

## TAX WEDGE IN OECD COUNTRIES – A NEW EVIDENCE

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### Abstract

Taxation of labor is one of the most important areas in economy, from which government can collect their taxes. Excessive taxation however can have distortionary effect on whole labor market. Aim of this paper is therefore to provide additional empirical evidence of distortionary effect of selected tax indicator on employment in OECD countries. Annual data were collected from period 2000–2016, which should represent the most recent trend. Both fixed-effect panel estimation and dynamic panel estimation were used as a statistical method to obtain robust results. Specific characteristics of labor market such as minimum wage and negotiating power of unions were also part of analysis. Main result of this paper is a negative effect of tax wedge increase on labor force participation rate in OECD countries.

### Keywords

Employment, Labor Market, Taxation, Tax Wedge

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### I. Introduction

Taxation is always a hot topic not only among economists but also among general public as well. Especially those, who are actual taxpayers, find this topic quite important. On one hand, collection of taxes provides necessary means for public goods and services such as education, law enforcement, defense, infrastructure and many others. These public services are pillars for every modern society and economy. On the other hand, taxation burdens it's taxpayers and can change their behavior and decision-making. Some of public finance can even be allocated inefficiently and some can be only seen as form of a bureaucratic burden.

Budget planning and structure of individual revenues and expenditures of government are main tool of fiscal policy of each government. There is a big difference between fiscal composition of an emerging country and a developed one. Mainly in volume of the overall budget and in quality of public goods and services. Governments, even those in the most developed economies, faces dilemma about optimal tax structure. The key question is not just how much of financial resources to obtain but also from where and who is going to pay for it.

This paper focuses on taxation of labor, which is part of direct taxes. Especially on taxes, which are portion of labor costs of employers, the tax wedge. More about tax wedge as an indicator and current situation in OECD can be seen in chapter III. Hypothesis, that higher taxation of labor force has unfavorable effect on both supply and demand of labor market, has been tested in previous studies. In this paper I would like to present additional and updated evidence of such effect, which affects employment in OECD countries.

Scientific benefit of this study is threefold. First, I consider specific characteristic of each national labor market. The role of Unions and the real minimum wage should not be omitted when testing the effect of labor taxation. Both characteristics have unique impacts on employment in observed countries. Secondly I have used the most recent dataset from 26 out of 35 OECD countries to provide updated results. Third, two different estimation methods are used to provide robust results, while nature of dataset ensure that both estimators are efficient.

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This paper has the following structure. Section II contains overview of related empirical literature, section III focuses on the tax wedge indicator in OECD countries, section IV presents data and methodology and section V shows econometrical results. General remarks, conclusion and aim of future research can be found in chapter VI.

## II. Empirical literature review

Scientific literature offers many of previous empirical studies focused on labor taxation and possible repercussion on unemployment or employment rate. Authors tried to describe the relationship between these variables using usually regression models with unemployment or employment rate as a dependent variable and tax indicator as a regressor.

Alesina and Perotti (1997) presented a theoretical model. They econometrically confirmed its outcome on a panel of 14 OECD countries. Welfare (redistribution) efforts, which are funded by an increase in labor taxes, elevate unit labor costs. This results in loss of competitiveness and eventually in fall of employment across whole domestic economy.

Another example of a panel study is one of Daveri and Tabellini (2000). They also examined 14 OECD countries in a time span of 1965–1991. They added labor market institutions as explanatory variables. The main characteristics, by which they could divide units of their datasets, was the competitiveness of labor market. Based on power or concentration of unions in selected countries, a strong negative correlation between labor taxation and employment was found. This effect was stronger in continental Europe against rest of OECD. Daveri and Tabellini (2000) calculated a negative effect of ten percentage point increase in labor taxation to lower employment rate by 4 to 5.5 percentage point.

Nickell et al. (2003) expanded dataset used in Daveri and Tabellini (2000). 20 OECD countries in period 1961–1992 had different outcome. Negative effect of taxation increase was significantly weaker – only 1.1 percentage drop in employment rate. Explanation was that labor taxation contributes to differences among selected countries but individual labor market institutions have much bigger effect on employment or unemployment rate.

Many authors emphasize role of a single labor market characteristic in their theoretical frameworks. Wage bargaining can have significant effect on repercussion of rise in labor taxation. Structure of taxation is also important. Some authors claim, there is a huge disparity, when you burden employers or employees. Muysken et al. (1999) examined impact of tax burden on both sides of labor market. They tried to prove or disprove the Dalton's Law<sup>2</sup> with model in their study. Dalton's Law states that it does not matter, which side of the market is taxed. Their discovery was that Dalton's Law preserves but only in equilibrium model. In the wage bargain model, there are positive effects of shifting taxation from employers towards employees, which can boost employment at least in short term. Again, the wage bargain model can be analogy to highly unionized countries.

Some authors focus only on one country in their studies. Kugler and Kugler (2003) examined increase of payroll taxes in Columbia. Their results showed that ten percentage points increase in payroll taxes decreases real wages by 1.4 to 2.3 percent and employment rate by 4 to 5 percentage point. Focus on Columbia was due to the rapid increase in labor taxation in period 1980–1990. They also noticed higher drop of employment in production sector.

Festa (2012) focused on Italy in period 1970–2004. He investigated impacts of tax wedge on regional employment. He found a negative effect of tax wedge on a private dependent employment in the short-term before this can affect value of real wages. Situation is worse in north part of Italy, where is strong decentralized bargaining level, which resist impact on real wages.

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<sup>2</sup> Dalton (1954).

Góra et al. (2006) stated other factor contributing to the negative relationship between tax wedge and employment. Their study described role of worker's skill and tax wedge. Higher tax wedge burdens low-skilled workers more heavily than their high-skilled counterparts. There is higher probability of high tax wedge for low-skill workers to result in unemployment or simple inactivity.

Bassanini and Duval (2006) examined government policies and institutions affecting employment and unemployment such as unemployment benefits, tax wedge, product market regulations. They also distinguished employment rate based on age, gender and work sector. Their result for 21 OECD countries in period 1982–2003 showed a significant negative impact of high tax wedge and unemployment benefits for all groups. Ten percentage points reduction in tax wedge should than increase employment rate by 3.7 percentage point.

Last important aspect of tax wedge is not only the volume or if it is aimed mostly at employer or employee, but it's tax progressivity. This was partly examined by Góra et al. (2008) but mostly in Lehmann et al. (2016). They tested theoretical predictions on panel of 21 OECD countries in time span of 1998–2008. Tax progressivity means lower burden on workers with the lowest real wages. On the other side, the tax burden is passed on highest wage earners. This principle is one of possible redistribution tools. Similar results were expected as in Góra et al. (2006) when burdening low-skill workers because one expects them to have minimal wages.

Lehmann et al. (2016) used Coefficients of Residual Income Progression and developed a new indicator of progressivity based on OECD tax wedge indicator. They discovered that more progressive taxation of labor can improve employment, specifically employment of low-skilled workers. Tax progressivity has also unemployment reducing effect while overall labor taxation has more deepening effect on unemployment. They also found an adverse effect of tax progressivity on overall productivity per worker. They quantified that one percentage point increase in progressivity, which can be imagined as half percentage point decrease of low-income workers tax wedge and half percentage point increase of high-income workers tax wedge simultaneously<sup>3</sup>, to boost employment by 1.01 percentage point.

Negative effect of labor taxation could be minimized by effective provision of public goods and transfers according to Doménech and García (2007). They tried to check a positive correlation between unemployment and labor taxation. This simple correlation was not robust without adding labor market institutions, transfers and public goods. They found an empirical evidence of negative unemployment effects with interaction between government inefficiencies and taxation for 21 OECD countries.

Some authors who examined panel of countries in their analysis such as OECD and EU countries divided these countries to subsets and compare them among each other. García and Sala (2008) divided 21 OECD countries to three groups. Anglo-Saxon, Nordic and countries of continental Europe. They found a big role of tax wedge on unemployment in continental Europe, which is significantly weaker in other countries. They also found additional feature of European labor market. Payroll tax which is levied on employees rather than employers tend to increase unemployment significantly.

Góra et al. (2008) also distinguished new member states of EU (NMS) from additional OECD members. They did not find a statistically significant relationship between employment growth rate and tax wedge but for NMS they find a significant negative correlation. One percentage point increase in tax wedge should slow down employment growth rate by 0.53 percentage point. Dolenc and Laporšek (2010) examined 27 EU countries in period 1998–2008. They discover mild but significant negative effect of tax wedge on employment. One percentage point drop in tax wedge

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<sup>3</sup> Lehmann et al. (2015) designated low-income workers to be ones with 67% of average wage and high-income workers to have 167% of average wage.

should promote employment by 0.04 percentage point. They also divided countries to two clusters based on level of tax wedge. For countries with higher tax wedge is this negative relationship stronger.

These were examples of previous empirical scientific studies with focus on tax wedge and employment (or unemployment). Description of a tax wedge as it is used in this paper with current situation in OECD countries, is subject of next chapter.

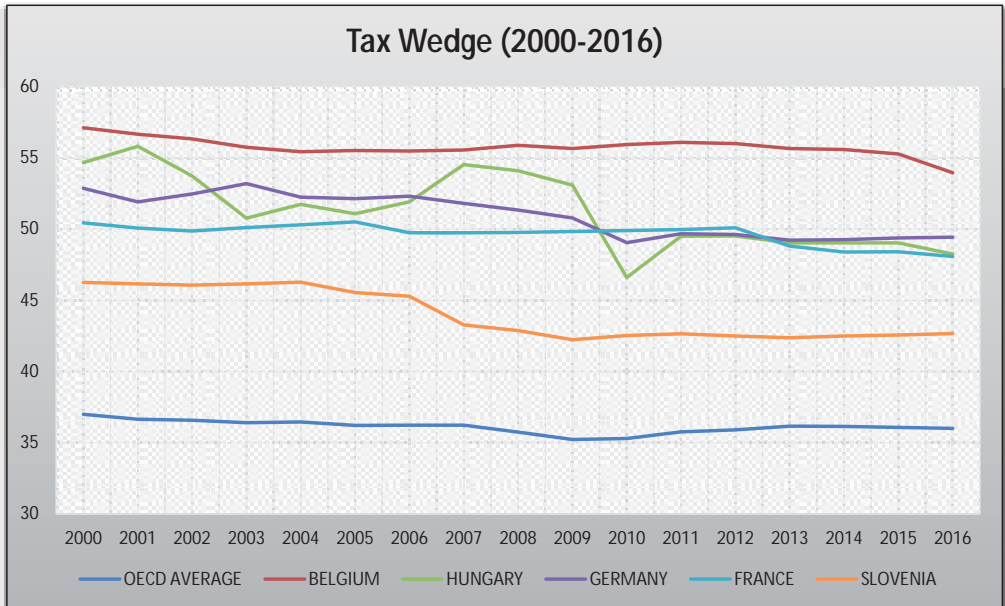
### III. Tax wedge in OECD countries

In previous chapter you can notice many authors to use tax wedge as some sort of taxation measure. Others used payroll taxes or personal income taxes as a measure of labor taxation. In this paper (as title prompt) tax wedge indicator is used. I used tax wedge defined by OECD (2017) as “the ratio between the amount of taxes paid by an average single worker (a single person at 100% of average earnings) without children and the corresponding total labor cost for the employer.”

Reason why I chose this indicator is better described in next section. It is a complex tax indicator which include personal income taxation, payroll tax, social security contribution of any kind. Outcome is total labor tax revenue from an average worker. OECD countries are substantially heterogenous considering tax wedge. There are countries such as Belgium, Hungary or Germany, which have tax wedge indicator over 50%. This means that from labor cost of an average worker more than 50 % are paid off as a tax of any form to the government. Worker therefore obtains less than half of employer labor costs.

Average tax wedge in OECD did not change in present century. It maintained steady level around 36 and 37 percent. However, there are two trends visible if you consider individual countries. Figure 1 displays countries with highest tax wedge in all OECD together with OECD average value (blue line). There is visible decreasing trend in all countries, especially Hungary (green line). Hungary managed to lower tax wedge from 55.8% in 2001 to 48.2% in 2016.

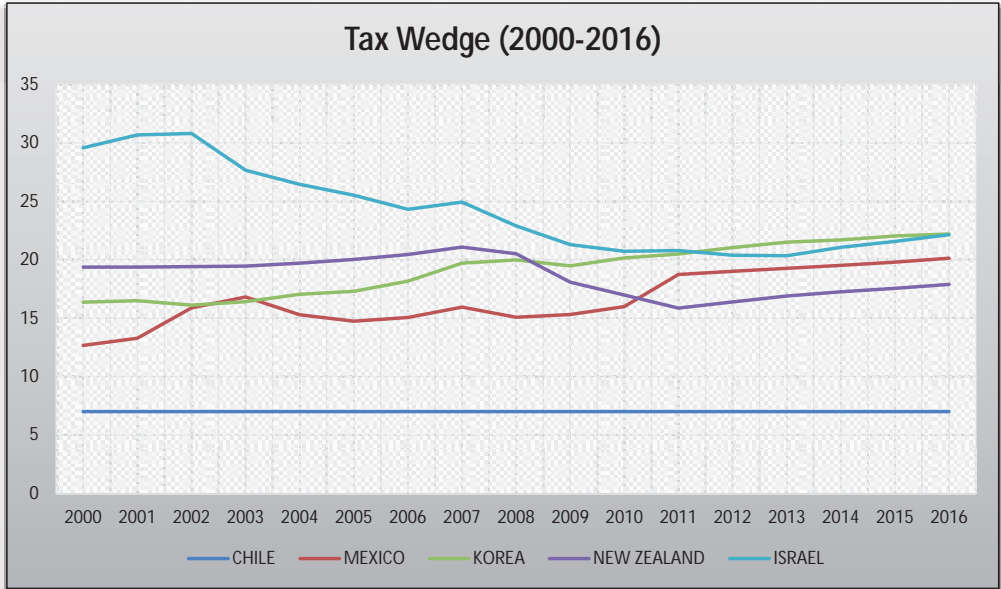
Figure 1 Tax wedge evolution in countries with highest tax wedge



Source: OECD Tax Statistics

The second trend implies countries with the lowest tax wedge and it is exactly opposite. Only exception is Chile, which has absolutely the same tax wedge through entire period. Evolution in other countries can be seen in figure 2.

Figure 2 Tax wedge evolution in countries with lowest tax wedge



Source: OECD Tax Statistics

Biggest increase in tax wedge had Mexico, from 12.7% to 20.1%. Increasing trend is visible in all four countries (Israel, Mexico, New Zealand and South Korea) in last six years. This may be some evidence of harmonization or convergence among OECD countries in taxation of labor.

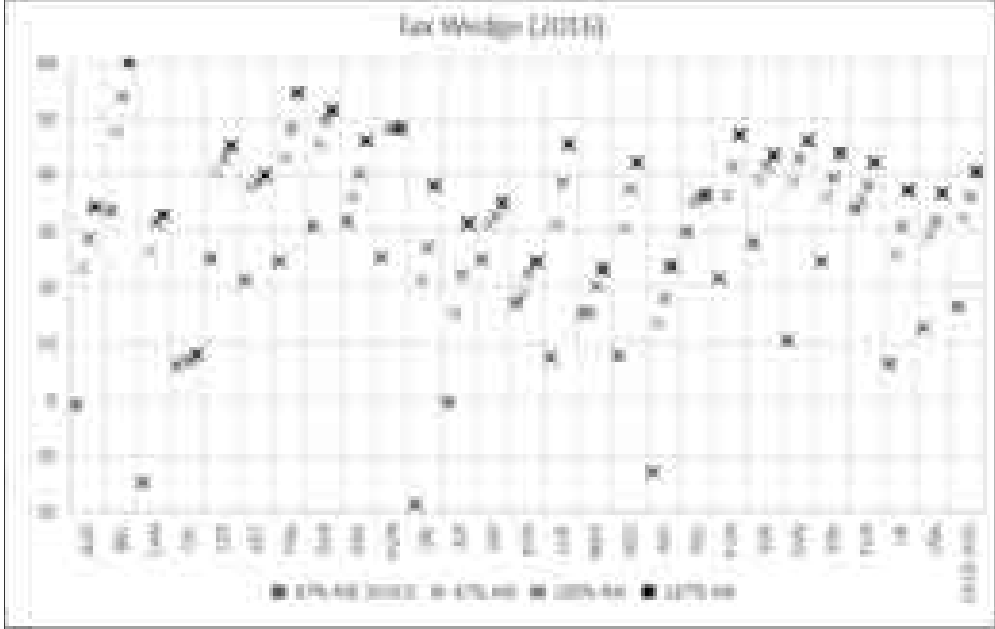
One disadvantage of this tax wedge indicator is measuring only for worker without children with average wage. To get more complex image of government policy of labor taxation, we need to expand tax wedge with progressivity and social aspect. From study of Lehmann et al. (2016) emerged knowledge to not disregard those aspects. Tax wedge in OECD was spread into 4 categories in figure 3 to better illustrate this.

Figure 3 contains data about tax wedge value of 26 OECD countries in 2016. Tax wedge is shown not only for worker without children with average wage but also for worker with wages of 67% and 167% of average. This can provide some illustration of labor tax progressivity in these countries. To add social aspect, tax wedge for worker with two children and 67% of average wage is also part of figure 3. The scale of progressivity can be visible by the spread of values for individual worker’s wages. You can notice that Hungary does not show any progressivity of labor taxation, while Chile indicate only minimal progressive tendencies, similar the Czech Republic, Estonia or Poland. On the contrary, countries such as Belgium, Ireland, Israel or Netherlands have wide spread of tax wedge values and can be marked as countries with progressive labor taxation.

Social aspect is here illustrated by difference between two workers with the same wage, one without children and the other with two children. The differential is so striking in some countries that tax

wedge can be close to zero (Australia and Israel) or even negative (Canada, Ireland and New Zealand). In the second instance, the tax subsidies are so large that they outweigh size of taxes and become transfers. This social aspect of various degree is visible in majority of countries. Exceptions are Chile, Hungary or Mexico.

**Figure 3 Tax wedge for different wage and social categories**



Source: OECD Tax Statistics, processing by author

For more detailed information and statistics about labor taxation and tax wedge, see OECD (2017).

#### IV. Data and Methodology

Annual data for this empirical study consists of 26 OECD countries<sup>4</sup> in time span of 2000–2016. I followed methodology in Dolenc and Laporšek (2010). They chose employment growth as a dependent variable and tax wedge together with macroeconomic control variables as regressors. I adjusted my research and added two labor market characteristics into a linear panel regression.

More estimation methods are used to obtain robust results. Besides fixed-effect panel regression (LSDV), there are two dynamic panel regressions with two different lagged dependent variables as instruments. Fixed-effects are used when units of research can have unobserved individual characteristics, which in case of different countries is a plausible assumption. Dynamic regression better describes the dynamics of change between regressors and dependent variables and it is effective, when number of units is larger than number of time periods, which in our case (N=26, T=17) is preserved.

Dependent variable is labor force participation rate. Independent variables are tax wedge of a childless worker with average wage together with control variables – real GDP growth rate and

<sup>4</sup> Specifically, they are in alphabetic order: Australia, Belgium, Canada, Chile, the Czech Republic (not Czechia), Estonia, France, Germany, Greece, Hungary, Ireland, Israel, Japan, South Korea, Luxembourg, Mexico, Netherlands, New Zealand, Poland, Portugal, Slovakia, Slovenia, Spain, Turkey, United Kingdom, United States of America.

inflation measured by Consumer Price Index. Union density and real minimal wage are regressors, which should refer to individual market's setting in each country. Both of these variables push on increase of employer's labor costs and should limit hiring mostly low-skilled workers. Then we can predict a negative impact on participation rate. Overview of all used variables can be found in table 1, which include definition of variables, units and descriptive statistics. All variables were obtained from OECD Statistics.

**Table 1 Definition and descriptive statistics of all variables**

Variables	Mean	Min	Max	Label
Labor force participation rate (%)	63.68	45.89 (TUR)	75.42 (NZL)	LFPR
Real GDP growth (%)	2.50	-14.21 (EST)	26.29 (IRL)	GDP
CPI Inflation rate (%)	2.97	-4.48 (IRL)	54.92 (TUR)	CPI
Tax Wedge (%)	34.88	7.00 (CHL)	57.10 (BEL)	TW
Union Density (%)	21.64	5.65 (EST)	56.35 (BEL)	Union
Annual real minimal wage (PPP's \$)	12745	1765 (MEX)	23401 (LUX)	MW

Source: Author's calculations

Panel data provides an excellent opportunity to study data internationally and over a long time-horizon. However, panel data consists of two components, cross section and time-series. The latter may have problem with non-stationarity of data. All variables were checked with ADF according to Levin et al. (2002). Presence of unit-root cannot be rejected in dependent variable, TW, UD and MW. First three variables were transformed to their respective first differences and minimal wage was transformed to percent growth-rate. Additional tests showed this procedure to solve problem with non-stationarity of present time-series.

Econometric equation, which is tested has final form of:

$$d\_LFPR_{i,t} = \alpha + \beta_1 d\_TW + \beta_2 GDP + \beta_3 CPI + \beta_4 d\_UD + \beta_5 MW + \varepsilon_{i,t} \quad (1)$$

GDP and CPI represent macroeconomic control variables. UD and MW should rectify results with labor market characteristics. Before presenting results in next chapter we can predict coefficients of independent variables. Not their size, of course, but their sign. Tax wedge creates burden in form of either employer's increased wage costs or employees lower wage. Both effects predict negative sign of this variable. Real GDP growth indicate growth of economy and possible more job opportunities, so positive sign is predicted. Inflation can distort price/wage ratio and with higher inflation to have additional negative effects on economy. Both negotiating power of unions and threshold of minimal wage mean additional labor costs for employer. So negative sign is predicted for both variables.

## V. Empirical results

Estimation results are visible in table 2. First column contains all independent variables, in second column are coefficient estimates from fixed-effect (LSDV) panel estimator and correspond to the econometric equation (1). Coefficients from dynamic panel regression are in column 3 and 4, where in third column there is only one lag of dependent variable as a regressor, while in column 4 there are two lags.

Quality of estimation can be demonstrated by coefficient of determination in LSDV regression. Value 0.55 indicates that model described by equation (1) explains 55% variability in dependent variable. I also performed Hausman test with p-value under 0.01. Use of fixed-effects is then more efficient than use of random effects or simple OLS estimator. Value of Durbin-Watson statistics is close to two, which indicates no autocorrelation. There is high number of instruments in dynamic

panel regression. Sargan's test (J-statistics lower than critical value) implies the use of lagged dependent variable as an instrument eliminated the endogeneity usual for panel data.

Results in the second column (LSDV estimator) are consistent with prediction. Real GDP growth stimulates labor participation rate. One percentage increase in average tax wedge decreases participation rate by 0.056 percentage point. There is also a mild negative effect of real minimal wage increase. Other variables are not statistically significant.

**Table 2 Estimation results of linear panel regression<sup>5</sup>**

Variables	LSDV	Dynamic AR (1)	Dynamic AR (2)
Constant	0.028 (0.332)	0.001 (0.100)	-0.000 (-0.030)
GDP	0.046*** (3.427)	0.030*** (4.263)	0.022*** (3.386)
CPI	0.004 (0.300)	0.036*** (4.403)	0.022 (1.177)
d_TW	-0.056* (-1.870)	-0.034* (-1.879)	-0.037** (-2.047)
d_UD	-0.076 (-1.492)	-0.085*** (-3.097)	-0.127*** (-3.232)
MW	-0.010* (-1.820)	0.006 (1.127)	0.005 (0.949)
d_LFRP(-1)		0.259*** (2.980)	0.305** (2.281)
d_LFRP(-2)			0.136 (0.959)
Number of observations	329	279	254
R <sup>2</sup>	0.550		
DW	1.600		
Number of instruments		81	80
J-statistics		19.010	18.515

Source: Author's calculations

Estimates in third and fourth column are slightly different from those in second column. Now there is a strong significant relationship between density of unions and participation rate, which is negative. Effect of minimal wage is not significant anymore. Result for tax wedge are slightly changed but show persistent negative trend. Role of real GDP growth is still positive and statistically significant.

Based on our estimation results, ten percentage points drop in tax wedge should boost employment by 0.34 up to 0.56 percentage point. If we compare it with results in previous empirical studies, the negative effect of tax wedge can be classified as minimal but still present. Numerically are results

<sup>5</sup> Appropriate t-statistics for each variable are listed in parentheses. The number of stars next to each coefficient represents significance level: (\*) 10%, (\*\*) 5% and (\*\*\*) 1%. Robust (HAC) standard errors were used in the estimation of LSDV. All coefficients and statistics are round to three decimal points. Labor force participation rate is a dependent variable.

similar to those in Dolenc and Laporšek (2010). Reason of this mild impact can be perhaps explained by decreasing trend of tax wedge in the most tax burdened economies.

## VI. Conclusion

Taxation of labor belongs to closely watched government policies by the general public and especially employers. There are many ways to measure taxation of labor. This study focuses on the tax wedge, which quantify overall taxation of employer's wage cost and contains not only personal income tax but also payroll tax and social security contribution.

Member states of OECD are heterogenous in their tax policies, which has been shown in section III on example of labor tax wedge. Results of our analysis cannot be related to one individual country. However, it can show a common trend in countries OECD on average. Last fifteen years is a period, in which economies with highest labor tax burden showed steady decline in labor taxation. This might have contributed to boost in aggregate employment.

Many articles have been written on a topic of taxation and impacts on employment or unemployment. This study does not contain any groundbreaking discoveries but provides additional evidence to relatively uniformed results as was stated in introduction as the aim of this paper. This study also constitutes a base model for future research. This simple analysis only showed effect of average tax wedge, but there are other factors which should be also included. Tax progressivity have effect on both employment and productivity according to previous studies. It is imperative for any policy maker to better understand this tradeoff to design an optimal policy together with other policies, which influence labor market, such as minimal wage and unemployment benefits. Future analyses will target division of developed economies on these policy criteria. This may hopefully create more homogenous clusters of economies and provide more concrete information about repercussion of their current tax policies.

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