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# The Decline of Labour Share in OECD and Non-OECD Since the 1980s

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## Abstract

This paper examines the causes of falling labour share in OECD and non-OECD countries since the 1980s. The results show that export and volatility are key drivers in OECD countries, but in non-OECD countries, the significant factors are financial openness and the capital's relative price.

**Keywords:** Elasticity of substitution; Financial openness; Labour share; Trade; Volatility

**JEL Classification:** E25; F66; O33

## 1 Introduction

Since the work of Kaldor (1957), labour's income share has been believed to be constant. However, many countries have experienced a decline in labour income share over the past three decades, as documented by Karabarbounis and Neiman (2014). This phenomenon has led to a strand of research investigating what factors behind this fall. Two recent works have

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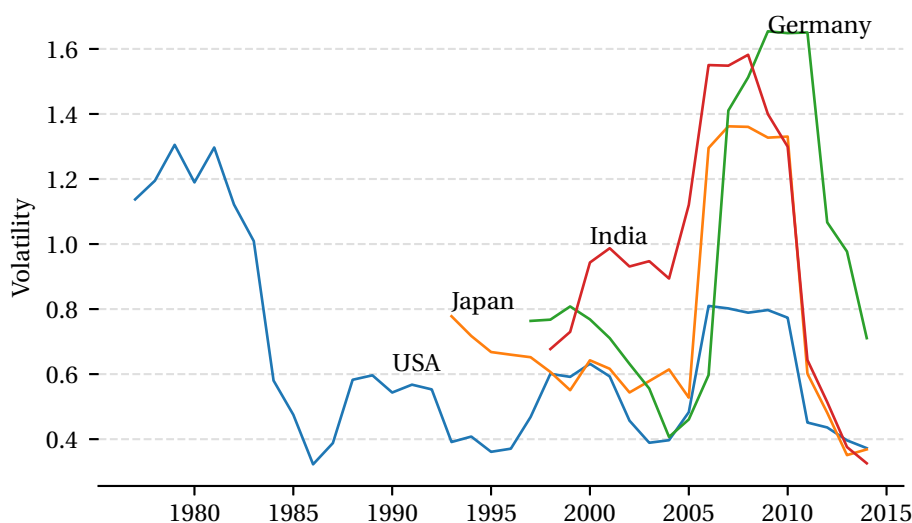
drawn worldwide attention. Piketty (2014) offers the fundamental laws of capitalism that help explain the evolution of capital share in the long run. His first law simply shows that the share of GDP going to capitalists increases as capital accumulates. Yet, this conclusion holds only if the elasticity of substitution between labour and capital exceeds unity. Based on this logic, Karabarbounis and Neiman (2014) provide evidence that labour and capital have been highly substitutable since the 1980s. This high elasticity enables Karabarbounis and Neiman (2014) to conclude that the falling relative price of investment goods induces firms to replace labour with capital to such a large extent that the income share of labour falls.

This paper contributes to the existing literature by using Karabarbounis and Neiman (2014)'s labour share model as a baseline from which we specify our econometric models to test the determinants of the labour share in Organisation for Economic Co-operation and Development (OECD) and non-OECD countries. It expands on the works of Elsby et al. (2013) and Karabarbounis and Neiman (2014): We include a new explanatory variable, *risk*, measured by the real GDP volatility, which affects both the labour share and the return rate of investment. Times of low risk tend to encourage firms to invest in capital and hire more labour, but in times of high risk, such as the 2007-2009 recession (see Figure 1), firms tend to disinvest and lay off workers (Kang et al., 2016). Because of the high substitution between capital and labour, firms utilise capital more proportionally than labour at times of low risk, thus leading to the decline of labour share. Our second contribution is that we also compare the falling labour shares between OECD and non-OECD countries. The economic performances and risk status of the OECD and non-OECD countries vary, leading to different labour share outcomes for the two groups.

We analyse labour share determinants using data for 30 OECD and 23 non-OECD countries from 1975 to 2014. We use a robust regression estimation and the result shows that the forces driving the declining labour share differ between the groups. Exports and volatility are driving labour share in the developed countries. In the non-OECD countries, the relative price of investment goods and financial openness appear to be the factors driving labour share. We also find that as labour and capital become more substitutable, firms are incentivised to become more capital intensive because of technological improvements in the production of investment goods, the availability of investment funds, low risk to capital investments, and

increasingly global competition.

**Figure 1:** Volatility trend of four large economies



Note: The figure shows the volatility trend of the world's four largest economies with available data since the 1980s. The volatility is measured by the standard deviation of the quarterly five-year moving average of GDP growth. China's quarterly GDP is not available, we therefore use India's data instead.

The remainder of the paper is organised as follows. Section 2 describes the the estimation of elasticity of substitution between capital and labour. Section 3 specify the econometric model, followed by estimation methods, data and results in Section 4; and conclusion in Section 5.

## 2 The Estimation of Elasticity of Substitution

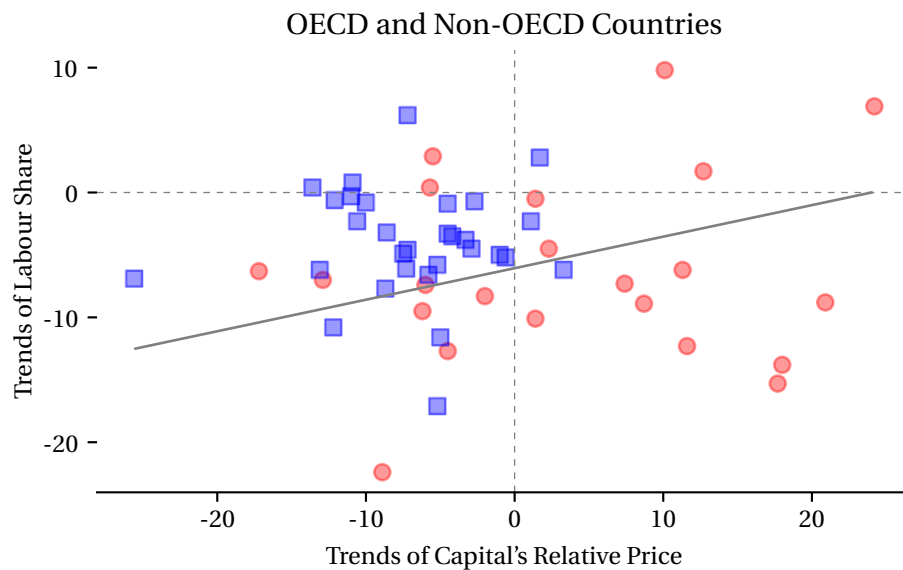
To empirically investigate labour share factors, we use Karabarbounis and Neiman's (2014) model of labour share, as in Equation (1).

$$\left( \frac{S_{j,t}}{1-S_{j,t}} \right) \hat{S}_{j,t} = \gamma + (\sigma - 1) \hat{\xi}_{j,t} + e_{j,t}, \quad (1)$$

where  $j$  denotes observations,  $t$  represents time,  $S$  stands for labour income share,  $\xi$  refers to relative price of investment,  $e$  is error term,  $\gamma$  is a constant,  $\sigma$  represents elasticity of substitution between capital and labour, and  $\hat{x} = \frac{\Delta x}{x} \approx \Delta \ln x$  denotes proportional change of

some variable  $x$  from  $t_1$  to  $t_2$ . The variable,  $S$ , is measured as the share of labour compensation in GDP at current national prices. The relative price of investment,  $(\xi)$ , is a ratio of the investment deflator to the consumer price index. The proportionate change of a variable (denoted as “hat”variable) is measured by the linear trend in the log of the variable and its level is approximated by its average value.

**Figure 2:** Trends of labour share and capital’s relative price for 53 countries

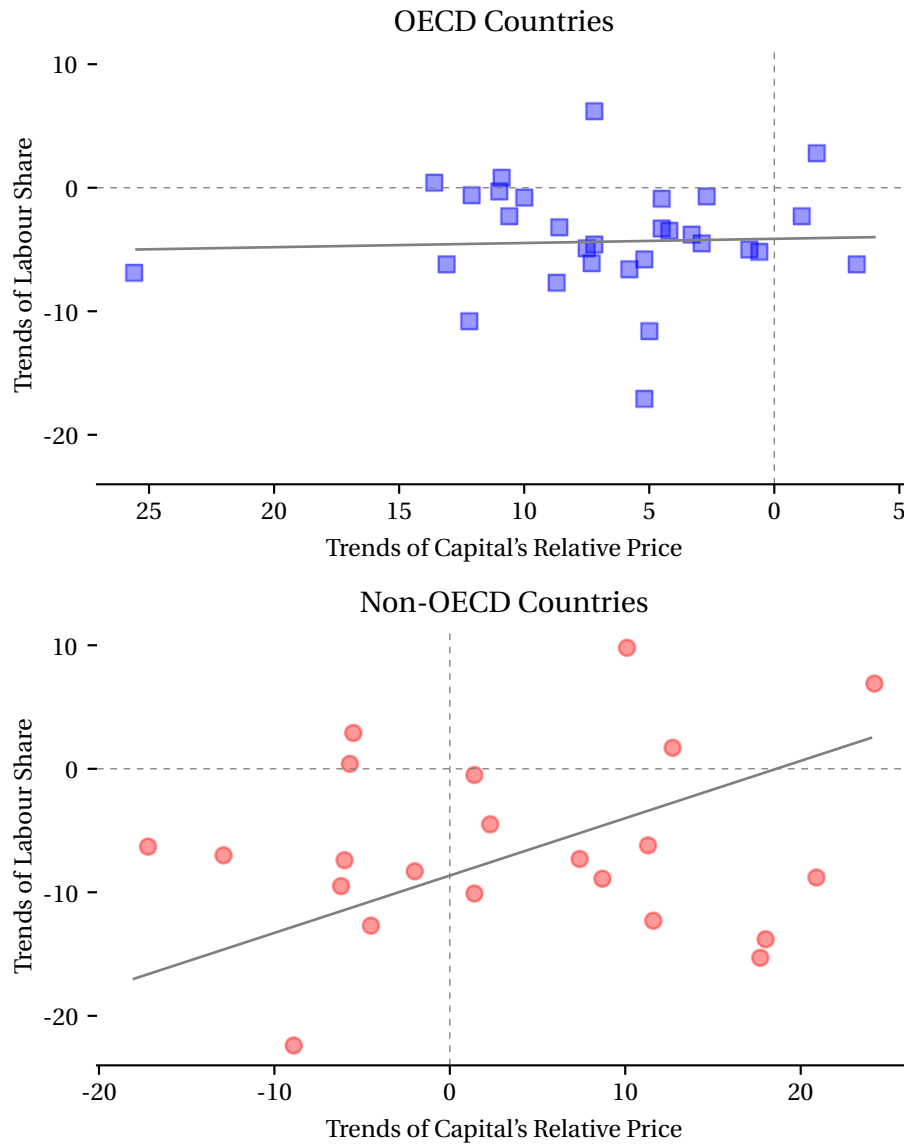


Note: The figure plots the trend in the log labour share against the trend in the log relative price of capital. All values are scaled to represent per cent changes per 10 years. For example, a value of 10 for the trend in the log relative price of capital means a 10 per cent increase in capital’s relative price every 10 years. We drop one outlying observation (Azerbaijan) because of its extremely low value. The solid line is the fitted line with the R-squared of 7.5%

Figure 2 presents a scatter plot between the long-run linear trends of the relative price of investment goods and labour share. The fitted line of their relationships is upward, implying that the elasticity of substitution,  $\sigma$ , is greater than one. Using Karabarounis and Neiman (2014)’s “robust regression” method, we obtain an estimate of 1.18 for  $\sigma$ , statistically significant at the 10 per cent level. Our estimate<sup>1</sup> is not statistically different from the point estimate of 1.25 obtained by Karabarounis and Neiman (2014), implying that the data we use at national levels yields similar results to those of Karabarounis and Neiman (2014) using data at firm levels.

<sup>1</sup>The 95% confidence interval is between 0.98 and 1.39.

**Figure 3:** Trends of labour share and capital's relative price for 53 countries



Note: The figure plots the trend in the log labour share against the trend in the log relative price of capital. All values are scaled to represent per cent changes per 10 years. For example, a value of 10 for the trend in the log relative price of capital means a 10% increase in capital's relative price every 10 years. We drop one outlying observation (Azerbaijan) from the non-OECD sample because of its extremely low value. The solid line is the fitted line. The fitted line for OECD countries has the R-squared of 0.1% and that for non-OECD countries has the R-squared of 26%.

Interestingly, when we separate the sample into two groups<sup>2</sup> - 30 OECD countries and 23 non-OECD countries - we observe that non-OECD countries appear to drive our estimation results which can be seen in Figure 3. This begs the question, do disaggregated results from OECD nations differ from the non-OECD nations?

<sup>2</sup>The OECD classification in this study is from the time of data selection in early 2018.

### 3 Econometric Model Specifications

Like Karabarbounis and Neiman (2014), we treat the relative price of investment goods as a given variable<sup>3</sup> and obtain the following econometric model.

$$\hat{S}_{t,j} = \gamma_0 + \gamma_1 \hat{\xi}_{t,j} + \gamma_2 \hat{Z}_{t,j} + \gamma_3 \nu_{t,j} + \varepsilon_{t,j}, \quad (2)$$

where  $\gamma_0$ ,  $\gamma_1$  and  $\gamma_3$  are constant,  $\varepsilon$  is error term,  $\nu$  is volatility of real GDP, and  $Z$  is a vector of other explanatory variables including: export, import, and financial openness.

Dao (2017) categorise labour share factors into three groups: technology, globalisation and labour market institutions. In addition, we introduce the role of volatility in reducing labour share. Because of data availability, we put labour market conditions into the error term. Since we don't know a true functional form of the relationships between those factors and labour share, we assume that they relate to labour share in the same way as the rental price of capital does.

Volatility is an indicator used to capture risk, affecting firms' investment and hiring behaviour and reflects the return rate of investment. Kang et al. (2016) show that high volatility makes firms temporarily reduce employment and investment. For instance, the 2007-2009 financial recession was exacerbated in most parts of the world by heightened economic volatility (Ozturk and Sheng, 2018). In a period of low volatility, firms tend to invest and hire more, but it also reflects a low return rate of investment, implying that capital's rental price is low. Since labour and capital are highly substitutable, firms use capital more proportionally than labour. As a result, the labour income share falls. We measure this volatility using the standard deviation of the growth rate of real GDP.

Current research shows that export firms are likely to be more productive, larger, and have a higher capital-labour ratio than non-export companies (Forslid and Okubo, 2016). More exports imply that a higher share of income goes to capital. In contrast, more imports lead to shrinking outputs, reflecting an increasing labour share. We measure the variables—export

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<sup>3</sup>We also consider the possibility that this relative price may be influenced by other factors. See Appendix A for details.

and import—as ratios of nominal export and import to nominal GDP.

Financial openness measures a country’s degree of capital account openness (Chinn and Ito, 2006). The current theory proposes that capital account liberalisation can enhance the development of the financial system through three channels. First, financial openness helps reduce financial control in protected financial markets, thus driving an interest rate to its competitive market equilibrium (Shaw, 1973). Second, it allows foreign and domestic investors to pursue more portfolio diversification. Third, the liberalisation process improves the efficiency level of the financial system by removing inefficient financial institutions and building up pressure to reform the financial infrastructure. These points indicate that financial openness raises the availability of funds and reduces the cost of capital for investors. Consequently, the labour share declines as firms use more capital because of its lower cost. We measure financial openness by Chinn-Ito Index.

Dao (2017) emphasises that technological advancement accelerates the automation of routine tasks. Thus, labour performing such tasks tends to be replaced by capital, leading to a lower income share going to labour. Autor et al. (2020) show that technological progress leads to the rise of “superstar firms” that tend to reap disproportionate rewards (e.g. high profits), implying a declining labour share. The relative price of investment goods reflects this technological advancement.

## 4 Estimation Methods, Data and Results

To operationalise Equations (1) and (2), we, following Karabarbounis and Neiman (2014), employ the robust regression to deal with long-run growth rates (at least 15 years) of variables ( $\hat{x}$ ). We estimate the models using data from 30 OECD countries and 23 non-OECD countries over the period 1975 to 2014. Financial openness index data is sourced from Chinn and Ito (2006)’s dataset. Data for the remaining variables are obtained from the Penn World Table version 9.0, and are restricted to countries with at least 15 years of available data (Table B in Appendix B for details).

Table 1 shows the results based on Equations (1) and (2). Using the robust regression, we



find the elasticity of substitution between capital and labour are significantly greater than one:  $\sigma = 1.36$  for non-OECD countries and  $\sigma = 1.18$  for pooled countries (similar results to Karabarbounis and Neiman (2014)). This high elasticity indicates that the labour share and capital's relative price are positively associated. However, capital's relative price does not appear to have any significant association on labour share when we include other determinants in the model. This finding lends support to the aggregate analysis by Elsby et al. (2013), which concluded that firms shift to be capital-intensive to exploit declining equipment prices, has not been a critical factor behind the evolution of the payroll share over the past 25 years in the US.

While the coefficients of volatility and financial openness are contrary to what we expected but are statistically insignificant for most cases, export and import have the correct signs in most of our model specifications for all three sample specifications: OECD, Non-OECD and the pooled data. Export and import appear to be positively related to labour share throughout all samples and models. As an average, their magnitudes of coefficients are twice as much for OECD countries than non-OECD countries. This result implies that workers in advanced countries, particularly those employed by labour-intensive firms, have borne the brunt of the declining labour share more than their counterparts in non-OECD countries because of global integration.

Looking at the combined effects of capital's relative price, exports, volatility, and financial openness altogether, we conclude that the drivers behind the labour share in both groups of countries. For OECD countries, export and risk appear to be major factors associated with the labour share. This suggests that large, export-orienting firms, and their decisions to invest in a globally competitive world, play a significant role in determining the income share going to workers. These large firms tend to have more bargaining power to drive wages and benefits down by offshoring some of their labour-intensive components or by relocating their productions to labour-abundant countries. In contrast, for non-OECD countries, the key drivers of the labour share appear to be financial openness and capital's relative price. Firms operating in a country with a more liberalised financial system have greater access to affordable funding that they can use for capital investment. This access can make firms more capital-intensive by exploiting the falling prices of investment goods and new technologies that these investment goods provide.

Table 1: Results for long-run growth rates using the robust regression method

<b>OECD Countries</b>				
Regressors	(1)	(2)	(3)	(4)
Relative Price of Investment Goods	0.06 (-0.19)	0.02 (-0.12)	0.16 (-0.14)	0.16 (-0.14)
Export		-0.31** (-0.14)	-0.41*** (-0.14)	-0.46*** (-0.16)
Import		0.35** (-0.15)	0.43*** (-0.15)	0.45** (-0.17)
Volatility			0.1 (-0.07)	0.1 (-0.07)
Financial Openness				0.03 (-0.02)
Observations	30	30	30	29
R-squared	0	0.18	0.28	0.31
<b>Non-OECD Countries</b>				
Regressors	(5)	(6)	(7)	(8)
Relative Price of Investment Goods	0.36** (-0.16)	0.11 (-0.17)	0.15 (-0.18)	0.21 (-0.19)
Export		-0.04 (-0.15)	-0.08 (-0.16)	-0.26* (-0.13)
Import		0.18 (-0.16)	0.19 (-0.17)	0.41*** (-0.12)
Volatility			-0.04 (-0.07)	-0.07 (-0.07)
Financial Openness				0.04 (-0.05)
Observations	23	22	22	21
R-squared	0.2	0.1	0.12	0.69
<b>Pooled Data</b>				
Regressors	(9)	(10)	(11)	(12)
Relative Price of Investment Goods	0.18* (-0.1)	0.04 (-0.08)	-0.03 (-0.09)	-0.06 (-0.08)
Export		-0.26*** (-0.08)	-0.14 (-0.09)	-0.26*** (-0.09)
Import		0.28*** (-0.09)	0.16 (-0.1)	0.29*** (-0.09)
Volatility			-0.05 (-0.04)	-0.06* (-0.03)
Financial Openness				0.05** (-0.02)
Observations	53	52	52	49
R-squared	0.06	0.19	0.09	0.26

Note: \*, \*\*, \*\*\* denote significance at the 10%, 5%, and 1% levels, respectively. Standard errors are in the parentheses. Robust regression is used to give less weight to outlying observations, which can significantly affect regression results when a sample is relatively small. Long-run refers to at least 15 years.

## 5 Conclusion

In this paper, we empirically investigate the factors behind declining the labour share in both OECD and non-OECD countries since the 1980s. We find that while factors of production (capital and labour) are highly substitutable in OECD and non-OECD countries, the drivers of falling labour share differ in each group. In high-income countries, exports and economic risk – measured by the volatility of real GDP – are the key factors driving the reduction of labour share. However, in non-OECD Countries, the major factors are financial liberalisation and the relative price of investment goods.

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## Online Appendices to "The Decline of Labour Share in OECD and Non-OECD Since the 1980s"

### Appendix A

We consider the possibilities that the price of investment goods appears to be influenced by the other factors in the model as well. That is,

$$\hat{\xi}_j = \lambda_0 + \lambda_1 \hat{Z}_j + \lambda_2 v_j + u_j \quad (\text{A.1})$$

Substituting Equation (A.1) into Equation (2) ( $\hat{S}_{L,j} = \gamma_0 + \gamma_1 \hat{\xi}_j + \gamma_2 \hat{Z}_j + \gamma_3 v_j + \varepsilon_j$ ), we obtain the following reduced form equation:

$$\hat{S}_j = \pi_0 + \pi_1 u_j + \pi_2 \hat{Z}_j + \pi_3 v_j + \omega_j. \quad (\text{A.2})$$

Equation (A.2) shows total effects of the other explanatory variables ( $Z$  &  $v$ ) on the labour share and the impact of other omitted variables ( $u_j$ ) influencing capital's relative price on the labour share.

When we estimate the system of two Equation (A.1) and (A.2), we perform two-stage residual inclusion estimation (2SRI). First, we regress Equation (A.1) to obtain the estimated residual ( $\hat{u}_j$ ). Second, we replace the error term  $u_j$  by its estimated value in Equation (A.2) and then apply 5000-replication bootstrap.

Table A: Results for long-run growth rates using robust regression method

<b>OECD Countries</b>						
Regressors	(A.1.2)	(A.2.2)	(A.1.3)	(A.2.3)	(A.1.4)	(A.2.4)
Residual (uhat)		0.02 (-0.12)		0.16 (-0.14)		0.16 (-0.14)
Export	0.1 (-0.21)	-0.31** (-0.14)	0.13 (-0.21)	-0.39** (-0.14)	0.22 (-0.22)	-0.43** (-0.16)
Import	-0.17 (-0.22)	0.35** (-0.15)	-0.19 (-0.23)	0.40** (-0.15)	-0.29 (-0.24)	0.41** (-0.17)
Volatility			-0.12 (-0.1)	0.08 (-0.06)	-0.13 (-0.1)	0.08 (-0.06)
Financial Openness					-0.03 (-0.03)	0.03 (-0.02)
Observations	30	30	29	30	28	29
R-squared	0.03	0.18	0.1	0.28	0.16	0.31
<b>Non-OECD Countries</b>						
Regressors	(A.1.6)	(A.2.6)	(A.1.7)	(A.2.7)	(A.1.8)	(A.2.8)
Residual (uhat)		0.11 (-0.17)		0.15 (-0.18)		0.21 (-0.19)
Export	-0.14 (-0.22)	-0.06 (-0.14)	-0.05 (-0.23)	-0.08 (-0.16)	-0.39** (-0.17)	-0.34*** (-0.11)
Import	0 (-0.24)	0.18 (-0.16)	0.01 (-0.24)	0.19 (-0.17)	0.35** (-0.16)	0.49*** (-0.1)
Volatility			0.11 (-0.1)	-0.02 (-0.07)	0.04 (-0.1)	-0.06 (-0.07)
Financial Openness					0.06 (-0.08)	0.05 (-0.05)
Observations	22	22	22	22	21	21
R-squared	0.04	0.1	0.1	0.12	0.33	0.69
<b>Pooled Data</b>						
Regressors	(A.1.10)	(A.2.10)	(A.1.11)	(A.2.11)	(A.1.12)	(A.2.12)
Residual (uhat)		0.04 (-0.08)		-0.03 (-0.09)		-0.06 (-0.08)
Export	-0.16 (-0.15)	-0.27*** (-0.08)	0 (-0.15)	-0.14 (-0.09)	-0.31*** (-0.1)	-0.24*** (-0.09)
Import	0.05 (-0.16)	0.28*** (-0.09)	-0.1 (-0.16)	0.16 (-0.1)	0.26*** (-0.1)	0.27*** (-0.09)
Volatility			0.13** (-0.06)	-0.05 (-0.04)	0.05 (-0.06)	-0.06* (-0.03)
Financial Openness					-0.02 (-0.04)	0.05** (-0.02)
Observations	52	52	52	52	50	49
R-squared	0.04	0.19	0.14	0.09	0.25	0.26

Note: \*, \*\*, \*\*\* denote significance at the 10%, 5%, and 1% levels, respectively. Standard errors are in the parentheses. Standard errors in the model specifications (16.) are obtained by 5000-replication bootstrap. Robust regression is used to give less weight to outlier observations, which can significantly affect regression results when a sample is relatively small. Long-run refers to at least 15 years.

Table A presents the results based on the system of these two equations. Under the robust regression for the long run growth rates, capital's relative price is not significantly influenced by the other factors in all model specifications for the OECD countries, but it becomes significantly impacted by export and import only in the model specification (A.1.8) and (A.1.12) for the non-OECD countries and pooled countries respectively.

While export is a significant driver of labour share in all model specifications for the OECD sample, it is not for the other two samples. Import significantly impacts labour share only in one model specification (A.2.4) for the OECD sample, but not for the non-OECD and pooled samples. The residual – the other factors affect the capital's relative price – and volatility do not have significant impacts on labour share in all model specifications for all three samples. Financial openness has significant effects on labour share for just the pooled sample, but its effects are counter-intuitive.

## Appendix B

Table B: A list of countries with at least 15 year data for labour share.

30 OECD Countries			23 Non-OECD Countries		
Country	Begin	End	Country	Begin	End
Australia	1975	2012	Armenia	1991	2011
Austria	1995	2013	Azerbaijan	1994	2012
Belgium	1985	2013	Bahrain	1995	2013
Canada	1975	2013	Belarus	1990	2012
Czech Republic	1992	2014	Bolivia	1975	2013
Denmark	1995	2014	Brazil	1992	2009
Estonia	1994	2013	China	1992	2012
Finland	1975	2014	Hong Kong	1980	2012
France	1975	2013	Macao	1996	2012
Germany	1991	2013	Colombia	1992	2012
Hungry	1995	2013	Costa Rica	1975	2012
Iceland	1975	2005	Kyrgyzstan	1990	2012
Italy	1980	2014	Lithuania	1995	2013
Japan	1980	2012	Namibia	1995	2013
Latvia	1994	2013	Niger	1995	2013
Luxembourg	1995	2012	Peru	1978	2010
Mexico	1993	2012	Philippines	1992	2012
Netherlands	1980	2014	Moldova	1995	2012
New Zealand	1982	2013	Singapore	1980	2010
Norway	1978	2013	South Africa	1985	2013
Poland	1995	2013	Taiwan	1995	2009
Portugal	1995	2014	Thailand	1975	2010
Republic of Korea	1975	2013	Tunisia	1992	2011
Slovakia	1993	2013			
Slovenia	1995	2013			
Spain	1995	2013			
Sweden	1994	2014			
Switzerland	1995	2012			
United Kingdom	1987	2013			
United States	1975	2014			