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Taxes and Wages

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Abstract

Using panel data for 72 countries and 22 years, we explore the link between taxes and manufacturing wages. We find, controlling for macroeconomic variables that have been found in the literature to influence wages, statistically significant evidence that wage rates are not responsive to median or average income tax rates. We find that wages are significantly responsive to corporate taxation, and that the responsiveness of wages to corporate taxation is larger in smaller countries. We also find that tax and wage characteristics of neighboring countries, whether geographic or economic, have a significant effect on domestic wages. These results are consistent with the frequently employed assumptions in the public finance literature that capital is highly mobile, but labor is not. Under these conditions labor will bear the burden of labor taxes, and bear or share the burden of capital taxes.

I. Introduction

Taxes distort incentives for economic agents. Corporate taxes raise the cost of capital for the business owner, thus reducing the demand for capital. However, the incidence of the corporate tax need not fall solely on capital. Lower investment in capital may lead to lower capital per worker, lower worker productivity, and lower real wages. [1] Similarly, personal income taxes distort the work-leisure decision for workers. High personal taxes may discourage participation in the labor market, thus reducing the supply of labor. However, if labor supply is sufficiently elastic, workers may pass on a share of the tax to capital in the form of higher wages. Hence both corporate taxes and personal income taxes may affect wages, through their impact on labor.

There is ample evidence linking national corporate tax rates to investment levels. Cummins, Hassett and Hubbard (1999) have documented the negative correlation between effective *marginal* corporate tax rates and investment across a large panel of countries. If investment and capital formation are a function of corporate tax rates, then worker productivity and wages may be as well. To date, this link has not been the subject of detailed econometric analysis. This paper fills that gap in the literature, and explores the relationship between corporate tax rates and wage rates.

Capital taxation does not occur in a vacuum. Accordingly, it is important to explore not only the impact of levels of tax variables, but also the impact of *relative* tax variables for competing countries.

[1] See Auerbach (2005) for a more recent analysis of who bears the burden of the corporate tax.

The effect of personal income taxes on work activity has been extensively studied in the literature. Davis and Henrekson (2004), among others, find that higher tax rates reduce work time in the market sector. However, there are no studies linking personal income tax rates and wage rates. Taken in this context, our paper fits into the larger public finance literature relating the tax on a commodity to its price. Poterba (1996) and Besley and Rosen (1994) examine the impact of sales and local taxes on prices of commodities, in order to analyze how much of the price increase due to the tax is actually shifted to consumers. If retail prices rise by exactly the amount of the tax, there is evidence of full tax shifting. Along the same lines, we aim to study the effect of an increase in labor income taxes on the price of labor, and whether there is any evidence to suggest that tax increases are shifted to capital through higher wages, thus transferring some of the burden from labor to capital.

Accordingly, the paper addresses two main questions: Do tax rates, corporate and personal income, systematically affect wage rates? Are wages in the domestic economy affected by taxes and wages in competing economies? These questions are addressed using a sample of developing and developed economies. Our empirical results indicate that domestic corporate taxes are negatively and significantly related to wage rates across countries. We also find that higher average wages in a country's neighbors leads to higher domestic wages. Further, high corporate taxes in competing countries also lead to higher domestic wages. Taken together, our results suggest that capital moves from high tax to low tax countries, and affects wages.

Our results for personal income taxes are surprising. We find that tax rates do not significantly impact wage rates. This is consistent with a model wherein no part of the

increase in labor taxes is passed onto wages. In such a model, labor bears the entire burden of the tax.

Section II provides a brief theoretical background and literature survey. Section III discusses the data and presents summary statistics. Section IV discusses preliminary regression results. Section V concludes.

II. The Linkage Between Capital Taxation and Wages

Since the theoretical linkage between labor taxes and the supply of labor (and hence wage rates) is fairly straightforward, we will focus the discussion in this section on capital taxes and wages. There are many *ex ante* reasons to expect that the linkages between capital taxation and the welfare of workers could be significant. Relying, for example, on the Solow model with a Cobb-Douglas production function with labor-augmenting technology:

$$Y = \mathrm{F}(K,L)=K^{\alpha}\,(AL)^{(1-\alpha)}$$

The wage equation is:

$$w = \frac{\partial Y}{\partial L} = (1-\alpha)A^{1-\alpha}\left(\frac{K}{L}\right)^{\alpha} = (1-\alpha)A^{1-\alpha}k^{\alpha}$$

where k is the capital stock per worker and A is the level of technology. The more capital per worker (the greater the value of k), the greater the wage is. Therefore, a lower corporate tax may lead to a larger capital stock, which may benefit those people at the lower end of the income distribution, who only earn labor income.

The effect might be immediate if there were no capital adjustment costs, but these are likely to be important in practice. It is not plausible, however, that enough capital could flow into a country in a single year to dramatically alter the marginal product of labor, although the effect could be quite large in a very small and undeveloped country. Accordingly, we will look for these effects over longer time horizons, giving the capital stock time to adjust to the lower tax rates.

These linkages can, in theory, be quite significant, and can lead to counterintuitive results. Mankiw (2001), for example, develops a simple model wherein a union that can dictatorially set taxes on capital and labor chooses optimally to set the capital tax to zero, even though its objective is simply the maximization of wages. In Mankiw's (2001) model, there are two distinct types of agents: workers and capitalists, and two types of taxes: capital taxes and labor taxes. Since workers outnumber capitalists, and the hypothesized economy is a democracy, workers effectively get to dictate the tax on capital and labor to maximize their own welfare. Mankiw shows that even in this context workers would optimally choose to set the capital tax to zero. The intuition is that workers would be better off with a higher capital stock, since that would increase worker productivity and feed through to wages. The theoretical case for zero capital taxes is explored in great detail in two recent reviews (Auerbach and Hines, 2001; Judd 2001).

Of course, the link would not be interesting if capital flows were unresponsive to tax variables, but the opposite appears to be the case. Indeed, as mentioned earlier, there are numerous studies linking corporate tax rates to investment levels, both at a domestic and at an international level. The empirical literature discussed in Hassett and Hubbard

(2002), has generally found that effective marginal tax rates significantly impact capital formation.

In addition, relative treatment across countries changes significantly over time. After large reductions in statutory corporate tax rates by Ireland, UK and USA in the mid 1980's, other OECD countries also cut their rates perhaps out of a concern that they would lose investments.[2] The international tax literature, recently summarized by Gordon and Hines (2002) and Devereux and Griffiths (2002) finds that mobile capital may often flow to low tax jurisdictions. Cross-sectional studies such as Grubert and Mutti (1991) and Hines and Rice (1994) estimate the effect of national tax rates on the distribution of aggregate American-owned property, plant and equipment in 1982. They report a negative elasticity with respect to local tax rates. If there is a drop in investment in relatively high-tax countries, this would reduce the amount of capital available to workers and thus reduce real wages in that country. Hence if tax competition is prevalent, then investment may not only be influenced by the level of rates but also by relative rates.

To move to an empirical model of wages, one needs to model the linkage between specific corporate tax variables and capital formation. The literature suggests that marginal tax rates may not be the only relevant variable. Corporate income taxes may also distort the incentives for *international* investment and create opportunities for international tax planning. If firms locate plants in low-tax jurisdictions, and plant location is the decision at the margin, then average tax rates may play an important role in determining international capital flows, and wages. Devereux and Griffiths (1998) concludes that the effective *average* tax rate play an important role in the choice of

[2] "Corporate Income Tax Rates: International Comparisons", November 2005, CBO

investment location within Europe. However, they do not find a significant role for effective marginal tax rates.

Tables 2 and 3 report the top statutory corporate tax rates, and average hourly wage rates, for a subset of the countries in our sample. There is considerable variation in corporate tax rates across countries. For example, in 1981, Australia had a top corporate tax rate of 45 percent, while Bolivia's highest rate was 30 percent. Also, there has been considerable variation in corporate tax rates over time; corporate tax rates have tended to decline over the last twenty years. For instance, among the OECD economies, Australia experienced a decline in corporate tax rates from 46 percent in 1985 to 30 percent in 2001. Over the same period, among non-OECD economies, Chile experienced a drop from 46 percent to 16 percent. These movements are also apparent in effective average and effective marginal tax rates (Figure 1).[3]

At the same time, average hourly wage rates, which are affected by many things in addition to tax rates, have generally increased over time for most countries (Figure 2). In Australia, the average dollar wage per hour went up by 17.5 percent over this period, while in Chile, the corresponding increase was 18.75 percent. Figure 2 also shows a downward trend in average personal income tax rates. The decline has been steeper for the OECD economies, but the OECD economies, on average, experienced higher rates of personal taxation than non-OECD economies.

To date, studies seeking to explain the cross-country variation in wage growth have not focused on the role of capital taxation. Rodrik (1999) finds that there is a robust

[3] An effective marginal tax rate is the percentage of the income from a marginal investment that must be paid as corporate income taxes. These rates are affected by rules for depreciation of productive assets and other features of the tax code.

and statistically significant association between the extent of democracy and the level of manufacturing wages in a country. This holds even after controlling for labor productivity and per capita incomes. Freeman and Ostendorp (2000) explain cross-country differences in terms of the level of gross domestic product per capita and unionization and wage setting institutions. Rama (2003) concludes that in the short run, wages fall with openness to trade and rise with foreign direct investment, but after a few years the effect of trade on wages is reversed. At a micro level, the widening wage distribution in the United States has been explained in terms of de-unionization and the erosion of the real value of the minimum wage (DiNardo, Fortin and Lemieux, 1996). Card, Kramarz and Lemieux (1996) similarly emphasize labor market rigidities as important factors. Katz (1999) points to the increasing use of computers and computer based technologies as affecting the relative demand for skilled workers, and wage inequality. Other papers, such as Davis and Henrekson (2004) study the effect of high personal income tax rates on hours worked in the market sector and other labor market outcomes. Some papers also study the effect of foreign direct investment on wage determination in a spatial setting. Feenstra and Hanson (1995) find that increased foreign direct investment in Mexico, just across the US border, caused an increase in the relative wages of skilled workers, in *both* countries along the border. They, however, did not explicitly model or estimate this relationship using regression analysis or spatial econometrics techniques.

III. Data and Empirical Model

The data cover the period 1981-2003 and include 72 countries.

Our basic approach is to follow Rodrik (1999), but to include tax variables as well.[4] That is, we estimate a fixed effects model with the (five year average) Log wage rate per hour (in manufacturing) as the dependent variable, and beginning of period values of other variables such as Log Corporate Tax Rates, Log Value Added (per worker in manufacturing) and Log consumer price index as the independent variables. We also include fixed year effects. Following Devereux et al. (1998) we present results with different measures of the corporate tax rates, such as the top national corporate tax rate, the effective marginal and the effective average corporate tax rate. In addition, we present results with the spatial variables included in the analysis, such as weighted average tax rates and weighted average wage rates. These capture the effect of spatial tax competition and spatial wage effects across countries.

The dependent variable in the empirical analysis is the average dollar wage earned in manufacturing per hour. The main source of data on wages is the Labor Statistics database available from the International Labor Organization (http://laborsta.ilo.org/). This source provides information on wages for a broad sample of countries, for the period 1981-2003. These figures are provided in local currency terms and we have converted them to US dollars using exchange rates provided by the Penn World Tables. The dependent data are therefore in nominal terms, although a price deflator is also included in the regression. That is, we take a specification for the real wage, and rearrange it so that the deflator is an explanatory variable. This specification follows Rodrik. [5] We tried specifications with the real wage as the dependent variable i.e the nominal wage deflated by the CPI. Results were similar.

[4] We discuss later why we do not include democracy as an explanatory variable, which Rodrik (1999) does.

International comparability of the data is made possible through use of various controls for differences in coverage and definitions. In most countries, the statistics on wages refer to "wages and salaries" which include direct wages and salaries, bonuses and gratuities, etc whereas in some countries they refer to "earnings", which include, more broadly, all compensation such as employers' contribution to social security, pension and insurance schemes. We then converted these total wage payments to hourly wage payments by dividing by the total number of hours worked, data for which was again obtained from the ILO. We check for the robustness of empirical results when controls for differences in coverage are included. The data are discussed in detail in the appendix. Average wages have been rising over the period 1981-2003 for all countries, though there is wide variation in countries both cross-sectionally and over time.

The other key variables in this paper are the tax rate variables. For these we draw on a new source, the AEI International Tax Database. From the raw tax rates, we calculate three measures of corporate tax rates: top national tax rate, effective average and effective marginal tax rates. Their derivation follows Devereux and Griffiths (1999). We control for difference in income taxation as well. To do this, we use average and median personal income tax rates from the AEI International Tax Database.[6] The tax database has information on the number of tax brackets and the corresponding tax rate for each country. We constructed average and median tax rates using these.

Other variables include the value added per worker (in manufacturing, constant 1990 dollars) and trade as a fraction of GDP (available from the ILO KILM database) to measure openness. To control for the effect of prices, we include the log of the consumer price index. This variable captures cost-of-living differences not captured by exchange

[6] Access to the AEI International Tax Database can be provided by writing to the authors.

rate conversions. We also experiment with additional variables such as the level of schooling, computerization and urbanization, highlighted by other papers in the literature.

To allow for the effect of labor market institutions, we use two variables. One of these measures the percentage of workers in a country covered by collective bargaining agreements, as a percent of total salaried or dependent workers. The second is a broader measure which is a count of the cumulative number of ILO conventions ratified by the country. The ILO conventions include ratification of conventions on child labor, forced or compulsory labor, discrimination, the right to organize and the right to bargain collectively. Thus the greater the number of ratified conventions, the greater the protection of workers rights. Information on these variables is available from the Fraser Institute's Economic Freedom of the World dataset and the World Bank Labor Market Database (WBLMD), (Rama, 1996), respectively.

Following Rodrik (1999), ideally we would like to include both the level of gross domestic product (GDP) per capita (available from Penn World Tables) and manufacturing Value Added (MVA) per worker (constant dollars) in the same regression. In case all changes in productivity are not captured by MVA, some should show in the estimated coefficient on aggregate GDP. However, our measure of MVA is noisy. We obtained MVA data from three sources: Key Indicators of the Labor Market (ILO), WBLMD (Rama, 1996) and UNIDO. The problem we faced was one of missing data for our sample of countries and years. The ILO database has more information on total Value Added across all sectors, rather than Value Added only in Manufacturing. The World Bank database provided information for selected countries only uptil 1993, while the

UNIDO database again had lots of missing values for the countries in our sample.[7] Thus our best option was to use the ILO total Value Added data as a proxy for MVA. For the countries that do report MVA, we have included that data. The correlation between this variable and the GDP variable is high, above 0.70. Hence while we get similar results with the two variables, we report results using the Value Added variable to measure productivity.[8]

Finally, we include in the regression analysis weighted averages of tax rates and wage rates in competing countries, following the standard spatial regression literature as summarized by Anselin (1999). The spatial weights matrix takes the form, $W_t=[W'_{1t.},\ldots\ldots\ldots,W'_{Nt.}]'$. At any time t, the ith row of this matrix is given by W_{it}, which specifies "neighborhood sets" for each observation i. The ij-th element of W_t, namely, $w_{ij,t}$, is positive if j is a "neighbor" of i, and is zero otherwise. In our model, we consider many forms of the weighting matrix. One is based on regional economic weights. In this, the countries are assigned to be "neighbors" if they are in the same region as country i. For example, Zambia would have as its neighbors, Zimbabwe, Malawi and Mauritius since they are all in the East African region, but would not include Bolivia, Australia etc since they are in other regions. Countries within the same region would then be weighted by their GDP. A second form of the weighting matrix is based on Income weights i.e. countries within the same income group, such as high income, low income, or upper

[7]Rodrik (1999) uses two samples. The BLS sample covers the period 1975-1994, while the WBLMD/UNIDO sample covers the period 1960-1994. Therefore he does not face a similar problem. The number of observations in the UNIDO data for our sample is 754, in WBLMD, 725 and in ILO 1305. Even though the sample size drops by a lot when we consider the UNIDO data (after taking five year averages and including other variables in the regression), it is comforting to note that we are able to reproduce our main results discussed later.

[8] The coefficient on corporate taxes is negative and significant, even when we include *both* GDP and MVA in the analysis. Also, if we use only the countries with manufacturing value added data in the ILO sample, and use 3-year averages (to increase sample size), we are still able to reproduce our results.

middle income etc are classified as neighbors. These countries are then weighted by their GDP. The third kind of weighting we used was to assign distance weights to countries within the same income group.

These weighting matrices were used to create weighted averages of corporate tax rates and wage rates in "neighbor" countries. In somewhat more detail, the *ijth* element of the weighting matrix at time *t*, is,

$$w_{ijt} = \frac{GDP_{ijt}}{\sum_{k} GDP_{ikt}}$$ where *k* is the number of "neighbor" countries for country *i*.

The weighting matrix based on distance is defined in a similar manner. By convention, a cross sectional unit is not a neighbor to itself, so that the diagonal elements of W_t are all zero i.e $w_{ii,t}=0$.

B. Summary Statistics

Summary statistics for the core variables are presented in Table 1. The average wage for the OECD economies for this period was nearly $9 per hour, whereas for Non-OECD economies it was $2.50. Surprisingly, however, the mean top corporate tax rate was similar-around 35 percent-for both sets of countries. Average personal income taxes were larger for the OECD economies (.31) than for the non-OECD economies (.23). Average wages nearly doubled for both OECD and Non-OECD economies over this period, and corporate tax rates declined by slightly less than half. As shown in Figures 1 and 2, on average for all countries, corporate and personal income taxes have been declining over the sample period 1981-2003. This is true for the top national corporate tax rate, as well as the effective marginal and average tax rates. At the same time, average hourly wage rates have been rising over time. The average corporate tax rate for all

countries went down from 42 percent in 1981 to around 29 percent in 2000.[9] For the same period, average wage rates increased from 3.5 dollars per hour to 6 dollars per hour. The correlation between these two variables was larger for the OECD countries (.355) than for the non-OECD countries. This is also reflected in the large negative coefficient on tax rates in a regression of tax rates on average wages for OECD countries (Figure 3).

IV. Regression Results

For purposes of the empirical analysis, we have grouped the data into nonoverlapping five year periods covering five sub-periods over 1981-2002.[10] The average wage is a five year average of each of the sub-periods. Note that the average wage is in nominal dollar terms. This is Rodrik's (1999) specification, but with tax variable added.[11] For the right hand side variables, we use the beginning of period values.

Table 4 presents the first set of regression results. All the regressions, unless otherwise stated, are estimated using fixed effects. All specifications also control for period (time) dummies. The main variables of interest in this paper are the corporate tax rate and the personal income tax rate. Regressions in Table 4 use the top national corporate tax rate as the explanatory variable. Results with other measures of corporate taxes, such as effective average and marginal corporate tax rates are presented in Table 5. The corporate tax rate variable is negative and highly significant. (p=.005) in the wage equation. This result is fairly stable across different specifications, and declines in

[9] The countries with the highest corporate tax rates were Belgium, Italy and Turkey, with rates close to 40 percent.

[10] The sub-periods are 1981-1985, 1986-1990, 1991-1995, 1996-2000,2001-2002

[11] Rodrik (1999) has a specification with log nominal wages as the dependent variable. He, however, acknowledges the possibility of spurious effects arising from wage and price inflation. Therefore, in one of his specifications using WMBLD/UNIDO data, he divides the nominal wage per hour by the Manufacturing Value Added (MVA) per hour, and that becomes the dependent variable.

significance only marginally when the number of observations is reduced in columns (4)-(5). The point estimates suggest that a one percent increase in corporate tax rates is associated with nearly a 0.8 percent decrease in wage rates according to the regression in Column (1), and on average about 0.95 percent decrease across different specifications. In Figure 3 we present scatter plots of corporate tax rates and wage rates for OECD and Non-OECD countries. In general, countries with high tax rates tend to have lower wages rates. A regression of average wages on corporate tax rates in different sub-samples of OECD and non-OECD economies yields a larger slope coefficient in the case of OECD countries, suggesting that on average over this period, capital-wage links have been stronger for the OECD countries.

In our model, corporate tax rates are assumed to affect wages through their impact on capital-labor ratios (investment) and worker productivity. To test for this, we obtained information on capital-labor ratios (from the Penn World Tables), and estimated a 2SLS regression of average wages on capital labor ratios using taxes as instruments. The first stage regression of capital labor ratios on corporate tax rates yielded a negative and significant coefficient on corporate tax rates ($p=0.048$). In the second stage regression, the coefficient on capital labor ratio is positive and significant at nearly 95 percent level of significance (t-statistic=1.93), with a coefficient close to 2. This confirms our intuition that higher corporate taxes may feed through to lower wages, through lower capital investment per worker.

Perhaps, surprisingly, we find that average personal income tax rates are insignificant in all specifications. Labor taxes do not systematically affect wages. This result holds even when we drop other variables, including the corporate tax variables,

from the regression (Column (3)). This suggests that labor bears the entire burden of labor taxes. There is no shifting of the tax to capital in the form of higher wages. This result is in line with Davis and Henrekson (2004). They conclude that the manufacturing sector is relatively insensitive to personal tax rates, because manufacturing production is highly capital intensive, larger firms and establishments predominate, and the workforce is highly specialized. They find in cross-country data a statistically insignificant effect of labor tax rates on manufacturing's share of total employment. Thus it is likely that manufacturing wages too are unresponsive to personal tax rates. We re-ran the regressions using *median* personal income tax rates as an alternative measure of the typical income tax paid by the typical manufacturing employee, but the results did not change. Median personal taxes were insignificant in all specifications.[12]

The regressions in columns (1)-(5) also reveal that MVA per worker is a significant determinant of wage levels. Not surprisingly, higher labor productivity is associated with higher wages. When Log wages are regressed on Log Value Added per worker alone, the coefficient is significant and positive with a coefficient of 2.3 and a t-statistic of 17.74. If instead of MVA per worker we substitute Log (GDP per capita) in the regression in Column (1), the results are similar. Therefore, we do not present them separately, and our analysis will be entirely in terms of MVA per worker.[13]

We tested for robustness of the coefficient on tax rates, by including additional variables. These include the level of schooling (measured by enrollment at different

[12] Davis and Henrekson (2004) study the effect of labor taxes on substitution away from market activities towards non-market activities within a country. They find that this kind of substitution is much lower in the manufacturing sector.

[13] As mentioned before, we are able to reproduce these results in the smaller UNIDO sample using a RE GLS model and a simple OLS regression with region dummies, both of which impose fewer restrictions on the degrees of freedom.

levels of schooling, such as primary, secondary and tertiary (ILO)), labor market regulations (as measured by the number of ILO conventions ratified by the country or the percent of workers covered by collective bargaining agreements), extent of computerization (measured as the estimated number of personal computers in use as a fraction of the population, available from ILO) and openness (measured by share of total trade in GDP). None of these enters significantly, since we control for labor productivity directly.[14] The estimated coefficient on corporate tax rates remains fairly similar across different specifications, and is significant at either the 95 or 99 percent level of significance. Note that the use of the fixed effects methodology eliminates country-specific idiosyncrasies regarding the type of coverage provided on wages and salaries.

In other regressions (not shown here), we defined the dependent variable as the real wage, rather than the nominal wage. Results were similar. The coefficient on corporate tax rates was in the same range as in other specifications. Personal taxes, median and average, were not significant.

We controlled for the effect of consumer prices. In general, higher prices may cause workers to bargain for higher wages. This variable remains positive and significant in all specifications.

We also experimented with other variables such as the share of government enterprises in all enterprises, number of employees in service industry or agriculture. However, none of these variables were significant while the sign on the corporate tax coefficient continued to be negative and significant.

[14]An OLS regression of average wages on corporate taxes, schooling and (trade/GDP) (controlling for region effects and time dummies) alone yields significant and positive coefficients on schooling and (trade/GDP), while still yielding a negative and significant coefficient on corporate taxes. A regression of average wages on computerization or number of ILO conventions alone yields a positive and statistically significant impact of these variables.

In Table 5, we tested to see if the above results carried over to other measures of the corporate tax rate, such as the Effective Marginal Tax Rate and the Effective Average Tax Rate. The coefficient on the effective marginal tax rate variable is negative and significant only at 90 percent level of significance in Column (1), while on the effective average tax rate variable is significant at 95 percent. In Columns (3) and (4) we have presented these results for the case when our sample includes only non-OECD economies. In this case, we do find that effective average taxes matter more than effective marginal tax rates. This supports weakly the results of Devereux and Griffiths (1998) and Hassett and Hubbard (2002) of the impact of tax rates on investment for effective average and marginal tax rates, respectively. Results for the other variables are similar to those in Table 4.

Table 6 incorporates measures of average tax rates and average wage rates in "neighbor" countries in the regression analysis. The domestic economy corporate tax rate variables continue to be significant in these specifications. Since personal taxes are found to be insignificant in all specifications, we do not include them in the specifications shown in Table 6. Interestingly, we find significant results for the spatial variables. Column (1) defines a weighted average of top corporate tax rates and wage rates in "neighbor" countries. "Neighbor" countries here are defined as all those countries that are in the same region, as described before. The weights that we use for these countries are GDP weights. Thus every country is weighted by its economic strength in the region. In this specification, the weighted average wage in the region turns out to be positive and significant. There could be at least two reasons for this result. An increase in wages in neighboring countries may increase capital outflow from these regions to relatively lower

wage neighbor countries, which in turn may increase the demand for labor, and hence the wage rate. Secondly, high wages in neighboring countries may cause workers to move to the high wage country. This would cause a decrease in supply of workers in the relatively low wage country, which could cause an increase in wages in the low wage country as well. For the weighted average tax rate, the coefficient is positive, but not significant.

In Column (2), we change the spatial neighbors by defining as neighbors those countries that are in the same *income* group (rather than in the same region). Countries within the same income group are then weighted by their respective GDP. This specification would be justified if workers are more likely to move between countries with the same per capita income than from very high to very low or vice-versa. In this specification, the weighted wage variable is again positive and significant. In this case, the weighted (top corporate) tax variable is positive, but not significant.[15]

Column (3) presents results with a different weighting scheme. While neighbors continue to be defined in terms of income groups, the countries within the group are now weighted using (inverse) distance weights. Thus the farther the country, the lower the weight it receives within the group. In this specification both the own region wage and the own region (top corporate) tax rates are positive and significant.

Finally, in Column (4), we re-ran the regression using as a measure of the domestic and international tax rates, the effective marginal tax rates, instead of the top corporate tax rates. In this specification, the income weighted tax rates are positive and

[15] While we use beginning of period values to ensure exogeneity of right-hand side regressors, we also use 2SLS estimation to test for this. It's possible that beginning of period average neighbor wages may be correlated with the left-hand side dependent variable. We therefore instrument for this variable in the standard way suggested in the spatial econometrics literature (Anselin, 1999). If our regression model has Y as the dependent variable and X, WX and WY as the right-hand side regressors, we instrument for WY using X, WX and W^2X, where W is the weighting matrix. Results did not change in the 2SLS specification.

significant at 90 percent level of significance. In Column (5), we use the GDP-weighted average of the effective average tax rates in neighbor countries to capture spatial tax competition. These results suggest that tax competition exists among "neighbor" countries, whether we consider the top corporate tax rate, effective marginal tax rates, or effective average tax rates. Competition could result from being geographic neighbors i.e countries within the same region, or from "economic" neighbors i.e countries in the same income group.

Table 7 presents results with the democracy variable included in Rodrik (1999), and other forms of taxes such as VAT and payroll taxes. Following Rodrik, we construct our measure of democracy using Freedom House's classification of countries based on political rights and civil liberties.[16] Column (1) shows that in a regression including the democracy variable, along with our tax rate variable, the coefficient on the democracy variable is insignificant, while the estimated coefficient on tax rates and MVA per worker continue to be significant as before. Unlike Rodrik (1999), we do not include democracy as an explanatory variable in our baseline specification since a variable like democracy is difficult to measure, and is highly likely to be correlated with other unobservables in cross-country regressions. Persson and Tabellini (2005) suggest that democracies are correlated with other features of the economic system, such as liberalization and trade openness, form of government and type of electoral rule. A VAR analysis of democracy and corporate tax rates suggests that democracy may granger-cause corporate tax rates. In the political science literature, Hays (2003), finds that international capital tax competition has the greatest negative impact in majoritarian democracies with closed

[16] Freedom House rates countries on a scale of 1 to 7 with higher ratings signifying less freedom. We combine the two ratings into a single index that varies from 0 to 1 (with higher values indicating greater democracy) by using the transformation [(14-civillib-polrights)/12].

economies. The paper uses a different measure of democracy, and distinguishes between majoritarian and consensus democracies.

In Columns (2) and (3), we test to see if other forms of taxes, such as value-added or sales tax (VAT) and (employer and employee) payroll taxes affect average wages, and find an insignificant effect. In Column (4), we address the question whether social security contributions by employers may be driving our results on personal taxes. Thus we exclude those countries where the wage measure includes contributions to social security by employers. As we can see from the table, this does not change our results. Moreover, any differences in the definition of wages across countries would be captured by the fixed effects.

Table 8 presents results for the case when the large economies (selected on the basis of GDP) are excluded from the sample. The intuition for this is that relatively small economies are much more likely to experience a sudden spurt in productivity and wages as a result of increased capital investment as compared to the richer economies have capital stocks that are large relative to the world supply of investment. Hence we should expect to see a larger impact of capital taxes on wages in these small economies, in terms of a larger size estimate of the coefficient on tax rates. Therefore Column (1) first presents results with the entire sample which serves as a basis of comparison. Column (2) presents results with the top 10 richest economies excluded from the sample. As we predicted, the coefficient on corporate tax rates increases to 1.07 from its value of 0.84 in Column (1).

Column (3) focuses specifically on the small or poor economies. We re-ran the regression including only the lowest GDP economies in the sample. In this case, the

coefficient on corporate tax rates increases significantly to 1.54. It nearly doubles in magnitude compared to Column (1). These results suggest that at least in the short-run (in the five year period used in the sample) smaller economies are significantly more likely to respond to corporate tax rates and see visible changes in productivity and wage rates. Larger economies experience the gain over a longer time period.

Finally, a Hausman test revealed no significant differences in fixed vs. random effects estimates. In Table 9 we present results using random effects GLS estimation and OLS estimation, allowing for region dummies in the latter specification. Column (1) presents the random effects estimates. The coefficient on top corporate tax rate is negative and highly significant with a t-statistic of 3.55. The coefficient on Value added per worker in manufacturing is positive and significant at 95 percent level of significance. The coefficient on Log (CPI) is positive and significant, while that on personal taxes is again insignificant. Column (2) finds similar results with OLS. Some of the region dummies are significant. Column (3) presents results using 3 year averages of the wage rate as the dependent variable. Results are similar to those mentioned for the specification in Columns (1).

To summarize, our results indicate that while personal income tax rates do not affect wages, corporate taxes are significantly related to wage rates across countries. Our coefficient estimates are large, ranging from 0.83 to almost 1-thus a 1 percent increase in corporate tax rates leads to an almost equivalent decrease in wage rates (in percentage terms). If we set all variables to their average values, an increase in corporate tax rates from a mean value of .35 to a 1-standard deviation increase of .10, would cause wage rates to decline by more than 25 percent (depending on the regression specification).

Thus a low wage-high tax economy, like Mexico (average wage over the period=$1.67 and average tax rate=.37), could raise wage levels if it could lower it's corporate tax rate to that of Canada's (.22). A 40 percent drop in corporate tax rates could raise wages by nearly 35 percent, up to $2.25.

These results also hold for effective marginal and average tax rates. The coefficient estimate is (on average) close to 0.5, though the level of significance is lower. This suggests that wages are as likely to be influenced by the top statutory corporate tax rate, as by the effective marginal and average tax rates. Hence corporate tax cuts in the form of large allowances for depreciation of equipment and structures which reduce effective marginal rates could effectively influence wage levels as well.

We find evidence of international tax and wage competition in the data. Country wage rates are affected not only by domestic tax rates, but also tax rates in competing economies. The coefficient estimates for the spatial wage and tax variables range from 0.39 to 0.56 for average neighbor wages and 0.51 to 0.55 for the average neighbor tax variable, suggesting significant quantitative impacts. A 1 percent increase in wages (taxes) in competing countries could raise domestic wages by 0.4 percent (0.5 percent). Comparing different weighting schemes, the effects are largest when "neighbors" are defined as countries within the same *income* group, rather than within the same region. This suggests that tax competition is most intense among, say, high income countries such as Canada, France and Italy, rather than between geographic neighbors. This makes sense intuitively since there do not appear to be large transport costs associated with moving capital across large distances, so capital can easily flow to the most remunerative locations.

V. Conclusion

The results in this paper suggest that corporate tax rates affect wage levels across countries. Higher corporate taxes lead to lower wages. A 1 percent *increase* in corporate tax rates is associated with nearly a 1 percent *drop* in wage rates. The intuition for this comes from a simple analysis of the Solow model that reveals that higher capital labor ratios lead to higher wages, by enhancing worker productivity.

We find no effect of personal income tax rates on wage rates. This could be because we are focusing on manufacturing wages, and this sector is highly capital intensive and as suggested by other authors (Davis et al.2004) unresponsive to tax rates. Thus a possible area of exploration in future research is to see if this result generalizes to other sectors.

We find evidence for international tax competition. In particular, there appears to be a link between high tax "neighbors" and high domestic wages. Presumably, as capital flows out of high tax "neighbor" countries to low tax countries, this increases worker productivity and hence wages, in the low tax country. Thus countries try to compete for capital with other countries by lowering their relative tax rates. We also find strong evidence to suggest that high wages in neighboring countries lead to high wages in the domestic economy. Again, a possible reason for this is capital flight. As capital moves to relatively low wage destinations, it increases worker productivity in these regions which in turn, causes wages to rise. The results for international tax competition are strongest in the case of countries within the same income group.

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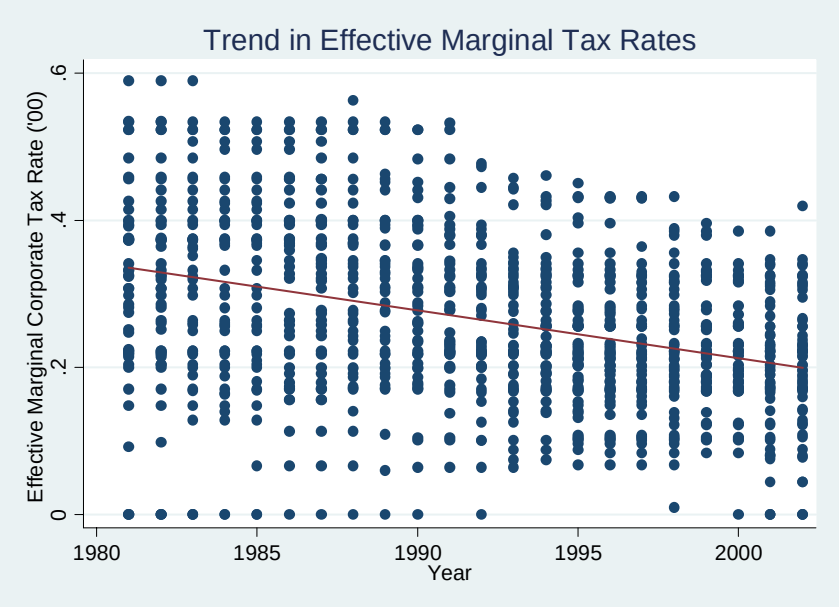
Table 1

Descriptive Statistics for Core Variables used in Regression

Variable	N	Mean	Std. Dev
Average Wage Per Hour	1309	4.92	7.30
OECD		8.61	6.85
Non-OECD		2.50	4.45
Log (Average Wage)	1309	.638	1.68
Top Corporate Tax Rate	1233	.35	.10
OECD	487	.35	.89
Non-OECD	746	.34	.10
Log Top Corporate Tax Rate	1230	-1.10	.39
Log Effective Average Tax Rate	1071	-1.24	.34
Log Effective Marginal tax Rate	1048	-1.40	.46
Average Personal Income Tax Rate	1047	26.32	9.90
OECD		31.17	8.68
Non-OECD		23.22	9.37
Median Personal Income Tax	1145	27.15	10.38
Log (Value Added Per Worker in Manufacturing)	1291	9.31	1.52
Log GDP per capita	1449	8.14	1.33
Log (Trade/GDP)	1412	4.15	.52
Schooling	1190	3.84	.60
Log price level	1606	4.89	.20

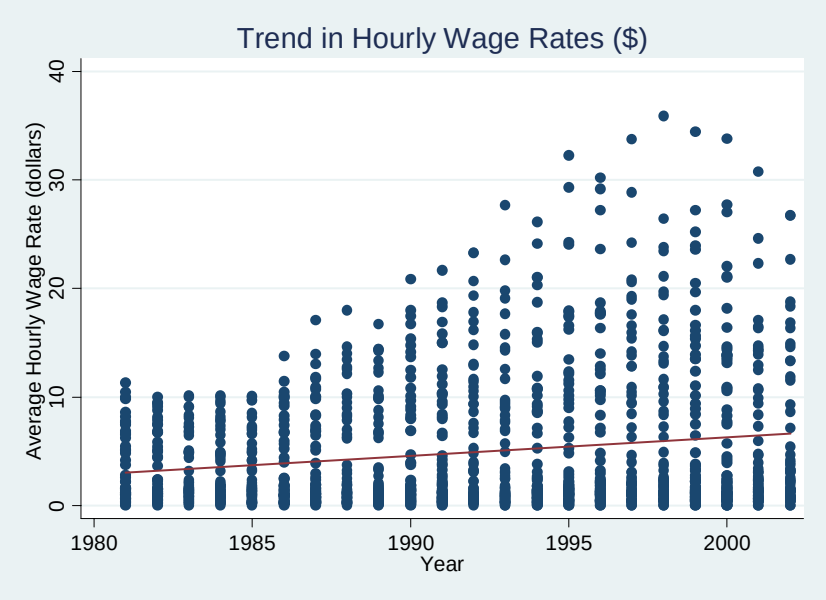
Figure 1: Trends in Corporate Tax Rates

A. Top National Corporate Tax Rate

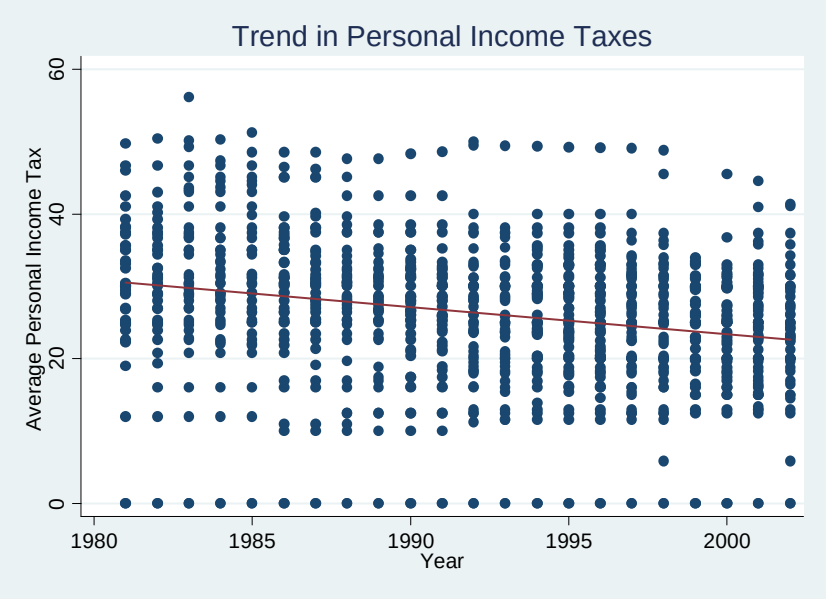


B. Effective Marginal Tax Rate

Figure 2:Wages and Income Taxes

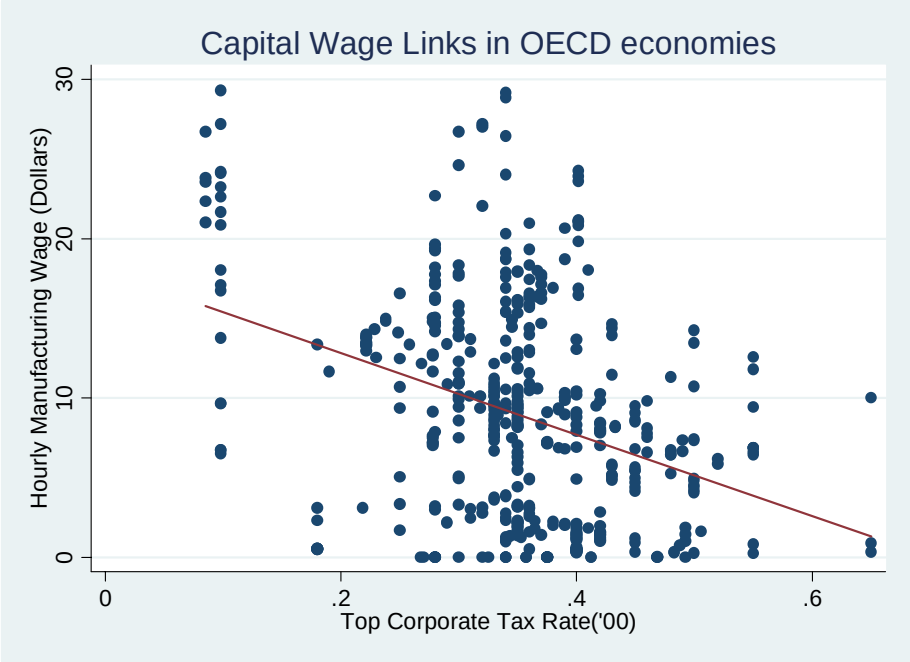


A. Trend in Average Hourly Wage Rates

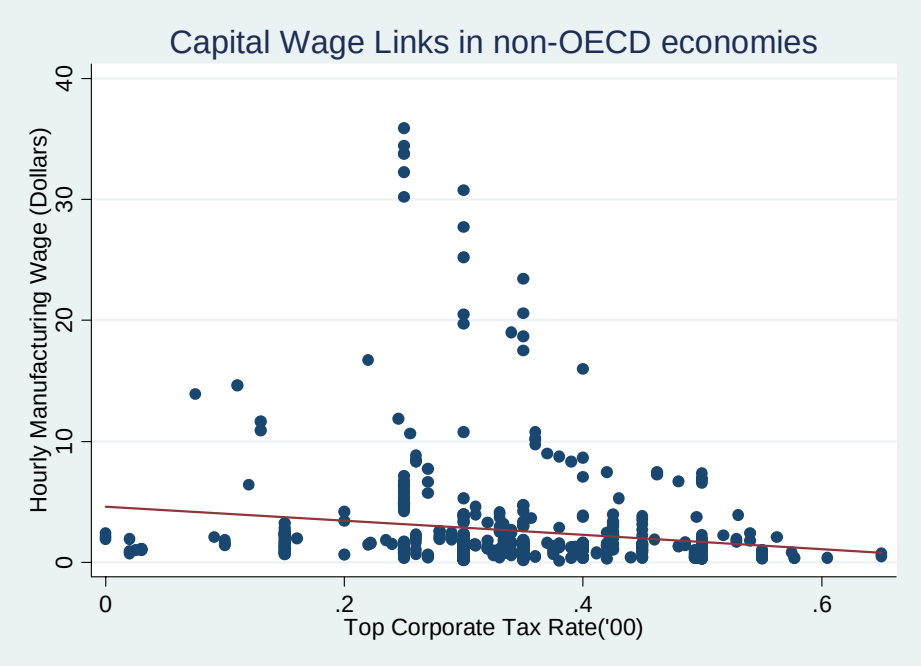


B. Trend in Average Personal Income Tax Rates

Figure 3: Capital Wage Links in OECD and Non-OECD Economies



OECD: Slope coefficient=-25.76



Non-OECD: Slope coefficient =-5.88

Table 2: Variation In Top Corporate Tax Rates ('00)

	Australia	Austria	Bolivia	Chile	Colombia
1981	0.46	0.55	0.3	0.48	0.4
1982	0.46	0.55	0.3	0.48	0.4
1983	0.46	0.55	0.3	0.46	0.4
1984	0.46	0.55	0.3	0.23	0.4
1985	0.46	0.55	0.3	0.1	0.4
1986	0.49	0.55	0.02	0.1	0.4
1987	0.49	0.55	0.02	0.1	0.3
1988	0.39	0.55	0.02	0.1	0.3
1989	0.39	0.3	0.025	0.09	0.3
1990	0.39	0.3	0.03	0.15	0.3
1991	0.39	0.3	0.03	0.15	0.3
1992	0.39	0.3	0.03	0.15	0.3
1993	0.33	0.3	0.03	0.15	0.37
1994	0.33	0.34	0.25	0.15	0.37
1995	0.36	0.34	0.25	0.15	0.35
1996	0.36	0.34	0.25	0.15	0.35
1997	0.36	0.34	0.25	0.15	0.35
1998	0.36	0.34	0.25	0.15	0.35
1999	0.36	0.34	0.25	0.15	0.35
2000	0.34	0.34	0.25	0.15	0.35
2001	0.3	0.34	0.25	0.15	0.35
2002	0.3	0.34	0.25	0.16	0.35

Table 3: Variation in Wage Rates (US $ per hour)

	Australia	Austria	Bolivia	Chile	Colombia
1981	9.8	6.87	1.2	1.64	1.15
1982	8.12	6.86	1.09	1.43	1.29
1983	7.51	6.85	1.5	1.90	1.34
1984	7.77	6.46	0.82	1.85	1.31
1985	6.59	6.63	1	1.43	1.11
1986	6.65	9.42	1.91	1.49	1.02
1987	7.36	11.80	0.73	1.62	0.82
1988	8.96	12.56	0.93	1.82	1.03
1989	9.84	12.28	0.98	2.05	1.11
1990	10.06	15.36	1.00	2.34	1.07
1991	10.33	15.81	1.10	2.78	0.84
1992	10.04	17.80	1.06	3.23	1.29
1993	9.53	17.65	1.08	1.60	0.93
1994	10.75	18.72	1.11	1.79	1.31
1995	11.55	17.87	1.11	2.15	1.32
1996	12.83	17.57	0.84	2.32	1.44
1997	16.58	15.41	0.94	2.48	1.55
1998	10.91	16.05	1.02	2.41	1.71
1999	15.66	15.36	1.07	2.24	1.45
2000	10.52	13.60	1.09	2.20	1.59
2001	9.40	12.49	1.22	1.99	1.60
2002	11.55	18.75	1.30	1.97	1.46

Table 4: Regression Results

	(1)	(2)	(3)	(4)	(5)
Dependent Variable: Log (Average Hourly Wage) (5 year average)					
Log(TopCorpTax)	-0.836	-0.841		-1.047	-1.193
	(2.85)***	(2.80)***		(2.03)**	(2.04)**
Log(ValueAdded)	0.444	0.438	0.644	0.621	0.246
	(1.79)*	(1.71)*	(2.56)**	(2.37)**	(0.55)
Log(CPI)	0.566	0.611	0.465	0.456	1.004
	(2.68)***	(2.53)**	(1.73)*	(1.65)*	(1.88)*
Log(PersonalTax)	-0.134	-0.117	-0.259	0.666	-0.724
	(0.51)	(0.44)	(0.96)	(1.37)	(1.44)
Log(Trade/GDP)		0.067	0.027	-0.005	
		(0.26)	(0.09)	(0.02)	
Log(LaborMktReg)				0.121	
				(0.20)	
Log(Computerization)					0.032
					(0.19)
Constant	-6.21	-6.67	-6.45	-5.69	-4.63
	(2.35)**	(2.32)**	(2.13)**	(1.63)*	(0.98)
Observations	218	214	215	180	128
Overall R-squared	0.26	0.26	0.21	0.29	0.26

Absolute value of t statistics in parentheses
***significant at 1%; **significant at 5%;*significant at 10%

1. All specifications include country fixed effects and period dummies.
2. The dependent variable is the 5 year average of the wage rate over sub-periods: 1981-1985, 1986-1990, 1991-1995, 1996-2000,2001-2002. The independent variables are the beginning of period values of these variables.

Table 5: Other Tax Measures

	(1)	(2)	(3)	(4)
Dependent variable: Log(Average hourly wage) (5 year average)				
Log(Eff.Mrg.Tax)	-0.372		-0.344	
	(1.66)*		(1.48)	
Log(Eff.Avg.Tax)		-0.660		-0.589
		(2.00)**		(1.83)*
Log(ValueAdded)	0.478	0.422	0.568	-0.528
	(1.84)*	(1.61)	(2.10)**	(1.99)**
Log(PersonalTax)	-0.197	-0.189	-0.274	-0.263
	(0.73)	(0.72)	(0.87)	(0.87)
Log(CPI)	0.710	0.742	0.452	0.474
	(2.91)***	(3.08)***	(1.81)*	(1.98)*
Constant	-6.495	-6.439	-5.88	-5.94
	(2.26)**	(2.27)**	(2.09)**	(2.18)**
Observations	195	199	94	97
Sample	All	All	Non-OECD	Non-OECD
R-squared	0.24	0.22	0.16	0.18

Absolute value of t statistics in parentheses
***significant at 1%; ** significant at 5%;*significant at 10%

1. All specifications include country fixed effects and period dummies.
2. The dependent variable is the 5 year average of the wage rate over sub-periods: 1981-1985, 1986-1990, 1991-1995, 1996-2000,2001-2002. The independent variables are the beginning of period values of these variables.

Table 6: Regressions with Spatial Variables

	(1)	(2)	(3)	(4)	(5)
Dependent Variable:	Log(Average Hourly Wage) (5 year average)				
Log(TopCorpTax)	-0.900	-0.900	-0.979		
	(3.03)***	(2.98)***	(3.18)***		
Log(Eff.Marg.Tax)				-0.312	
				(1.39)	
Log(Eff.Avg.Tax)					-0.706
					(2.16)**
Log(ValueAdded)	0.252	0.403	0.471	0.358	0.173
	(0.96)	(1.44)	(1.77)*	(1.19)	(0.63)
Log(CPI)	0.506	0.419	0.449	0.396	0.556
	(2.43)**	(1.93)*	(2.15)**	(1.49)	(2.15)**
Wgt.OwnRegWage	0.395				0.408
	(2.25)*				(2.26)**
Wgt.OwnRegTax	0.097				0.517
	(0.39)				(2.93)*
Incwt.OwnRegWage		0.468		0.557	
		(1.64)*		(1.87)*	
Incwt.OwnRegTax		0.504			
		(1.50)			
Incwt.OwnRegEffMargTax				0.548	
				(1.71)*	
Distincwt.OwnRegWage			0.347		
			(1.69)*		
Distincwt.OwnRegTax			0.531		
			(1.87)*		
Constant	-4.851	-5.563	-6.328	-4.51	-3.75
	(1.93)*	(2.07)**	(2.46)**	(1.49)	(1.38)
Observations	220	222	222	197	201
R-squared	0.27	0.25	0.26	0.22	0.20

Absolute value of t statistics in parentheses
***significant at 1%; ** significant at 5%;*significant at 10%

1. All specifications include country fixed effects and period dummies.
2. The dependent variable is the 5 year average of the wage rate over sub-periods: 1981-1985, 1986-1990, 1991-1995, 1996-2000,2001-2002. The independent variables are the beginning of period values of these variables.
3. Columns (1) and (5)use GDP-weighted own region countries as neighbors. Column (2) and (4) use GDP-weighted own Income group countries as neighbors. Column (3) uses Distance weighted own Income group countries as neighbors.

Table 7: Results with Other Explanatory Variables: Democracy, Payroll and VAT Taxes

	(1)	(2)	(3)	(4)
Dependent Variable: Log(Average Hourly Wage) (5 year average)				
Log(TopCorpTax)	-0.794	-0.592	-0.625	-0.949
	(2.65)***	(1.79)*	(1.88)*	(3.11)***
Log(ValueAdded)	-0.417	0.642	0.780	0.685
	(1.70)*	(1.90)*	(2.67)***	(3.19)***
Log(CPI)	0.514	0.549	0.863	0.464
	(2.45)**	(2.38)**	(2.63)***	(2.62)**
Log(PersonalTax)		-0.329		-0.192
		(1.02)		(0.91)
Democracy	0.355			
	(0.90)			
Log(Payrolltax)		-0.223		
		(1.25)		
Log(VAT)			-0.510	
			(1.31)	
Constant	-1.498	-6.73	-9.52	-7.86
	(0.53)***	(1.88)*	(2.74)***	(3.53)***
Observations	220	254	158	175
Sample	All	All	All	Exclude SS
R-squared	0.28	0.25	0.21	0.23

Absolute value of t statistics in parentheses
*** significant at 1%; ** significant at 5%;***significant at 10%

1. All specifications include country fixed effects and period dummies.
2. The dependent variable is the 5 year average of the wage rate over sub-periods: 1981-1985, 1986-1990, 1991-1995, 1996-2000,2001-2002. The independent variables are the beginning of period values of these variables.

Table 8: Small Economy Results

	(1)	(2)	(3)
Dependent Variable: Log(Average Hourly Wage) (5 year average)			
Log(TopCorpTax)	-0.842	-1.070	-1.543
	(2.88)***	(3.16)***	(1.88)*
Log(Personaltax)	-0.156	-0.045	-0.413
	(0.61)	(0.15)	(0.58)
Log(ValueAdded)	0.453	0.206	0.248
	(1.83)*	(0.62)	(1.20)
Log(CPI)	0.589	0.556	0.538
	(2.85)***	(2.33)**	(1.53)
Constant	-6.300	-4.553	-4.466
	(2.39)***	(1.23)	(2.13)**
Sample	All	All-Top 10	Smallest 12
Observations	218	178	44

Absolute value of t statistics in parentheses
*** significant at 1%; ** significant at 5%;*significant at 10%

1. All specifications include country fixed effects and period dummies.
2. The dependent variable is the 5 year average of the wage rate over sub-periods: 1981-1985, 1986-1990, 1991-1995, 1996-2000,2001-2002. The independent variables are the beginning of period values of these variables.

Table 9: Other Specifications: Random Effects, OLS

Dependent Variable: Log(Average Hourly Wage)

	(1) RE GLS(5-yr average)	(2) OLS(5-yr average)	(3) RE GLS (3-year average)
Log(TopCorpTax)	-0.919	-0.844	-0.517
	(3.55)***	(2.59)***	(2.72)***
Log(ValueAdded)	0.245	0.183	0.319
	(2.47)**	(1.49)	(3.31)**
Log(PersonalTax)	-0.174	0.082	0.198
	(0.76)	(0.28)	(1.06)
Log(CPI)	0.825	1.014	0.725
	(4.82)***	(4.33)***	(4.43)***
EastAfr		1.241	
		(1.88)	
SouthAfr		1.545	
		(2.88)**	
Caribbean		2.416	
		(3.31)**	
Cent.America		0.995	
		(2.09)*	
South.Am		0.361	
		(0.84)	
Southasia		-0.374	
		(0.64)	
Westasia		-0.728	
		(1.50)	
Easteuro		0.163	
		(0.38)	
Northeuro		1.585	
		(4.20)**	
Southeuro		1.052	
		(2.57)*	
Westeuro		1.647	
		(4.22)**	
Southeastasia		0.422	
		(1.00)	
Constant	-5.272	-5.481	-6.389
	(1.55)**	(3.22)**	(5.61)**
Period Dummies	Yes	Yes	Yes
Observations	218	218	309
R-squared	0.29	0.50	0.27

Absolute value of z statistics in parentheses
*** significant at 1%; ** significant at 5%;*significant at 10%

Data Appendix

The statistics on wages are obtained from the ILO's Key Indicators of the Labor Market (KILM). The ILO reports *average earnings* per worker or, in some cases, *average wage rates*. Some of the series cover wage earners (i.e. manual or production workers) only, while others refer to salaried employees (i.e. non-manual workers), or all employees (i.e. wage earners and salaried employees). The series cover workers of both sexes, irrespective of age.

Earnings: The concept of earnings relates to remuneration in cash and in kind paid to employees, as a rule at regular intervals, for time worked or work done together with remuneration for time not worked, such as for annual vacation, other paid leave or holidays. Earnings exclude employers' contributions in respect of their employees paid to social security and pension schemes and also the benefits received by employees under these schemes. Earnings also exclude severance and termination pay.

Statistics of earnings should relate to employees' gross remuneration, i.e. the total before any deductions are made by the employer in respect of taxes, contributions of employees to social security and pension schemes, life insurance premiums, union dues and other obligations of employees.

Earnings include: direct wages and salaries, remuneration for time not worked (excluding severance and termination pay), bonuses and gratuities and housing and family allowances paid by the employer directly to this employee. (a)Direct wages and salaries for time worked, or work done, cover: (i) straight time pay of time-rated workers; (ii) incentive pay of time-rated workers; (iii) earnings of piece workers (excluding overtime premiums); (iv) premium pay for overtime, shift, night and holiday work; (v) commissions paid to sales and other personnel. Included are: premiums for seniority and special skills, geographical zone differentials, responsibility premiums, dirt, danger and discomfort allowances, payments under guaranteed wage systems, cost-of-living allowances and other regular allowances. (b) Remuneration for time not worked comprises direct payments to employees in respect of public holidays, annual vacations and other time off with pay granted by the employer. (c) Bonuses and gratuities cover

seasonal and end-of-year bonuses, additional payments in respect of vacation period (supplementary to normal pay) and profit-sharing bonuses. (ii) Statistics of earnings should distinguish cash earnings from payments in kind.
Wage rates: These include basic wages, cost-of-living allowances and other guaranteed and regularly paid allowances, but exclude overtime payments, bonuses and gratuities, family allowances and other social security payments made by employers. *Ex gratia* payments in kind, supplementary to normal wage rates, are also excluded.

Thus broadly country coverage differs due to the following reasons: (1) whether the reported statistic is wages or earnings (2) whether it covers employees, wage earners or salaried employees (3) whether it includes social security contributions by employer. When we studied the descriptions more closely, we found that certain countries like Chile, Turkey, Colombia, Ecuador, Kenya, Kyrgyzstan, Mexico, Malaysia, Panama and Ukraine included social security contributions by employers in the earnings data. Another difference arises because the industrial classification changed during this period. Since the beginning of the 1990s an increasing number of countries have made a switchover in their data reporting systems for industrial statistics from Revision 2 to Revision 3 of the International Standard Classification of All Economic Activities (ISIC).

Including dummies to allow for all these differences in coverage in a panel regression (without country fixed effects) yielded a highly significant negative sign on corporate tax rates, and no change in results for the other variables.