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Introduction.

Musgrave and Musgrave (1989) in their «Public finance in theory and practice» classified the tax incidence as statutory incidence, determining the statutory obligation for economic agents to pay taxes, and effective incidence, which refers to the tax bearer – a person who really bears this tax burden (Musgrave and Musgrave, 1989, 237).

The obligation to pay taxes far from always means that such tax agent bears an appropriate tax burden. Therefore, the question of tax incidence arises. Corporate income tax (CIT) incidence can have either direct or indirect impact on workers. The direct impact relates to the change of employment income, while the implicit effect concerns changes of employment conditions arising when a company does not cut wages. This can result to the decrease in labor productivity and average value added per worker, which in turn can lead to the slowdown in economic growth. Therefore, the paper aims to investigate the relationship between level of corporate taxation (in terms of corporate income tax rate) and labor market indicators in countries worldwide to identify the suggested corporate tax incidence and its potential causes.

The paper is structured as follows. Section II provides research background on incidence of the corporate tax on labor for both the open and closed economy cases. Section III describes methodology, and Section IV provides results of empirical analysis of relationship between corporate taxation and labor market indicators in countries. Section V concludes.

1. Research Background

After introducing the capital income tax in 1909, which differed from existing indirect and property taxes, the issues of its incidence arose. The popular opinion was that in the short-term there was no incidence of such tax on workers. The partial equilibrium models were the main instrument of estimation of incidence. The first attempt to use the general equilibrium model in order to analyze the incidence of capital income tax was done by Harberger (1962). He provided both a theoretical analysis of the effects of the corporation income tax and estimation of its probable incidence in the United States. He developed a general-equilibrium model with corporate and non-corporate industries (sectors), each employing two factors of production, labor and capital. The realization of model with an example of the United States allowed him to conclude that capital bears close to the full burden of the tax.

The Harberger's conclusions related to the incidence of capital income tax on labor remained generally acknowledged until the growth of globalization and the increased number of international economic agreements had put the issue of openness of the economy in the forefront in the analysis of macroeconomic processes (Melvin (1982), Grubert and Mutti (1985) etc.)

In theory, any source-based capital tax in the small open economy is inefficient (Diamond and Mirrlees (1971)), and the share of the corporate tax burden falling on domestic immobile factors increases (compared to closed economy case). Thus, if the country has no market power on the world markets, the after-tax rate of return to capital is fixed. Moreover, if such a country raises the corporate income tax, this results in decrease in domestic investment and the increase of pre-tax rate of return to investment. The latest will rise until the domestic after-tax rate of return will equal the international after-tax rate of return. This means that the corporate income tax burden is fully shifted to domestic immobile factors of production, which include immobile labor or land. In the open economy, the tax distorts both the domestic and the international allocation of capital. In the long-run the marginal productivity of labor and, consequently, the wages (according to the theoretical assumptions) will decrease. This lead to the decrease in labor demand, and the corporate tax burden born by labor, will rise.

Harberger itself (1995, 2008) revised the incidence of corporate income tax in an open economy having been stated that the openness of a state should be regarded as a crucial factor in analyzing the incidence of corporate taxation. He found that domestic labor often bears the full burden of the

corporate tax and that a larger burden on capital reduces both the degree of international capital mobility and the degree of substitutability between domestic and importing goods.

Further research providing empirical estimation of corporate tax incidence on labor used mainly the general equilibrium models. And the obtained results varied widely. Some of them confirmed Harberger's findings (Randolph (2006), Felix (2009), McKenzie and Ferede (2017)), others (Fuest (2011), Fuest, Peichl, and Siegloch (2016) demonstrated that the labor bears an essential share of the corporate tax burden, but reject an assumption that the corporate tax falls primarily on business owners). Finally, Gravelle and Smetters (2006), Gravelle (2013), Agarwal and Chakraborty (2017) etc. argued that the corporate tax falls largely on capital income, which is similar to the closed economy case.

When the small open economy faces the perfectly elastic supply of capital, the corporate income tax burden is shifted to factors other than capital. The latter will continue to move abroad until its domestic after-tax return would equal the world return. Such decrease of capital will lead to the lower marginal productivity of labor, and, in turn, if the capital is perfectly mobile, the corporate income tax burden will be fully shifted into the labor.

In contrast, when the economy is large, the high corporate income tax could reduce an international after-tax rate of return. As a result, the immobile factors of production again bear a part of corporate tax burden, but in such a case, the capital owners will also lose, while immobile factors owners in other countries with capital inflow will benefit. Workers on the domestic labor market will bear the burden since the most part of them cannot move freely between countries and domestic wages will fall. At the same time, in the foreign labor market the foreign workforce benefits from the increase of foreign capital.

Thus, in general, according to Fuest (2015), the open economy models predict that "the smaller is the country imposing the tax relative to the world or domestic economy...the larger is the burden on immobile factors" (Fuest, 2015, p.8).

Another set of papers use wage bargaining models (Brenzel, Gartner, and Schnabel (2013), Arulampalam et al. (2012), Fuest (2015)) in order to analyze the impact of corporate income tax changes on wages. In general their results indicate that the enhancing of bargaining power of companies weakens the incidence of corporate income tax; however these models do not consider both an open economy and capital mobility. However, when the economy is open, a company has the possibility to shift both production, and capital abroad; this could improve its bargaining position. This means, according to Exbrayat et al. (2016) the direct tax incidence, which increases with the level of economic integration. In competitive labor markets, the indirect incidence of corporate income tax arises from variations in the capital-to-labor ratio (invested in each country), when the capital outflow from a high tax country reduces the marginal productivity of labor in smaller tax country and strengthen thereby such corporate tax incidence. Nevertheless, when the labor cost is taken into account the tax cuts could not lead to the expected results, notably to prevent capital outflow. The question is that countries raise corporate income tax rates in order to lower domestic labor cost. I.e., when the government is concerned with lower wages one of the ways to achieve it is to maintain corporate income tax rates on the relatively high level (compared with other countries) (Lockwood and Makris, 2006; Exbrayat et al., 2016).

Therefore, according to the existing studies, in the open economy the corporate tax burden is partially (or entirely) shifted onto labor. The level of incidence depends on the size of the country, on the degree of substitution between imported and domestic products, on the degree of factor substitution and the intensity of their use. The theory suggests that the increase in CIT rate means for companies the necessity of cutting wages for maintaining commodity prices at the same level. However at the same time there is a strong possibility that to maintain the certain level of wages, companies will manipulate the number of hired employees, terms and conditions of employment and dismissal, amounts of severance pay, number of working hours etc., which can lead to the decrease in average value added per worker. In other words, companies can shift the corporate tax burden onto labor by changing conditions of employment.

Hereafter, we investigate the relationship between change of CIT rate and labor market indicators to identify the suggested corporate tax incidence and its potential causes.

2. Methodology

Our analysis includes two stages.

I. Identification as a whole the suggested tax incidence through worsening working conditions by companies. The latter can be expressed numerically by labor freedom index, which is the integral quantitative indicator considering the impact of six factors: ratio of minimum wage to the average value added per worker; hindrance to hiring additional workers; rigidity of hours; difficulty of firing redundant employees; legally mandated notice period, and mandatory severance pay (The Labor Freedom Index, 2017).

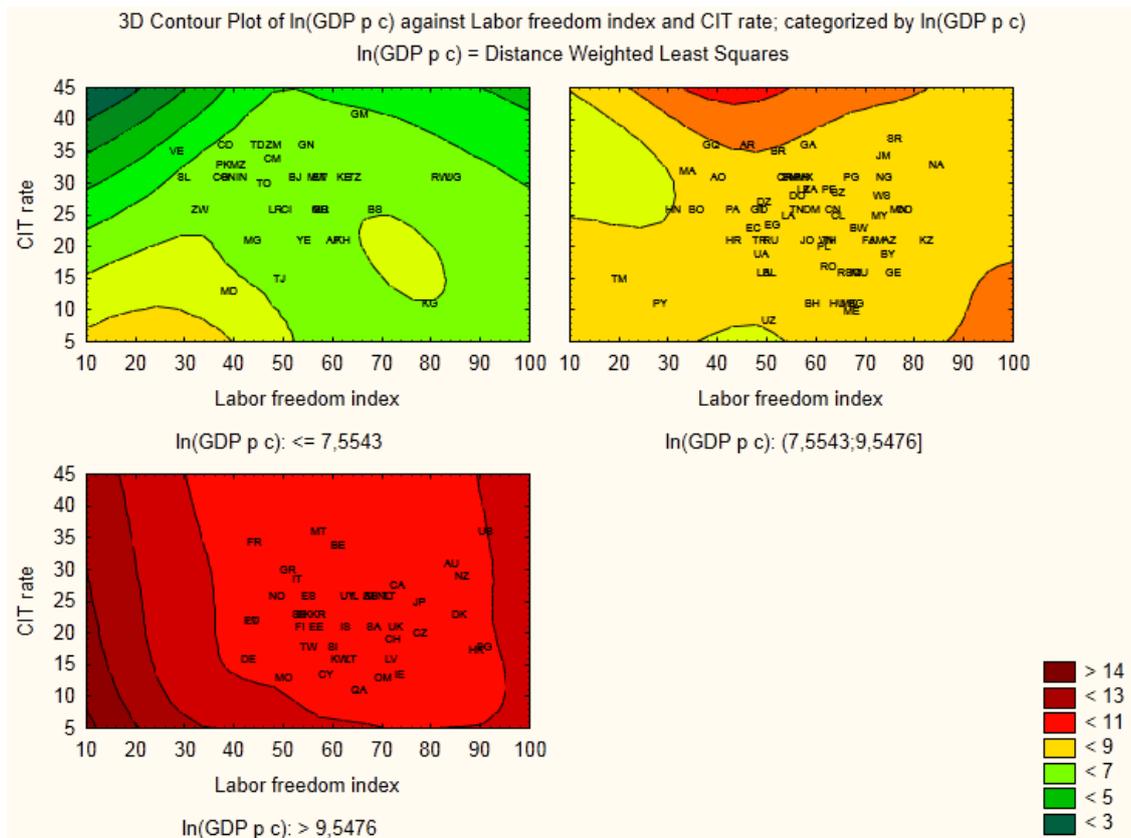
II. Analysis of each of these factors in order to identify overarching factor(s), and the nature of its(their) relationship with CIT rates in countries.

Our estimations based on the data on 145 countries for 2009-2017 retrieved from KPMG, Deloitte and Ernst & Young, The Heritage Foundation, The International Labor Organization, and The World Bank databases, including Doing Business database. The methodology includes statistical and factor analysis, as well as comparative analysis.

3. Case Studies

First, we divided all countries according their level of economic development expressed as GDP per capita (Fig.1).

Figure 1. Corporate tax rates, GDP per capita and labor freedom index in countries, 2016.



Source: author

Note: the natural logarithm of GDP per capita, $\ln(\text{GDPpc})$ used to simplify visual comprehension

For countries with lower GDP per capita (Fig. 1) one can observe a relatively wide dispersion of both CIT rates and labor freedom index, while in middle-income countries the dispersion of CIT rates decreases, but the dispersion of labor freedom index remains relatively wide.

For countries with higher GDP per capita, the level of both corporate taxation and labor freedom tend towards their average. In general, Fig. 1 shows that the higher is GDP per capita the more is the impact of the CIT rate and labor freedom index.

The change of corporate income tax rate affects virtually all components of labor freedom index. When the tax rate increases the company instead of reducing wages can change the number of working hours and their distribution (to introduce the night shift etc.), reduce the number of hired workers and increase the number of dismissed ones, and reduce severance pay as well. Moreover, in developed economies due to stable and efficient labor market institutions companies have less capability to manipulate the conditions of employment than in developed countries.

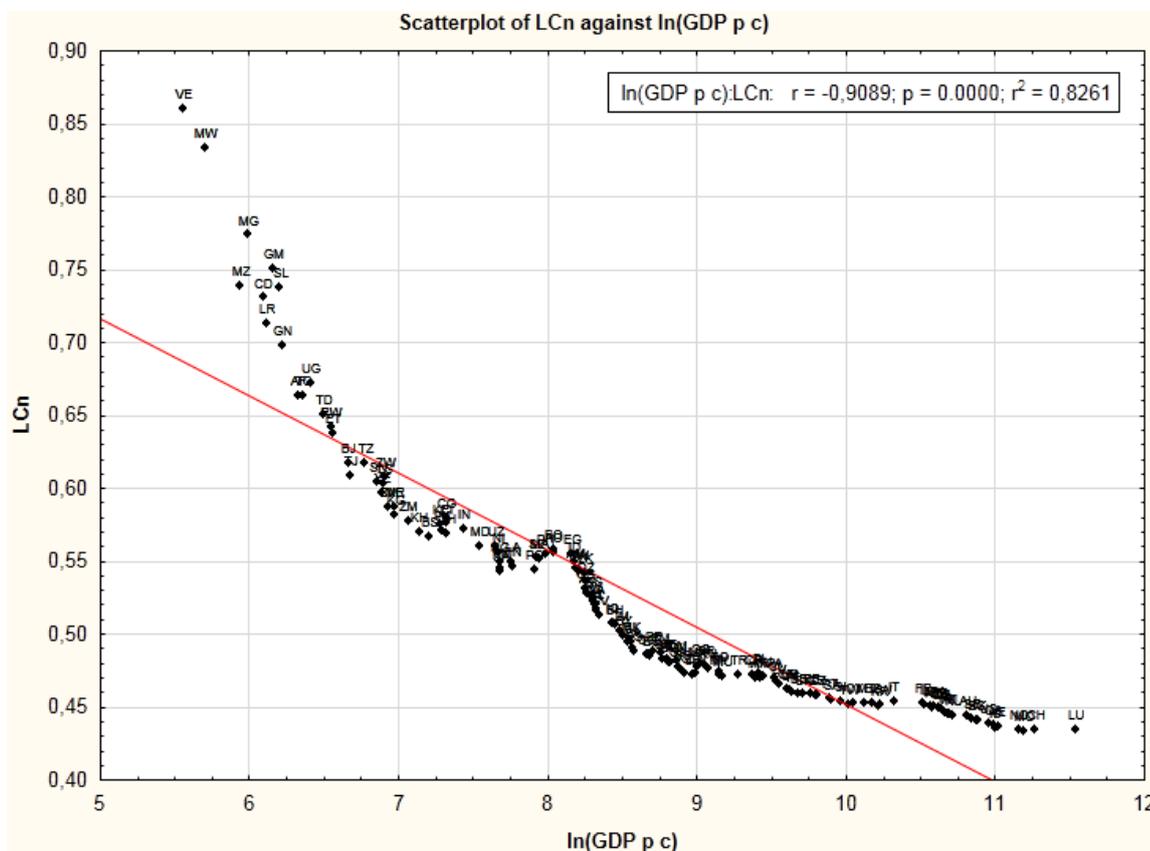
To provide further analysis and to simplify visual comprehension of findings we calculated the ratio of labor freedom index and CIT rate (LC_n) as:

$$LC_n = \frac{\sum_{i=1}^n LF_i / CIT_i}{n}, n = 1, 2, \dots, N \quad (1)$$

where N is the number of countries; LF_i is the labor freedom index of the i -th country; CIT_i is the corporate income tax rate of the i -th country.

Fig. 2 presents the results of correlation analysis between labor freedom indices and CIT rates (as LC_n ratio) and GDP per capita ($\ln(GDPpc)$) in countries worldwide.

Figure 2. The results of correlation analysis between labor freedom indices and CIT rates, 2016.



Source: author

Fig. 2 demonstrates the inverse correlation between analyzed variables. Such statistically significant dependence is visible even for the linear approximation – $R^2 > 0,8$; for other approximation types – exponential, power and logarithmic, the value of R^2 is even larger.

This means that increase of corporate tax rate leads to the reduction of labor freedom index. In other words, when companies for whatever reason do not want to reduce wages in response to increase of CIT rate they shift the CIT burden onto workers by worsening their employment conditions.

However, such relationship varies depending on the level of GDP per capita. This means that for low-income and low-middle-income countries such relationship will differ from both upper-middle-income countries and high-income countries. Said otherwise, the richer and more developed countries have indicators, which determine the labor freedom index and which are not aligned with the tax rate,

Accordingly, they reach the same value of labor freedom index with larger tax rate, which, in turn, gives lower ratio of these two variables compared to other countries.

In countries with high GDP per capita, the corporate tax burden is shifted onto workers (due to worsening their employment conditions) in lesser extent than in countries where GDP per capita is relatively low.

II. At this stage we analyze specific elements of labor freedom index in order to identify the nature of their relationship with CIT rates in countries, and potential tax incidence.

We found 62 countries worldwide with different levels of GDP per capita, in which the CIT rates have been changed during 2009-2017.

For each country, we provide a factor analysis, starting with exclusion of factors of labor freedom index, which have no variance (data reduction method).

After we analyzed the descriptive statistics (Table 1. as an example for Angola, where we excluded three variables with no variance) and built correlation matrices (Table 2, where three variables have significant correlation with CIT rate)

Table 1. Descriptive statistics

	Valid N	Mean	Min	Max	Variance	Std.Dev.	Coef.Var.	Std.Error
Standard CIT rate	8	12,5000	10,0000	15,0000	7,14286	2,672612	21,38090	0,944911
Minimum wage for a full-time worker	8	198,2255	182,3044	209,8582	70,75396	8,411537	4,24342	2,973928
Ratio of minimum wage to value added per worker	8	0,3855	0,3545	0,4100	0,00040	0,020048	5,20000	0,007088
Maximum working days per week	8	5,6250	5,0000	6,0000	0,12500	0,353553	6,28539	0,125000
Paid annual leave	8	20,2500	20,0000	22,0000	0,50000	0,707107	3,49189	0,250000
Severance pay for redundancy dismissal	8	10,2944	10,1000	11,6000	0,27831	0,527548	5,12459	0,186516

Source: author

Table 2. Correlation matrix

	N	Mean	Std.Dv.	r(X,Y)	r ²	t	p
Standard CIT rate		12,5000	2,672612				
Paid annual leave	8	20,2500	0,707107	-0,377964	0,142857	-1,00000	0,355918
Severance pay for redundancy dismissal	8	10,2944	0,527548	-0,371514	0,138023	-0,98017	0,364854
Minimum wage for a full-time worker	8	204,1190	7,673855	-0,747955	0,559436	-2,76024	0,032844
Ratio of minimum wage to value added per worker	8	0,3855	0,020048	-0,925239	0,856067	-5,97378	0,000987
Maximum working days per week	8	5,6250	0,353553	-0,755929	0,571429	-2,82843	0,030020

Source: author

The results for 62 countries showed the following tendencies (Table 3)

Table 3. Results of statistical and factor analysis for countries with change in CIT rates

	Factor	Number of countries with significant correlation
1	Minimum wage for a full-time worker	Angola, Belarus, Brazil, Cameroon, Chile, Columbia, Congo, Rep., Cyprus, Ecuador, El Salvador, Estonia, Guatemala, Jordan, Laos, Madagascar, New Zealand, Pakistan, Senegal, Slovenia, Thailand, Taiwan, Tunisia, UK, Uzbekistan, Vietnam
2	Ratio of minimum wage to value added per worker	Guatemala, Jordan, Laos, Madagascar, New Zealand, Pakistan, Senegal, Slovenia, Thailand, Taiwan, Tunisia, UK, Uzbekistan, Vietnam
3	Maximum working days per week	Albania, Angola, Bangladesh, Cyprus, Greece, Namibia
4	Premium for night work	Chile, Finland, Iceland, Slovenia, Switzerland
5	Premium for work on weekly rest day	Congo, Cyprus, Fiji, Ireland, Portugal, Slovenia, Switzerland, Vietnam
6	Paid annual leave	Slovenia, Tunisia
7	Severance pay for redundancy dismissal	Brazil, Congo, Dominica, Ecuador, Madagascar, Senegal, Slovenia, Taiwan
8	Notice period for redundancy dismissal	Congo, Panama, Portugal, Slovenia, Tajikistan, Tunisia, UK, Uzbekistan

Source: author

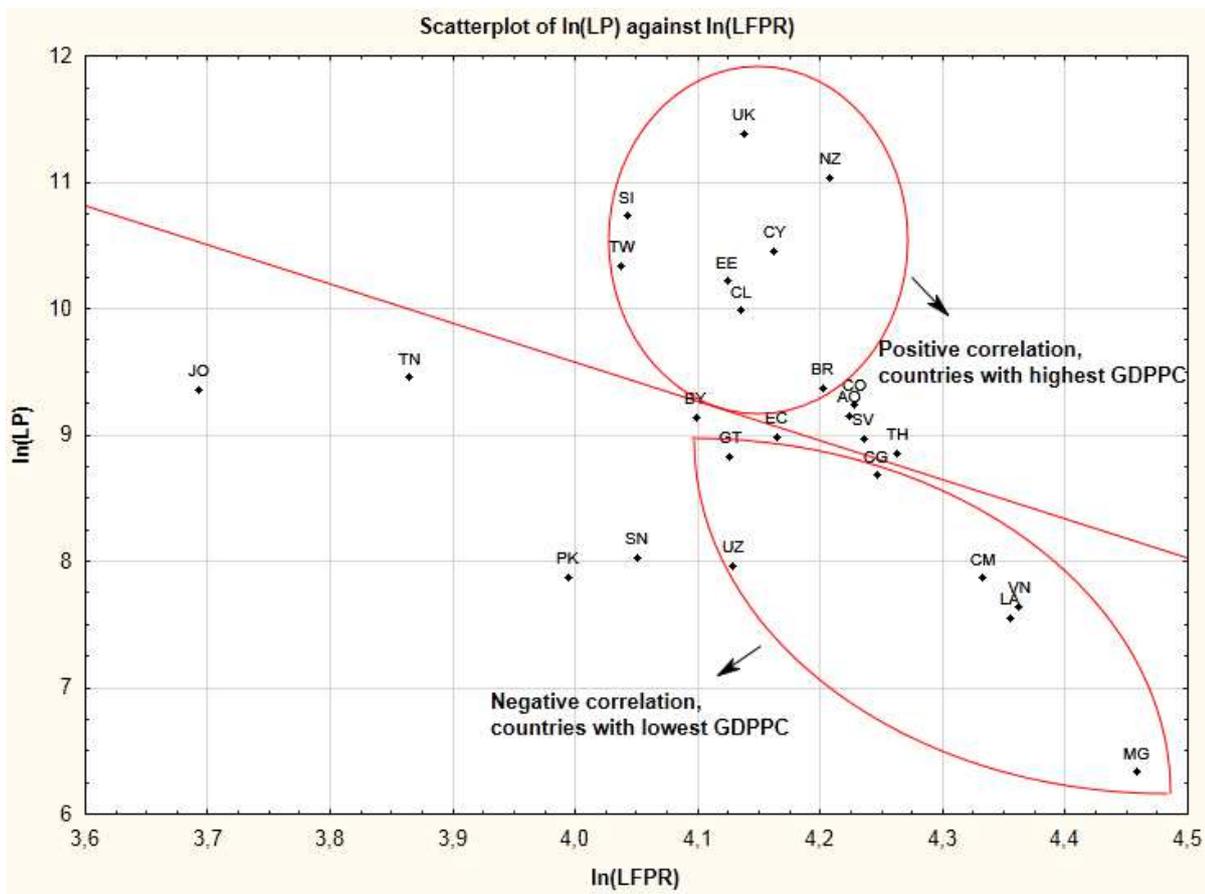
Note: for factors 1 and 2 the signs of correlation coefficients are identical.

The value added per worker as well as the labor productivity can increase due to investment and R&D, and some research argued that lower CIT rates have either a positive effect on these factors. (HM Treasury, 2013; Gravelle and Marples, 2014 etc) or any significant effect (Hungerford, 2014). Moreover, in the open economy the labor productivity declines due to capital outflow occurred as a result of increase in CIT rates (Diamond et al. 2013; Boghean and State, 2015), and according to Ogawa et al., (2016) in the unionized country such capital outflow reduces labor productivity (compared to the non-unionized country case).

To provide comparative analysis of obtained results for 25 countries, in which the significant correlation between CIT rate change and minimum wage for a full-time worker/ ratio of minimum wage to value added per worker is observed, we used both labor force participation rate and labor productivity indicators.

The results of analysis are presented on Fig. 3.

Figure 3. Results of comparative analysis of countries with the significant correlation between CIT rate and minimum wage/ratio of minimum wage to value added per worker



Source: author

Note: $\ln(LFPR)$, $\ln(LP)$ are natural logarithms of labor force participation rate and labor productivity respectively

Fig. 3 demonstrates that countries with lowest GDP per capita have upper middle levels of labor force participation rate while the labor productivity is rather low. It can be explained, ultimately, by a large number of low-skilled and unskilled jobs with simultaneous low value added per worker.

In contrast, countries with highest GDP per capita with large share of R&D and highly skilled work have high labor productivity rates with labor force below average.

Consequently, in countries with lower GDP per capita the negative significant correlation means that the increase in CIT rate leads to the decrease in ratio of minimum wage to value added per worker due to weak unions/labor protections, and because of large share of low-skilled jobs. Therefore, the increase in CIT rate affects labor productivity (that is contrary to Hungerford (2014)).

In contrast, the decrease in CIT rate leads to the increase in labor productivity resulting from capital inflow from unionized countries. The latter ties up with suggestions of Ogawa et al. (2016). In the non-unionized country, labor is paid according to its marginal product, while in the unionized state the labor is overpaid. In the open economy case, implying the integration of capital markets, the labor market of non-unionized country benefits from capital inflow.

Countries with higher GDP per capita demonstrate the positive significant correlation between CIT rate and the ratio of minimum wage to value added per worker, which can be explained by a large share of tax-favored activity, which is mostly related to the R&D (for these countries Fig. 3 demonstrates high rates of labor productivity with average labor force participation rate);

government incentive to take part in international tax competition to prevent capital outflow, notably from R&D sector (Sokolovska, 2016) and consequently to prevent the decrease of labor productivity (the higher is the tax rate, the higher is the labor productivity – as a result of tax incentives).

5. Conclusion

The tax theory suggests that in the open economy the corporate tax burden is partially (or entirely) shifted onto labor. This burden can be shifted either by cutting wages or by worsening employment conditions – in case when companies do not cut wages.

The conditions of employment in countries worldwide generally can be determined by labor freedom index: the higher is its value the better are terms of employment in country (conditions for hiring and dismissals, rigidity of hours, amount of mandatory severance etc.).

An empirical analysis for 145 countries demonstrated the negative and statistically significant relationship between labor freedom index and corporate tax rate, which varies depending on the level of GDP per capita. This could be evidence that corporate tax rate increase leads to the worsening employment of conditions since companies do not want or cannot to cut wages. Moreover, in countries with higher GDP per capita the strength of such relationship differs from countries where GDP per capita is relatively low.

In terms of corporate tax incidence this means that in developed countries with higher GDP per capita the corporate tax burden is shifted onto workers (particularly, by worsening their employment conditions) in lesser extent compared with countries with relatively low GDP per capita.

Further analysis for 62 countries with changes of CIT rates allowed to suggest that such change in countries with low GDP per capita affects labor productivity, identifying the potential tax incidence, due to a large share of labor force employed in low-skilled and unskilled jobs, and also due to capital inflow as a result of capital market integration, that affects labor market.

For countries with higher GDP per capita is the suggested corporate tax incidence is determined by a significant part of tax-favored activity, notably R&D with high value added per worker, and also by government incentive participate in international tax competition.

Consequently, the corporate tax incidence diversely affects the labor productivity in countries with different GDP per capita, and the direction of such impact is determined by composition of labor force and openness of economy.

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