%. In 1989, the payroll taxes required for in-kind transfers to low-income families increased from 2% to 3%. The first increase in mandated contributions for old age, disability, and survivor pensions occurred in 1985 with an increase of 2% from 4.5% to 6.5%. The payroll contributions for pensions increased again in 1992 by 1.5% and then the SSR generated large increases in payroll taxes for pensions from 1994 to 1996 equivalent to 5.5%. The SSR also increased payroll contributions for health benefits for the first time in decades between 1994 and 1996 equivalent to 5%. The SSR, thus, increased payroll taxes for pensions and health by 10.5% in a two-year period. This provides a large temporal change in payroll taxes and much larger than what is usually observed in developed countries. Figure 1 shows the trends of employer social security contributions for pensions and health, while Figure 2 shows the trends of payroll taxes for in-kind transfers to low-income households, family allowances, and training. Finally, Figure 3 shows the evolution of the total mandated non-wage costs, which illustrates the sharp rise after the SSR reform just described.
As indicated above, theory tells us that payroll taxes should not affect employment and, thus, unemployment if payroll taxes are completely passed on to workers as lower wages. This is more likely to happen if the workers’ valuation of the services financed by payroll taxes coincide with their cost. In Colombia, however, the link between payroll taxes and benefits is not exact because many of the benefits financed through payroll taxes are not directly accrued by employees. In particular, training, family allowances, and in-kind transfers for low-income families are financed with payroll tax revenues but only benefit some workers. For this reason, payroll taxes are less likely to be passed onto wages in Colombia than in most countries where employer mandated contributions solely finance direct benefits. Moreover, the SSR affected the tax-benefit linkage for pensions. On the one hand, the reform introduced a parallel fully-funded system of individual accounts next to the already existing pay-as-you-go system, and workers were allowed to opt into either system. Unlike the pay-as-you-go system which may not return to the beneficiary the amount contributed into the system, the system of individual accounts system and thus strengthens the tax-benefit linkage. On the other hand, the SSR introduced minimum benefits for workers previously uncovered by the system, which are partly financed by cross-subsidization from an additional contribution of 1% made for workers earning more than four times the minimum wage. Contrary to the change from a PAYG system to a fully-funded system, this cross-subsidization weakened the tax-benefit linkage and reduced the possibility of shifting taxes to workers in the form of lower wages.

Aside from weak tax-benefit linkages, firms may not be able to pass on their higher payroll taxes to workers in the form of lower wages if wages are downwardly rigid. For costs like payroll taxes. However, after the Labor Market reform severance payments were essentially turned into payroll taxes.
example, such shifting cannot occur if workers are already earning the minimum wage. Evidence on the minimum wage in Colombia over the period of our study suggests that the minimum wage binds for unskilled workers in Colombia. Bell (1997) concludes that the rise of 10% in the statutory minimum wage during 1981–87 leads to a drop in unskilled employment in the range of 2%-12%. Maloney and Núñez (2001) also estimate an elasticity of employment with respect to the minimum wage of 0.15 for a later period, which is equivalent to Bell’s upper bound. The combination of a constant real value of the minimum wage in Colombia over the last few years and increasing payroll taxes reduces the possibility for firms to shift their costs of taxation onto workers.

4. Empirical Analysis

4.1. The Data

To analyze the impact of payroll taxes on employment and labor costs, we exploit the temporal variation induced by the statutory rise in employer contributions as a percentage of wages and the cross-sectional variation due to heterogeneity in payroll taxes across firms. Our sample consists of a balanced panel of 235 plants from the Colombian Manufacturing Survey for the 1982–96 period. The trends in the sample coincide with the general picture in manufacturing as a whole. Figure 4 shows the continuous rise in the real wage and Figure 5 shows the sharp drop in employment since 1991.

Figure 6 shows the trend in average tax rates over the sample period. The average tax rate in Figure 6 is calculated as the ratio of payroll taxes to the wage bill. This figure illustrates an upward trend over the 1980’s, a drop in the early 1990’s and the sharp rise in tax rates starting in 1993 coinciding with the SSR. These changes coincide with the trends observed in Figure 5, which illustrates the statutory changes in payroll taxes described in
the previous section. An advantage of our data, is that while the changes in payroll taxes coincide with the statutory changes, we can rely on actual information of the payroll tax cost of the plants rather than having to impute the average cost to firms based on sector and time period and, thus, we can also exploit the variation in tax rates across firms.

The data shows substantial variation in tax rates across firms. Figure 10 shows the distribution of the average tax rate for non-production workers and Figure 16 shows the distribution of the average tax rate for production workers during the 1980’s. The figures show substantial variation in the tax rates for both non-production and production workers. The minimum and maximum tax rates of non-production workers are 10% and 75%, with a mean of 47%. The minimum and maximum tax rates of production workers are 27% and 74%, with a mean of 45%. Figures 19, 20, and 21 show the distribution of tax rates for both production and non-production workers during the 1990’s. Figure 19 shows the distribution of average tax rates in 1992-93 and shows a similar distribution to that observed during the 1980’s. In contrast, the distribution of average tax rates in Figure 20 for 1993-94 shows a shift of the distribution towards the right and an increase in the mean average tax rate, which is consistent with the increase in statutory payroll taxes after the SSR. Figure 21 shows a farther shift in the distribution towards the right and an increase in the mean average tax rate to 60% after the full implementation of the SSR in 1995-96.

The distributions of average tax rates not only show the temporal change in tax rates, but also substantial cross-sectional variation. There are four main sources of legitimate variation in taxes across plants. First, there is heterogeneity in the share of the wage bill covered by social security because some plants use informal employment and do not pay mandated benefits. Second, the variation in employment of temporary workers, who are not subject to some benefits (e.g., paid vacations), also generates differences in tax
rates across plants. Third, injury risk variation across plants also generates payroll tax differentials because employers’ work injury contributions depend on the degree of risk, ranging from 0.35% to 8.7% (see Table 1). Fourth, there is variation in payroll taxes for paid vacations. While the minimum mandatory paid vacation is half a month or about 4.15% in payroll taxes, some plants choose to give more paid vacation and, consequently, contribute higher payroll taxes for paid vacations.2

4.2. Results

One way of assessing the effect of changes in payroll tax rates would be to examine the wage and employment changes after 1994. Table 2, however, helps to illustrate why this is not a very good strategy in the Colombian context. The table shows that the SSR of 1993 coincided with an expansion and, thus, this strategy would bias the results towards less finding of shifting to wages as well as less effect on employment. Even if we included time dummies, there may be effects of the expansion that may not be captured by the time dummies such as greater use of temporary employment, higher injury risks or higher paid vacations being offered during expansions. For this reason, we instead restrict our analysis to years at similar points in the cycle. For the 1980’s, we use 1983-1984 and 1989-90 for pairs of expansionary years and 1984-85 and 1988-89 for pairs of recessionary years. For the 1990’s, we use 1993-94 and 1994-95 as pairs of years at similar points in the business cycle before and after the implementation of the SSR.

We use our data to estimate two types of regressions. First, we estimate a basic difference regression for average wages and employment of the following form:

2 Aside from these true sources of exogenous variation in tax rates, standard measurement error in the tax and wage bills may also contribute to the observed differences in tax rates across firms. Measurement error in the tax bill will bias the effects of payroll taxes on wages and employment towards zero, while measurement error
\[ \Delta \log(W_{ijt}/E_{ijt}) = \alpha_1 + \beta_1 \Delta \log(T_{ijt}/W_{ijt}) + P_{ijt} + u_{ijt}, \]
\[ \Delta \log(E_{ijt}) = \alpha_2 + \beta_2 \Delta \log(T_{ijt}/W_{ijt}) + P_{ijt} + e_{ijt}, \]

where the ratio of total payroll taxes, \( T_{ijt} \), over total wages, \( W_{ijt} \), gives the tax rate and \( P_{ijt} \) is a production worker dummy included in pooled regressions for the pre-1992 sample, for which we have information disaggregated between non-production and production workers. Estimating this regression in differences for the sub-samples of production and non-production workers and for the post-1992 period for which production and non-production workers cannot be separated allows controlling for plant and year effects. The identifying assumption is that the spurious correlation between taxes and wages and employment is only along plant and year dimensions and that the true correlation varies along sector, plant x year, plant x sector, sector x year, and sector x plant x year dimensions. In contrast, estimating this regression in the pooled sample for the pre-1992 period, allows controlling for plant, year, and worker type effects, and for interactions of plant-worker type, and year-worker type. In this case, the identifying assumption is that the true correlation between taxes and wages and employment are along the following dimensions: sector, plant x year, plant x sector, sector x year, sector x worker type, year x plant x worker type, year x plant x sector, plant x worker type x sector, year x worker type x sector, and year x plant x group x sector. In addition, we include specifications with sector trends. When sector trends are included, the effect of taxes on wages and employment in the production/non-production sub-samples and the post-1992 sample are identified by variation in sector, plant x sector, plant x year, and plant x year x sector. In this case, the effect of taxes on wages and employment in the pre-1992 pooled regressions are identified by variation in sector, plant x

in the wage bill will bias the results towards a finding of shifting to wages and the effect of payroll taxes on employment also towards zero.
sector, plant x year, sector x worker type, year x plant x worker type, plant x year x sector, year x worker type x sector, plant x year x worker type x sector.

In our second set of regressions, we consider instead a differences-in-differences (or differences-in-differences-in-differences when both production and non-production workers are included) specification. In particular, we include plant dummies to control for plant x year variation in wages and employment. The estimated regressions in this case are:

\[ \Delta \log\left(\frac{W_{ijt}}{E_{ijt}}\right) = \alpha_3 + \beta_3 \Delta \log\left(\frac{T_{ijt}}{W_{ijt}}\right) + P_{ijt} + F_j + u'_{ijt}, \]

\[ \Delta \log(E_{ijt}) = \alpha_4 + \beta_4 \Delta \log\left(\frac{T_{ijt}}{W_{ijt}}\right) + P_{ijt} + F_j + e'_{ijt}, \]

where \( F_j \) is a full set of plant dummies. As before, we also estimate specifications with sector trends. When sector trends are included in the regressions for the sub-samples and the post-1992 sample, the effect of taxes on wages and employment is identified by variation in sector and plant x sector. In the regressions for the pre-1992 sample, the effect is identified by variation in sector, sector x worker type, sector x plant, year x plant x worker type, plant x group x sector, year x worker type x sector, year x plant x worker type x sector.

Table 3 shows the results of the basic differences regressions and of the differences-in-differences-in-differences regressions for the expansionary years during the 1980’s. Columns 1 and 2 show the effects of payroll tax rates on the wages and employment of production and non-production workers pooled together. The results show partial shifting of payroll taxes to wages and negative effects on employment. The extent of shifting and the negative effects of taxes on employment, however, become larger when sector x year, plant x year and plant x year x sector variation in wages and employment are controlled for. These results suggest that a 10% increase in payroll tax rates reduces average wages by
2.3%. This effect is similar in magnitude to the effect of OASDHI on wages found by Hamermesh (1979), although this study does not examine the effect of the social security payroll taxes on employment in the U.S. Our results show that the partial shifting of wages (i.e., only about a fifth of the taxes is passed on as lower wages) implies a large negative effect of payroll taxes on employment. In particular, the results indicate that a 10% increase in payroll tax rates reduces employment by 4.9%.³

Columns 2-6 show similar results, separating production and non-production workers. These results show less shifting to wages for production than for non-production workers. This is consistent minimum wages binding more for production than for non-production workers (see Bell, 1997; Maloney and Núñez, 2001). Moreover, consistent with the smaller passthrough for production workers, the results indicate greater negative effects of payroll taxes on the employment of production than of non-production workers.⁴

Table 4 shows similar results for recessionary years during the 1980’s. As before, the table reports the results for basic differences regressions and for differences-in-differences-in-differences regressions with and without sector trends. The pooled estimates are very similar to those reported in Table 3 and indicate that a 10% increase in payroll taxes reduces wages by 2.4% and employment by 4.5%. As before, the estimates in this table show smaller shifting for production than for non-production workers and larger employment reductions for production than for non-production workers as a result of higher payroll taxes. Although minimum wages are much more likely to bind for production than for non-production workers, the difference in shifting between production and non-

³ Contrary to previous studies for Colombia which examine the effect of payroll taxes on labor demand, our effect of payroll taxes captures the net effect of demand and supply shifts on employment and wages.
⁴ Note that there is no reason to expect the coefficients in the pooled specification to be spanned by the coefficients in the separate sub-samples since, as indicated above, the two specifications control for different factors.
production is not as large as one may expect. This is probably because the stronger link between benefits and costs for production workers and the higher labor demand elasticities for production workers also increase the extent of shifting for this type of workers. These results, then, suggest that policies aimed at boosting the relative demand of production workers by reducing the payroll taxes for this group of workers are likely to be effective.

While the 1990’s data does not allow us to disaggregate production and non-production workers, the large temporal changes in payroll taxes occurred during this time period after the SSR. Table 5 reports estimates of the impact of payroll taxes on the wages and employment of production and non-production workers together during the 1990’s. The estimates indicate similar effects to those reported in Tables 3 and 4. An increase in payroll taxes of a similar magnitude to the increase that followed the 1993 SSR (i.e., a 10% increase) reduces wages by 2.2% and employment by 4.2%. These results indicate slightly less shifting and more disemployment effects after the reform. This could be the result of the weaker tax-benefit linkage generated by the cross-subsidization of the SSR of 1993. At the same time, the movement from a PAYG system to a fully-funded system may have led to more tax-benefit linkage, so that the cross-subsidization effect would have had to be strong enough to weaken the linkage overall. In addition, one may have expected the effects to be greater during the 1990’s when trade liberalization was introduced, if as predicted by the theory trade liberalization increased labor demand elasticities through both scale and substitution effects. However, Fajnzylber and Maloney (2000) find that labor demand elasticities increased mildly only for blue collar workers in Colombia after trade was liberalized in the 1990’s. But it is precisely for these workers that the minimum wage binds, and the numeraire impact reported by Maloney and Núñez (2001) precludes enough wage flexibility for elasticity changes to affect employment. The
similar payroll tax effects during the 1980’s and 1990’s that we find in our data are then consistent with these observations.

5. Conclusion

Colombia has experienced a sharp rise in unemployment starting in 1996, especially for unskilled workers. This paper suggests that one possible factor contributing to the rise in unemployment in Colombia in recent years, especially among the unskilled, may have been the sharp rise in labor costs faced by firms.

This paper uses a panel of manufacturing plants from Colombia to analyze the effects of the sharp rise of 10.5% in payroll tax rates following the SSR of 1993. The estimates indicate that only about a fifth of the rise in payroll taxes is shifted to workers as lower wages. This is similar to the result in Hamermesh (1979) indicating that at most a third of the social security payroll tax in the U.S. was shifted onto wages. The even smaller shift onto wages in the Colombian context is probably due in part to the constant real value of the minimum wage, which was upheld through the interpretation by Courts of the 1991 Constitution as dictating on fairness grounds that the minimum wage must be indexed to inflation (see, e.g., Kugler and Rosenthal, 2000). The downward wage rigidities generated by a binding minimum wage preclude plants from passing their higher taxes to workers in the form of lower wages. In addition, the weak linkage between employees’ benefits and employers’ contributions is also likely to reduce the extent of linkage in the Colombian context. Given that only about a 20% of taxation costs are passed on to workers as lower wages, it is not surprising that we find a large negative effect of payroll taxes on employment. In particular, we find that a 10% increase in payroll taxes reduces employment between 4.2% and 4.9%. In addition, we find less shifting and greater
negative effects of payroll taxes on employment for production than for non-production workers. This is consistent with soaring unemployment, especially among the unskilled for whom the minimum wage binds.
References


Figure 1

![Average Real Wage per Worker (PPI deflated, in logs)](chart1)

Figure 2

![Average Employment (in logs)](chart2)
Table 1 - The Composition of Payroll Taxes: 1980 - 1996

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<td>Training</td>
<td>1.0%</td>
<td>2.0%</td>
<td>2.0%</td>
<td>2.0%</td>
<td>2.0%</td>
<td>2.0%</td>
<td>2.0%</td>
<td>2.0%</td>
</tr>
<tr>
<td>Paid Vacations</td>
<td>4.15%</td>
<td>4.15%</td>
<td>4.15%</td>
<td>4.15%</td>
<td>4.15%</td>
<td>4.15%</td>
<td>4.15%</td>
<td>4.15%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>23.0% - 31.35%</td>
<td>24.0% - 32.35%</td>
<td>26.0% - 34.35%</td>
<td>27.0% - 35.35%</td>
<td>28.5% - 36.35%</td>
<td>32.0% - 38.35%</td>
<td>34.0% - 43.35%</td>
<td></td>
</tr>
</tbody>
</table>

Notes: Work injury compensation taxes only apply to workers in manufacturing and commerce and depend on the degree of risk faced by the firm. The paid vacations contributions reported in the table are the minimum paid vacations mandated by law, but firms’ payroll contributions for paid vacations may vary because some firms offer their employees paid vacations above this minimum level.

Figure 3
Figure 4

**Evolution of payroll taxes financing indirect benefits**

- Training
- Welfare
- Food Subsidies

Figure 5

**Evolution of Total Mandated Non-wage Costs**

Figure 6

**Average Nonwage Costs as Fraction of Wagebill (Implicit Tax Rate)**
<table>
<thead>
<tr>
<th>Year</th>
<th>Obs.</th>
<th>Average Tax Rate</th>
<th>Average Real Wage (in logs)</th>
<th>Total Employment (in logs)</th>
<th>GDP Growth (%)</th>
<th>Per Capita GDP Growth (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>82</td>
<td>235</td>
<td>0.4710 (0.2195)</td>
<td>4.9201 (0.4048)</td>
<td>3.7782 (1.0867)</td>
<td>0.9</td>
<td>-1.3</td>
</tr>
<tr>
<td>83</td>
<td>235</td>
<td>0.4816 (0.2291)</td>
<td>5.4654 (0.4148)</td>
<td>3.7786 (1.0761)</td>
<td>1.6</td>
<td>-0.6</td>
</tr>
<tr>
<td>84</td>
<td>235</td>
<td>0.4876 (0.2203)</td>
<td>5.4843 (0.4015)</td>
<td>3.8173 (1.0529)</td>
<td>3.4</td>
<td>1.3</td>
</tr>
<tr>
<td>85</td>
<td>235</td>
<td>0.4845 (0.2112)</td>
<td>5.6176 (0.3816)</td>
<td>3.8083 (1.0204)</td>
<td>3.1</td>
<td>1.1</td>
</tr>
<tr>
<td>86</td>
<td>235</td>
<td>0.5050 (0.2229)</td>
<td>5.7897 (0.3924)</td>
<td>3.8217 (0.9880)</td>
<td>5.8</td>
<td>3.8</td>
</tr>
<tr>
<td>87</td>
<td>235</td>
<td>0.5362 (0.2104)</td>
<td>5.9577 (0.3779)</td>
<td>3.8485 (1.0168)</td>
<td>5.4</td>
<td>3.4</td>
</tr>
<tr>
<td>88</td>
<td>235</td>
<td>0.5459 (0.2119)</td>
<td>6.0238 (0.4123)</td>
<td>3.8467 (1.0269)</td>
<td>4.1</td>
<td>2.1</td>
</tr>
<tr>
<td>89</td>
<td>235</td>
<td>0.5727 (0.2428)</td>
<td>6.4237 (0.3809)</td>
<td>3.8596 (1.0664)</td>
<td>3.4</td>
<td>1.5</td>
</tr>
<tr>
<td>90</td>
<td>235</td>
<td>0.5787 (0.2418)</td>
<td>6.5144 (0.3836)</td>
<td>3.8517 (1.0923)</td>
<td>4.3</td>
<td>2.4</td>
</tr>
<tr>
<td>91</td>
<td>235</td>
<td>0.5839 (0.2610)</td>
<td>7.0360 (0.3941)</td>
<td>3.8807 (1.1227)</td>
<td>2.0</td>
<td>0.2</td>
</tr>
<tr>
<td>92</td>
<td>235</td>
<td>0.4966 (0.2120)</td>
<td>7.5365 (0.4675)</td>
<td>3.4765 (1.3395)</td>
<td>4.0</td>
<td>2.2</td>
</tr>
<tr>
<td>93</td>
<td>235</td>
<td>0.5494 (0.1978)</td>
<td>8.1597 (0.3982)</td>
<td>4.0117 (1.1171)</td>
<td>5.4</td>
<td>3.6</td>
</tr>
<tr>
<td>94</td>
<td>235</td>
<td>0.5390 (0.1697)</td>
<td>7.8511 (0.4332)</td>
<td>3.4536 (1.2431)</td>
<td>5.8</td>
<td>4.0</td>
</tr>
<tr>
<td>95</td>
<td>235</td>
<td>0.5922 (0.1945)</td>
<td>8.3265 (0.4630)</td>
<td>3.4469 (1.2491)</td>
<td>5.8</td>
<td>3.9</td>
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<tr>
<td>96</td>
<td>235</td>
<td>0.5979 (0.1846)</td>
<td>8.5848 (0.4645)</td>
<td>3.4088 (1.2367)</td>
<td>2.0</td>
<td>0.2</td>
</tr>
</tbody>
</table>

Notes: Tax rates are the employer contributions as a fraction of wages. Real wages are total wages over number of workers deflated using PPI. Standard deviations are in parenthesis. Columns 3-5 tabulated from the Annual Colombian Manufacturing Survey; column 6-7 provided by DANE.
Figure 7

![Graph of Nonproduction workers tax rate]

Figure 8

![Graph of Average Real Wage for Nonproduction Workers (PPI deflated, in logs)]
Figure 9

Nonproduction Workers Employment (in logs)

Figure 10

Distribution of average tax rate for Non-Prod workers 1982-1991
Figure 13

![Production workers tax rate graph](image)

Figure 14

![Production Workers Employment in logs graph](image)

Figure 15

![Average Real Wage for Production Workers (PPI deflated, in logs) graph](image)
Figure 16

Distribution of tax rate for Production workers 1982-1991

Figure 17

Distribution of Production Workers Ln Real Wage 1982-1991
Figure 18

Distribution of Production Workers Ln Average Employment 1982-1991
Table 3 – Effects of Payroll Taxes on Wages and Employment:
Expansionary years during the 1980’s

<table>
<thead>
<tr>
<th>Sector Trends</th>
<th>Pooled</th>
<th>Production workers</th>
<th>Non - Production workers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Wages</td>
<td>Employment</td>
<td>Wages</td>
</tr>
<tr>
<td>Basic Differences Regressions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>-.1685</td>
<td>(.0602)</td>
<td>-.1925</td>
</tr>
<tr>
<td>Yes</td>
<td>-.1746</td>
<td>(.0318)</td>
<td>-.2093</td>
</tr>
<tr>
<td>Differences in Differences</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>-.2274</td>
<td>(.0435)</td>
<td>-.5031</td>
</tr>
<tr>
<td>Yes</td>
<td>-.2345</td>
<td>(.0279)</td>
<td>-.4867</td>
</tr>
</tbody>
</table>

Notes: All regressions are run as first-differences using data from 1983-84 and 1989-90. The regressions include sector dummies. Pooled regressions include both Production and Non-production workers and a production dummy is included in the regressions. The differences-in-differences regression includes plant effects in the differences regression. Standard errors are in parenthesis. In terms of the business cycle, both 1984 and 1990 are peaks in GDP growth.
Table 4 – Effects of Payroll Taxes on Wages and Employment:
Recessionary years during the 1980’s

<table>
<thead>
<tr>
<th>Sector Trends</th>
<th>Basic Differences Regressions</th>
<th>Pooled</th>
<th>Production workers</th>
<th>Non - Production workers</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td></td>
<td>Wages</td>
<td>Employment</td>
<td>Wages</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-.1717</td>
<td>-.1638</td>
<td>-.0798</td>
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<tr>
<td></td>
<td></td>
<td>(.0691)</td>
<td>(.0847)</td>
<td>(.0394)</td>
</tr>
<tr>
<td>Yes</td>
<td></td>
<td>-.1752</td>
<td>-.2086</td>
<td>-.1094</td>
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<tr>
<td></td>
<td></td>
<td>(.0863)</td>
<td>(.0704)</td>
<td>(.0526)</td>
</tr>
<tr>
<td>Differences - in - Differences Regressions</td>
<td></td>
<td>Wages</td>
<td>Employment</td>
<td>Wages</td>
</tr>
<tr>
<td>No</td>
<td></td>
<td>-.1369</td>
<td>-.4983</td>
<td>-.1459</td>
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<tr>
<td></td>
<td></td>
<td>(.0625)</td>
<td>(.0471)</td>
<td>(.1046)</td>
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<tr>
<td>Yes</td>
<td></td>
<td>-.2364</td>
<td>-.4532</td>
<td>-.1509</td>
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<td></td>
<td></td>
<td>(.0643)</td>
<td>(.0931)</td>
<td>(.0716)</td>
</tr>
</tbody>
</table>

Notes: All regressions are run as first-differences using data from 1984 - 85 and 1988 - 89. The regressions include sector dummies. Pooled regressions include both Production and Non-production workers and a production dummy is included in the regressions. The difference-in-difference-in-difference regression includes plant effects in the differences regression. Standard errors are in parenthesis. In terms of the business cycle, both 1985 and 1989 are troughs in GDP growth.
Figure 19
Average Tax Rates: 1992 – 93

Figure 20
Average Tax Rates: 1993 – 94
Figure 21
Average Tax Rates: 1995 – 96

Figure 22
Average Real Wages (Deflated by PPI): 1992 – 93
Figure 23
Average Real Wages (Deflated by PPI): 1993 - 94

Distribution of All workers' real wage-PPI deflated: 1993-1994 average

Figure 24
Average Real Wages (Deflated by PPI): 1995 - 96

Distribution of All workers' real wage-PPI deflated: 1995-1996 average
Figure 25
Average Employment: 1992 – 93

Distribution of All labor: 1992-1993 average

Figure 26
Average Employment: 1993 – 94

Distribution of All labor: 1993-1994 average
### Table 5 - Effects of Payroll Taxes on Wages and Employment: 1990’s

<table>
<thead>
<tr>
<th>Sector Trends</th>
<th>All workers</th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Wages</td>
<td>Employment</td>
<td></td>
</tr>
<tr>
<td>Basic</td>
<td>- .1422</td>
<td>- .2725</td>
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</tr>
<tr>
<td>Differences</td>
<td>(.0112)</td>
<td>(.0837)</td>
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<td>Regressions</td>
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<tr>
<td>Yes</td>
<td>- .1869</td>
<td>- .3047</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(.0128)</td>
<td>(.0933)</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>- .2346</td>
<td>- .3841</td>
<td></td>
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<td>(.0883)</td>
<td>(.1572)</td>
<td></td>
</tr>
<tr>
<td>Differences</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-in-</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Differences</td>
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<td></td>
<td>- .4182</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(.0371)</td>
<td>(.1753)</td>
<td></td>
</tr>
</tbody>
</table>

Notes: These regressions are run on the basis of first-differences for 1993 - 94 and 1994 - 95. They include sector dummies. The DD regressions include plant fixed effects. GDP grows at the same rate in 1994 and 1995, namely 5.8%. In 1993, the growth rate is slightly lower at 5.4%.