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Income distribution and economic growth in Finland: Applying Bhaduri – Marglin model

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We apply Bhaduri and Marglin model to estimate the effect of income distribution on economic growth in Finland from 1975 to 2020. The Bhaduri–Marglin model is a post-Kaleckian model with the key assumption of different propensity to consume out of wages and out of profits. ARDL model is adopted to analyze the effect of profit share increase on aggregate demand components. Findings indicate that income redistribution towards profits leads to decline in economic growth due to fall in consumption, and it positively affects investments and net export due to increased international competitiveness through costs reduction; the first effect is stronger than two other effects. These results confirm the hypothesis about wage-led regime in Finland. The approach of Scandinavian countries and Finland to the role and effect of wages, for instance, differs from classical idea about the effect of wage restraint policy for increase in investments. Rise in wages is seen as a way to increase labor productivity. Since our findings indicate wage-led accumulation regime in Finland, this approach, being consistent with Bhaduri – Marglin model, seems more appropriate.

Keywords: *economic growth; income distribution; Bhaduri – Marglin model; wage-led accumulation regime; Finland*

JEL codes: *E12, E20, E25*

Распределение дохода и экономический рост в Финляндии: анализ на основе модели Бхадури – Марглина

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В статье анализируется влияние распределения доходов на экономический рост в Финляндии с 1975 по 2020 гг. Теоретической основной для проведения исследования является модель Бхадури и Марглина. Эта модель развивает калецкианскую теорию экономического роста. Ключевой является предпосылка о том, что предельная склонность к потреблению, финансируемому за счёт заработной платы, больше, чем предельная склонность к потреблению, финансируемому за счёт прибыли. Для анализа влияния увеличения доли прибыли на компоненты совокупного спроса мы использовали ARDL-модель. Полученные результаты указывают на то, что перераспределение доходов в пользу получателей прибыли приводит к снижению темпа экономического роста из-за падения потребления. В то же время, такое перераспределение влияет на инвестиции и чистый экспорт из-за повышения международной конкурентоспособности за счет снижения издержек. Первый эффект сильнее двух других. Наши результаты подтверждают гипотезу о наличии в Финляндии режима, основанного на заработной плате. Подход скандинавских стран и Финляндии в плане роли и влияния заработной платы отличается от классического представления о воздействии политики ограничения заработной платы на увеличение инвестиций. Повышение заработной платы рассматривается как способ повышения производительности труда. Такой подход представляется более правильным, как утверждается в работе Бхадури и Марглина, особенно учитывая тот факт, что результаты нашего исследования указывают на существование в Финляндии режима накопления, основанного на заработной плате.

Ключевые слова: *экономический рост; распределение дохода; модель Бхадури – Марглина; режим накопления, основанный на заработной плате; Финляндия*

Introduction

Economic growth of Finland is known for its stability during last decades. However, about a century ago, Finland was poor agrarian country which was dependent on Russia. In the twentieth century it became advanced country in line with top performers. After World War II policy aimed to increase wage share in total income was introduced in Finland. That led to strong government intervention, powerful labor unions and progressive tax system, what differ Finland from most other countries. We aim to study whether wage share increase positively affects economic growth in Finland. The question is legitimate because during periods of income policy Finland performed better, according to Uusitalo (1983). Meanwhile, this author argued that other European countries also introduced

income policies, and successful performance of Finland cannot be explained only by income policies. Other important feature Finland economy, namely, institutionalized and centralized decision-making, was highlighted. It is considered as a main source of successful economic performance in Finland (Ibid.). Although, government intervention is associated with income policy as government primary benefits poor and labor force by transfers (Lavoie and Stockhammer, 2013), therefore wage share increase with higher government intervention. Therefore, the hypothesis is that successful performance of Finland economy relates to increase in wage share due to pro-labor government policies.

Traditional macroeconomic theories do not take into account the role of income distribution for economic growth. They are mainly focused on supply-side factors, and differences in economic growth are explained by differences in productivity, the role of demand being ignored.

To study the effect of income distribution on economic growth and test the hypothesis, we use Post-Kaleckian growth model. Michal Kalecki highlighted the positive effect of income redistribution towards wages on economic growth. This effect is explained by different propensity to consume out of different sources of income – wage earners consume more than profit earners – therefore redistribution towards wages leads to increase in consumption. That boosts the demand due to higher purchasing power. These ideas are described by the paradox of costs (Lavoie, 2006): higher wages lead to increase in consumption, which, in turn implies higher demand and capacity utilization rate. The described aspects were developed in neo-Kaleckian growth models.

One of Post-Kaleckian models introduced in Bhaduri and Marglin (1990) allows to identify which factor boosts economic growth in a particular country: wages or profits, and it considers the effect of income distribution on components of aggregate demand. Wage increase affects economic growth in two directions: higher wage leads to higher prices of goods due to higher costs, and costs reduction is usually seen as a way to increase profit margin; although consumers are able to buy more goods, and rising purchases imply expansion of consumption. The model assumes different relationship between profits and investments in oppose to the original ideas of Kalecki: profit share is included in investment function as an indicator of expected profitability. While profit share increase leads to higher investment, what is also good for the economy, consumption falls due to lower propensity to consume out of profits. Also, the increase in profit share implies rising international competitiveness what is taken into account in export function. Magnitude of these effects identifies the accumulation regime in country. It mainly depends on the openness of economy. In case of open economy its trade balance which is profit-led determines overall economic regime because external demand dominates internal one.

The regime of economic growth, profit led or wage led, was investigated for a wide range of countries. It was noticed that there was little research for Nordic countries and little evidence about accumulation regime (Storm and Naastepad, 2012). At the same time, experience of these countries is relevant for the research because of policies introduced there which pay more attention to the role of income distribution. Income policies were introduced after World War II. Labor unions have real power there, also progressive tax system leads to high social benefits and equality of disposable income. Economic performance is better than in average in other countries of European Union. Also, pro-labor policy implemented in these countries is successful in income redistribution and in the reduction of income inequality. Bhaduri-Marglin model has not been applied to Finnish economy yet, although it would be helpful for better understanding of the reasons of its success. Hence, we want to find out whether economy of Finland is wage-led as most countries. If so, Finland is a good example of the implementation of pro-labor policy for wage-led country. Moreover, this research contributes to empirical literature on Bhaduri-Marglin model by broadening the range of considered countries.

Theoretical framework

The effect of income distribution on economic growth has been discussed since Michal Kalecki (1971), who considered increase in wage share as a main source of economic growth (Lavoie, 2006). In his model only positive effect of wage share increase was presented due to increase in consumption. Furthermore, a positive influence of increasing wage share on demand usually takes place when excess capacity exists. And in turn higher capacity utilization implies rise in investments.

Blecker (1989) extended the model for open economy. Furthermore, ideas of Kalecki were formalized. Dual effect of wage increase on economic growth was highlighted in Blecker (2016). This idea is based on the fact that open economy implies international competition, and wage increase in case of open economy would lead to decrease in export due to fall in international price competitiveness, and, therefore, results in economic decline. Also, increase in wage share leads to the decrease in investments. On the other hand, wage increase allows consumers to buy more goods and expands the consumption. Author argues that negative effects are more significant in short run, while positive effect is present in long run.

Post-Kaleckian growth model introduced in Bhaduri and Marglin (1990) included effect of profit share change on investments. It does not necessary imply increase in demand because of rise in wage share, in oppose to original version of Kaleckian model. Bhaduri – Marglin model defines two possible effects of redistribution on economic growth: wage-led and profit-led. Positive effect of increase in profit share on investments due to increase in profitability was included in the model. That effect confronts with the paradox of costs, which implies positive effect of wage share's increase on investments. Therefore, in this model the character of total effect of wage increase on aggregate demand depends on the wage effect on consumption and the wage effect on investment. These effects are unique for each country. Wage share also negatively affects international competitiveness, therefore its effect on trade can overweigh positive effect on consumption. Accumulation regime in the country determines what effect is more significant. Empirical evidence presented in Hein and Vogel (2008) indicates wage-led growth for larger economies and profit-led regime in smaller countries. The findings indicate wage-led regime for most of countries.

Government expenditures are excluded from consideration in all related sources because the model is focused on private demand. The effect of increase in profit share on government expenditure is beyond our study.

Other limitation is that income distribution is considered exogeneous. Lavoie and Stockhammer (2013) believe that trade unions and laws which determine wages are the main determinants of wage share. The application of instrumental variables is complicated because the strength of labor unions is hard to estimate. Furthermore, only investment equation contains profit share as a regressor. In the case of other components of demand the effect of profit share is not estimated directly.

First attempt to estimate Bhaduri – Marglin model empirically was in Bowles and Boyer (1995). The effect of profit share increase was estimated for each component of aggregate demand separately. This approach called single-equation approach allows to see the effect of income redistribution both for domestic and international markets. It also represents an analysis of how a change in the wage share makes an influence on aggregate demand in the whole and its components (Onaran and Obst, 2016). Results indicate different accumulation regimes for the countries considered in the research. Wage-led growth was revealed for France, Germany, Japan, the UK, and the USA. Meanwhile, after considering the effect of profit rate increase on net export profit-led regime was discovered for France, Germany and Japan. Although the results of single-equation approach are easier to interpret, it does not consider interaction between the components of aggregate demand. In most of the literature this simplification is accepted for better and easier interpretation.

Other approach how to apply Bhaduri-Marglin model in empirical literature is to estimate all relationships between variables in one model. For that Vector Autoregressive model is used (for example, Onaran and Stockhammer, 2005). It allows to capture interaction between variables, although it is harder to derive individual coefficients. That requires additional calculations of impulse-response functions, and that approach is less popular in the literature.

Literature which employs that method differs in approaches how to estimate the effect on net export: directly (Onaran and Galanis, 2012) or separately on import, export, domestic and export prices (Jetin and Reyes, 2020). Also, the terms of trade or exchange rate (Onaran and Galanis, 2012; Jetin and Reyes, 2020) or profit share as a proxy for the terms of trade (Dräger et al, 2009) is used. In this study we use the terms of trade because little evidence about the effect of profit share on net export is present. Furthermore, an influence of terms of trade on net export is more understandable in comparison with an influence of profit share. We estimate the effect of change in profit share on net export using chain derivative rule because profit share is not used as regressor for net export function. This allows not to deal with the endogeneity of profit share.

Besides, variables used in the model differ in the literature. Most of the research consider only variables from theoretical model, control variables are being neglected (for example, Onaran and Galanis, 2012). Different measures for capacity utilization rate are used because this variable is hard to estimate. Capacity utilization rate is approximated by gross domestic product in most of related literature because of absence of data on that indicator (Bowles and Boyer, 1995).

For Nordic countries only one research was done. Applying single-equation approach, Bengtsson and Stockhammer (2021) found a "weakly positive effect on growth" in Sweden, Denmark and Norway. Although, authors highlight that it cannot be said that wage share is the main determinant of economic growth. There are many factors which were not considered in the model, for instance policy. That work also uses historical data – more than 100 years. Most of the literature examines shorter periods, for example, Jetin and Reyes (2020) study China in 1978–2016, Dräger et al. (2009) – France and Germany in 1960–2005, Onaran and Stockhammer (2005) – Turkey in 1963–1997 and South Korea in 1970–2000.

Our research adds to the empirical literature on Finland experience, which, as we noted previously, succeeded more than other European countries on average, according to Uusitalo (1983). Although, income policies were introduced in many countries in the period after the World War II. Scharpf (1981) argues that centralized decision-making, norms and strategies are more important than economic indicators. After Finland implemented related measures, its dynamic performance improved.

Lavoie and Stockhammer (2013) described the role of pro-capital and pro-labor income distribution policies. The aim of these policies is to increase either profit share or wage share. Furthermore, these authors noted importance for the policy to coincide with accumulation regime in a particular country to improve economic performance. They also investigated the factors determining income distribution and argued that wage share is mainly affected by trade unions and laws which determines wages.

Empirical study: data, methodology and estimates

Data sources

Data was gathered from AMECO database for Finland and gross domestic product for its main trade partners for 1975–2020. The database contains annual macroeconomic indicators for European countries.

Variables are consumption (C), compensation of employees (W), gross operational surplus (OS), gross domestic product in current and constant prices (GDP_current, GDP), investments (I), the sum of gross domestic product of main trade partners (it was taken from the Worldbank data) such as China, the USA, the Netherlands, Russia, Germany (GDP_tradepartners), real exports of goods and service (EX), real imports of goods and services (IM), price deflator (GDP_price_defl), nominal (ULC) and real (RULC) unit labor costs, import price deflator (P_IM), export price deflator (P_EX), GDP at factor costs (GDP_factorcosts).

With that variables profit share (h) was calculated as a rate between gross operational surplus and gross domestic product at current prices. Wage share and profit share sum up to one, therefore wage share is calculated as 1-h. Import and export price deflators are used as import and export prices, respectively. The terms of trade or the relative price of export is calculated as a ratio of export price to import price. Relative domestic price is a ratio of domestic price deflator to import price deflator. Descriptive statistics is presented in Appendix (Tables 1A, 2A and 3A).

Estimation method: ARDL model

In order to analyze the effect of income distribution on economic growth, each component of aggregate demand was estimated separately. In oppose to earlier methods, this approach accounts for the effect of international trade. Redistribution towards wages leads to higher cost of labor, therefore it lowers international competitiveness through increase in domestic price level. It implies that rising price will make exports more expensive and decrease net exports.

ARDL model is used to analyze the relationship between variables in each component of aggregate demand. Some of variables are not stationary, therefore cointegration technics are required. The results

of ADF-test for variables in ARDL models are presented in Appendix. ARDL model is more appropriate than the use of differenced data because it saves long-run properties of data, as said in Nkoro and Uko (2016). Furthermore, authors claim error-correction model representation of ARDL is more efficient with small or finite sample. In Adebola et al. (2011) it is also claimed that ARDL model performs better on small samples. In addition, variables are allowed to have different order of integration, which is not true for other cointegration technics. In our research some variables are I (0) and others are I (1).

Other advantage of ARDL approach is that, being transformed into error-correction model, it allows to estimate both long run and short run coefficients.

Pesaran et al. (2001) claim that the absence of autocorrelation is the main assumption of the model, and maximum lag length should be chosen based on that criteria. For this purpose, Akaike Information Criteria is used. Also, the number of lags should coincide with the number of variables and observations in order to get appropriate degree of freedom, therefore maximum 5 lags were allowed based on sample size.

After the estimation of ARDL diagnostics tests are required to verify that there is no autocorrelation. Ramsey RESET test on specification is also applied in order to verify that non-linear regressors do not explain variation in dependent variable better than present model. Other requirement for the residuals is to be normally distributed and that there is no multicollinearity. Although ARDL with error-correction model deals with the multicollinearity due to differenced data, it should be tested because it may affect the standard errors of variables and lead to insignificant results.

After that the partial effects of profit share change on the components of aggregate demand are derived and total effect is calculated as a sum of individual effects, then multiplier effect is considered.

Methodology

Following empirical literature (Onaran and Galanis, 2012; Jetin and Reyes, 2020), single equation approach is adopted to conduct the research. It allows to estimate the effect of income redistribution for the components of aggregate demand separately. Empirical model is based on Bhaduri – Marglin theoretical model. Aggregate demand is a function of consumption, investment, net export and government expenditure.

$$AD = C(Y, h) + I(Y, h) + NX(Y, h, z) + G(Y, z), \tag{1}$$

where AD is aggregate demand, I is investment, Y is GDP, h is profit share, NX is net export, G is government expenditure, z is other variables.

Consumption, based on Keynes model, is a function of income. According to Kalecki, consumption also depends on income, however consumption differs across the sources of income – marginal propensity to consume out of profits, C_p is lower than out of wages, C_w. Therefore, consumption function is defined by:

$$\mathrm{C} = \mathrm{C}(W, P) = \ C_w + C_p = c_w(Y - P) + c_p P, \tag{2}$$

where C is total consumption, P is profit, W is wages.

Investment function is a function of profit share as an indicator of expected profitability and output which is a proxy for capacity utilization rate. Capacity utilization rate represents the demand because increase in demand requires more capacity.

$$I = I(Y, h). \tag{3}$$

Trade balance is other component of aggregate demand. Export is a function of relative export price and income of trade partners (this income is treated as a proxy for external demand).

$$EX = EX(\frac{p_{ex}}{P_{IM}}, Y_{tradepartners}). \tag{4}$$

Import is determined by relative domestic price to price of import and domestic income.

$$IM = IM(\frac{P}{P_{IM}}, Y). \tag{5}$$

Import and export functions depend on the prices, therefore domestic prices are determined by firms by unit labor costs and prices of imported goods and services.

$$p = p(ULC, P_{IM}), \tag{6}$$

where p is domestic price, ULC is unit labor costs, IM_{price} is import price.

Export price function is defined in the same way as domestic price function: it is determined by unit labor costs and prices of imported materials.

$$p_{EX} = p(ULC, P_{IM}). \tag{7}$$

If equation (1) is differentiated, the effect of increase in profit share on GDP is:

$$\frac{\frac{dY}{Y}}{dh} = \frac{\frac{\frac{dC}{Y}}{dh} + \frac{\frac{dI}{Y}}{dh} + \frac{\frac{dNX}{Y}}{dh}}{1 - (\frac{dC}{dY} + \frac{dI}{dY} - \frac{dIM}{dY})}. \tag{8}$$

Numerator is a sum of effects on the components of aggregate demand, which is also called private excess demand. The inverse of denominator is a multiplier which includes the effect of change in income due to income redistribution on the components of demand affected by income (consumption, investment, import). Each component of aggregate demand is estimated with ARDL with error-correction model or in first differenced if bound test indicates no cointegration between variables. R programming language is used to estimate equations (2)-(7) and to conduct postestimation tests and tests on the existence of unit root. These equations contain all necessary coefficients to calculate total effect (equation 8).

Consumption

Firstly, consumption function was estimated. Consumption is assumed to be the function of wage and profit. Wage is represented by the compensation of employees, while profit is approximated by gross operational surplus. Independent variables are in current prices, therefore in order to get their real values they are deflated by the price deflator of GDP. Furthermore, they were log transformed in order to see per cent changes. All variables used in that function are integrated of order one, that is why the existence of cointegration between them was tested. Number of lags is chosen based on AIC. Then following ADRL equation was adopted to study the relationship between variables.

$$\begin{aligned}\Delta\log C_t = \beta_0 + \alpha_1\Delta\log W_{t-1} + \alpha_2\Delta\log OS_{t-1} + \alpha_3\Delta\log C_{t-1} + \alpha_4\log W_{t-1} + \\ + \alpha_5\log OS_{t-1} + \lambda\log C_{t-1} + u_t.\end{aligned} \tag{9}$$

The same equation is rearranged in error-correction form after the existence of cointegration is tested which has more economic interpretation:

$$\begin{aligned}\Delta\log C_t = \beta_0 + \alpha_1\Delta\log W_t + \alpha_2\Delta\log OS_t + \lambda(\log C_{t-1} - a_l - \beta_1\log W_{t-1} - \\ - \beta_2\log OS_{t-1}) + u_t,\end{aligned} \tag{10}$$

where $\beta_1 = -\frac{a4}{\lambda}, \beta_2 = -\frac{a5}{\lambda}$, and these coefficients represent long-run elasticities of wages and profits, respectively. Speed of adjustment, λ, takes values from zero to minus one.

Prior to the estimation of equation in error-correction term, the existence of cointegration between variables was verified by Wald test on joint equality of lagged variables to zero (H_0: $\alpha_4 = \alpha_5 = \alpha_6 = 0$) in

equation 9. Bounds test proposed by Pesaran et al. (2001) indicates possible existence of cointegration, therefore ARDL (1, 1, 1) model with error-correction term is appropriate for the estimation.

Table 1 depicts estimates for ARDL with error-correction term (equation 10) and diagnostic tests.

Table 1

Consumption function, ARDL model

Depvar d(l_C)	Consumption ARDL (1, 1, 1)	Std. Error	t-stat
(Intercept)	–0.03360	(0.07158)	–0.469
L(l_C, 1)	–0.142*	(0.070)	–2.022
L(W_defl_l, 1)	0.138*	(0.079)	1.746
L(OS_defl_l, 1)	0.017*	(0.008)	2.125
d(W_defl_l)	0.612***	(0.089)	6.866
d(OS_defl_l)	0.133***	(0.024)	5.487
Num.Obs.	45	DW test (prob.)	0.25489
R2	0.794	BP test (prob.)	0.928
R2 Adj.	0.768	Mean VIF	5.86
RESET test (prob.)	0.14995	Bound F–test (prob.)	0.0394

* p < 0.1, ** p < 0.05, *** p < 0.01
Source: authors

Postestimation tests indicate model is specified correctly and do not suffer from omitted variables, autocorrelation, multicollinearity or heteroscedasticity and residuals are normally distributed.

The coefficients of first differences of variables indicate short-run relationship between variables. The increase in compensation of employees (wages) in 1 per cent leads to increase in the same variable on 0.612 per cent after 1 year, and operating surplus (profits) increases on 0.13 per cent due to increase in the same variable in previous year.

Coefficients with lagged variables represent long run coefficients. In order to interpret the coefficients, long-run elasticities are calculated as the rates of coefficients of lagged independent and dependent variables taken with negative sign. Explanation is seen from equations 9 and 10.

Long-run elasticities are

$$\frac{dC}{dW} * \frac{W}{C} = -\frac{\beta_1}{\lambda} = -\frac{0.138}{-0.142} = 0.97, \frac{dC}{dOS} * \frac{OS}{C} = -\frac{\beta_2}{\lambda} = -\frac{0.017}{-0.142} = 0.12.$$

Therefore, long run relationship between variables is represented by equation:

$$\log C_{t-1} = 0.97 \log W_{t-1} + 0.12 \log OS_{t-1} + u_t.$$

Although cointegration exists, some fluctuations from equilibrium happen, either permanent or temporary. If wage or profit change form equilibrium value, consumption out of wages decreases and out of profits it increases, elasticities are 0.612 and 0.133, respectively:

$$\Delta \log C_t = \beta_0 + 0.612\, \Delta \log W_t + 0.133\, \Delta \log OS_t,$$

and λ captures part of the disequilibrium that vanishes in next period, it is equal to 14 per cent.

Therefore, temporary shock vanishes in about 7 years. In the case of permanent shock, the equilibrium value of log of consumption increases by 14 per cent.

$$\Delta \log C_t = \beta_0 + 0.612\, \Delta \log W_t + 0.133\, \Delta \log OS_t - 0.14(\log C_{t-1} -$$

$$-0.97 \log W_{t-1} - 0.12 \log OS_{t-1}) + u_t.$$

Equation which includes both short run and long run relationship is:

In order to calculate the marginal effect of increase in profit share on consumption, consumption is divided into consumption out of wages and out of profits. Since income is a sum of profits and wages, consumption is represented with marginal propensities to consume out of wages and profits (C_w, C_p), income (Y) and profit share (h) (Dräger et al, 2009):

$$C = C_w + C_p = c_w(Y - P) + c_p P = c_w Y + (c_p - c_w)P =$$

$$= c_w Y + (c_p - c_w)Y * \frac{P}{Y} = c_w Y + (c_p - c_w)Y * h$$

$$\frac{dC}{dh} = (c_p - c_w)Y \Rightarrow \frac{\frac{dC}{Y}}{dh} = (c_p - c_w).$$

Using this equation, the partial effect of profit share increase on consumption is calculated as

$$\frac{\frac{dC}{Y}}{dh} = c_p - c_w = \left(\frac{dC}{dOS} * \frac{OS}{C}\right) * \frac{C}{OS} - \left(\frac{dC}{dW} * \frac{W}{C}\right) * \frac{C}{W} =$$

$$= 2.23 * 0.12 - 1.04 * 0.97 = 0.27 - 1.008 = -0.74.$$

It indicates that one per cent increase in profit share decreases consumption on 0.74 percent of GDP.

Marginal propensities to consume out of profits and wages are 0.27 and 1.01, respectively. Assumption about different propensities to consume out of different sources of income holds. The receivers of wages and salaries consume all their income as the theoretical model predicts.

Further, the effect of change in income on consumption calculated as a sum of effects of change in profits and wages:

$$\frac{dC}{dY} * \frac{Y}{C} = \frac{dC}{dOS} * \frac{OS}{C} + \frac{dC}{dW} * \frac{W}{C} = 0.017 + 0.138 = 0.155, \frac{dC}{dY} = 0.155 * \frac{C}{Y} = 1.09 *$$

$$0.517 = 0.56.$$

Increase in income on 1 per cent leads to increase in consumption on 0.56 per cent.

Investment

Investments are assumed to be determined by capacity utilization rate and profit share what indicates operating efficiency and expected profitability, respectively. Both variables are expected to be positively associated with investment share. All variables are in logarithms except profit share which is already in per cents. Therefore, log-linear model is estimated.

ARDL model is adopted to investigate relationship between variables. According to ADF test, variables are not stationary, therefore in order to estimate the model linear combination of the variables that is stationary must exist. Bound cointegration test indicates existence of cointegration, therefore long-run coefficients can be estimated with the following equation. The optimal number of lags was determined based on AIC.

$$\Delta \log I_t = \beta_0 + \alpha_1 \Delta \log Y_t + \alpha_2 \Delta \log Y_{t-1} + \alpha_3 \Delta h_t + \alpha_4 \Delta h_{t-1} + \\ + \alpha_5 \log Y_{t-1} + \alpha_6 h_{t-1} + \lambda \log I_{t-1} + u_t. \quad (11)$$

Following ARDL (1, 2, 2) model with error-correction term was estimated:

$$\Delta \log I_t = \beta_0 + \alpha_1 \Delta \log Y_t + \alpha_2 \Delta \log Y_{t-1} + \alpha_3 \Delta h_t + \alpha_4 \Delta h_{t-1} + \\ + \lambda \left(\log I_{t-1} - a_1 - \beta_1 \log Y_{t-1} - \beta_2 h_{t-1}\right), \quad (12)$$

where $\beta_1 = -\frac{\alpha_5}{\lambda}, \beta_2 = -\frac{\alpha_6}{\lambda} * 100$ and these coefficients represent long-run elasticity of capacity utilization rate and semi-elasticity of profit share,respectively.

Coefficients for equation 10 and postestimation tests are presented in Table 2.

Table 2

Investment function, ARDL (1, 2, 2) model

Depvar d(logI)	Coefficient	Std.Error	t-stat
(Intercept)	–0.523***	(0.064)	–8.209
L(l_I, 1)	–0.079*	(0.038)	–2.073
L(l_GDP, 1)	0.05**	(0.016)	3.499
L(h, 1)	0.039*	(0.023)	1.696
d(l_GDP)	1.957***	(0.242)	8.100
d(L(l_GDP, 1))	0.793**	(0.235)	3.375
d(h)	0.006	(0.0039)	1.646
d(L(h, 1))	0.008*	(0.004)	1.948
Num.Obs.	44	RESET test (prob.)	0.4706
R2	0.8417	DW test (prob.)	0.1393
R2 Adj.	0.8109	BP test (prob.)	0.3552
AIC	–171.8	Mean VIF	1.578382
BIC	–155.7	Bound F–test (prob.)	0.000001
Log.Lik.	94.887		

* p < 0.1, ** p < 0.05, *** p < 0.01

Source: authors

The long-run elasticity of investments with respect to income is:

$$\frac{dI}{dY} * \frac{Y}{I} = -\frac{\beta_1}{\lambda} = \frac{0.056}{-0.08} = 0.7.$$

The long run coefficient of profit share is estimated as follows: $\frac{dlogI}{dh} = -\frac{\beta_2}{\lambda} = -\frac{0.039}{-0.08} = 0.4875$. It indicates that increase in profit share on one unit (on 1 per cent) leads to increase in investment on 0.4875 per cents.

Postestimation tests indicate that model is specified correctly and do not suffer from omitted variables, autocorrelation or heteroscedasticity. After that the partial effect of profit share increase on investments share in GDP is calculated using mean values of sample:

$$\frac{dlogI}{dh} = \frac{\frac{dI}{I}}{dh} = 0.4875 => \frac{\frac{dI}{Y}}{dh} = 0.4875 * \frac{I}{Y} = 0.4875 * 0.3 = 0.146.$$

The effect of increase in profit share on investments is positive as assumed in theoretical model due to increased expected profitability.

After that, the marginal effect of increase in income on investments was calculated with elasticity and mean values of income and investments:

$$\frac{dI}{dY} = \left(\frac{dI}{dY} * \frac{Y}{I}\right)\frac{\mathrm{I}}{Y} = 0.7 * 0.3 = 0.21.$$

Increase in income on 1 per cent leads to growth of investments on 0.21 per cent.

Net export

In order to estimate the effect of income redistribution on net export, import and export functions are estimated separately. These functions depend on relative domestic and export prices, therefore price functions are also estimated.

Export function

Export function is estimated as a function of relative export price in terms of import price, income of main trade partners of Finland. Real exchange rate was included if significant. ARDL model is adopted to study the relationship between variables in export function.

$$\begin{aligned}\Delta\log EX_t = {} & a_0 + \alpha_1 \Delta \log Y_t^f + \alpha_2 \Delta\log Y_{t-1}^f + \alpha_3 \Delta\log Y_{t-1}^f + \alpha_4 \Delta\log EX_{t-1} + \\ & + \alpha_5 \Delta\log Y_{t-2}^f + \alpha_6 \Delta\log PS_t + \lambda\log EX_{t-1} + \alpha_7 \log Y_{t-1}^F + \\ & + \alpha_8 \log PS_{t-1} + u_t.\end{aligned} \tag{13}$$

After that the existence of cointegration was verified by bound test which tests the hypothesis about joint equality of the coefficients of lagged variables to zero ($H_0 = \alpha_7 = \alpha_8 = \lambda = 0$). If null hypothesis holds, cointegration between variables does not exist. Bound integration test (Table 4) rejects the hypothesis, therefore cointegration possibly exists.

ARDL (2, 3, 1) model with error-correction term was employed to estimate both long-run and short-run relationship between variables in export function as follows:

$$\begin{aligned}\Delta log EX_t = {} & a_0 + \alpha_1 \Delta \log Y_t^f + \alpha_2 \Delta\log Y_{t-1}^f + \alpha_3 \Delta\log EX_{t-1} + \alpha_3 \Delta\log Y_{t-2}^f + \\ & \alpha_4 \Delta\log tot_t + \lambda(\log EX_{t-1} - a_l - \beta_1 \log Y_{t-1}^F - \beta_2 \log tot_{t-1}) + u_t,\end{aligned} \tag{14}$$

where $\beta_1 = -\frac{\alpha_7}{\lambda}, \beta_2 = -\frac{\alpha_8}{\lambda}$, long-run elasticities of GDP of trade partners and terms of trade.

Table 3 presents the estimated coefficients of equation 12.

Table 3

Export function, ARDL model

Depvar d(l_EX)	Export ARDL (2, 3, 1)	Std. Error	t-stat
(Intercept)	–2.823*	1.3	–2.172
L(l_EX, 1)	–0.070	0.045	–1.541
L(l_GDP_tp, 1)	0.106*	0.049	2.165
L(l_tot, 1)	–0.404*	0.177	–2.288
d(L(l_EX,1))	0.047	0.134	0.350
d(l_GDP_tp)	0.009	0.164	0.054
d(L(l_GDP_tp,1))	–0.281*	0.162	–1.731
d(L(l_GDP_tp,2))	–0.750***	0.169	–4.440
d(l_tot)	–0.772*	0.352	–2.194
Num.Obs.	44	RESET test (prob.)	0.3791
R2	0.472	DW test (prob.)	0.6898
R2 Adj.	0.418	BP test (prob.)	0.3871
AIC	–122.1	Mean VIF	4.242797
BIC	–111.4	Bound F–test (prob.)	0.000532
Log.Lik.	67.071		

* p < 0.1, ** p < 0.05, *** p < 0.01
Source: authors

The long-run elasticity of export with respect to export price is calculated using coefficients presented in Table 4:

$$\frac{dEX}{dp_{EX}} * \frac{p_{EX}}{EX} = -\frac{-0.404}{-0.07} = -5.77.$$

1 per cent increase in export price decreases export on 5.77 per cent. The magnitude of this effect is very high. Its sign coincides with the law of demand.

The effect of income of main trade partners is also significant and has expected positive sign.

Import function

After that import function was estimated. This is a function of GDP of home country and domestic to import price. Following ARDL (1, 1, 1) equation is estimated:

$$\Delta IM_{\mathrm{t}} = a_0 + \alpha_1 \Delta \log Y_t^h + \alpha_2 \Delta \log tot_{IM_t} + \\ + \lambda \log IM_{t-1} + \alpha_3 \log tot\_IM_{t-1} + \log GDP_{t-1} + u_t . \quad (15)$$

ARDL (1, 1, 1) model with error-correction term is used after the existence of cointegration was verified with Bound test. Equation 14 is rearranged into error-correction form to derive long-run coefficients:

$$\Delta IM_{\mathrm{t}} = a_0 + \alpha_1 \Delta \log Y_t^h + \alpha_2 \Delta \log tot_{IM\,t} + \\ + \lambda (\log IM_{t-1} - a_l - \beta_1 \log Ptot_{IM\,t-1} - \beta_2 \log Ptot_{IM\,t-1}) + u_t , \quad (16)$$

where $\beta_1 = -\frac{\alpha_3}{\lambda}, \beta_2 = -\frac{\alpha_4}{\lambda}$ – long-run elasticities of import price and GDP.

Table 4 presents estimated coefficients and postestimation tests for equation 14.

Table 4

Import function, ARDL model

Depvar d(l_IM)	Coefficient	Std.Error	t-stat
(Intercept)	0.048	(0.115)	0.422
L(l_IM, 1)	–0.147***	(0.030)	–4.945
L(l_GDP, 1)	0.111***	(0.029)	3.809
L(tot_IM, 1)	0.235**	(0.064)	3.643
d(l_GDP)	1.478***	(0.176)	8.389
d(tot_im)	–0.035	(0.120)	–0.290
Num.Obs.	45	RESET test (prob.)	0.1135
R2	0.797	DW test (prob.)	0.6479
R2 Adj.	0.759	BP test (prob.)	0.1934
AIC	–171.0	Mean VIF	8.1147
BIC	–154.8	Bound F–test (prob.)	0.000001
Log.Lik.	94.519		

* p < 0.1, ** p < 0.05, *** p < 0.01

Source: authors

Postestimation tests indicate that model is specified correctly.

Short run elasticity of GDP indicates that the effect of increase in relative domestic price on import in the next year is insignificant. That is explained by the fact that demand reacts to the change in price slowly. The long-run elasticity of import with respect to domestic price is derived from the coefficients: $\frac{dIM}{dP} * \frac{P}{IM} = -\frac{\beta_1}{\lambda} = -\frac{0.235}{-0.1472} = 1.59$. Increase in domestic price on 1 per cent leads to 1.59 per cent increase in import. The sign of elasticity is in accordance with the law of demand.

The effect of increase in income on import is:

$$\frac{dIM}{dY} =$$

$$\left(\frac{dIM}{dY} * \frac{Y}{IM}\right)\frac{IM}{Y} = -\frac{0.135}{-0.139} * 0.404 = 0.392.$$

Export price equation

Export price function is estimated as a function of nominal unit labor costs and import price. ARDL (1, 2, 1) was adopted to study the relationship between variables.

$$\Delta \log P_{EX_t} = a_0 + \alpha_1 \Delta \log ULC_t + \alpha_2 \Delta \log ULC_{t-1} + \\ + \alpha_3 \Delta \log P_{IM_t} + \lambda \log P_{EX_{t-1}} + \alpha_4 \log ULC_{t-1} + \alpha_5 \log P_{IM_{t-1}} + u_t. \quad (17)$$

After the existence of cointegration was verified, previous equation is rearranged into error-correction form:

$$\Delta P_{EX_t} = a_0 + \alpha_1 \Delta \log ULC_t + \alpha_2 \Delta \log ULC_{t-1} + \\ + \alpha_3 \Delta \log P_{IM_t} + \lambda (\log P_{EX_{t-1}} - a_l - \beta_1 \log ULC_{t-1} - \beta_2 \log P_{IM_{t-1}}) + u_t, \quad (18)$$

where $\beta_1 = -\frac{\alpha_4}{\lambda}, \beta_2 = -\frac{\alpha_5}{\lambda}$ are long-run elasticities of export price with respect to ULC and import price.

Estimates for equation 16 are depicted in Table 5.

Table 5

Export price function, ARDL (1, 2, 1) model

Depvar d(l_P_EX)	Coefficient	Std. Error	t-stat
(Intercept)	−0.95569**	(0.317)	−3.013
L(l_EX_price, 1)	−0.157**	(0.055)	−2.855
L(l_ULC, 1)	0.143**	(0.053)	2.695
L(l_IM_price, 1)	0.131***	(0.048)	2.756
d(l_ULC)	−0.100	(0.137)	−0.729
d(L(l_ULC, 1))	−0.365**	(0.139)	−2.624
d(l_IM_price)	0.927***	(0.059)	15.613
Num.Obs.	44	RESET test (prob.)	0.15722
R2	0.906	DW test (prob.)	0.4267
R2 Adj.	0.891	BP test (prob.)	0.1642
AIC	−210.6	Mean VIF	4.501374
BIC	−196.3	Bound F–test (prob.)	0.03332
Log.Lik.	113.291		

* p < 0.1, ** p < 0.05, *** p < 0.01

Source: authors

The elasticity of export price with respect to unit labor cost is calculated:

$$e_{P_x,ULC} = \frac{dp_{EX}}{dULC} * \frac{ULC}{p_{EX}} = -\frac{0.143}{-0.157} = 0.91.$$

It indicates increase in unit labor costs on 1 per cent increases export price on 0.91 per cent. Higher costs of production result in prices increase.

Domestic price equation

Domestic price function is a function of unit labor costs. These costs represent average cost of labor required to produce unit of output and the price of imported goods because economy of Finland depends on international trade. Intermediate goods are imported and increase in its price leads to increase in domestic prices. The growth of prices on fuel is a main reason for increase in import prices, and it affects domestic prices. Both dependent variables are expected to be positively associated with domestic price.

Bound test for cointegration was applied to domestic price equation. It indicates there is no long-run relationship between domestic price, import price and nominal unit labor costs. Therefore, only short run elasticities are estimated with the following equation in differences (similar to ARDL with ECT if long-run relationship does not exist):

$$\Delta \log P_t = \alpha_1 + \alpha_2 \Delta \log P_{IM_t} + \alpha_3 \Delta \log ULC_t + u_t . \quad (19)$$

Estimates for that model are presented in Table 6.

Table 6

Domestic price function, ARDL model

Depvar $\Delta \log P_t$	Coefficient	Std.Error	t-stat
(Intercept)	0.029***	(0.004)	6.904
Δl_ULC_diff	0.174**	(0.074)	2.365
Δl_P_IM	0.162*	(0.081)	1.984
Num.Obs.	45	RESET test (prob.)	0.1294
R2	0.783	DW test (prob.)	0.1439
R2 Adj.	0.773	BP test (prob.)	0.1795
AIC	−195.3	Mean VIF	1.7962
BIC	−188.1	F	14.174
Log.Lik.	101.652		

* p < 0.1, ** p < 0.05, *** p < 0.01
Source: authors

The elasticity of domestic price with respect to unit labor costs is directly taken from estimated coefficients.

$$e_{P,ULC} = \frac{dp}{dULC} * \frac{ULC}{p} = 0.174 .$$

1 per cent increase in unit labor costs increases domestic price on 0.174 per cent due to higher costs of production.

Further, elasticity of unit labor costs with respect to real unit labor costs is calculated. Real unit labor cost is equal to nominal unit labor divided by price level, therefore

$$\log P_t = \alpha_1 + \alpha_2 \log P_{IM_t} + \alpha_3 \log ULC_t + u_t <=>$$

$$\log P_t = \alpha_1 + \alpha_2 \log P_{IM_t} + \alpha_3 \log RULC_t + \alpha_3 \log P_t + u_t <=>$$

$$\log P_t = \frac{(\alpha_1 + \alpha_2 \log P_{IM_t} + \alpha_3 \log RULC_t + u_t)}{1 - \alpha_3} .$$

Taking derivative with respect to real unit labor costs give

$$\frac{dlogP}{dlogRULC} = \frac{\alpha_3}{1-\alpha_3} = \frac{dlog\frac{ULC}{RULC}}{dlogRULC} = \frac{dlogULC - dlogRULC}{dlogRULC} =$$

$$= \frac{dlogULC}{dlogRULC} - 1 <=> \frac{dlogULC}{dlogRULC} = \frac{\alpha_3}{1-\alpha_3} + 1 = \frac{1}{1-\alpha_3} = \frac{1}{1-0.174} = 1.21.$$

Results and discussion

The total effect of increase in profit share on gross domestic product is calculated with estimated coefficients. With this effect and elasticities calculated above, the effect of profit share on income is calculated as the effect of increase in wage share taken with negative sign. Chain elasticity rule is used, and mean values of import, income and real unit labor costs are used to convert elasticity into marginal effect:

$$\frac{\frac{dIM}{Y}}{dh} = -\frac{\frac{dIM}{Y}}{dh} = -\left(e_{IM,P}\ e_{P,ULC} * e_{ULC,RULC} * e_{WS,RULC}\right) * \frac{\frac{IM}{Y}}{rulc} =$$

$$= -\left(e_{IM,P}\right)\left(e_{P,ULC}\right) * \frac{1}{\left(1-e_{p,ULC}\right)}\left(\frac{Y^f}{Y}\right)^1 \frac{\frac{IM}{Y}}{rulc} = -1.59 * 0.174 * \frac{1}{1-0.174} * 0{,}964 *$$

$$* 0{,}006 = -0.00194.$$

Increase in profit share indicates increase in international competitiveness, therefore import decreases. Although, that effect is low in magnitude.

In a similar way, the effect of change in profit share on export is calculated:

$$\frac{\frac{dEX}{Y}}{dh} = -\frac{\frac{dEX}{Y}}{dh} = -\left(e_{EX,P_{EX}} * e_{P_{EX},ULC} * e_{ULC,RULC} * e_{RULC,WS}\right) * \frac{\frac{EX}{Y}}{rulc} =$$

$$= -(-5.77) * 0.91 * \frac{1}{(1-0.91)}\left(\frac{Y^f}{Y}\right)\frac{\frac{EX}{Y}}{rulc} =$$

$$= 58.34 * 0.68 * 0.004 = 0.16.$$

Then the effect of change in profit share on net export is identified:

$$\frac{\frac{dNX}{Y}}{dh} = \frac{\frac{dEX}{Y}}{dh} - \frac{\frac{dIM}{Y}}{dh} = 0.16 - (-0.00194) = 0.16194.$$

After that multiplier effect is calculated:

$$m = \frac{1}{1-(\frac{dC}{dY}+\frac{dI}{dY}-\frac{dIM}{dY})} = \frac{1}{1-(0{,}56+0.21-0.392)} = 1.61.$$

It allows to include the effect of increase in income on components of aggregate demand. Summary effect on the components of aggregate demand is private excess demand which represents change in demand due to redistribution in income.

It is equal to $\frac{\frac{dY}{Y}}{dh} = \frac{\frac{dC}{Y}}{dh} + \frac{\frac{dI}{Y}}{dh} + \frac{\frac{dNX}{Y}}{dh} = -0.74 + 0.146 + 0.161 = -0.433$. That means 1 per cent increase in profit share decreases economic growth on 0.433 per cent. If further effect of increase in income redistribution is considered, total effect is $1.61 * (-0.433) = -0.69$.

[1] $RULC = WS * \frac{Y_{factor\ \ costs}}{Y}$

This result confirms the hypothesis that economic growth of Finland is wage-led. Income redistribution towards profits leads to decline in economic growth due to fall in consumption. Purchasing power falls and lowers the demand. Positive effect on investments and net export due to increased international competitiveness because of lower costs does not overweigh the negative effect on consumption.

The estimates of total effect and its components for Finland and related literature are presented in Table 7. Wage-led accumulation regime was found in Sweden, Denmark and Norway (Bengtsson and Stockhammer, 2021). Nordic countries show strong government intervention, labor unions and laws which support the rights of workers, and findings indicate that redistribution towards wages positively affects economic performance there. Similar approach to the estimation of income redistribution effect identifies the profit-led regime of economic growth only in China (Onaran and Galanis, 2012).

Table 7

Estimates for Finland and other countries

Effects and its components	Estimates for Finland	China (Onaran and Galanis, 2012)	Sweden (Bengtsson and Stockhammer, 2021)	Denmark (Bengtsson and Stockhammer, 2021)	Norway (Bengtsson and Stockhammer, 2021)
$\frac{dC}{dY}$	0.56	0.54	–	–	–
$\frac{dI}{dY}$	0.21	2.03	–	–	–
$\frac{dIM}{dY}$	0.392	1.5	–	–	–
$\frac{dC/Y}{dh}$	–0.74	–0.41	–0.3	–0.22	–0.14
$\frac{dI/Y}{dh}$	0.146	0	0.4	0.94	0
$\frac{dNX/Y}{dh}$	0.161	1.99	–0.49	b–0.51	–0.36
Total $\left(\frac{\frac{dC}{Y}\frac{\pi}{\pi}+\frac{dI}{Y}\frac{\pi}{\pi}+\frac{dNX}{Y}\frac{\pi}{\pi}}{1-\left(\frac{dC}{dY}+\frac{dI}{dY}-\frac{dIM}{dY}\right)}\right)$	–0.69	1.95	–0.38	–0.1	–0.17

Source: authors

Conclusion

We estimated the effect of income distribution on economic growth in Finland from 1975 to 2020 using Bhaduri and Marglin (1990) model. ARDL model is applied to analyze the effect of profit share increase on aggregate demand components. Single-equation estimation approach is adopted because it is more interpretable, and it allows to differentiate between the effect on domestic sector and the effect of trade. Findings indicate that income redistribution towards profits leads to decline in economic growth due to fall in consumption, and positively affects investments and net export due to increased international competitiveness through costs reduction; the first effect is stronger than two other effects. These results confirm the hypothesis about the wage-led regime of economic growth in Finland.

Based on the findings it cannot be stated that the redistribution of income towards wages was the only or the most important source of economic growth during the considered period. Income policies also affect economic performance of Finland, as well as supply-side factors. Considering other factors is beyond the focus of our research, although their importance is not neglected.

Approach of Scandinavian countries, and Finland to the role and effects of wages, for instance, differs from classical idea about the effect of wage restraint policy for increase in investments. Rise in wages is seen as a way to increase labor productivity. This approach appears more adequate, as being consistent with Bhaduri and Marglin (1990), especially considering the fact that our findings indicate wage-led accumulation regime in Finland. The results of this study support further implementation of income policy and illustrate that if policy goes in line with the regime of economic growth in the country, it positively affects economic development. Therefore, implementation of income policy corresponding to the regime of economic growth is recommended for all countries. The model also shows that increase in profitability is not necessarily good for economic growth, and its negative effect on the demand should also be considered.

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Appendix

Table A1

Description of variables

Symbol	Variable	Description
C	Consumption	Private consumption at constant prices, billions of euro
I	Investments, nominal	Gross fixed capital formation, nominal, billions of euro
W	Wages	Compensation of employees, nominal, billions of euro
OS	Profits	Gross operating surplus, nominal
h	Profit share (OS/GDP)	Share of profits in GDP
WS	Wage share, 1–h	Share of wages in GDP
RULC	Real unit labor costs ($\frac{ULC}{P}$)	Real compensation per employee divided by nominal GDP per person employed
ULC	Nominal ULC	Nominal compensation per employee divided by nominal GDP per person employed, affects export and import price level because of increase in production costs
Y	Real GDP	Gross domestic prices at constant prices, billions of euro
P	Price deflator	Change in price with comparison to base year (Nominal GDP / Real GDP)
IM	Import of goods and services, at constant prices (2015)	Import at constant prices, billions of euro
EX	Export of goods and services, at constant prices (2015)	Export at constant prices, billions of euro
GDP_ tradepartners	Sum of gross domestic product of Russia, China, the USA, the Netherlands, Germany	Gross domestic prices of main trade partners, billions of euro
P_EX	Export price deflator (proxy for export price)	Change in export price with comparison to base year (Nominal EX / Real EX)
P_IM	Import price deflator (proxy for import price)	Change in import price with comparison to base year (Nominal IM / Real IM)
tot_EX	Terms of trade (P_EX / P_IM)	Number of units of exports needed to purchase a unit of import
tot_IM	Terms of trade for import (P / P_IM)	The number of times domestic prices exceeds import prices

Source: authors

Table 2A

Summary statistics

Variable	Mean	SD	Min	Median	Max
C	83.5	24.8	45.8	78.9	122.3
OS	30.3	18.3	3.5	31.1	60.0
W	60.0	32.3	9.9	54.1	111.9
price_defl	69.7	24.5	20.7	74.2	106.0
I	28.8	10.0	13.3	27.8	50.8
GDP	118.2	47.4	48.3	116.7	220.3
IM	45.7	25.2	15.2	38.9	91.1
GDP_current	123.5	69.8	18.1	115.7	240.6
P_IM	87.3	16.9	41.3	91.5	108.0
EX	46.5	27.3	10.1	41.6	91.6
P_EX	94.3	15.2	52.1	99.7	111.7
GDP_tradepartners	8239.9	4986.3	2603.5	6640.4	18802.8
GDP_factorcosts	65.3	5.2	58.3	63.7	75.0
WS	65.3	5.2	58.3	63.7	75.0
ULC_nom	75.4	19.0	33.1	76.7	103.3
ULC_real	105.2	9.0	94.1	102.2	124.2

Source: authors

Table 3A

Augmented Dickey-Fuller test

Variable	ADF statistics	p-value
l_C*	−1.5456	0.7547
l_W	−2.0422	0.5572
l_OS	−1.6489	0.7136
PS	−1.8338	0.64
l_I	−2.5661	0.3489
L_EX	−1.6997	0.6933
L_GDP_tp	−2.2666	0.4679
l_tot_EX	−2.681	0.3032
L_IM	−1.2522	0.8713
L_tot_IM	−1.6341	0.7194
L_GDP	−2.5675	0.3483
L_P_IM	−5.1751	0.01
L_ULC	−1.4496	0.7928
L_P_EX	−4.6883	0.001
L_GDP_pricedeflator	−4.1358	0.01247
L_GDP_real	−2.2666	0.4679

Note: "l_..." represents log of variable, variables which are initially at current prices were deflated with price deflator. H_0: unit root is present
Source: authors