

## The effects of tax policy and labour market institutions on income inequality\*

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### Abstract

*The purpose of this research is to investigate how labor market institutions and regulations and tax policies effect income inequality across the European member countries. The sample contains the fifteen core European Union (EU) members as well as thirteen Central and Eastern European (CEE) economies which have recently joined. Using fixed and random effect panel models over the sample period 2000–2011 we test the influence of three major tax forms (labor, capital and consumption), social security contributions, and labor market institutions. We demonstrate that the overall social contributions and labor taxes lead to statistically significant improvements in income inequality among EU member states. We conclude that tax policy, specifically the choice of taxes implemented, and labor market institutions, union membership in particular, reduce income inequality in the EU-28 in the observed period.*

**Key words:** income inequality, taxes, corruption, labor market institutions, education

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## 1. Introduction

In this paper we discuss and analyze the effects labor market institutions and tax policies have on income inequality across the European Union which includes Croatia as its newest member. We consider income inequality in the European Union during the process of enlargement because inequality across member countries is driven by structural differences across the fifteen “core” EU15 economies and the thirteen new member states (EU13) which make up the European Union (EU). Special attention is paid to discussing income inequality in Croatia. Questions regarding income inequality, such as redistributive role of taxes, transfers and other expenditure policies will also be discussed. Overall, we consider the EU economies as a whole but elaborate on the differences between the new and the old member states because of heterogeneous levels of development and policy across the EU.

Contemporary labor economics is increasingly concerned with the issue of labor institutions/regulations impact on markets and economic outcomes. The overarching goal of labor market policies is income redistribution, therefore, it can be an effective at reducing income inequality. Labor market institutions include: (1) social protection systems (programs and unemployment benefits, early retirement system, and various social forms of income support); (2) different aspects of labor legislation (law on minimum wages, employment protection legislation and the enforcement of the legislation); (3) the implementation of active labor market policies, and (4) participation in trade unions and collective bargaining. One concentration of this paper is the role labor market policies (active and passive one) and union power have on inequality.

While wage and salary differentials are standard contributors to income inequality, transfer payments, taxes, and social security contributions play a role in counteracting it. Similarly, fiscal authorities use progressive taxation to distribute income more equally. Limits of the effectiveness of such policies depend on how individuals and firms respond to changes in relative prices and other elasticities.

This paper presents a hypothesis that implementation of selected labor market institutions/regulations and fiscal measures influence inequality reduction. Additionally, determinants of social security contributions, labor market institutions (participation in trade unions and labor market policies), education and three major tax forms (labor, capital and consumption) as well as other relevant measures related to tax policy will be tested.

The remainder of the paper is organized as follows. Section 2 summarizes the extant literature on the determinants of inequality in developed and transition countries; Section 3 presents used methodology and comparative evidence on inequality trends and highlights examples in which labor market and fiscal policy are used to

reduce inequality in European Union member states. This section also elaborates causes of rising income inequality in Croatia. In Section 4 we discuss the data used and summarize the empirical strategy and in Section 5 we present our main results and discuss them. Section 6 gives some concluding recommendations.

## **2. Literature review**

While, defining income inequality from an economic perspective is relatively easy and is frequently used as an indicator of relative poverty or prosperity and as an argument for income redistribution policies, the difficulty lies in understanding its origins. Previous studies, put the emphasis on family structure, technology, globalized markets, immigration, property rights or trade. Others focus on the regulatory reforms and institutional changes and show the effects achieved with these measures are contradictory. On one hand, they increase employment possibilities, however, regulations can also contribute to wider wage disparities.

Globalization is frequently cited as a leading cause for rising income inequality, though questions arise on how this occurs. Some studies, e.g. Jaumotte et al. (2008), find that rising imports from developing countries influence income inequality reduction in advanced countries. Others find that increased trade integration is responsible for increased income inequality in both high and low-wage countries as in Milanovic and Squire (2005). Krugman (2007) and Scheve and Slaughter (2007) suggest that globalization has a significant impact on income distribution in the United States mainly due to trade, foreign direct investment and offshore activities. The new financial crisis made these inequalities worse in innumerable ways, beyond the higher unemployment, lost homes, stagnating wages (Stiglitz, 2012: 3).

Other studies stress technological progress as an important catalyst in widening income inequality. The role played by technology in raising inequality is straightforward: technological progress changes the type of labor demanded in the labor market and creates jobs previously non-existent, shifting labor demand from low to high skilled labor. It should be noted the use of technology reduces consumption good's prices which may improve the welfare of lower income households.

Studies which examine the role of education in income inequality have proven the importance of "up-skilling" the labor force, such as Saint-Paul and Verdier (1992), Eckstein and Zilcha (1994) and Zhang (1996). Karaman Aksentijević et al. (2006) identify education as the most influential area of economic and social policy which reduces poverty and economic inequality in Croatia over the long term.

Next we explore how the effects of tax and transfer policies on income inequality and elaborate differences on the extent of redistribution in developed and transition countries. We use Meltzer and Richard's (1981) argument that the median voter's

interest in redistribution will be greater in more unequal societies as a starting point of our investigation. Several papers have already tested this hypothesis (Milanovic, 2000; Kenworthy and Pontusson, 2005; de Mello and Tiongson, 2006; Lupu and Pontusson, 2011) and come to various conclusions. An earlier theory from Alesina and Rodrik (1994) and Persson and Tabellini (1994) demonstrate that countries with more income inequality are more likely to suffer from political instability. Similar theories have been earlier developed by Alesina and Rodrik (1994) and Persson and Tabellini (1994). It is also very intriguing how Alesina and Perotti (1996) highlight countries with more income inequality are more likely to suffer from political instability.

Studies confirm that public cash transfers (as for example passive labor market policies), as well as income taxes and social security contributions played a major role in reducing market-income inequality. Estimates using the working-age population show an average reduction in income equality, as measured by the Gini coefficient, of about 25% across OECD countries (OECD, 2011: 36). The final quarter of the past century experienced an increase in annual working time of production workers not only in the US but in Sweden as well (Bowles, 2012: 162). In OECD countries the Gini coefficient averaged 0.29 in the mid-1980s. By the late 2000s, however, it had increased by roughly 10% to 0.32, rising in 17 of the 22 OECD countries (OECD, 2011: 22). Different measures for Croatia, Gini coefficients (separately measured for employed, retirees, small business and taxpayers) calculated by Sever and Drezgić (2003) were between 0.38 and 0.41 over the period 1995 to 2001. They conclude that the overall values of the total Gini coefficients are very high what characterizes societies of typical liberal capitalism and confirm that the previous Croatian fiscal and tax system increased income inequalities.

There are only a few empirical studies on the determinants of inequality in transition countries. Mitra and Yemetsov (2006) illustrate how the liberalization of capital, goods and services, labor markets, privatization of state-owned enterprises and establishment of new institutions lead to a heterogeneous increase in inequality across transition economies. They find that the republics of the former Soviet Union, not including the three Baltic republics, endured a rapid rise in inequality, whereas the EU13 experienced a smaller and more gradual increase in inequality. Giammatteo (2006) argues that the redistribution policies allowed governments to contain rising inequality during the transition period. Nestić (2002) concludes that changes in inequality in Croatia between 1973-1998 were mild due to an expansion of social transfers and the absence of major wage increases. Šućur (2011) looks at the impact of pensions and other social contributions on gross and disposable income inequality in Croatia during the period 2001–2009 and demonstrates that the inequality reduction effects of state transfers were not as effective as expected.

Changes in labor market institutions, policies and regulations in general are negatively correlated, albeit very modestly in most cases, with changes in wage dispersion within countries. Milanovic (1999) argues that the observed increase in inequality in transition countries is driven mainly by higher inequality in wage distribution. Galbraith (2012) shows that more equal societies systematically enjoy lower unemployment. Keane and Prasad (2002) also find that the reallocation of workers from the public sector with a compressed wage distribution to the private sector with much higher wage inequality, accounts for the bulk of increased earning inequality during transition. They also highlight the role that increased social transfers have on limiting increases in inequality. Koeninger et al. (2007) show that labor market institutions and policies account for much of the change in wage inequality: the authors argue that union density, employment protection, tax wedges, levels and duration of benefit replacement rates, and the minimum wage all negatively affect the wage differential.

Finally, research also focuses on the relationship between corruption and income inequality. Gupta et al. (2002) present arguments which confirm that high and rising corruption increases income inequality and poverty through several channels. An important implication of their findings is that policies that reduce corruption will most likely reduce income inequality and poverty as well.

### 3. Methodology and conception of analysis

We employ fixed and random effect panel models given by

$$Gini_{it} = \alpha + x'_{it}\theta + \epsilon_{it}, \quad i = 1, \dots, N \text{ and } t = 1, \dots, T \quad (1)$$

where  $Gini \in (0,1)$  is the Gini coefficient and the regressors are defined as

$$x_{it} = (Tax_{it}, UD_{it}; z_{it})'$$

Tax is the various average tax rates, defined alternatively as total, social contributions, labor, capital, and consumption taxes; and  $UD$  is union density.  $z$  is the vector of country specific control variables

$$z = (EDUC-3, \ln(RGDPPC), Debt-GDP, \ln(CPI))'$$

where  $EDUC-3$  is a measure of tertiary education;  $RGDPPC$  real per capita real GDP;  $Debt-GDP$  is the debt-to-GDP ratio; and  $CPI$  is the Corruption Perception Index, details below.  $\alpha$  is a scalar

The error term can be decomposed as  $\epsilon_{it} = \mu_i + u_{it}$  where  $\mu_i$  is a time invariant unobservable country specific effect and  $u_{it}$  is the composite error term. Equation (1) nests the two standard panel models used. If  $\mu_i$  is fixed for each of the  $N$  countries, with the orthogonality condition  $E(\mu_i \epsilon_{it}) = 0$ , and  $\alpha = 0$ , equation (1) is a fixed effect model. On the other hand, if  $\mu_i$  is random with  $\mu_i \sim iid(0, \sigma_\mu^2)$ ,  $E(\mu_i x_{it}) = 0$ , and

$\alpha \neq 0$  equation (1) is the random effects model. The term  $E(\mu_i x_{it}) = 0$  represents the orthogonality condition that the fixed effects and regressors are uncorrelated.

*Ex-ante* we anticipate that estimated coefficients on taxes, particularly labor, social contributions, and, hence, total taxes, to be negative because of the redistributive effects of taxes. On the other hand, lower capital taxes are likely to worsen income inequality and hence have a positive estimated coefficient. Given that VAT is levied on consumption the impacts on inequality are likely to be ambiguous. The redistributive effects of increased union membership should improve income equality, see Burniaux et al. (2006) and Checchi and Garcia-Peñalosa, (2005).

For the control variables, positive relationships are likely to exist for education and, possibly per capita real GDP. The size of the government, proxied by the debt-to-GDP ratio is ambiguous as this elasticity depends on the nature of government spending. Because debt accumulates because of either government consumption *and/or* transfer payments higher debt could be the result of redistribution, which would ameliorate inequality, or expenditures, might have a negligible impact. In a subsample of our countries, there is a potentially close association to the debt-to-GDP ratio to corruption. The CPI index accounts for this, because a higher score reflects a lower level of perceived corruption will improve inequality yielding a negative estimated coefficient.

### 3.1. The role of taxes and social contributions in reducing income inequality

Tax policy can play a major role in making post-tax income distribution more equal. In addition, taxes are the most important and abundant public revenue. Taxes and social contributions finance public expenditures on pensions, social security system, health, education and provide potential economic protection to citizens. A widespread view is that progressive taxation of income is one of the main ways for governments to distribute income. Since World War II tax policy has become one of the major instruments in achieving social and economic policy goals.

The goal of every modern tax system is efficiency, that is a system that harmonizes the effects and goals of tax policy. But this is difficult to achieve because of unforeseen incentives and externalities associated with tax policy choices. Therefore, it is not sufficient to know if taxes are regressive or progressive, but also how they affect behavior. For example, raising the value added tax (VAT) rate leads to regressive consumption taxes. But this negative effect can be mitigated by using progressive tax rates of personal income taxes, or transfer payments to low income households. Or regressive the effects of consumption taxes can be reduced by lowering VAT rates on staples.<sup>4</sup>

<sup>4</sup> Goods and services subject to reduced or 0% VAT rate are similar in the EU15 and the EU12 and like in the Croatia are connected with exemption of foods, drugs, newspapers etc.



Crossen (1992) argues that although more tax rates in the VAT system can satisfy politicians it is an administratively inadequate, non-sustainable, and complicated method for reducing tax burden for low income families. It is still politically very popular to use reduced VAT tax rates regardless of their proven relative ineffectiveness.

The tax systems of EU member states are quite different and were largely introduced when the economies were relatively closed.<sup>5</sup> We can divide the EU member states into two sub-samples. One is consistent with so called old European member states or EU15 and the other from EU13.<sup>6</sup>

Tax systems in the EU15 member states are relatively well established and less adept to changes. On the other hand, the EU13 member states are required to change their tax systems due to the transition process and accession to the EU and, generally, have more homogeneous tax systems.<sup>7</sup> Among the EU15 interesting differences still exist. In the Nordic countries<sup>8</sup> the largest tax burdens are direct taxes, while Greece and Portugal use more indirect taxes. Denmark finances the majority of the social safety net with direct taxes and not through social insurance contributions. In Germany and France there is a considerable burden from social contributions. Overall, tax-to-GDP ratios are generally significantly higher in the EU15 member states than in the EU13 member states.

The tax systems in the EU new member states are more transparent and less complicated, though not necessarily more efficient. The difference between them is also visible in shares of revenues from different type of taxes. EU15 economies raise roughly equal shares of revenues from direct taxes, indirect taxes, and social contributions while the EU13 member states display a lower share of direct taxes in total.<sup>9</sup>

Some EU13 economies have adopted a flat tax rate system and collect less revenue from direct taxes, because of lower direct tax rates.<sup>10</sup> While the overall tax levels are lower in the EU13 member states, this may not apply to labor taxation, in Hungary and the Czech Republic implicit tax rates are well above the EU average.

<sup>5</sup> Those are primarily the tax systems of the EU15.

<sup>6</sup> The EU15 include: Belgium, Germany, France, Luxemburg and Netherlands, Denmark, Ireland, Greece, Spain, Cyprus, Hungary, Malta, Austria, Portugal, Finland, Sweden and United Kingdom. The EU13 include: the Czech Republic, Estonia, Cyprus, Latvia, Lithuania, Hungary, Malta, Poland, Slovenia, Slovakia, Bulgaria, Romania, and Croatia.

<sup>7</sup> Transition economies have departed from pure income-based or consumption-based orientation of tax systems.

<sup>8</sup> Denmark, Sweden and Finland.

<sup>9</sup> This not the case in Malta.

<sup>10</sup> In 2011 the lowest shares of direct taxes (Eurostat, 2013) were in Lithuania (only 17% of the total, markedly down from 31% in 2008), Bulgaria (18.9% of the total), Hungary (18.7%) and Slovakia (19.1%).

Croatia, which gained accession to the European Union in 2013, shares some above mentioned characteristics of other EU13 tax systems, but has some idiosyncrasies. One of them is the large share of consumption taxes in total taxes and tax treatment of capital income which is in general a little more favorable than in other transition countries. In addition, tax systems in the EU13 are relatively unstable as these economies made changes in response to the recent economic crises.

Answering the question what is the cause of income inequality and how is it related to tax policies can be complicated. Although, progressive income taxation typically ameliorates inequality it can also have unintended consequences, particularly if taxes are highly progressive. If governments raises income tax rates for upper incomes individuals may respond by taking steps to reduce their taxable income. That can be achieved either by substituting work for leisure<sup>11</sup> (productivity response) or through tax avoidance.<sup>12</sup> Thus such policies may worsen income distribution.

### **3.2. The role of labor market institutions and education in reducing income inequality**

The rise in wage inequality since the 1980s coincided with more moderate labor market institutions and policies, such as trade unions and minimum wage laws. It has been argued that the declining role of labor institutions and policies have significantly reduced the government's ability to redistribute income thus exacerbating distribution. Recent studies confirm the influence of labor market institutions and policies has declined over time in many OECD countries (OECD, 2011: 99). The current economic crisis also shows that increased unemployment is one of the major sources of inequality and labor market policies are a potential instrument for reducing inequality: "Unemployment – the inability of the market to generate jobs for so many citizens – is the worst failure of the market, the greatest source of inefficiency, and a major cause of inequality" (Stiglitz, 2012: xii).

Over the sample period trade union density rates, defined as the percentage of workers who are union members, have fallen across the majority of the sample countries. There are number of reasons for the decline in union density in new and old EU member states. The trend of union decline is a result of numerous factors: An unfavorable political environment; managerial opposition; employees' career loyalty instead of loyalty to collective aims; union leader infighting; deindustrialization; the rise of the less unionized service sectors; high unemployment; and the growing number of small and medium-sized enterprises, see Obadić and Pološki Vokić (2012). Union membership does not adequately

<sup>11</sup> Such as more vacation time or retirement.

<sup>12</sup> This is a case of tax evasion.



capture the bargaining coverage – an issue particularly important in France and Spain where the density is relatively low (around 7-8% in 2010), but the bargaining power is strong (more than 90% of workers are covered with collective agreements). In Croatia, union membership in 2010 was 34.7% and the proportion of collective agreements significantly over EU average (61%). This can be considered relatively satisfactory since it is significantly above the average of the EU13 and because collective bargaining as it exists today in the countries of Central and Eastern Europe were unknown before year 1989 (Obadić, 2012: 118-120).

In Sweden, the recent rise in income inequality is associated with declining trade union membership beginning in the early 1990s and particularly since 2006 (OECD, 2011: 102). As Noah (2012) emphasizes, the rise of inequality has coincided with a dramatic decline in the power of organized labor. Union membership in the United States reached its historic peak in 1979 at about 21 percent of the workforce, but currently it represents about 12 percent. Although the chief purpose of a union is to maximize the income of its members, one might think that higher union membership would increase income inequality. But Freeman (1980) demonstrated that union's ability to reduce income disparities among members outweighed other factors, and therefore their net effect was to reduce income inequality, see Noah (2012).

In relative terms, total expenditure for labor market policies in EU member states represents just fewer than 2% of GDP of member states (excluding Greece). The highest relative level of expenditure in 2011 was reported in Belgium and Denmark (both 3.7 % of GDP), followed by Ireland and Spain (both 3.6% of GDP) – the only other EU member states to spend more than 3% of their GDP on such policies. Conversely, ten member states spent less than 1% of GDP on LMP: Bulgaria, the Czech Republic, Estonia, Latvia, Lithuania, Malta, Poland, Romania, Slovakia, the United Kingdom, and Croatia are about 0.5% of GDP (Eurostat, 2013). Generally, EU13 countries rank at the bottom of LMP spending (as a share of GDP) compared to EU15 countries.

Policy and institutional reforms contribute to widening wage disparities, as low skill workers enter the labor market and highly skilled benefit from a more dynamic economy. Decreasing benefit replacement rates for low-wage workers increase up wage dispersion – lower replacement rates mean lower reservation wages (OECD, 2011: 31). It has been hypothesized that high replacement rates would strengthen the bargaining position of lower-paid workers more than that of higher-paid workers, and hence would lower the wage differential. Higher unemployment insurance replacement rates are negatively associated with wage dispersion (OECD, 2011: 104-119).

Vanhoudt (1997) analyzes the impact of labor market policies on income inequality in member states of OECD. He finds that the Gini coefficient is not affected by

labor market policies, although other measures of inequality are. Specifically, he finds that active labor market policies – such as expenditures for public employment services, labor market training and subsidized employment – improve the income share of the bottom quintiles of the population and reduce the income gap between the top and bottom quintiles. Passive labor market policies (for example, compensation schemes) have a minor impact.

Countries with high graduation rates at the tertiary level are also those most likely to develop or maintain a highly skilled labor force. The emerging knowledge-based information economy requires a large supply of highly skilled people, particularly for tertiary graduates – especially in the fields of science and engineering. It should be noted that union membership and education are generally negatively correlated. However, education and union membership in the public sector are positively correlated in Denmark, Ireland, Iceland, Netherlands, Norway, Germany, Poland, the U.S. and the UK (Blanchflower, 2006). Most commonly, the most qualified and many low-skilled unemployed are not in union, so the membership is concentrated around medium-skilled jobs.

Economists have put forward alternative reasons for the rise in income inequality in developed and developing countries since 1970s. Some support the “new technologies” arguments which states that new technologies put premium on skills associated with higher education, for example Murphy and Welch (1989). Skill wage premia have risen rapidly in the past generation exacerbating income distribution. Saint-Paul and Verdier (1992), Eckstein and Zilcha (1994) and Zhang (1996) develop models where continued support for public education lowers the level of income inequality over time. However, Jimenez (1986) argues that many public education expenditures do not benefit the poor at all and, hence, do not reduce income inequality, as does Fields (1989).

Ram (1989) reviews previous theoretical and empirical research and concludes there is not strong support for increasing education lowers income inequality. Carnoy et al. (2012) examine various aspects of the complex relationship between higher education expansion and income inequality in developing countries (BRIC countries – Brazil, Russia, India and China). Their results show that mass higher education expansion did not appear to have decreased income inequality. In fact, their analysis suggests that higher education expansion contributed to greater inequality in China.

## 4. Empirical data and analysis

### 4.1. Empirical data

The sample analyzed is for the 28 EU economies, the “core” fifteen predominately western economies and the thirteen newly admitted Central and Eastern European economies using annual data from 2000–2011. We use the Gini coefficient as the measure of income inequality, which is between 0 and 1. The overall tax burden is the sum of four components:

- *Social contributions* (hereafter “social” taxes), includes include both compulsory and voluntary social contributions;
- *Labor* (earned income), taxes on wage and/or salary income, includes social contributions;
- *Capital*, taxes on business income; and
- *Consumption* (VAT), taxes levied on final consumption;

all are measured as percentage of GDP. To measure the impacts of labor institutions we use union density (UD) which is the percentage of union membership to all wage and salary earners, from Visser (2014).

Control variables include the percentage of 30-34 year olds who have completed a tertiary (university) level of education (EDUC-3) per capital real GDP (PCRGDP) in euro; and the debt-to-GDP ratio (Debt-GDP), to measure the size of government expenditure. To account for the distributive effects of corruption, we use the Corruption Perceptions Index (CPI) from Transparency International which is between 0 and 10 with 10 being the least corrupt.

### 4.2. Descriptive statistics and empirical analysis

Table 1 provides descriptive statistics for our sample period. The total number of observations, overall panel mean,  $\frac{1}{NT} \sum_i \sum_t x_{it}$ ; the standard deviation, and the minimum and maximum for each variable.

Table 1: Descriptive statistics

Variables	N × T	Mean	Std. Dev.	Min	Max
Gini	286	29.292	4.001	22.00	38.90
Taxes					
Total	335	36.204	5.992	26.00	51.50
Social Contributions	335	10.933	3.603	1.00	17.10
Labor	336	16.687	5.868	0.40	30.80
Capital	336	6.876	2.662	1.10	14.00
Consumption	336	12.203	1.928	7.30	19.10
UD	233	31.839	19.647	7.10	80.10
EDUC-3	330	19.903	7.043	4.90	35.30
ln(PCRGDP)	336	9.648	0.783	7.70	11.16
Debt-GDP	335	50.492	28.440	3.70	170.30
ln(CPI)	329	1.783	0.331	0.96	2.30

Source: Authors

Concentrating first on taxes see that, on average, the largest share of taxes is generated by labor income with 16.7% of GDP, the smallest is on capital at about 6.9% of GDP. Over the sample period, these percentages remain more or less the same. Overall taxes vary from a low of 26% of GDP to a high of 51.1%. Somewhat surprising is the difference in the union density rate, while the average percentage of wage earners is 32%, the low is 7.1% and the high of 80%. Turning our attention to the percentage of adults with a tertiary education is 32% with a low of 4.9% and a max of 35%.

## 5. Results and discussion

### 5.1. Results

We began our analysis by conducting Breusch-Pagan random effect tests under the null that variance of the errors of OLS regressions with time fixed effects are constant across the N countries. We soundly rejected the null  $\sigma_{u,i}^2 = \sigma_{u,j}^2 \forall i \neq j$  economies and conclude that panel models are appropriate.

Table 2: Random effects model – dependent variable: Gini coefficient

Variables	Total	Social Contributions	Labor	Capital	Consumption
	(1)	(2)	(3)	(4)	(5)
Tax	-0.257*** (0.001)	-0.493*** (0.000)	-0.406*** (0.000)	0.101 (0.424)	-0.036 (0.847)
UD	-0.036 (0.192)	-0.092*** (0.000)	-0.024 (0.374)	-0.067** (0.018)	-0.067** (0.020)
EDUC-3	0.931 (0.286)	0.695 (0.415)	1.131 (0.188)	1.014 (0.277)	0.921 (0.324)
ln(PCRGDP)	1.262 (0.214)	0.346 (0.720)	0.895 (0.366)	0.362 (0.755)	0.651 (0.560)
Debt-GDP	-0.008 (0.402)	0.003 (0.740)	0.001 (0.884)	-0.005 (0.595)	-0.008 (0.436)
CPI	-3.716** (0.016)	-4.313*** (0.004)	-3.598** (0.017)	-4.274*** (0.006)	-4.271*** (0.008)
Constant	31.77*** (0.000)	39.81*** (0.000)	31.39*** (0.000)	31.97 (0.000)	30.65*** (0.001)
$p_w(\text{Tax-UD})$	0.000	0.000	0.000	0.041	0.061
Hausman	0.231	0.380	0.109	0.734	0.802
Sargan-Hansen	0.225	0.378	0.100	0.741	0.808
$R^2_o$	0.362	0.472	0.447	0.281	0.256
T × N	199	199	199	199	199

Notes:  $p$ -values in parenthesis, \*\*\*, \*\*, \* denote statistical significance at the 1%, 5%, and 10% levels respectively.  $p_w(\text{Tax-UD})$  is the  $p$ -value on a Wald jointly testing  $\text{Tax} = \text{UD} = 0$ . The Hausman statistic is the  $p$ -value of a  $\chi^2(5)$  test and the Sargan-Hansen statistic is the  $p$ -value of a Wald test for over identified orthogonality restrictions.  $R^2_o$  is the overall  $R^2$ . OLS results are available on request.

Source: Authors

Results of the random and fixed effects models are in Tables 2 and 3 respectively. Columns (1) – (5) represent different model specifications and is dependent on which tax rate is used: total taxes (1), social (2), labor (3), capital (4), or consumption (5) respectively.  $p$ -values are in parenthesis, stars are used as standard to denote statistical significance. Wald tests are conducted to jointly test  $\text{Tax} = \text{Union Density} = 0$ ,  $p$ -values of these tests are denoted as  $p_w(\text{Tax-UD})$ . We also present the overall- $R^2$  and the number of observations,  $T \times N$ .

Table 3: Results fixed effects model –dependent variable: Gini coefficient

Variables	Total	Social Contributions	Labor	Capital	Consumption
	(1)	(2)	(3)	(4)	(5)
Tax	- 0.246***	-0.454***	-0.593***	0.040	-0.003
	(0.008)	(0.007)	(0.000)	(0.768)	(0.987)
UD	-0.023	-0.045	-0.010	-0.047	-0.046
	(0.657)	(0.387)	(0.850)	(0.374)	(0.384)
EDUC-3	1.165	1.158	1.428	0.903	0.896
	(0.305)	(0.308)	(0.196)	(0.435)	(0.439)
PCRGDP	1.257	0.706	0.175	1.070	1.179
	(0.510)	(0.712)	(0.925)	(0.589)	(0.547)
Debt-GDP	-0.015	-0.005	-0.003	-0.009	-0.010
	(0.172)	(0.658)	(0.808)	(0.449)	(0.371)
CPI	-3.998**	-4.373***	-4.756***	-4.365***	-4.349**
	(0.017)	(0.009)	(0.003)	(0.010)	(0.012)
Constant	31.37*	33.57*	43.37**	25.45	24.78
	(0.088)	(0.069)	(0.017)	(0.173)	(0.189)
$p_W(\text{Tax-UD})$	0.021	0.019	0.000	0.655	0.684
$R^2_o$	0.325	0.354	0.416	0.257	0.240
T × N	199	199	199	199	199

Notes:  $p$ -values in parenthesis, \*\*\*, \*\*, \* denote statistical significance at the 1%, 5%, and 10% levels respectively.  $p_W(\text{Tax-UD})$  is the  $p$ -value on a Wald jointly testing  $\text{Tax} = \text{UD} = 0$ .  $R^2_o$  is the overall  $R^2$ .

Source: Authors

In Table 2 we also provide the results of two tests which are used to determine which of the panel regressions is the “best” model: the Hausman efficient estimator and the Sargan-Hansen overidentifying tests. While these tests are not specifically intended to test for the appropriate panel model, low estimated  $p$ -values, at, say,  $p \leq 5\%$ , are generally interpreted as a rejection of the random effects model (See Baltagi, 2013: 24-25). And  $p$ -values for the Hausman and Sargan-Hansen tests favor the random effects model.



## 5.2. Discussion

Turning our attention to the estimates we see that the overall, labor, social contributions and labor taxes are negative and statistically significant at the 1% level. Consumption taxes have a negligible negative impact inequality. As hypothesized, higher capital rates exacerbate inequality, but estimates are not significant. The estimates are consistent across the two models. The largest tax elasticity, in absolute value, in the random effects model is for social contributions while for the panel model it is labor taxes. Estimated coefficients for union density,  $UD$ , are all negative, as posited.<sup>13</sup> However, the estimates are significant only in the random effects model and when matched with social, capital, and consumption taxes.

Notably, while the estimated coefficients for education are of the correct sign, it has no statistically significant impact on income inequality in any of the model specifications. Similarly, the positive impact of per capita real GDP is not statistically significant. Nor is the debt-to-GDP ratio and while the estimates are generally negative, the estimated coefficients are effectively equal to zero. Finally, less corruption is a strong indicator of better income distribution, most of the estimates are greater than 4.0 in absolute value and significant at roughly the 1% level. Wald tests for the joint restriction  $Tax = UD = 0$  are generally rejected.

The applied fixed and random effect panel models show that the taxes on labor and social contributions and falling union membership are associated with an increase in inequality. And that's what labor organizing is like three decades into the Great Divergence as Noah (2012) concluded. Our results show that tertiary education does not impact income inequality, but results are informative. Using OLS with time fixed effects, education are statistically significant with positive sign, but not with the panel models. Such results correspond with those of Ram (1989) who concludes that there is not strong support that increasing education within the population lowers income inequality and Carnoy, et al. (2012) who find that investing in higher education did not appear to reduce income inequality.

## 6. Conclusion

The aim of this paper is to identify the effects of tax policies and labor market institutions on income inequality across EU member states with emphasis on the Croatia economy. The paper includes theoretical background, comparison of present differences among the taxation systems of the EU member states, and advantages and disadvantages of different types of taxes and labor market institutions. We

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<sup>13</sup> We also experimented with the three definitions of labor market policy (LMP) interventions as defined in Visser (2014), LMP total categories 1-9, LMP categories 2-7, and LMP categories 8-9. Only LMP categories 2-7 (or labor market measures – active labor market policies) were statistically significant and were similar to the results for union density.

use panel analysis and conclude that participation in trade unions and tax policies reduce income inequality in EU-15 and EU-13 countries in 2000–2011 period, which proves our initial hypothesis. This research provides new evidence using a cross section of established EU and new EU entrant countries on the impacts of tax policy and labor market institutions on income inequality. We show that taxes, particularly labor, social contribution, and overall taxes do ameliorate income inequality in the sample countries. Moreover, union membership contributes to reductions in income inequality when a random effects model is used. Interestingly, tertiary education has no statistically significant impact on inequality in our results. Perhaps predictably, rising corruption exacerbates inequality. Whereas taxes and transfers have significant redistributive impact and this development affect income inequality and depend on the type of tax implanted. Social security contributions and consumption taxes tend to be regressive in Croatia and in most countries and due to reductions related to capital taxation the redistributive impact of those taxes has also been reduced. It should be noted there is still an education “puzzle” that needs to be solved. We did not experience a lot of problems or limitations during our investigation, however a concern lack of observations overtime. Given the dynamic processes in labor markets, particularly with respect to economy wide structural changes, our sample may be unable to pick longer term shifts in economic fundamentals. An additional factor which could influence income inequality is membership in the EU. Entry to the EU requires a number of structural changes which must be met before accession. Therefore, guidelines for further research should involve using the Difference-in-Differences approach to analyse the impacts of accession to the EU on income inequality. We recommend that economic policy makers take income inequality into consideration when designing tax and labor market reforms. Tax policies must be perceived to be equitable to maintain social cohesion. To decrease income inequality in labor market the new member states should invest more in specially targeted to improving coordination between parties in collective bargaining. Furthermore, the results demonstrate that investing more in higher education will not decrease income inequality, though this is an avenue for further investigation. We believe that progressive taxes reduce income inequalities and improving human capital will bring about a lessening of income inequality if used effectively.

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## Učinci porezne politike i institucija tržišta rada na dohodovne nejednakosti

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### **Sažetak**

*Cilj ovog rada bio je istražiti kako institucije i regulativa na tržištu rada te porezna politika utječu na dohodovne nejednakosti zemalja članica Europske unije. Istraživanje je provedeno na uzorku koji se sastojao od starih zemalja članica (EU15) i novih zemalja članica (EU13) Unije. Modeliranje je izvršeno uporabom panela sa fiksnim i slučajnim efektima za vremensko razdoblje od 2000.–2011. godine, a kako bi se testirao upliv triju temeljnih grupa poreza (kojima oporezujemo rad, kapital i potrošnju), socijalnih doprinosa i institucija tržišta rada. U radu je dokazano kako socijalni doprinosi i oporezivanje rada dovode do statistički značajnih poboljšanja povezanih uz dohodovne nejednakosti među zemljama članicama EU što dovodi do zaključka, kako porezna politika, osobito izbor poreznog oblika, kao i institucije tržišta rada, osobito članstvo u sindikatima, smanjuju dohodovne nejednakosti u EU28 u promatranom razdoblju.*

**Ključne riječi:** *dohodovne nejednakosti, porezi, korupcija, institucije na tržištu rada, obrazovanje*

**JEL klasifikacija:** *H2, I24, J38, J51, O23*

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