



## Unionization and Labor Share of Income Distribution: An Empirical Investigation of OECD Countries

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### ABSTRACT

This paper investigates the effects of unionization of the labor force and capital openness on the labor share of the income distribution. This paper empirically studies the relationship between labor share and unionization for OECD countries by regressing labor share on unionization of the labor force and other controlling variables. We use the Generalized Least Squares estimation method in panel data for the period of 1999-2011. Our controlling variables include political stability, economic growth, and capital share. We employ different panel data techniques with different hypothesis testing for robustness. Our regression results show that an increase in capital openness decreases labor share while an increase in unionization rate increases it. On the other hand, political stability has a positive effect on labor shares while economic growth seems to affect labor shares negatively. Also, an increase in capital share decreases the labor share but it is not statistically significant.

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## 1. Introduction

The struggle between capital holders and labor force to share the generated income is an old story dating back to feudalism, maybe long before. The fight over the share of the income between the two generally favors the capital holders as the modern world economic structure relies on capitalism. Unfortunately, this reality made the income distribution unbalanced and skewed to capital. As a result, the labor force began to form unions to protect their share. Therefore, the question here is "does unionization have an effect on labor shares?"

Thus, to answer this question we investigate the effects of unionization of the labor force and capital openness on labor shares of income distribution for OECD countries. Our expectation is that in the OECD countries, the relationship between the unionization rate and labor shares of income is positive while the relationship between capital openness and labor share is negative. Literature and our findings also support our expectations.

Schultz & Mwabu (1998) has examined union wage effects in South Africa among Africans and whites, controlling for human capital variables, rural residence, and industry; and found that union membership among African workers increases their wages by 145 percent at the bottom tenth percentile of the wage distribution and increases their wages by 19 percent at the top 90th percentile. Among white workers, the relative increase in union wages is 21 percent at the tenth percentile but is associated at the 90th percentile with a reduction of 24 percent.

Wallace, Leicht & Raffalovich (1999) utilized time series equations for quarterly data in the US from 1949 to 1992 and investigated the impact of union membership and strike activity on the labor's share. They found that union membership redistributed the income from capitalists to workers throughout the post-war capital-labor accord. However, after 1980, the weakened position of organized labor prevented unions to have a re-distributional impact. Also, they didn't find any evidence that strikes having a re-distributional impact.

Jayadev (2007) measured the capital account openness for world countries basing it on the Quinn's index after controlling for GDP per capita, trade ratio, trade taxes, real interest rate and budget deficits. He examined its effect on the labour share; and found that as capital account openness increases, the labor share of income diminishes.

Fichtenbaum (2009) analyzed the U.S. manufacturing sector from 1949 to 2006 with time series analysis and found that labor's share of income declined approximately 25 percentage points in this period while around 28% of that decline is explained by the decline in unionization.

Herzer (2014) found a negative long-run relationship between union density and income inequality in Ireland for the period of 1963-2000 employing time series cointegration and causality analyses.

Young & Zuleta (2015) use a panel of US industries over the years of 2002-2005 (4 years) to investigate the relationship among labor shares, union membership rates, and ratios of capital to value-added. They relate industries' labor shares to their union membership rates while controlling for capital-to-output ratios, labor adjustment costs, and biased technical change; also, a measure of globalization. Across US industries and time, they find that union memberships positively and significantly is associated with labor shares.

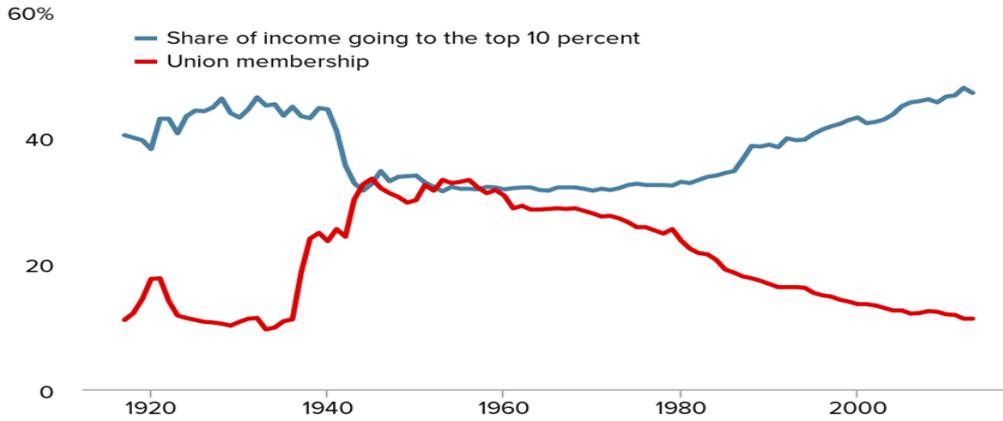
Elveren, Marr & Renard (2017) examined the effects of female participation in the labor force on profits and capacity utilization by utilizing indirect and 2-stage least square regression method by controlling for the gender wage gap, unemployment, unionization rate. They found that increasing female labor force participation and gender wage gap increases the profits and capacity utilization while the increase in the unionization rate decreases the firm profits and doesn't affect the capacity utilization significantly.

Young & Lawson (2018) analysed the relationship between the economic freedom and labour share for 93 OECD and non-OECD countries while controlling for various variables such as union density, democracy, real GDP, size of government, legal structure, and school enrolment etc. by utilizing panel least square regressions and found that economic freedom positively affects labor share. Also, their regression is controlled for unions only in one regression and they found a positive effect, but it was not statistically significant. However, they relate the capital's share with economic freedom and use Fraiser Institute's Economic Freedom of World index (EFW) to measure against labor share. As can be seen from the brief literature review, the labor share of national income can be related to many things including political factor. This paper empirically and specifically investigates the relationship between union membership ratio and the labor share of national income. Figure 1 below can give a sense of relationship between the labor share and distribution of national income.

As can be seen in figure 1, an increase in union membership is associated with a decrease in the income that is going to the top 10% of the population (vice versa). Then it can be inferred that a rise in unionization leads to a fall in the share of capital which in turn can be inferred as a rise in the labor share of income from the production function.

**Figure 1: Union membership and share of income**

**Union membership and share of income going to the top 10%**



Source: U.S. Census Bureau and Piketty and Saez (2013)

Economic Policy Institute

Source: Mishel & Schieder, 2016.

## 2. Theory

The analysis here is based on the neoclassical production function. According to the production function, income or GDP is a function of labor and capital. GDP is distributed to the production factors, namely capital share and labor share. The Cobb-Douglas production function is revered as the most common representation of an economy. Thus, we here assume a neoclassical production function as follows

$$Y_{it} = f(K_{it}, A_{it}L_{it}) \quad (1)$$

Here Y, A, K, L respectively denotes output, technology (productivity), capital, and labor, where AL denotes effective labor.

$$y_{it} = \frac{Y_{it}}{K_{it}} = F\left(\frac{K_{it}}{K_{it}}, \frac{A_{it}L_{it}}{K_{it}}\right) = F\left(1, \frac{A_{it}L_{it}}{K_{it}}\right) \quad (2)$$

$$y_{it} = \frac{Y_{it}}{K_{it}}, \quad \frac{K_{it}}{Y_{it}} = \frac{1}{y_{it}} = k_{it} \quad (3)$$

$$l_{it} = \frac{A_{it}L_{it}}{K_{it}}, \quad y_{it} = f(l_{it}) \quad (4)$$

$$Y_{it} = y_{it} \cdot K_{it} = f(l_{it}) \cdot K_{it} \text{ (Assuming constant returns to scale)} \quad (5)$$

where  $y_{it}$  is output to capital ratio and  $k_{it}$  is capital to output ratio, and  $l_{it}$  effective labor per unit of capital.

The marginal product of labor is the partial derivative of Y according to L and describes the wage rate, denoted by

$$w = \frac{\partial Y_{it}}{\partial L_{it}} = A_{it} \cdot f'(l_{it}) \quad (6)$$

while the marginal product of capital is the derivative of Y according to K and describes the profit rate, denoted by

$$r = \frac{\partial Y_{it}}{\partial K_{it}} = f(l_{it}) - l_{it} \cdot f'(l_{it}) \quad (7)$$

$$Y_{it} = w \cdot A_{it} L_{it} + r \cdot K_{it} \quad (8)$$

$$y_{it} = w \cdot l_{it} + r \quad (9)$$

$$1 = \frac{w \cdot l_{it}}{y_{it}} + \frac{r}{y_{it}} \quad (10)$$

where the economy's labor share is  $\frac{w \cdot l_{it}}{y_{it}}$  and the economy's capital share is  $\frac{r}{y_{it}}$ . Thus, labor's share is represented by the share of labor compensation in GDP in this study.

$$\text{labour share} = \frac{w \cdot l_{it}}{y_{it}} = \frac{A_{it} \cdot f'(l_{it}) \cdot l_{it}}{f(l_{it})} \quad (11)$$

The elasticity of substitution between labor and capital:

$$\rho = \frac{d(K/L)/(K/L)}{d(r/w)/(r/w)} \quad (12)$$

Let  $K/L$  be denoted by  $k$ , then it becomes

$$\rho = - \frac{(f'(k))^2}{(f''(k)) \cdot (f'(k))} \cdot \frac{w}{r \cdot k} \quad (13)$$

If the elasticity of substitution ( $\rho$ ) equals 1 ( $\rho=1$ ), there is no change to the capital's share. If  $\rho>1$ , capital's share will increase when  $k$  increases. If  $\rho<1$ , the capital's share will decrease and labor's share will increase when  $k$  increases.

Thus, as the capital share increases, labor share decreases. We assume that unionization affects labor productivity. We, therefore in this paper, test explicitly and empirically how unionization affects labor share through productivity variable.

### 3. Data and Empirical Analysis

Our following estimation model is based on Young & Lawson (2014) with our additional variables especially unionization rate. The regression analysis covers the

OECD countries and the period of 1999-2011. The time span is based on the availability of the data during the research.

$$\text{labsh}_{it} = \beta_0 + \beta_1 \text{kaopen}_{it} + \beta_2 \text{tud}_{it} + \beta_3 \text{gcf}_{it} + \beta_4 \text{polsta}_{it} + \beta_5 \text{gdp}_{it} \quad (14)$$

where labsh is labor share of income; kaopen is Chinn&Ito capital account openness index; tud is trade union density ( $\frac{\text{union membership}}{\text{employment}}$ ); gcf is gross capital formation percent of GDP; polsta is political stability and absence of violence, and gdp is gross domestic product growth. Data is gotten from Penn World Tables 8.1 (labsh), World Development Indicators – World Bank (gcf, gdp), Worldwide Governance Indicators – World Bank (polsta), OECD Statistics (tud), The Chinn-Ito Financial Openness Index – Portland State University (kaopen).

**Table 1. Descriptive Statistics**

	labsh	kaopen	tud	gcf	polsta	gdp
<b>Mean</b>	0.58	1.88	29.72	23.49	0.70	2.48
<b>Median</b>	0.60	2.39	21.71	22.86	0.86	2.78
<b>Max.</b>	0.75	2.39	92.47	39.35	1.67	10.83
<b>Min.</b>	0.35	-1.19	6.23	13.87	-1.62	-14.72
<b>Std. Dev.</b>	0.08	0.96	20.48	3.98	0.66	3.26
<b>Obs.</b>	352	352	352	352	352	352

Source: Authors' elaboration.

The Chinn-Ito (kaopen) Index is an index measuring a country's degree of capital account openness constructed by Chinn&Ito based on binary dummy variables that codify the tabulation of restrictions on cross-border financial transactions reported in the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions. Index approximately ranges from -2.5 to +2.5, higher number implying greater openness for capital account. As it can be seen from table 1 median is a high number of 2.38 implying most of the OECD countries have high capital openness ratio.

Labour's share of income is the share of labor compensation in GDP at current national prices and used in the production function. Theory postulates that sum of the labor share and capital share equals one. The mean (0.58) and median (0.60) of labor share show that labor's share of income is around 60% of GDP and have a higher share than capital in most of the OECD countries. This is a plausible statistic. Because most of the OECD countries are developing countries and most of them are in the transition period from the labor-intensive production structure to capital intensive production structure.

Trade union density is the ratio of union members in totally employed people. Higher density translates to higher union membership thus greater unionization rate. Mean of 29.7 means that in OECD countries on average 30% of the employed are members of trade unions.

Political Stability and Absence of Violence/Terrorism measures perceptions of the likelihood of political instability and/or politically-motivated violence, including terrorism. Estimate gives the country's score on the aggregate indicator, in units of standard normal distribution, ranging from approximately -2.5 (weak) to 2.5 (strong). A value of 2.5 means politically stable while -2.5 means instable. Looking at the statistics, it can be seen that OECD countries are mostly stable but they have concerns usually.

Gross capital formation percent of GDP consists of outlays on additions to the fixed assets of the economy plus net changes in the level of inventories. It seems that in OECD countries on average 23% of GDP is formed by capital investments.

On average OECD countries have approximately 2.5 percent growth rate.

Below is the estimation results.

We used Generalized Least Squares Method to eliminate the autocorrelation issues directly in the weighting matrix of the regression, also Ordinary Least Squares have a stable variance and normal distribution assumptions which don't hold in our data set, however, GLS can be used in this situation.

**Table 2. Fixed Effects vs. Random Effects- Hausman Test**

	<b>(b) fixed</b>	<b>(B) random</b>	<b>(b-B) difference</b>	<b>sqrt(diag(V_b-V_B)) S.E.</b>
<b>kaopen</b>	-.0061	-.005	-.0005	.0003
<b>tud</b>	.0009	.001	-.00006	.0001
<b>gcf</b>	-.0004	-.0003	-.00002	.00002
<b>polsta</b>	.012	.013	-.001	.0007
<b>gdpg</b>	-.001	-.001	.00006	.00003
<b>chi-square (5) = (b-B)'[(V_b-V_B)^(-1)](b-B)</b>				<b>8.01</b>
<b>Prob&gt;chi-square</b>				<b>0.1558</b>

Source: Authors' elaboration.

Firstly, we estimated regression for both fixed effect and random effect models, then used the Hausman Test to determine which model is the correct choice for our data set.

b = consistent under Ho and Ha

B = inconsistent under Ha, efficient under Ho

Test: Ho: difference in coefficients not systematic

From Table 2 it can be seen that Prob>Chi2=0.1558 which means Ho is accepted indicating a difference in coefficients are not systematic, the individual level effects are adequately modeled by a random effects model, thus Random Effect model is better for this regression.

**Table 3. Panel GLS Random Effects Model Regression Results**

Labor share	coefficient	t-Statistic
Constant	0.57	31.70 ***
kaopen	-0.005	-2.90 ***
tud	0.001	3.89 ***
gcf	-0.0003	-1.12
polsta	0.013	3.29 ***
gdpg	-0.001	-5.13 ***
R-squared: within = 0.1830		Wald $\chi^2$ (5) = 75.85
between = 0.1561		Prob > $\chi^2$ = 0.0000
overall = 0.1565		

Source: Authors' elaboration.

According to regression results in Table 3 all the variables, excluding gross capital formation, are statistically significant at 1% significance level. Results support our hypothesis. That is, trade union density, that is, increased unionization of labor force has a positive effect on labor's share of income. Also, political stability has a positive effect on labor's share. As the political stability increases, economic uncertainties decrease, leading to a more predictable economic future which in turn lessens unemployment, which increases wages. Capital account openness, on the other hand, affects labor's share negatively. Higher rates of capital openness indicate easier capital mobility and easier acquisition of capital making what is earned to be invested in the capital more thus increasing capital's share of income while decreasing labor's share. It seems that GDP growth also lowers labor's share. This shows that economic growth in OECD countries sustained by capital investments leading to capital's share of returns to be more and labor's less.

#### 4. Conclusion

This study shows that unionization has a positive effect on labor's share of income which verifies our expectations and conforms to the literature. Seeing unionization has a positive effect on labor share, if governments have a goal of increasing labor's share of income, they may encourage membership of trade unions. As a policy recommendations, governments increase the incentives to membership of unions by paying the membership fees of unions for workers. Better income distribution is a desirable outcome for many countries since better income distributions can reduce the social conflict, political and social violence. Therefore, one of the most important goals of fiscal policies of countries is to have a better income distribution. For that end, interferences into market determined income distribution is a common action. One of the interference measures of government policies of market determined income distribution is to regulate the economy. One of the tools for that regulation is to have minimum wage. However, encouraging the membership of unions can be a better policy of governments to have better income distributions. This study is done for only OECD countries because of data restrictions. When the data become available for the whole world, this study would be replicated for world countries.

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