Corporate taxation of heterogeneous firms and the welfare effects of labor unions

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Abstract
This article examines the welfare effects of powerful labor unions when the government levies a uniform tax rate – as is currently the case in most OECD countries – and firms are heterogeneous with respect to productivity. We show that an increase in the bargaining power of labor unions decreases the welfare loss generated by restriction of the tax policy and provide conditions under which powerful labor unions decrease the likelihood that firms will move abroad. We also reproduce the well-known effect whereby powerful labor unions decrease corporate tax rates if firms are mobile.

JEL classification: corporate taxation, uniform tax rate, collective bargaining

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1 Introduction

In discussions on the role of labor unions in the context of internationally mobile firms, powerful labor unions are often presented in a bad light. The reason, as outlined by Fuest and Huber (2000), is that labor unions increase wage costs and might therefore drive some firms out of the domestic market, leading to an increase in unemployment. Moreover, there are arguments that an increase in the bargaining power of labor unions reduces foreign direct investment (FDI) (Naylor and Santoni 2003) or leads to inefficiently high FDI if firms use this to increase their domestic bargaining position (Lommerud et al. 2003). This article, however, provides an argument in favor of powerful labor unions. If the government levies a uniform tax rate but firms are heterogeneous, a welfare loss arises that can be reduced by powerful labor unions. In addition, if a uniform tax rate exists, some firms might move abroad. We show that the likelihood of such migration can be reduced if labor unions are powerful.

A uniform tax rate is the most widely used tax regime in the OECD (in 23 out of 34 countries).\(^{1}\) There are also some countries that levy two or three different tax rates depending on firm size, profits or turnovers and, therefore, partly account for firm heterogeneity.\(^{2}\) However, progressive tax systems do not play a major role in corporate taxation.\(^{3}\) Starting with this observation, we analyze the welfare effects of powerful labor unions when the government’s tax policy is restricted to a uniform tax rate.

Our paper is connected to the literature on interdependence between corporate tax policies, internationally mobile firms, and unionized labor markets. Fuest and Huber (1999, 2000) analyzed the optimal tax policy for the existence of labor unions. They picked up the important result reported by Bucovetsky and Wilson (1991) that uncoordinated tax policies across countries lead to inefficient low tax rates, and showed that in the presence of labor unions, by contrast, inefficiently high tax rates might be realized. Fuest and Huber (2000) also explained why it is rational for governments to use investment subsidies instead of employment subsidies – as often occurs

\(^{1}\)These countries are Australia, Austria, Belgium, Canada, Chile, Czech Republic, Denmark, Estonia, Finland, Germany, Iceland, Ireland, Italy, Luxembourg, Mexico, New Zealand, Norway, Poland, Slovak Republic, Slovenia, Sweden, Switzerland, and Turkey. Note that in Belgium, Canada, and Germany, there are some differences in corporate tax rates depending on ownership or location but tax rates do not directly depend on productivity.

\(^{2}\)These countries are France, Hungary, Republic of Korea, Netherlands, and Spain.

\(^{3}\)In Japan, the UK, and the USA, the corporate tax system is progressive, at least for some profit ranges.
in reality – when unions lead to disturbances in the labor market. Some papers argued that incomplete labor markets lead to lower corporate tax rates than those applied when labor markets are complete. Egger and Seidel (2011) showed that higher fair wage preferences in a country, i.e., more constrained labor markets, decrease the incentives for mobile firms to locate in that country, and therefore lead to lower equilibrium corporate tax rates. Haufler and Mittermaier (2011) reached a similar result, arguing that governments of countries with a unionized labor market have an incentive to attract FDI via low tax rates or subsidies. They also concluded that countries with unionized labor markets have a stronger incentive to attract FDI to reduce inefficiencies in labor and product markets caused by the labor unions. Finally, Exbrayat et al. (2012) showed that in a situation in which governments compete for mobile resources lower corporate tax rates compensate mobile firms for the negative impact on labor costs induced by powerful labor unions. While governments in a country with powerful labor unions decrease corporate tax rates, there might be an increase in corporate tax rates in countries with weak labor unions.

Two additional papers analyzed tax competition in incomplete labor markets when firms do not relocate production facilities but can engage in profit-shifting activities. Riedel (2011) emphasized the impact of different tax systems and showed that under separate accounting an increase in the corporate tax rate increases domestic wages and decreases foreign wages, where the results are reversed under formula appointment. Moreover, separate accounting might mitigate the race to the bottom in tax competition, whereas formula appointment fosters it. Krautheim and Schmidt-Eisenlohr (2012) extended this work by deriving the equilibrium of a tax game between a large country and a tax haven. They provided conditions under which the bargaining process between a multinational firm and a labor union increases/decreases the corporate tax rate in the large country.

Motivated by the current tax systems in the OECD, here we restrict the government’s tax policy to a uniform tax rate and assume, as in Fuest and Huber (2000) and Krautheim and Schmidt-Eisenlohr (2012), firm heterogeneity. Using these two assumptions, we provide conditions under which powerful labor unions decrease the welfare loss caused by restriction of the tax policy and show that powerful labor unions might decrease the likelihood that firms will move abroad.

The remainder of the article is organized as follows: Section 2 derives optimal corporate tax rates when firms and labor unions bargain over wages and describes the effects of a uniform tax rate on welfare and the firms' profits. Section 3 analyzes the impact of labor union power on the corporate tax
rate, welfare loss, and the likelihood that firms will move abroad. Section 4 concludes.

2 Uniform tax rate

Assume a simple model with a government, two firms, $i \in \{L, H\}$, and two labor unions, each of which is active in one of the two firms. The government levies a uniform tax rate $\tau$ to maximize welfare. Each of the two firms operates as a monopolist and produces a homogeneous good with price 1 using labor $l$ as the unique input factor. The firms’ goods are non-substitutable. The production function of firm $i$ is $F_i(l_i; \theta_i)$, where $\theta_i$ denotes productivity. We assume standard characteristics for the production function that is, $\partial F_i(l_i; \theta_i)/\partial l_i > 0$, $\partial^2 F_i(l_i; \theta_i)/\partial l_i^2 < 0$, and $\partial F_i(l_i; \theta_i)/\partial \theta_i > 0$. The net profits of firm $i$ are

$$\Pi^\tau_i \equiv \Pi^\tau_i(w_i, l_i) = (1 - \tau)(F_i(l_i; \theta_i) - w_i l_i).$$  \hspace{1cm} (1)

The firms are internationally mobile and foreign owned. The outside option for firm $i$ is $\bar{\Pi}_i \geq 0$. For simplicity, we assume that employees do not move between industries (i.e., they have acquired firm-specific human capital) or countries. The total workforce is denoted by $2\bar{l}$, where $\bar{l}$ employees can work in firms 1 and 2. Employees face a firm-specific wage rate that is the outcome of the bargaining process between the firm and its firm-specific labor union. The utility of the labor union is

$$U_i(w_i, l_i) = w_i l_i + \bar{w}(\bar{l} - l_i),$$  \hspace{1cm} (2)

where $\bar{w}$ denotes the outside option for employees. This reservation wage is equal for both types of potential employee. By assumption employees work as long as the wage rate paid by their respective firm is at least as high as their reservation wage.

The timing of the model is as follows. First, the government sets the corporate tax rate $\tau$. Second, firms and their respective labor unions negotiate the firm-specific wage rate $w_i$. Then the firms decide whether to move abroad or not; if they decide to stay, they demand labor $l_i$. If a firm decides to move abroad, labor demand in the country of interest is zero. Finally, employees decide whether to work or not, and then profits, labor union utilities, and tax revenues are realized.
If labor unions and firms negotiate wage rates $w_i$, the firms set the optimal labor demand $l_i^*$ in the third stage according to the following first-order condition

$$\frac{\partial F_i(l_i; \theta_i)}{\partial l_i} = w_i. \quad (3)$$

In the second stage, the bargaining process between the firm-specific labor union and the respective firm is described by a Nash bargaining problem. Observing the corporate tax rate $\tau$ and anticipating equilibrium labor demand as given by (3), the Nash product is

$$\left(\Pi_i^\tau - \bar{\Pi}_i\right)^{1-\rho_i} \left((w_i - \bar{w})l_i^*\right)^{\rho_i} \quad i = L, H, \quad (4)$$

where $\rho_i$ denotes the bargaining power of the labor union. Taking logs and differentiating (4) with respect to $w_i$, the first-order conditions are

$$\phi_{w_i} \equiv \frac{1 - \rho_i}{\Pi_i^\tau - \Pi_i} \frac{\partial \Pi_i^\tau}{\partial w_i} + \frac{\rho_i}{w_i - \bar{w}} + \frac{\rho_i}{l_i^*} \frac{\partial l_i^*}{\partial w_i} = 0 \quad i = L, H. \quad (5)$$

Solving this equation for $w_i$ gives the equilibrium wage rate

$$w_i^* = \bar{w} - \frac{1}{\frac{\partial l_i^*}{\partial w_i} + \frac{1 - \rho_i}{\rho_i} \frac{\partial \Pi_i^\tau}{\partial w_i} \frac{1}{\Pi_i^\tau - \Pi_i}} > \bar{w}. \quad (6)$$

Equilibrium wage rates are higher than the workers’ outside option $\bar{w}$, because labor demand and net profits decrease as a function of the wage rate, that is, $\partial l_i^*/\partial w_i < 0$ and $\partial \Pi_i^\tau/\partial w_i < 0$. To examine the effect of the labor unions’ bargaining power on the equilibrium tax rate it is helpful to analyze the effect of a change in the corporate tax rate on the equilibrium wage rates. Lemma 1 summarizes this result.

**Lemma 1.** The wage rate decreases as a function of the corporate tax rate.

**Proof:** Implicitly differentiating (6) gives

$$\frac{dw_i^*}{d\tau} = \frac{\partial \phi_{w_i}}{\partial w_i} < 0, \quad (7)$$

where $\partial \phi_{w_i}/\partial w_i < 0$ because of the concavity of the bargaining problem. Considering $\partial \Pi_i^\tau(w_i^*)/\partial w_i = -(1 - \tau)l_i^*$, $\partial \Pi_i^\tau(w_i^*)/\partial \tau = -\Pi_i(w_i^*)$, $\partial \Pi_i^\tau(w_i^*)/\partial w_i \partial \tau = l_i^*$, and $\partial l_i^*/\partial \tau = \partial^2 l_i^*/\partial w_i \partial \tau = 0$, we have

$$\frac{\partial \phi_{w_i}}{\partial \tau} = -(1 - \rho_i) \frac{\bar{\Pi}_i}{\Pi_i^\tau(w_i^*) - \Pi_i} l_i^* < 0, \quad (8)$$
which proves \( \frac{d w^*_i}{d \tau} < 0 \). \( \square \)

In the first stage of the game, the government anticipates \( l^*_i \) and \( w^*_i \) according to (3) and (6) and sets the corporate tax rate to maximize welfare, which is the sum of tax revenues and the aggregate utility of the labor unions reduced by unemployment transfers. Therefore, the government’s objective is to maximize

\[
W = \sum_i \left( \tau_i \Pi^*_i + w^*_i l^*_i \right).
\]

(9)

An increase in the tax rate increases tax revenue, induces a reduction in the wage rates and, finally, increases labor demand. If the government could discriminate between firms and the firms’ outside options are not binding, the first-order conditions for the equilibrium tax rates \( \tau^*_i \) are

\[
\phi_{\tau_i} = \Pi^*_i + (1 - \tau_i) l^*_i \frac{d w^*_i}{d \tau} + w^*_i \frac{d l^*_i}{d \tau} = 0, \quad i \in \{1, 2\},
\]

(10)

with

\[
\frac{d l^*_i}{d \tau} = \frac{1}{\frac{\partial^2 F(l_i)}{\partial l_i^2}} \frac{d w^*_i}{d \tau} > 0.
\]

As our aim is to analyze the effect of powerful labor unions, we keep the optimal tax problem under the discriminatory tax regime as simple as possible and assume that the outside options for both firms are not binding at the optimal discriminatory tax rates.

**Assumption 1.** Given the current bargaining power of the labor unions, the outside options for both firms are not binding under the discriminatory tax regime, that is, \( \Pi^*_i \geq \bar{\Pi}_i \), for \( i \in \{L, H\} \) and \( \tau^*_i \) given by (10).

Moreover, we restrict our analysis to interior solutions, that is, \( \tau^*_i \in (0, 1) \). We can now state the following lemma.

**Lemma 2.** If the government’s tax instruments are not restricted to a uniform tax rate, the production function is sufficiently concave, and Assumption 1 holds, the tax system is progressive, that is, the high-productivity firm is taxed at a higher rate than the low-productivity firm.
Proof: As \( \tau_i \) is welfare-maximizing, we obtain \( \partial \phi / \partial \tau < 0 \) (assuming an interior solution). Moreover, we have

\[
\frac{\partial \phi}{\partial \theta_i} = \frac{\partial \Pi_i^*}{\partial \theta_i} + (1 - \tau_i) l_i^* \frac{d^2 w_i^*}{d \tau d \theta_i} + (1 - \tau_i) \frac{d w_i^*}{d \tau} \frac{d l_i^*}{d \theta_i} + l_i^* \frac{d^2 l_i^*}{d \tau d \theta_i} + \frac{d l_i^*}{d \tau} \frac{d w_i^*}{d \theta_i} \leq 0.
\] (11)

The sign of \( \partial \phi / \partial \theta_i \) is generally ambiguous. If, however, the production function is sufficiently concave, that is, \( \partial^2 F(l_i^*; \theta) / \theta^2 \) is sufficiently high, the labor market effects are dominated by the profit effects, and therefore \( \partial \phi / \partial \theta_i > 0 \). With Assumption 1 we exclude situations in which a sufficiently high outside option for the high-productivity firm requires a lower tax rate for this firm than for the low-productivity firm. \( \Box \)

Motivated by the fact that no OECD country has a regressive corporate tax system, we assume for the remaining analysis that the government would favor a progressive tax system if it could discriminate between firms. Nevertheless, our basic argument remains as long as the government has an incentive to apply different tax rates to the two firms if it has the possibility to do so.

If the government levies a uniform tax rate, \( \tau^* \), in the first stage the first-order condition is

\[
\phi_\tau \equiv \sum_i \left( \Pi_i^* + (1 - \tau) l_i^* \frac{d w_i^*}{d \tau} + w_i^* \frac{d l_i^*}{d \tau} \right) = 0.
\] (12)

Let the solution of this equation be denoted by \( \tilde{\tau} \). If the outside option for the high-productivity firm is not binding at this tax rate, that is, if \( \Pi_i^* \geq \bar{\Pi}_H \), and if the government has an incentive to keep both firms in the country, that is, if

\[
\sum_i (\tilde{\tau} \Pi_i^* + w_i^* l_i^*) - \tau_L^* \Pi_L^* (\tau^*_L) + w_L^* l_L^* \geq 0,
\] (13)

the equilibrium tax rate \( \tau^* \) is equal to the solution of (12). If the participation constraint for the high-productivity firm is not fulfilled for the tax rate that solves (12), let \( \hat{\tau} \) denote the tax rate for which the high-productivity firm is indifferent between moving and staying. The equilibrium tax rate \( \tau^* \) is then either \( \tau_L^* \) or \( \hat{\tau} \). If (13) holds for \( \tilde{\tau} = \hat{\tau} \), the government has an incentive to keep both firms in the country and the equilibrium tax rate is \( \tau^* = \hat{\tau} \). Otherwise it is \( \tau^* = \tau_L^* \). The following proposition summarizes the effect of a uniform tax rate.
Proposition 2. If the government does not discriminate between firms but instead levies a uniform tax rate, then (i) there is, in general, a welfare loss and (ii) the high-productivity (low-productivity) firm loses (benefits). (iii) Moreover, the high-productivity firm might move abroad.

Proof: (i) If the government levies different tax rates on the firms if it can, a uniform tax rate reduces the government’s policy instruments and therefore leads to a welfare loss. (ii) A necessary condition so that $\tau^*_H$ and $\tau^*_L$ are interior solutions are $\Pi^*_i + (1 - \tau^*_i)l^*_i dw^*_i/d\tau < 0$, $i \in \{L, H\}$ (see (10)). Thus firms benefit by higher tax rates because the decrease in the labor demand inefficiencies overcompensates the direct tax effect. Finally, as the uniform tax rate lies between the two tax rates realized under the discriminatory regime, that is, $\tau^*_L < \tau^* \leq \tau^*_H$, part (ii) holds. Part (iii) is a direct consequence of the result of part (ii).

A uniform tax rate favors the low-productivity firm and reduces profits for the high-productivity firm, which can finally induce this firm to move abroad. Deciding on whether to keep the high-productivity firm in the country or not, the government faces the following trade-off. If the high-productivity firm moves abroad, on the one hand, no tax revenues will be generated by this firm. On the other hand, the absence of the high-productivity firm gives the government the possibility of taxing the low-productivity firm efficiently. Because of Assumption 1, the government always has the possibility of keeping both firms in the country, but it does not always have an incentive to foster this situation, as previously discussed.

3 Impact of the labor unions’ bargaining power

To keep the remaining analysis as simple as possible, we assume that the equilibrium uniform tax rate is the solution of (12) and that both firms facing this tax rate are currently located in the country. Starting with this situation, we examine the effects of a change in the labor unions’ bargaining power. There are some direct effects of an increase in this bargaining power. Powerful labor unions shift rents from firms to employees. Thus, while firms lose, the latter benefit. Considering (6), the wage rate increases, and therefore the labor demand decreases as a function of the labor unions’ bargaining power. The equilibrium wage rate and the labor demand are convex functions of $\rho$. Proposition 3 summarizes the effect of an increase in the labor unions’ bargaining power on the corporate tax rate.
Proposition 3. An increase in the labor unions’ bargaining power reduces the corporate tax rate.

Proof: We implicitly differentiate the first-order condition in (12) to obtain
\[
\frac{d\tau^*}{d\rho_i} = \frac{\delta\phi_{\tau}}{\delta\rho_i}.
\]

From the proof of Proposition 2 we already know that $\partial\phi_{\tau}/\partial\tau < 0$. Moreover, we have
\[
\frac{\partial\phi_{\tau}}{\partial\rho_i} = (1 - \tau^*) \left( \frac{dl^*_i}{d\rho_i} \frac{dw^*_i}{d\tau} + l^*_i \frac{d^2w^*_i}{d\tau^2} \right) - \left( l^*_i - \frac{dl^*_i}{d\rho_i} \right) \frac{dw^*_i}{d\rho_i} + w^*_i \frac{d^2l^*_i}{d\tau^2} < 0.
\]

with $d^2l^*_i/d\tau d\rho_i < 0$ and $d^2w^*_i/d\tau d\rho_i < 0$. □

If powerful labor unions exist, the government will reduce the corporate tax rate, an argument already made by Egger and Seidel (2011) and Exbrayat et al. (2012).

Proposition 4. The effect of an increase in the labor unions’ bargaining power on welfare is ambiguous. If the production function is sufficiently concave, the effect is positive.

Proof: Differentiating the welfare function (9) with respect to $\rho_i$ and taking the first order condition for the tax rate (12) into account gives
\[
\frac{dW}{d\rho_i} = \left( (1 - \tau^*)l^*_i + \frac{1}{\delta^2F(l^*_i)} w^*_i \right) \frac{dw^*_i}{d\rho_i}.
\]

Although the effect of an increase in a labor union’s bargaining power is generally ambiguous, it becomes positive if the production function is sufficiently concave. If the production function is sufficiently concave the term in brackets is positive. □

On the one hand, an increase in $\rho_i$ shifts surplus from the firm to the labor union, which increases welfare. On the other hand, an increase in $\rho_i$
leads to an even more inefficient labor market, which reduces welfare. This paper was motivated by a situation in which labor unions have a negative effect on welfare. The following proposition states the key argument of the paper showing that although labor unions might have a negative effect on welfare they can reduce inefficiencies if the government’s tax policy is restricted.

**Proposition 5.** An increase in the bargaining power of labor unions that have a negative effect on welfare decreases the welfare loss generated by a uniform tax rate.

*Proof:* The welfare loss that arises from application of a uniform tax rate is

\[
\begin{align*}
WL & \equiv \sum_i \left( \tau_i^* \Pi_i^*(\tau_i^*) + w_i^*(\tau_i^*) l_i^*(\tau_i^*) \right) - \sum_i \left( \tau_i^* \Pi_i^*(\tau_i^*) + w_i^*(\tau_i^*) l_i^*(\tau_i^*) \right) \\
& \quad - \sum_i \left( \tau_i^* \Pi_i^*(\tau_i^*) + w_i^*(\tau_i^*) l_i^*(\tau_i^*) \right)
\end{align*}
\]

(17)

Differentiating (17) with respect to \( \rho_i \), \( i \in \{1, 2\} \), gives

\[
\frac{dWL}{d\rho_i} = \frac{dW(\tau_i^*)}{d\rho_i} - \frac{dW(\tau^*)}{d\rho_i} 
\]

(18)

with \( dW/d\rho_i \) given by (16). As the government realizes optimal tax rates under both tax regimes – with discriminatory tax rates and a uniform tax rate – the change in the labor union’s bargaining power affects the welfare loss only via the direct wage effect (see (16)). In a situation where labor unions reduce welfare, an increase in the bargaining power of firm \( i \)’s labor union reduces welfare generated by this firm under both tax regimes and, moreover, welfare is a convex function of the bargaining power. Thus, the reduction in welfare is larger under the discriminatory tax regime where \( \tau_i^* \) maximizes welfare generated by firm \( i \) than with application of a uniform tax rate, that is, (18) is negative.

Proposition 5 shows that the negative welfare effect of firm-specific labor unions is more pronounced under a tax regime that discriminates between firms than under a tax regime that levies a uniform tax rate. Finally, we show in the following proposition how an increase in the bargaining power of the labor unions affect the likelihood that the high-productivity firm will move abroad.

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Proposition 6. If labor unions have a negative effect on welfare, an increase in the bargaining power of the labor union of the low-productivity (high-productivity) firm decreases (increases) the likelihood that the high-productivity firm will move abroad.

Proof: Focusing on the low-productivity firm, we can directly apply the proof of Proposition 5. The LHS of (13) increases in \( \rho_L \), and therefore it is more likely that the inequality will hold and that both firms will remain in the country. On the other hand, differentiating the LHS of (13) with respect to the bargaining power of the high-productivity firm gives \( dW(\tau)/d\rho_H \). This term is positive (negative) if welfare increases (decreases) as a function of the bargaining power of the labor union of the high-productivity firm. \( \square \)

An increase in the bargaining power of the labor union of the low-productivity firm affects welfare if both firms stay in the country and if the high-productivity firm moves abroad. However, an increase in the bargaining power of the labor union for the high-productivity firm only changes welfare if both firms stay in the country. Thus, the latter only increases the likelihood that both firms will stay if the welfare effect of the labor union is positive.

4 Conclusion

Most OECD countries currently apply a uniform tax rate and therefore tax heterogeneous firms equally. Starting with this observation, we examined the welfare effects of powerful labor unions. A uniform tax rate generally leads to a loss of welfare. However, if wages are the outcome of the bargaining process between a firm and its specific labor union, this welfare loss can be decreased. We also found that powerful labor unions can reduce the likelihood that firms will move abroad. Showing that the corporate tax rate decreases with the bargaining power of the labor unions, we reproduced the argument already made in other studies that mobile firms located in countries with strong labor unions have to be compensated for their high wage offers with low tax rates.

Our model could be extended to analyses of an open economy in which the outside options for the firms are determined by the tax policies of other countries. Although the aim of this study was not to analyze the interactions between different countries, it nevertheless provides some hints about the welfare effects of fostering nonpreferential tax regimes in the EU or OECD. The EU and OECD currently strongly favor nonpreferential tax regimes.
On the one hand, such a tax regime eliminates tax competition activities and therefore increases aggregate welfare. On the other hand, a nonpreference tax regime reduces welfare if countries differ in productivity or in their preference for the public good. Then, according to the same argument made in this paper, powerful labor unions can reduce inefficiencies.

References


