



## ES-Working Paper no. 4

### Economic Integration, Corporate Tax Incidence and Fiscal Compensation

Nelly Exbrayat and Benny Geys

March 22nd, 2016

This text may be downloaded for personal research purposes only. Any additional reproduction for other purposes, whether in hard copy or electronically, requires the consent of the author(s), editor(s). If cited or quoted, reference should be made to the full name of the author(s), editor(s), title, the working paper or other series, the year and the publisher.

Printed in Belgium

Vrije Universiteit Brussel

Faculty of Economics, Social Sciences and Solvay Business School

B-1050 Brussel

Belgium

[www.vub.ac.be](http://www.vub.ac.be)

# Economic Integration, Corporate Tax Incidence and Fiscal Compensation

Nelly Exbrayat<sup>\*</sup> and Benny Geys<sup>^</sup>

## Abstract

*Higher corporate taxes are often argued to depress wages (a tax incidence effect), while higher wages may require compensation via lower corporate tax rates (a fiscal compensation effect). Yet, existing empirical evidence ignores that i) both effects are likely to occur simultaneously (necessitating a joint estimation approach), and ii) capital mobility might play a critical moderating role for the strength of both effects. Using a panel dataset comprising 24 OECD countries over the period 1982-2007, we address both these deficiencies. This clearly illustrates the simultaneous existence of tax incidence and fiscal compensation effects. Moreover, capital mobility (and the ensuing relative bargaining power of economic agents) has a significant influence on both the prevalence and strength of these effects.*

**Keywords:** Tax Incidence, Fiscal Compensation, Corporate taxation, Wage bargaining, Capital mobility.

**JEL-Codes:** H22, H25, J21, J31, H32

---

<sup>\*</sup> GATE Lyon-Saint-Etienne, Université de Lyon, Université Jean Monnet, 6 rue basse des rives, 42023 Saint-Etienne cedex 02. Email: nelly.exbrayat@univ-st-etienne.fr. (Corresponding author).

<sup>^</sup> Norwegian Business School BI, Nydalsveien 37, N-0442 Oslo, Norway. Email: Benny.Geys@bi.no; and Vrije Universiteit Brussel (VUB), Pleinlaan 2, B-1050 Brussels, Belgium. Email: Benny.Geys@vub.ac.be.

## **I. Introduction**

A substantial literature going back to at least Harberger (1962) argues that corporate taxes exert a negative impact on wages as long as the capital supply is not completely inelastic (i.e. a tax incidence effect; Harberger, 1962, 1995). A more recent literature suggests that the causal connection between corporate taxes and wages might well be reversed because governments could have an incentive to compensate firms for high labor costs by reducing corporate taxes (Haufler and Mittermaier, 2011; Exbrayat *et al.*, 2012; Mittermaier and Rincke, 2013). While not denying the relevance of tax incidence effects, casual observation appears to corroborate the existence of such fiscal compensation effects. For instance, the UK instituted a national minimum wage in 1998, and simultaneously introduced substantial cuts in its corporate income tax rate. The same pattern – i.e. a decrease in corporate taxation following an increase in the minimum wage level – also materialized in several Canadian provinces (including British Columbia and Ontario) and the United States (where president Bush conditioned his support for a minimum wage increase in May 2007 on business tax breaks). Hence, it appears that “fiscal policies are used to compensate investors for the location disadvantages of facing high wages” (Haufler and Mittermaier, 2011, 795).

Thus far, empirical analyses of the tax-wage relation assess *either* corporate tax incidence on wages (Randolph, 2006; Desai *et al.*, 2007; Felix and Hines, 2009; Dwenger *et al.*, 2011; Arulampalam *et al.*, 2012; Fuest *et al.*, 2012; Clausing, 2013) *or* fiscal compensation for higher wage costs (Mittermaier and Rincke, 2013), and ignore the potential bi-directional nature of this relation. The first contribution of this article therefore lies in simultaneously testing for *both* a tax incidence *and* a fiscal compensation effect in a dataset comprising 24 OECD countries over the period 1982-2007. Although previous studies control for reverse causality using, for instance, instrumental variables techniques, our simultaneous estimation

of both relations is important since the bi-directional, negative relationship between corporate taxes and wages suggested in the theoretical literature can only be accommodated via such an approach.

Our second, and arguably more important, contribution lies in extending the existing empirical literature via the first evaluation of the moderating role of capital mobility for both tax incidence and fiscal compensation effects. With respect to the fiscal compensation effect, economic theory provides a clear prediction. As the risk of capital outflows becomes more prominent with the integration of global economies, the potential negative effects of rising wage costs (including capital outflows, or reduced inflows) strengthen with increasing capital mobility. This is likely to make rational governments more inclined to provide compensation for high wages through the corporate tax system – for instance, by implementing compensating corporate tax discounts (Haufler and Mittermaier, 2011; Exbrayat *et al.*, 2012).

With respect to the tax incidence effect, it is important to take into account the exact nature of the wage setting process. In the presence of a wage bargaining process, a so-called *direct* tax incidence arises because corporate taxation reduces the quasi-rent over which workers and firms can bargain. Arulampalam *et al.* (2012) and Fuest *et al.* (2012) show that an improvement in the relative bargaining power of firms *weakens* this direct tax incidence effect (because workers capture a smaller share of the quasi-rent). Capital mobility plays no role in their models because the bargaining power and position of firms and workers are exogenous to the level of economic integration. However, as first shown by Dinopoulos and Mezzetti (1991), a credible threat to shift production abroad improves the bargaining position of the firm, and reduces the negotiated wage (see also Zhao, 1995; Eckel and Egger, 2009). As this is particularly relevant for multinational firms that can easily shift production across borders

(Eckel and Egger, 2009),<sup>1</sup> we could expect direct tax incidence to *increase* with economic integration (or, at least, corporate internationalization). In the presence of competitive labor markets, the incidence of the corporate tax on wages is *indirect* and results from variations in the level of capital-to-labor invested in each country. As shown by Harberger (1995), an increase in capital mobility in such a setting allows capital owners to partially escape taxation via investments in low-tax countries. This capital outflow from a high tax country strengthens *indirect* tax incidence by reducing the marginal productivity of labor in this country.

Overall, therefore, capital mobility and corporate internationalization could strengthen the interrelations between wages and corporate taxes (either directly or through its influence on the wage bargaining process). We test this intuition by analyzing how economic openness as well as the bargaining power of workers relative to firms influence both the tax incidence and fiscal compensation effects.

In the next section, we briefly discuss the existing theoretical and empirical literature on corporate tax incidence and fiscal compensation, and thereby highlight the potential role of capital mobility on both effects. Then, section III presents our methodological approach and main empirical results. Section IV concludes.

## **II. Literature Overview and Hypotheses**

### *II.a Corporate tax incidence on wages*

Corporate taxes can be passed on to workers by lowering wages. This can arise via various mechanisms depending on the time horizon and the labor market structure. The overall incidence of the corporate tax on wages can be decomposed into a *direct* effect in the short-

---

<sup>1</sup> For example, Goodyear decided to fall back on imports from subsidiaries abroad after a major strike of steelworkers in the US and Canada in 2006 in order to limit the harmful impact of these strikes on production.

run and an *indirect* effect in the long-run (Arulampalam *et al.*, 2012; Fuest *et al.*, 2012). The direct effect captures the incidence of the corporate tax on wages in the presence of a wage bargaining process, for given capital stock and output prices. Specifically, a rise in corporate taxation depresses wages by reducing the quasi-rent over which workers and firm can bargain. In the long-run, however, corporate taxes also influence wages through the adjustment of the capital stock per worker or output prices (known as the indirect tax incidence effect). This arises because the corporate tax first exerts a negative influence on capital investment, which reduces the capital-to-labor ratio. This, in turn, reduces the marginal productivity of labor, and the resulting wages, in the presence of competitive labor markets.

The earliest literature regarding corporate tax incidence was devoted to indirect tax incidence in a competitive economy. In his pioneering contribution, Harberger (1962) develops a closed-economy model with a perfectly competitive corporate and a non-corporate sector. He concludes that corporate taxation drives down the post-tax return to capital, which is *fully* borne by *all* capital owners under various circumstances.<sup>2</sup> This result, however, crucially depends on the elasticity of capital supply, which is assumed to be fixed in his closed-economy framework. Extending the model to an open-economy framework, Harberger (1995) illustrates that the burden of a corporate tax can in some cases be fully shifted onto workers. The reason is that in an open economy, capital supply becomes elastic at the country level, which equalizes the net return to capital just as international trade equalizes the prices of tradable goods.<sup>3</sup> As capital will now (at least partly) move out of the country when it is taxed,

---

<sup>2</sup> The standard example taken by Harberger (1962) is an economy where production is determined by a Cobb-Douglas function and expenditures are divided among both goods in given proportions. Under such circumstances, consumers who spend a larger share of their budget on the corporate good will suffer losses that are exactly compensated by the gains for consumers who prefer the non-corporate good. Consequently, on average, only capital owners bear the tax burden.

<sup>3</sup> Other assumptions can be relaxed in general equilibrium models considering open economies. See Gravelle (2013) for a survey of the literature.

the capital flows reduce (resp. increase) the capital-to-labor ratio and the resulting competitive wages in high-tax (resp. low-tax) countries.<sup>4</sup>

From an empirical perspective, a first strand of the literature building on Harberger's (1962, 1995) insights tries to quantify this *indirect* incidence of the corporate tax burden in the long run. Randolph (2006), for instance, simulates a general equilibrium model à la Harberger (1995, 2006) under the assumptions that the worldwide capital stock is fixed and the US accounts for 30% of world capital, and finds that labor bears 70% of the US corporate income tax. In the presence of capital flows impeded by imperfect substitutability of products between countries, the simulations of Gravelle and Smetters (2006) conclude that labor bears less than 70% of the burden. However, Clausing (2013) argues that these early analyses do not rigorously test the general equilibrium mechanism underlying indirect tax incidence, and that their findings are sensitive to a number of key economic parameters. Therefore, most recent studies rely on econometrics to test the indirect incidence of the corporate tax in open economies. For example, using data on the foreign activities of American multinational firms for a panel of more than 50 countries between 1989 and 2004, Desai *et al.* (2007) jointly estimate the degree to which owners of capital and labor share the burdens of corporate income taxes, with the restriction that the overall burden is ultimately shared between them. The results suggest that 45 to 75 percent of the burden of corporate taxes is borne by labor. Other cross-country studies relying on a single-equation regression (Felix, 2007; Hasset and Mathur, 2010) likewise provide evidence that increases in the corporate tax rate significantly reduce wages. By contrast, Clausing (2013) finds an ambiguous and small impact of corporate taxes on wages using a vector autoregression model.

---

<sup>4</sup> Consumers in this set-up also bear part of the burden of the corporate tax in non-tradable sectors as prices will continue to vary in these sectors.



Studies focusing on the *direct* incidence of the corporate tax generally rely on reduced-form regression analyses. Using data on the union-wage premium in the US, Felix and Hines (2009) estimate that workers in a fully-unionized firm capture 54% of the benefits of low tax rates. Arulampalam *et al.* (2012) estimate the direct incidence of corporate income taxation by controlling for the influence on wages of the value-added per worker. Using micro-data on nine European countries over the period 1996-2003, they find that a rise of 1\$ in taxes would reduce the wage bill by 49 cents. Dwenger *et al.* (2011, 3) use data on all employees on the Social Security payroll in Germany between 1998 and 2006. Controlling for the adjustment in employment induced by changes in wages and the user cost of capital, they find that an increase of corporate tax revenues by 1 Euro reduces the wage bill by 0.47 Euro. Besides controlling for the level of factor inputs, Fuest *et al.* (2012, 3) compare the level of tax incidence depending on whether or not firms are covered by collective bargaining agreements. Using panel of data on German local tax rates linked to matched employer-employee data, they find “a full incidence, consisting of the direct and indirect effect, of 77 cents”. They also illustrate that this result is mostly driven by the direct effect.

### *II.b Fiscal compensation for high labor costs*

Recent theoretical work suggests that high (low) taxes might not only lead to low (high) wages, but that wage levels might also influence corporate taxation. Let us again first consider a closed economy with imperfectly competitive good markets. In such a setting, higher wages can be partially passed on to consumers through higher prices, which reduces consumers' surplus (Mauleon and Vannetelbosch, 2003). Even with perfectly competitive labor markets ensuring full employment, benevolent governments could then be tempted to compensate firms (via lower taxes) for high wage costs to limit the detrimental effect on consumers' surplus. Such a compensatory tax policy turns out to be even more likely in an open economy.

As the tax competition literature shows, capital mobility might lead governments to behave strategically and engage in a race-to-the bottom (in terms of corporate taxation) to protect their country from capital outflows (for a survey, see Wilson, 1999; recent empirical evidence is provided in Devereux *et al.*, 2008; Overesch and Rincke, 2011). As shown by, for instance, Ottaviano and Van Ypersele (2005), such strategic tax setting is expected to be stronger in countries that are structurally less attractive. In this respect, production costs also matter as these are detrimental to firms' competitiveness. Hence, this gives an additional reason for offering corporate tax discounts by governments keen to limit capital outflows.

This idea was recently rationalized in partial equilibrium models of tax competition with unionized labor markets by Haufler and Mittermaier (2011) and Exbrayat *et al.* (2012). These authors analyze how wage setting influences corporate taxes through international capital flows. When investors can choose among a unionized and a non-unionized country (in which wages are relatively lower), the government of the unionized country in equilibrium sets a lower corporate tax (or a higher subsidy) to compensate firms for the higher wage caused by union power. Therefore, in an economy characterized by mobile capital and immobile labor, the labor cost exerts a negative influence on the corporate tax rate at the national level.

To the best of our knowledge, there is only one empirical analysis of such fiscal compensation effect. Mittermaier and Rincke (2013) use European data over the period 1982-2000 to explore the impact of *relative* wages (or a labor cost disadvantage with respect to other countries) on *absolute* levels of corporate taxation. According to their estimates, a 1\$ increase in the compensation cost differential between countries triggers a cut of the statutory income tax by about 1%. Identification of the causal nature of this effect derives from an ingenious IV strategy exploiting the end of the Cold War. They do not, however, test the impact of *absolute*

labor costs on corporate taxation, evaluate the simultaneous presence of a tax incidence effect, nor assess the mediating role of capital mobility.

### *II.c Hypotheses*

Theoretical work suggests a bi-directional relation between corporate taxes and wages. Moreover, empirical work has provided some substantiation for both tax incidence and fiscal compensation effects. As a direct result, it becomes important to account for this bi-directional relationship to avoid biased inferences. This leads to our first hypothesis:

H1: Tax incidence and fiscal compensation occur jointly.

As discussed above, economic theory predicts that the *indirect* tax incidence and fiscal compensation effects become more prominent when capital supply is more elastic. Indeed, (financial) openness of the economy limits the variation of the net-return to capital following changes in corporate tax rates. This allows the burden of corporate taxation in a given country to be distributed between capital owners (through a lower return to capital), and workers (through lower wages) – causing a tax incidence effect (Harberger, 1995).<sup>5</sup> Moreover, capital mobility strengthens the potential negative effects of increasing wage costs, which provides governments with a stronger incentive to implement compensating corporate tax discounts (Haufler and Mittermaier, 2011; Exbrayat *et al.*, 2012).

Recent theoretical work by Arulampalam *et al.* (2012) and Fuest *et al.* (2012), however, brings forward an alternative view for the *direct* tax incidence effect. Their models suggest

---

<sup>5</sup> Harberger (1995) also analyzes how economic openness on both product and capital markets shapes the incidence of corporate taxation on consumers. He shows that the burden of corporate taxation in a given country should increase prices in the corporate non-tradable sector and decrease prices in the non-corporate non-tradable sector (especially in labor-intensive activities). Economic openness on the capital and product markets should therefore also contribute to a fall in *real* wages in the corporate (e.g. manufacturing) sector.

that the direct tax incidence effect is *increasing* (resp. decreasing) with the relative bargaining power of workers (resp. firms). The intuition is the following. When workers have no bargaining power, the firm reduces their wages to the reservation wage and the quasi rent created in the firm will go to the firm's owners. An increase in corporate taxes will then be fully borne by the firm because workers are at their reservation wage. When the relative bargaining power of workers rises and they capture more and more of the quasi-rent generated within the firm through higher wages, the firm can pass a larger proportion of any corporate tax increase onto them. While an interesting theoretical possibility, Arulampalam *et al.* (2012) themselves fail to substantiate this effect in their empirical analysis. Specifically, they show that the short-run elasticity of the wage rate to corporate taxes is equivalent between stand-alone companies and firms that are part of a multinational group (which are assumed to enjoy stronger bargaining power relative to workers as they can shift production across borders).

It should be noted, however, that Arulampalam *et al.* (2012) and Fuest *et al.* (2012) consider the bargaining power and position of firms and workers as exogenous in their models – rather than endogenous to the level of economic integration. This not only ignores that economic integration probably does affect these relative bargaining positions, but might also affect their theoretical predictions. Indeed, as first shown by Dinopoulos and Mezzeti (1991), a credible threat to shift production abroad improves the bargaining position of the firm *and* reduces the negotiated wage (see also Zhao, 1995; Eckel and Egger, 2009). This result is found to hold particularly for multinational firms that can more easily shift their production abroad (Eckel and Egger, 2009). Hence, the direct tax incidence may well be *stronger* in the presence of

*endogenous* production-shifting possibilities as it improves the bargaining position of firms compared to workers (Azémar and Hubbard, 2015).<sup>6</sup>

H2: Capital mobility could strengthen both tax incidence and fiscal compensation effects.<sup>7</sup>

### **III. Empirical Analysis**

#### *III.a Methodology and Data*

Studies of corporate tax incidence and fiscal compensation effects often rely on an instrumental variables approach to deal with potential endogeneity concerns. Yet, no study to date has taken supportive theoretical and empirical evidence for both effects (see above) as a cue to deal more directly with the simultaneity issue these results raise. In contrast, and using data from 24 OECD countries over a period covering up to 26 years (1982-2007),<sup>8</sup> we explicitly evaluate the bi-directional nature of the negative relationship between corporate taxes and wages using the following reduced-form two-equation model (Data definitions, summary statistics and sources are in appendix):<sup>9</sup>

---

<sup>6</sup> Note that Arulampalam et al.'s framework (2012) also includes a production shifting possibility (see above). Yet, in their model the resulting fall-back profit is exogenous while it is endogenous to the level of economic integration in Zhao (1995) and Eckel and Egger (2009).

<sup>7</sup> The opposing hypotheses inferred from existing theoretical work drive our careful phrasing here, as it implies that the role of capital mobility on *direct* tax incidence remains an empirical question.

<sup>8</sup> The sample of countries and time period analysed are both driven by data availability. The sample includes Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Hungary, Ireland, Italy, Japan, Luxembourg, the Netherlands, Mexico, Norway, New Zealand, Poland, Portugal, Spain, Sweden, United Kingdom, and United States. The starting point of our dataset follows from the availability of corporate tax rate data (source: Loretz, 2008), while the endpoint is due to the lack of more recent data on some of our control variables.

<sup>9</sup> Our reduced-form approach implies an exclusive focus on *direct* tax incidence, and leaves aside any additional *indirect* effects (e.g., long-run effects arising through the adjustments of input levels or output prices). Such restriction naturally follows from the fact that workers' bargaining power relative to that of firms – analysed in section III.c below – is most closely linked to the *direct* incidence of corporate taxation on workers (see above).

$$TAX_{i,t} = \alpha_i + \beta_1 WAGE_{i,t} + \beta_2 X_{i,t} + \beta_3 Y_{i,t} + \nu_t + \varepsilon_{i,t} \quad (1)$$

$$WAGE_{i,t} = \alpha_i + \delta_1 TAX_{i,t} + \delta_2 X_{i,t} + \delta_3 Z_{i,t} + \nu_t + \psi_{i,t} \quad (2)$$

Our first dependent variable –  $TAX_{i,t}$  – is the top statutory corporate income tax rate in country  $i$  at time  $t$ . The calculation of  $TAX_{i,t}$  thereby accounts for the presence and level of local profit taxes, as well as their potential deduction from the national-level corporate income tax base (this approach follows Devereux *et al.*, 2002; Loretz, 2008). Although the statutory tax rate does not include tax base effects and firms are likely to decide their investment decisions based on the entire tax schedule (i.e., tax base and tax rate), statutory tax rates are directly observable and most easily adjusted by the government. Hence, they are the most relevant measure of corporate tax policy for our purpose.<sup>10</sup> Our second dependent variable –  $WAGE_{i,t}$  – is measured as the real hourly compensation cost of production workers in the manufacturing sector in US dollars, obtained from the US Bureau of Labor Statistics. It includes total hourly direct pay, employer social security contributions and labor-related taxes on payrolls or employment (for details, see BLS, 2009). Like Mittermaier and Rincke (2013), we prefer this source to several other measures of compensations costs because the BLS data have been specifically created to allow evaluations of differences in employer labor costs across countries.

Both equations include controls for a full set of time-specific ( $\nu_t$ ) and country-specific ( $\alpha_i$ ) fixed effects to capture unobserved heterogeneity across time and space, as well as a set of common control variables ( $X_{i,t}$ ).<sup>11</sup> The latter includes – following earlier empirical work on tax incidence or fiscal compensation – the country’s unemployment rate, urbanness (measured

---

<sup>10</sup> Nevertheless, for comparison and robustness, we ran our estimations also with the Effective Average Tax Rate (EATR) and the Effective Marginal Tax Rate (EMTR) levied on machinery and buildings (see section III.d) (all tax data obtained from Loretz, 2008).

<sup>11</sup> As a robustness check, we also ran our regressions using country-specific period effects (see section III.d).

as the share of population in urban areas), trade openness (imports plus exports as a share of GDP), dependency ratio (share of under 14 and over 65 to working-age population), education (% school enrolment in tertiary education), union density (union membership as share of employment; taken from the OECD labour force statistics) and an indicator variable for membership of the European Union or its precursors. We furthermore include a number of control variables specific to either equation. For the TAX-equation, this supplementary control vector ( $Y_{i,t}$ ) is inspired by research in the vast tax competition literature (Devereux *et al.*, 2008; Overesch and Rincke, 2011; Exbrayat and Geys, 2014) and includes total population size (in million people), political leaning of the government (1 if left-wing, 0 otherwise), majority status of government (dummy = 1 if majority, 0 if minority) and public consumption (i.e., public sector size as a share of GDP in PPP). For the WAGE-equation, this supplementary control vector ( $Z_{i,t}$ ) includes a measure of worker's productivity (i.e., GDP per person employed in constant 1990 US\$ at PPP) and the number of working days lost due to strikes and lock-outs (obtained from the International Labor Organization).<sup>12</sup>

As both equations include only a partially overlapping vector of exogenous variables, the system cannot be estimated by ordinary least squares (OLS). Instead, we rely on GLS estimation of a system of seemingly unrelated regressions (SUR) (Dwivedi and Srivastava, 1978). In such an approach, the vectors of supplementary control variables (i.e.,  $Y_{i,t}$  and  $Z_{i,t}$ ) can be seen as 'instruments' for the identification of the endogenous variables (i.e.,  $TAX_{i,t}$  and  $WAGE_{i,t}$ ). The validity of our inferences thus to some extent depend on the reliability of the components of  $Y_{i,t}$  and  $Z_{i,t}$  as instruments. Valid inferences particularly require that the elements in  $Y_{i,t}$  *only* affect the tax rate (and have no direct effect on wages), while the elements in  $Z_{i,t}$  *only* affect wages (and have no direct effect on the tax rate). While this

---

<sup>12</sup> Note that, as argued by Arulampalam *et al.* (2012), the variable for worker's productivity is critical here, as it controls for (part of) the *indirect* incidence of the corporate tax. This also allows interpreting our results as estimates of only the *direct* tax incidence effect.

appears reasonable for most elements in  $Y_{i,t}$  and  $Z_{i,t}$ , one might argue that left-wing governments and government expenditures (both in  $Y_{i,t}$ ) directly influence wages. Auxiliary regressions suggest that this is not the case in our sample (details upon request), allowing their usage as instruments for the tax rate in the analysis below. Nonetheless, we should point out that including both these variables in  $X_{i,t}$  (rather than  $Y_{i,t}$ ) – and thus *de facto* excluding them from the instrument vector – leaves all inferences reported below unaffected (details upon request). More formal tests likewise support our instruments' validity: i.e. Anderson's canonical correlation LM test rejects the null hypothesis of weak instruments for both the wage and tax equations ( $p < 0.001$  in both cases), while a Sargan test fails to substantiate that there is an overidentification problem ( $p < 0.10$  in both cases).

### *III.b Baseline findings*

Our baseline findings – addressing hypothesis H1 – are summarized in Table 1. For comparison, and to obtain more information on the potential bias induced by ignoring the bi-directional nature of the wage-tax relation, the first four columns present results using OLS, and the final two columns contain our preferred SUR results. Note that the second set of OLS results only differs from the first set in terms of the sample employed: it matches the sample used in the SUR regressions.<sup>13</sup> Starting our discussion with a quick overview of the control variables in the TAX equation, we first of all observe that larger countries with a higher union density have higher statutory corporate tax rates. The former effect confirms that larger countries with a larger market can maintain higher taxes (Ludema and Wooton, 2000; Kind *et al.*, 2000; Baldwin and Krugman, 2004; Exbrayat and Geys, 2014). To understand the latter effect, note that the union density variable captures the *direct* impact of unionization on

---

<sup>13</sup> Note that the SUR estimates by construction exclude all observations with missing values for any variable included in *either* equation. The resulting sample is also employed in the second set of OLS results. The sample size in the first set of OLS estimates is slightly larger as it only excludes observations with missing values for variables in the independently estimated TAX and WAGE equations.



corporate taxes, its *indirect* effect being captured by the wage variable. Thus it may reflect that, for a given wage level, stronger unions can insist on a ‘fairer’ fiscal contribution from employers. In line with a standard tax competition argument, trade openness bears a negative relation to corporate tax rates, while the negative effect of EMU suggests that fiscal competition strengthens when countries join the European Union (thus generating downward pressure on corporate tax rates; see also Davies and Voget, 2013, and references therein). Higher unemployment has a similar negative effect, as predicted by Exbrayat *et al.* (2012). Finally, a higher dependency ratio tends to depress corporate tax rates.

Turning to the WAGE equation, we find that, in line with expectations, union density, the prevalence of strikes and worker productivity are all positively associated to the wage level. Unemployment, on the other hand, shows a significant negative effect, presumably because wage demands are likely to be limited when unemployment rates are high. A similar negative effect is found for trade openness. The share of the population enrolled in tertiary education has a somewhat unexpected effect, but this might simply signal that higher education levels reduce the number of production workers, which reduces their (wage) bargaining power.

---

Table 1 about here

---

When we look at our key explanatory variables, Table 1 suggests that both the effect of corporate taxation on production workers’ wages and the effect of these wages on corporate tax rates are robustly negative. Yet, not accounting for reverse causality in the OLS results substantially biases the point estimates towards zero. Moreover, accounting for the simultaneity of both effects substantially improves the precision with which the coefficients are estimated. Overall, our preferred SUR specification shows strong support for the

simultaneous presence of *both* a direct tax incidence effect on wages (with the point estimate suggesting that a 1% increase in the statutory tax rate decreases wages with approximately \$0.89) *and* a fiscal compensation effect (a \$1 increase in wages is connected to a tax cut of roughly 1.02%; in line with Mittermaier and Rincke, 2013). This simultaneous empirical relevance of both effects is supportive of hypothesis H1.

### *III.c The role of international capital mobility and the relative bargaining power of agents*

Table 1 follows previous work in focusing on the general relation between taxes and wages. Below, we extend the analysis to test the idea – stated in hypothesis H2 – that tax incidence and fiscal compensation effects could strengthen with the extent of international capital mobility. We evaluate this in two ways. First, following theoretical arguments by Harberger (1995), Haufler and Mittermaier (2011) and Exbrayat *et al.* (2012), we compare economies depending on the openness of their capital markets. Second, as a more indirect test, we look at the bargaining power of firms relative to workers. We specifically evaluate the role of workers' bargaining power by relying on measures of legally entrenched worker rights (Rodrik, 1999), labor mobility (Ortega and Peri, 2013), and the political ideology of the ruling government (since left-wing parties tend to be more concerned with workers' rights). All these can undermine the improved relative bargaining position of firms due to economic integration.<sup>14</sup>

#### ***1. Capital market integration***

Economic theory predicts that a more elastic capital supply could strengthen the direct tax incidence and fiscal compensation effects (Harberger, 1995; Haufler and Mittermaier, 2011;

---

<sup>14</sup> Lacking a convincing proxy for the bargaining power of governments with respect to firms (beyond size, which is clearly endogenous to taxation decisions), assessing the influence of firms' and governments' relative bargaining power in more detail is unfortunately unfeasible.

Exbrayat *et al.*, 2012). To assess the empirical validity of this idea, we introduce a measure of (the absence of) capital mobility constraints. The Index of Capital Mobility Constraints (ICMC) from the Economic Freedom of the World database combines information about foreign investment restrictions (taken from the Global Competitiveness Report) and international capital controls (taken from the IMF) into a 10-point scale, where increasing numbers indicate *higher* capital mobility. Since interaction effects are notoriously difficult to specify and interpret in SUR models (as employed here), we split the sample – i.e., either at the mean or median level of ICMC or at the value of ICMC creating two roughly equal samples<sup>15</sup> – and assess whether direct tax incidence and fiscal compensation are stronger in the subsample with lower constraints on capital mobility.

---

Table 2 about here

---

The results are summarized in Table 2 (suppressing control variables to preserve space). In all cases, we find that the coefficient estimates are more negative for the subsample of more open economies. This confirms hypothesis H2, according to which both the direct tax incidence and fiscal compensation effects become more prominent when capital supply is more elastic. It also complements Azémar and Hubbard's (2015) findings regarding the determinants of corporate tax incidence on wages. Using BLS data for 13 OECD countries between 1980 and 2004, they indeed show that three country characteristics contribute to raise corporate tax incidence on domestic wages by facilitating capital mobility: i.e. the degree of trade openness, the generosity of depreciation allowances, and the fact the corporate income tax is source-based rather than residential-based.

---

<sup>15</sup> The median ICMC value does not exactly split the sample in half, since we use the mean/median value of ICMC for all available observations of the index in our sample of countries and time-period, not just those in the estimation sample. Note also that though the sample size tends to become more constrained, using the sub-index of restrictions on FDI flows from the same source provides qualitatively similar results (details upon request).

## *2. Firms' bargaining power relative to workers*

We evaluate the importance of workers' bargaining power relative to firms via three separate measures. The first rests on the idea that workers' bargaining power is strengthened when their rights are more firmly entrenched in a country's legislation. We thereby follow Rodrik (1999) in employing the number of ILO's eight fundamental worker rights conventions ratified by a country.<sup>16</sup> Our second indicator is based on labor mobility, which is bound to reduce firms' bargaining power relative to workers. Particularly, we introduce the number of emigrants as a percentage of the total population.<sup>17</sup> Finally, as left-wing governments are more likely to defend workers than firms (compared to right-wing governments), we introduce a simple indicator variable for left- versus right-wing governments. As before, we use these indicators to split the sample in two groups with relatively strong and weak bargaining power for workers (with cut-offs indicated in the top row of table 3).

---

Table 3 about here

---

The results are described in Table 3. As workers' bargaining power is expected to mainly affect direct tax incidence, we concentrate our interpretation predominantly on the WAGE equation (though we obviously need to simultaneously estimate the WAGE equation to avoid biased inferences, see above). Overall, we find that the depressing effect of corporate tax

---

<sup>16</sup> These conventions relate to fundamental principles and rights at work: i.e., freedom of association and the effective recognition of the right to collective bargaining; the elimination of all forms of forced or compulsory labour; the effective abolition of child labour; and the elimination of discrimination in respect of employment and occupation. Data underlying this variable were obtained from: [http://www.ilo.org/dyn/normlex/en/f?p=1000:10011:3533117451708198::NO:10011:P10011\\_DISPLAY\\_BY,P10011\\_CONVENTION\\_TYPE\\_CODE:2,F](http://www.ilo.org/dyn/normlex/en/f?p=1000:10011:3533117451708198::NO:10011:P10011_DISPLAY_BY,P10011_CONVENTION_TYPE_CODE:2,F)

<sup>17</sup> We are grateful to Francesc Ortega for providing us the emigration data. We should note, however, that this index of international migration is arguably a very crude indicator of labour mobility, as it includes the movement of children, retired people as well as people of working age for all sectors (not just manufacturing) and excludes information about the domestic mobility of labour.

burdens on workers' wages is significantly stronger in the bottom half of Table 3. This holds for all three indicators of the strength of worker's bargaining power (i.e., less than six or less than seven ILO conventions ratified, low emigration rates and the presence of a right-wing government). Stronger worker rights, higher worker mobility or the presence of a left-wing government thus indeed improve the bargaining power of workers relative to firms, leading to a weaker depressing effect of taxes on wages. Interestingly, this result appears to invalidate theoretical predictions of Arulampalam *et al.* (2012) and Fuest *et al.* (2012). One possible explanation, as mentioned, might lie in the exogeneity of the bargaining power of firms and workers in their models, as models where such bargaining power is endogenous to the level of economic integration provide grounds for a theoretical intuition in line with our results.

Casting a brief look at the TAX equation (even though we have no strong theoretical prior there), we observe that strong workers are associated with a somewhat stronger tax compensation effect. One possible interpretation might be that a stronger position permits workers to demand measures from the government – such as fiscal compensation – that allow the country to avoid capital flight and increased unemployment following strong wage demands. Interestingly, such situation might lead firms to acquiesce in strong wage demands, as long as workers simultaneously support measures compensating these wage demands in terms of firms' overall costs structure.

### *III.d Robustness checks*

A first issue with respect to the overall robustness of our results concerns their potential sensitivity with respect to key variables such as corporate taxes or capital mobility. Therefore, we test hypotheses 1 and 2 using the Effective Average Tax Rate (EATR) and the Effective Marginal Tax Rate (EMTR) levied on machinery and buildings as alternative dependent

variables (all tax data obtained from Loretz, 2008). As one can see from Tables 4 and 5, this leaves our main findings unaffected.

---

Tables 4 and 5 about here

---

Table 6 instead employs an alternative measure for the mobility of physical capital: i.e. the OECD index for FDI restrictions in the manufacturing sector (with higher values indicating more stringent restrictions).<sup>18</sup> Four types of measures are covered by this index: (i) foreign equity restrictions, (ii) screening and prior approval requirements, (iii) rules for key personnel, and (iv) other restrictions on the operation of foreign enterprises. The results indicate that both the tax incidence and fiscal compensation effects fail to reach statistical significance at conventional levels in the sub-sample of countries with strong restrictions ('closed' economy), but are substantively and statistically meaningful in the sub-sample of countries with low restrictions ('open' economy). This is supportive of hypothesis 2.

---

Table 6 about here

---

Second, one might worry about potential collinearity among our explanatory variables affecting our findings. Careful analysis of the pairwise correlations between our explanatory variables indicates moderately strong correlations (i.e. correlation above 0.4 in absolute terms) for four pairs of variables.<sup>19</sup> Importantly, excluding any of these variables from the estimation model always leaves our findings from table 1 and table 3 unaffected (in terms of sign and statistical significance at conventional levels). The stronger direct tax incidence effect in open economies observed in table 2 likewise persists. However, the stronger fiscal compensation effect in open economies severely weakens when we exclude the dependency

---

<sup>18</sup> This index is available only for the years 1997, 2003 and 2006. As variation over time appears very minimal, we simply take the mean the three available observations and apply the result to all years within our sample period.

<sup>19</sup> Those variable pairs are population size and trade openness ( $r = -0.539$ ), education and real productivity ( $r = 0.473$ ), the dependency ratio and urbanness ( $r = 0.461$ ), and population size and union density ( $r = -0.446$ ).

ratio or workers' real productivity as control variables. Nevertheless, this observation arises only when using the ICMC index as a measure of capital mobility. The result remains statistically significant when we instead use the OECD index of FDI restrictiveness in the manufacturing sector (details available upon request).

Finally, we evaluated whether our results are sensitive to our set of countries or our approach to dealing with potential time-period effects. This indicates that most findings in tables 1 through 3 are not dependent on the inclusion of any specific country. Two limited exceptions should be noted. First, removing the US from the sample leads to a statistically insignificant estimate for the direct tax incidence effect in table 1. Second, excluding Norway leads to statistically insignificant estimates of the WAGE coefficients in the TAX equations of both open and closed economies (table 2) when using the ICMC index of capital mobility. However, both TAX and WAGE coefficients retain a negative and statistically significant effect in open economies (as expected under hypothesis H2) when using OECD index of FDI restrictiveness or ICMC sub-index based on restrictions of FDI. Such a limited number of deviations can be expected given the substantial number of statistical tests involved in this replication exercise (type II error). Moreover, excluding the US does not affect our findings in tables 2 and 3, while removing Norway does not influence the inferences from tables 1 and 3 (or those related to the fiscal compensation effect in table 2). Hence, we feel that our results are, on the whole, quite robust to the specific estimation sample employed (details available upon request).

Our results are also largely robust to using country-specific period effects rather than year effects. Specifically, we created indicator variables for the 1980s, 1990s and 2000s and interacted these with the country-level dummy variables. Adding these variables leaves our baseline findings in tables 1 and 3 qualitatively unaffected. With respect to the influence of capital mobility (table 2), our results are again robust when using the OECD index of FDI

restrictiveness or the ICMC sub-index based on restrictions of FDI (though they substantially when using the general ICMC measure; details available upon request).

#### **IV. Conclusion**

This article provided empirical evidence for a two-way relationship between wages and corporate taxation at the international level over the period 1982-2007. We find that: i) governments compensate firms for high labor costs through lower corporate taxation *and* ii) firms pass their fiscal burden on to workers through lower wages. Crucially, both relationships are found to be significantly stronger when capital market integration is stronger. Finally, and contrary to existing theoretical predictions, we provide evidence that corporate tax incidence on domestic wages is decreasing with the relative bargaining power of workers relative to firms. As existing models treating the bargaining power of firms and workers as exogenous cannot explain this observation, this finding calls for theoretical models of corporate tax incidence allowing the relative bargaining power of economic agents to be endogenous to economic integration (in spirit of Eckel and Egger, 2009).

These results have important theoretical as well as practical implications. Indeed, the tax-induced capital outflow that drives the race-to-the-bottom result in the tax competition literature is challenged. Indeed, corporate tax cuts might be ineffective in preventing capital outflows once we take into account the possibility that the labor cost subsequently adjusts upwards. This would be especially the case when firms are more responsive to labor cost than to taxes. In such a situation, we could obtain a race to-the-top rather than a race-to-the-bottom in taxes if governments compete by raising taxes to improve the attractiveness of their country through a lower labor cost. A recent paper by Lockwood and Makris (2006) takes a first step toward this direction. They incorporate tax-shifting, heterogeneity between agents within



countries and a majority rule decision-making process in a Zodrow and Mieszkowski (1986) tax competition model. Doing so, capital mobility induces a tax incidence effect, which makes that Nash taxes are *higher* than in a closed economy.

In this respect, it is important to note that the existence of significant (direct) corporate tax incidence on wages also calls for a new welfare analysis regarding tax competition. Indeed, the fiscal competition literature often argues that strategic interactions are harmful for immobile workers. The intuition for this result is that governments shift part of the tax burden onto workers because their labor supply elasticity is finite (Bucovetsky and Wilson, 1991). Our empirical results suggest that, depending on the tax base elasticity in the presence of corporate tax incidence, workers might be either harmed, better off or unaffected by tax competition. Thus, policy recommendations regarding tax competition need to be reconsidered by taking into account the potential ability for firms to pass their fiscal burden on to workers.

## References:

- Arulampalam, W., M.P. Devereux and G. Maffini (2012). The direct incidence of corporate income tax on wages, *European Economic Review*, 56(6), 1038-1054.
- Azémar, C. and G. Hubbard (2015). Country Characteristics and the Incidence of Capital Income Taxation on Wages: An Empirical Assessment. *Canadian Journal of Economics/Revue canadienne d'économique*, forthcoming.
- Baldwin R.E. and P. Krugman (2004). Agglomeration, integration and tax harmonisation. *European Economic Review* 48, 1-23.
- Bucovetsky, S. and J.D. Wilson (1991). Tax competition with two tax instruments, *Regional Science and Urban Economics*, 21, 333-350.
- Clausing K. (2013). Who pays the corporate tax in a global economy?, *National Tax Journal* 66(1), 151-184.
- Davies, R.B. and J. Voget (2013), Tax Competition in an Expanding European Union, *mimeo*.
- Desai, M.A., C.F. Foley and J.R. Hines. (2007). Labor and Capital Shares of the Corporate Tax Burden: International Evidence, *mimeo*.
- Devereux M.P., R. Griffith and A. Klemm (2002). Corporate Income Tax: Reforms and Tax Competition, *Economic Policy* October, 450-495.
- Devereux M.P., Lockwood B. and M. Redoano (2008). Do countries compete over corporate tax rates? *Journal of Public Economics* 92, 1210-1235.
- Dwenger, N., P. Rattenhuber and V. Steiner (2011). Sharing the Burden: Empirical Evidence on Corporate Tax Incidence. *Pre-print of the Max Planck Institute for Tax Law and Public Finance*, nr. 2011-14.
- Dwivedi, T. and K. Srivastava (1978). Optimality of Least Squares in the Seemingly Unrelated Regressions Model, *Journal of Econometrics* 7, 391-395.
- Eckel, C. and P. Egger (2009). Wage bargaining and multinational firms, *Journal of International Economics* 77, 206-214.
- Exbrayat N., C. Gagné and S. Riou (2012). The Effects of Labor Unions on International Capital Tax Competition. *Canadian Journal of Economics*, 45(4), 1480-1503.
- Exbrayat, N. and B. Geys (2014). Trade Integration and Corporate Income Tax Differentials, *International Tax and Public Finance*, 21(2), 298-323.
- Felix, A. R. and J.R. Hines. (2009). Corporate Taxes and Union Wages in the United States. *NBER Working Paper*, nr. 15263.
- Fuest C., A. Peichl and S. Siegloch (2012). Do Higher Corporate Taxes Reduce Wages? Micro Evidence from Germany. *CESifo Working Paper*, nr. 4247.
- Gravelle J.G and K.A. Smetters (2006). Does the Open Economy Assumption Really Mean That Labor Bears the Burden of a Capital Income Tax? *The B.E. Journal of Economic Analysis & Policy*, 6(1), 1-44.
- Gravelle J. (2013). Corporate tax incidence: Review of general equilibrium estimates and analysis, *National Tax Journal*, 66(1), 185-214.
- Harberger A.C. (1962). The Incidence of the Corporation Income Tax. *Journal of Political Economy*, 70(3): 215-240.

- Harberger A.C. (1995). The ABC's of Corporate Tax Incidence: Insights into the Open Economy Case, in *Tax Policy and Economic Growth*, Washington, DC: American Council for Capital Formation.
- Harberger A.C. (2006). Corporation Tax Incidence: Reflections on what is Known, Unknown and Unknowable, in J.W. Diamond and G.R. Zodrow (eds.) *Fundamental Tax Reform: Issues, Choices, and Implications*. Cambridge: MIT Press.
- Haufler A. and F. Mittermaier (2011). Unionisation triggers tax incentives to attract foreign direct investment, *Economic Journal*, 121(553), 793-818.
- Kind H., K. Midelfart Knarvik and G. Schjelderup (2000). Competing for capital in a lumpy world. *Journal of Public Economics* 78, 253-274.
- Lockwood B. and M. Makris (2006). Tax incidence, majority voting and capital market integration, *Journal of Public Economics* 90(6-7), 1007-1025.
- Loretz S. (2008). Corporate taxation in the OECD in a wider context. *Oxford Review of Economic Policy* 24(4), 639-660.
- Ludema R. and I. Wooton (2000). Economic geography and the fiscal effects of regional integration. *Journal of International Economics* 52, 331-357.
- Mauleon A. and V. Vannetelbosch (2003). Market Competition and Strike Activity, *International Journal of Industrial Organization* 21(5), 737-758.
- Mittermaier F. and J. Rincke (2013). Do Countries Compensate Firms for International Wage Differentials?, *Journal of Public Economics* 102, 23-36.
- Ottaviano, G.I.P., and T. Van Ypersele (2005). Market size and tax competition, *Journal of International Economics* 67, 25-46.
- Rodrik D. (1999). Democracies Pay Higher Wages, *Quarterly Journal of Economics*, 114(3), 707-738.
- Ortega F. and G. Peri (2013). The Effect of Income and Immigration Policies on International Migration, *Migration Studies*, 1, 1-28.
- Overesch M. and J. Rincke (2011). What drives corporate tax rates down? A reassessment of globalization, tax competition, and dynamic adjustment to shocks, *Scandinavian Journal of Economics*, 113(3): 579-602.
- Randolph, W.C. (2006). International Burdens of the Corporate Income Tax, *Congressional Budget Office Working Paper Series*, nr. 2006-09.
- Wilson, J.D. (1999). Theories of Tax Competition, *National Tax Journal*, 52(2), 269-304.
- Zhao L. (1995). Cross-hauling, direct foreign investment and unionized oligopoly, *European Economic Review* 39, 1237-1253.
- Zodrow, G.R. and P. Mieszkowski (1986). Pigou, Tiebout, Property Taxation and the Underprovision of Local Public Goods. *Journal of Urban Economics*, 19(3), 356-370.

*Table 1: Baseline estimation results*

Dep. Var.	OLS		OLS		SUR	
	TAX	WAGE	TAX	WAGE	TAX	WAGE
WAGE	-0.159 (-0.95)	-	-0.210 (-1.14)	-	-1.024 *** (-4.93)	-
TAX	-	-0.061 (-1.02)	-	-0.062 (-1.05)	-	-0.892 *** (-4.79)
Population	0.0001 (1.41)	-	0.0001 (1.53)	-	0.00002 (0.41)	-
Left-wing gov.	0.489 (0.90)	-	0.679 (1.18)	-	0.021 (0.15)	-
Majority gov.	-1.561 (-0.30)	-	-3.017 (-0.53)	-	-0.147 (-0.23)	-
Gov. expenditures	-0.132 (-0.17)	-	-0.231 (-0.28)	-	-0.037 (-0.24)	-
EMU	-5.253 *** (-2.88)	-1.040 (-0.92)	-5.612 ** (-2.82)	-0.895 (-0.76)	-6.098 *** (-5.99)	-5.477 *** (-3.94)
Dependency ratio	-0.404 ** (-2.19)	0.186 (1.19)	-0.605 *** (-3.00)	0.186 (1.17)	-0.514 *** (-5.01)	-0.429 ** (-2.48)
Education	-0.100 (-1.30)	-0.020 (-0.49)	-0.090 (-1.11)	-0.018 (-0.45)	-0.123 *** (-3.55)	-0.115 *** (-3.21)
Unemployment	-0.771 *** (-4.25)	-0.189 * (-1.69)	-0.635 *** (-3.71)	-0.196 * (-1.67)	-0.762 *** (-6.89)	-0.700 *** (-4.78)
Openness	-0.009 (-0.21)	-0.043 * (-1.67)	-0.034 (-0.65)	-0.043 * (-1.64)	-0.058 ** (-2.13)	-0.058 ** (-2.33)
Union Density	0.089 (0.78)	0.084 ** (2.04)	0.085 (0.69)	0.079 * (1.85)	0.170 *** (3.36)	0.157 *** (3.49)
Urbanness	-0.289 (-1.00)	-0.162 (-0.64)	-0.316 (-0.82)	-0.126 (-0.48)	-0.395 ** (2.41)	-0.354 ** (-2.25)
Strikes	-	0.002 (1.54)	-	0.002 (1.49)	-	0.001 (0.40)
Productivity	-	0.0004 ** (1.99)	-	0.0004 * (1.88)	-	0.0001 (0.39)
Year Dummies	YES	YES	YES	YES	YES	YES
Country fixed effects	YES	YES	YES	YES	YES	YES
N	513	472	454	454	454	454
(uncentered) R <sup>2</sup>	31.81	48.46	35.85	54.16	85.28	68.19

Note: The dependent variables are, respectively, the statutory corporate income tax rate (*TAX*) and the real hourly compensation cost of production workers in the manufacturing sector (*WAGE*). The first four columns estimate both equations independently via OLS, whereas the last two columns implement a SUR approach to account for simultaneity. The second set of OLS results only differs from the first set in terms of the sample employed (i.e. it matches the sample used in the SUR regressions). The sample size in the SUR estimates is lower than the first set of OLS estimates due to the exclusion of all observations with missing values for any variable included in *either* equation (whereas the first set of OLS estimates only excludes observations with missing values for variables in the independently estimated equations). t-statistics, based on standard errors adjusted for country-level clustering, between brackets; \*\*\*, \*\*, \* indicate significance at 1%, 5% and 10% respectively.

*Table 2: Results depending on capital mobility*

Dep. Var.	Cut-off = Mean ICMC		Cut-off = Median ICMC		Equal-split sample	
	<i>TAX</i>	<i>WAGE</i>	<i>TAX</i>	<i>WAGE</i>	<i>TAX</i>	<i>WAGE</i>
<b>'open' economy</b>						
<i>WAGE</i>	-0.132 (-0.37)	-	-0.123 (-0.36)	-	-1.668 ** (-2.24)	-
<i>TAX</i>	-	-1.392 *** (-3.67)	-	-1.461 *** (-3.53)	-	-0.731 *** (-3.25)
Year Dummies	YES	YES	YES	YES	YES	YES
Country fixed effects	YES	YES	YES	YES	YES	YES
N	282	282	277	277	229	229
(uncentered) R <sup>2</sup>	91.23	62.84	91.18	57.95	81.47	81.81
<b>'closed' economy</b>						
<i>WAGE</i>	0.883 (1.06)	-	0.422 (0.74)	-	-0.757 *** (-3.06)	-
<i>TAX</i>	-	-0.318 *** (-3.09)	-	-0.355 *** (-3.24)	-	-0.395 ** (-2.54)
Year Dummies	YES	YES	YES	YES	YES	YES
Country fixed effects	YES	YES	YES	YES	YES	YES
N	172	172	177	177	225	225
(uncentered) R <sup>2</sup>	91.99	94.75	92.48	94.44	90.98	91.60

Note: The dependent variables are, respectively, the statutory corporate income tax rate (*TAX*) and the real hourly compensation cost of production workers in the manufacturing sector (*WAGE*). All models are based on a SUR approach to account for simultaneity. t-statistics between brackets; \*\*\*, \*\*, \* indicate significance at 1%, 5% and 10% respectively. All controls included as in Table 1. Mean and median ICMC are 5.999 and 6.4, respectively. For equal-split sample cut-off for ICMC is set at 7.599.

*Table 3: Results depending on worker's rights*

Dep. Var.	Cut-off = 6 conventions		Cut-off = 7 conventions		Cut-off = Median Emigration		Left versus right gvt.	
	<i>TAX</i>	<i>WAGE</i>	<i>TAX</i>	<i>WAGE</i>	<i>TAX</i>	<i>WAGE</i>	<i>TAX</i>	<i>WAGE</i>
<b>'strong' workers</b>								
<i>WAGE</i>	-0.868 *** (-2.70)	-	-1.397 *** (-3.15)	-	-1.524 (-1.55)	-	-3.184 *** (-4.66)	-
<i>TAX</i>	-	-0.089 (-0.87)	-	0.074 (0.84)	-	-0.084 (-0.90)	-	-0.512 *** (-3.55)
Year Dummies	YES	YES	YES	YES	YES	YES	YES	YES
Country fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
N	375	375	235	235	248	248	167	167
(uncentered) R <sup>2</sup>	87.57	92.76	84.60	96.40	89.57	95.58	76.19	89.39
<b>'weak' workers</b>								
<i>WAGE</i>	-0.819 (-0.19)	-	-0.858 *** (-2.98)	-	-0.626 *** (-2.77)	-	-0.127 (-0.24)	-
<i>TAX</i>	-	-0.764 *** (-4.11)	-	-0.923 *** (-5.24)	-	-2.207 *** (-2.41)	-	-2.032 *** (-5.31)
Year Dummies	YES	YES	YES	YES	YES	YES	YES	YES
Country fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
N	79	79	219	219	206	206	164	164
(uncentered) R <sup>2</sup>	93.21	89.34	93.14	70.79	89.53	1.20	93.39	20.39

Note: The dependent variables are, respectively, the statutory corporate income tax rate (*TAX*) and the real hourly compensation cost of production workers in the manufacturing sector (*WAGE*). All models are based on a SUR approach to account for simultaneity. The median emigration share in the sample is 0.00152. t-statistics between brackets; \*\*\*, \*\*, \* indicate significance at 1%, 5% and 10% respectively. All controls included as in Table 1.

## **Appendix: Data sources and summary statistics**

*WAGE*: Hourly Compensation cost in manufacturing in real US dollar (source: BLS).

*TAX*: Statutory Tax Rate (source: Loretz, 2008).

*Population*: Total population, in thousands (source: World Bank Development Indicators)

*Left-wing gov*: Coded -1 if left, 1 if right, 0 if center (source: World Bank: Database of Political Institutions).

*Majority gov*: Fraction of seats held by the government minus 50% (source: World Bank: Database of Political Institutions).

*Gov. expenditures*: Government Consumption Share of PPP Converted GDP Per Capita at current prices (source: Penn World Tables).

*EMU*: dummy = 1 if the country (or its predecessors) is member of EMU.

*Dependency ratio*: Age dependency ratio, in % of working-age population (source: World Bank Development Indicators).

*Education*: School enrollment, tertiary (% gross) (source: World Bank Development Indicators).

*Unemployment*: Unemployment rate, in % (source: International Labour Organization, Labour Statistics)

*Dependency ratio*: Age dependency ratio (% of working-age population).

*Openness*: Trade openness (source: Penn World Tables).

*Union density*: Union Density (source: OECD labour force statistics)

*Strikes*: Total number of strikes and lockouts (source: International Labour Organization, Labour Statistics).

*Productivity*: GDP per person engaged (constant 1990 US\$ at PPP) (source: International Labour Organization, Labour Statistics).

*Urbanness*: proportion of population living in urban areas (source: World Bank Development Indicators).

*ICMC*: Index of Capital Mobility Constraints (source: Economic Freedom of the World).

*Workers' rights*: number of ILO's eight fundamental worker rights conventions ratified by a country (source: International Labour Organization).

*Emigration share*: Number of emigrants as a percentage of the total population (source: Ortega and Peri, 2013).

*FDI index*: FDI Regulatory Restrictiveness Index in the manufacturing sector (source: OECD)

### Summary statistics (1982-2007)

<b>Variable</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min.</b>	<b>Max.</b>
<i>WAGE</i>	2.36	17.553	7.211	41.044
<i>TAX</i>	36.648	10.734	10	65
Population	36093.73	53172.14	228.16	311666
Left-wing gvt.	0.421	0.494	0	1
Majority gvt.	0.079	0.135	-0.245	0.5
Gov. expenditures	9.237	2.717	2.6	16.99
EMU	0.456	0.498	0	1
Dependency ratio	51.262	6.949	38.147	94.244
Education	41.79039	21.29972	1.44493	98.09171
Unemployment	7.180	3.985	1	23.9
Openness	73.373	43.666	13.76	324.36
Union Density	37.423	21.525	5.797	96.355
Strikes	411.952	825.762	0	12765
Productivity	35195.27	11415.15	10678	65480
Urbanness	37.423	21.525	5.797	96.355
ICMC	5.999	2.952	0	10
Workers' rights	5.950	1.771	0	8
Emigration share	0.002	0.002	5.66e-07	0.0139



*Table 4: Robustness Baseline Estimation to operationalisation of TAX*

Dep. Var.	SUR		SUR	
	<i>EATR</i>	<i>WAGE</i>	<i>EMTR</i>	<i>WAGE</i>
<i>WAGE</i>	-0.005 *** (-3.09)	-	-0.004 ** (-2.14)	-
<i>EATR</i>	-	-97.798 *** (-4.48)	-	-
<i>EMTR</i>	-	-	-	-76.074 *** (-4.00)
Year Dummies	YES	YES	YES	YES
Country fixed effects	YES	YES	YES	YES
N	436	436	436	436
(uncentered) R <sup>2</sup>	86.26	71.47	81.32	72.31

Note: The dependent variables are, respectively, the effective *average* or effective *marginal* corporate income tax rate (*EATR* and *EMTR*) and the real hourly compensation cost of production workers in the manufacturing sector (*WAGE*). Estimated coefficients derive from a SUR approach to account for simultaneity. t-statistics, based on standard errors adjusted for country-level clustering, between brackets; \*\*\*, \*\*, \* indicate significance at 1%, 5% and 10% respectively.

*Table 5: Robustness Capital Mobility and Worker Rights results to operationalisation of TAX*

Dep. Var.	ICMC Equal-split sample		ICMC Equal-split sample		Cut-off = 7 conventions		Cut-off = 7 conventions	
	<i>EATR</i>	<i>WAGE</i>	<i>EMTR</i>	<i>WAGE</i>	<i>EATR</i>	<i>WAGE</i>	<i>EMTR</i>	<i>WAGE</i>
	<b>'open' economy</b>		<b>'open' economy</b>		<b>'strong' workers</b>		<b>'strong' workers</b>	
<i>WAGE</i>	-0.009 *	-	-0.016 ***	-	-0.009 ***	-	-0.009 ***	-
	(-1.91)		(-2.68)		(-2.76)		(-2.63)	
<i>EATR</i>	-	-79.17 ***	-	-	-	7.333	-	-
		(-3.07)				(0.71)		
<i>EMTR</i>	-	-	-	-30.872 *	-	-	-	6.370
				(-1.92)				(0.65)
Year Dummies	YES	YES	YES	YES	YES	YES	YES	YES
Country fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
N	223	223	223	223	235	235	235	235
(uncentered) R <sup>2</sup>	86.90	84.96	75.25	90.43	85.56	96.46	84.66	96.48
	<b>'closed' economy</b>		<b>'closed' economy</b>		<b>'weak' workers</b>		<b>'weak' workers</b>	
<i>WAGE</i>	0.0003	-	0.003	-	-0.014 ***	-	-0.022 ***	-
	(0.12)		(1.39)		(-4.27)		(-4.25)	
<i>EATR</i>	-	-37.921 **	-	-	-	-105.41 **	-	-
		(-2.11)				(-2.45)		
<i>EMTR</i>	-	-	-	-28.424 *	-	-	-	-53.604
				(-1.89)				(-1.36)
Year Dummies	YES	YES	YES	YES	YES	YES	YES	YES
Country fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
N	213	213	213	213	201	201	201	201
(uncentered) R <sup>2</sup>	91.60	92.60	89.54	93.28	89.74	71.28	78.03	77.07

Note: The dependent variables are, respectively, the statutory corporate income tax rate (*TAX*) and the real hourly compensation cost of production workers in the manufacturing sector (*WAGE*). All models are based on a SUR approach to account for simultaneity. t-statistics between brackets; \*\*\*, \*\*, \* indicate significance at 1%, 5% and 10% respectively. All controls included as in Table 1. The equal-split sample cut-off for ICMC is set at 7.599.

*Table 6: Robustness capital mobility results*

Dep. Var.	Cut-off = Mean FDI index		Cut-off = Median or equal-split FDI index	
	<i>TAX</i>	<i>WAGE</i>	<i>TAX</i>	<i>WAGE</i>
<b>'open' economy</b>				
<i>WAGE</i>	-1.607*** (-4.33)	-	-1.288*** (-4.9)	-
<i>TAX</i>	-	-0.741 *** (-3.94)	-	-0.533*** (-3.63)
Year Dummies	YES	YES	YES	YES
Country fixed effects	YES	YES	YES	YES
N	351	351	277	277
(uncentered) R <sup>2</sup>	81.71	76.78	83.99	81.92
<b>'closed' economy</b>				
<i>WAGE</i>	-1.248 (-0.57)	-	0.218 (0.57)	-
<i>TAX</i>	-	0.211 (1.16)	-	0.066 (0.59)
Year Dummies	YES	YES	YES	YES
Country fixed effects	YES	YES	YES	YES
N	103	103	176	278
(uncentered) R <sup>2</sup>	91.85	97.35	94.61	93.16

Note: The dependent variables are, respectively, the statutory corporate income tax rate (*TAX*) and the real hourly compensation cost of production workers in the manufacturing sector (*WAGE*). All models are based on a SUR approach to account for simultaneity. t-statistics between brackets; \*\*\*, \*\*, \* indicate significance at 1%, 5% and 10% respectively. All controls included as in Table 1. Mean and median FDI index are 0.0424 and 0.001, respectively. For equal-split sample cut-off for FDI index is set at 0 and yields identical results as the median FDI index.

*Table 7: Robustness Baseline Estimation to inclusion of country-specific period effects*

Dep. Var.	OLS		OLS		SUR	
	<i>TAX</i>	<i>WAGE</i>	<i>TAX</i>	<i>WAGE</i>	<i>TAX</i>	<i>WAGE</i>
<i>WAGE</i>	-0.156* (-1.72)	-	-0.135 (-1.26)	-	-1.354*** (-3.59)	-
<i>TAX</i>	-	-0.054 (-0.72)	-	-0.055 (-0.74)	-	-1.059 (-1.57)
Country-specific period effects	YES	YES	YES	YES	YES	YES
N	513	472	454	454	454	454
(uncentered) R <sup>2</sup>	9.63	26.48	12.73	30.68	86.49	71.10

Note: The dependent variables are, respectively, the statutory corporate income tax rate (*TAX*) and the real hourly compensation cost of production workers in the manufacturing sector (*WAGE*). The first four columns estimate both equations independently via OLS, whereas the last two columns implement a SUR approach to account for simultaneity. The second set of OLS results only differs from the first set in terms of the sample employed (i.e. it matches the sample used in the SUR regressions). The sample size in the SUR estimates is lower than the first set of OLS estimates due to the exclusion of all observations with missing values for any variable included in *either* equation (whereas the first set of OLS estimates only excludes observations with missing values for variables in the independently estimated equations). t-statistics, based on standard errors adjusted for country-level clustering, between brackets; \*\*\*, \*\*, \* indicate significance at 1%, 5% and 10% respectively.