EFFECT OF ENTRY REGULATION ON LABOUR SHARE OF INCOME: EVIDENCE FROM NETWORK INDUSTRIES IN FINLAND AND SWEDEN

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JYVÄSKYLÄN YLIOPISTO

ABSTRACT

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Abstract

Decrease in labour share of income relative to profit share has been widely studied subject in economics lately, since for decades this ratio has been considered constant. There has been found many different mechanisms for this phenomenon, yet the prevailing consensus is that globalization is the main driving factor for this. This study focuses on the effect of entry barriers on the labour share in Finland and Sweden between 1975-2013. Earlier studies have concluded differing results; when entry barriers are fading, 1) labour share tends to increase due to decreasing profit margins or lower product prices for the customers, 2) labour share decreases because of market concentration towards firms with higher than average productivity or the productivity growth in such firms.

Research section utilizes wide panel data from different network industries. Statistically significant results from random and fixed effect regressions show positive relationship between entry barriers and labour share. Moreover, results are also economically significant, since one-unit change in market entry barrier index indicates around two percent point change in labour share of income. In order to mitigate bias, instrumental variable method alongside other expanded models are used, which show that the results are consistent. Such relationship according to theories comes possibly from the growing aggregate productivity within industries through the process of creative destruction – mainly due to high productivity of market entrants or growing R&D-intensity within the incumbent firms. However, it is hard to make widely editorialised political recommendations based on the study, because exact origins of the mechanism are not modelled in this thesis. Despite that, it is quite important to define foundation of changes in the aggregate labour share so that evaluation of inflationary pressures as well as wage politics can be successful.

Keywords
Functional income distribution, labour share of income, market entry barriers, productivity, panel regression

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Tiivistelmä

Kansantalouden työn tulo-osuuden vähentyminen suhteessa voittojen osuuteen on ollut viime vuosina paljon tutkittu aihepiiri taloustieteessä, sillä suhdeluvun ajateltiin pitkään olevan lähes muuttumaton. Ilmiölle on löydetty useita eri mekanismeja, mutta tiedeyhteisön konsensuksen mukaan globalisaatio on suurin yksittäinen selittävä tekijä. Tässä tutkielmassa perehdytään kuitenkin tarkemmin siihen, millainen markkinoille pääsyn rajoittavien tekijöiden vaikutus on ollut työn tulo-osuuteen Suomessa ja Ruotsissa vuosina 1975-2013. Aiheeseen liittyvät aikaisemmat tutkimukset ovat antaneet erisuuntaisia tuloksia; kun kilpailua estävät rajoitteet poistuvat 1) työn tulo-osuus kasvaa pienentyvien voittomarginaalien kautta tai halvempien kulutustuotteiden hintojen kautta, 2) tulo-osuus laskee keskimääräistä tuottavampien yritysten haaliessa lisää markkinaosuuksia tai näiden kasvattaessa tuottavuuttaan.

Tutkimusosiossa käytetään laajaa koottua paneeliaineistoa useilta eri verkostotoimialoilta. Satunnaisia ja kiinteitä vaikutuksia hyödyntävillä regressioilla saadut tilastollisesti merkittävät tulokset osoittavat, että markkinasäätelyllä ja työn tulo-osuudella on positiivinen yhteys. Tulokset ovat myös taloudellisesti merkittäviä, sillä yhden yksikön muutos markkinasäätelyindeksissä indikoi noin kahden prosenttiyksikön samansuuntaista muutosta työn tulo-osuudessa. Tulosten harhaisuuden vähentämiseksi käytetyt instrumenttimuuttuja- sekä muut tarkentavat testimenetelmät osoittavat, että tulokset pysyvät johdonmukaisina. Tutkittu yhteys on teoriaan pohjaten mahdollisesti seurausta toimialojen aggregaattitason tuottavuuskasvusta luovan tuhon kautta – lähinnä markkinoille tulevien yritysten korkean tuottavuuden tai markkinoilla jo olevien yritysten lisääntyneiden T&K-panostuksien vuoksi. Laajalti kantaaottavia politiikkasuosituksia on kuitenkin haastavaa tehdä, sillä mekanismien tarkkaa alkuperää ei tässä tutkimuksessa ole mallinnettu. Tästä huolimatta on huomattavan tärkeää, että työn tulo-osuuden muutoksen lähtökohtia saadaan selville, jotta inflaatiopaineiden ja palkkojen muutostarpeiden arviointi onnistuu.

Asiasanat
Funktionaalinen tulonjako, työn tulo-osuus, markkinoille pääsyä rajoittavat tekijät, tuottavuus, paneeliregressio

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TABLE OF CONTENTS

TABLES

FIGURES

1 INTRODUCTION

Ever since Kaldor (1957) introduced his stylized facts of the economic growth, his contribution has been considered nominal in the field of economics. The stability of labour share of income was one the key foundations of Kaldor's (1957) work and many economic theories are built on the base of that factor (Karabarbounis & Neiman 2016). However, economies have seen some major development from those days and issues have risen concerning this constant, which Kaldor (1957) represented as one of the stylized facts of the economic growth. This supports for other major economic growth theory contributor Robert Solow (1958) who was sceptical all along about this belief and suggested that it might be an "optical illusion".

The labour share of income has reportedly been decreasing significantly all around the world as early as from 1980s and the magnitude has been significant. This phenomenon has been arising from various factors according to large variety of studies and clear understanding of these mechanisms does have an important role in the policy recommendations. Wide knowledge is somewhat crucial since public discussion usually emphasizes wage policies in the context of national income mechanics. Moreover, Bentolila and Saint-Paul (2003) point out that labour share is mistakenly interpreted as changes in real wages in policy debate. This might lead politicians towards wrong decisions if the changes in the labour share is seen only through decelerating wages. This is the case because there exists only a weak correlation between changes in labour share and changes in wages (Bentolila & Saint-Paul, 2003). Therefore, it is important, as Böckerman and Maliranta (2012) state, to separate causes of the emerging changes between accelerated productivity and decelerated wage growth. Especially, interest should be paid on the essential micro-level mechanisms around these changes (Böckerman & Maliranta, 2012).

Bengtsson (2014) has captured the long run aggregate labour share development in Sweden from the year 1900 to 2000. He finds out that after 1980, the long period where labour's share increased, shifted to a period of continuous decrease. This structural break occurred mainly by a large devaluation[1] in pursuance of increase in competitiveness of the Swedish firms. Other major factor presented is decentralisation of 1983 that drove the wage-bargaining system into a disorder. (Bengtsson, 2014.) In Finland, the results are somewhat similar. In the 1990's there has been major decrease in Finnish labour share (Ripatti & Vilmunen, 2001). In this matter, Böckerman and Maliranta (2012) argue that increased productivity – and declining labour share – are caused mainly by micro-level restructuring. On the other hand, Bentolila and Saint-Paul (1999) provide evidence that labour share increased in both Finland and in Sweden from 1970 to 1990. However, labour share in Sweden indeed decreases from 1980 to 1990 in their findings, which can be reflected to Bengtsson (2014). Nevertheless, the labour

[1] This supposedly decreased the Swedish real wages (Bengtsson, 2014).

share decreased in many other sample countries during this period (Bentolila and Saint-Paul, 1999).

The mechanics of the labour share are somewhat varying: Some affecting factors are clearly understood whereas others are more complex and less studied. Moreover, there exists vast literature about the most common mechanisms e.g. globalisation, technological progress, unionization, financialization and other productivity changing phenomenon. One of the less studied subjects in this context is entry regulation: much of because regulation levels are hard to identify not to speak about quantifying them. However, there exist indices for entry barriers in OECD regulatory database, which have been provided by Nicoletti et al. (2000) and later updated by Koske et al. (2015), which are utilized in empirical part of this thesis. Previous studies suggest that the relationship could be either way around. Azmat et al. (2012) as well as Blanchard and Giavazzi (2003) argue that aggregate labour share is about to fall when markets are being deregulated. Contrary to that, Autor et al. (2017a) provide information about positive relationship between entry barriers and labour share of income. Goal of this thesis is to test whether entry regulation has any explanatory power in the possible movement of the labour share of income in Finland and Sweden, respectively. The null hypothesis tested in this matter is that the labour share is not affected by the regulatory changes.

Finland and Sweden are chosen because they share some major similarities in industrial and economic as also in institutional structures. Therefore, it is interesting to see whether there exists divergence between these countries. More precisely, study focuses on network industries because they cannot be traded, hence mitigating the effect of globalization on the labour share. In this matter, chapter four includes labour share decomposition approach based on data that prof. Mika Maliranta generously provided. More in depth analysis is done using random and fixed effect panel regressions as main estimation methods. These methods are later expanded to instrumental variable approach as well as two-step GMM method. Additionally, thesis introduces wide variety of robustness checks, which are highlighted in chapter 5.

The paper proceeds in the following order. Second chapter focuses on the theoretical background in main topics discussed in this thesis and the third chapter sums up earlier studies regarding the labour share of income and entry regulations. Data and empirical methods for utilizing it are explained in the fourth chapter. Chapter five introduces results, whereas chapter six concludes the main findings.

2 THEORETICAL BACKGROUND

2.1 Economic Growth

In economics, economic growth is arguably the main subject of study in field of macroeconomics, not only because of its' importance on the national development and wellbeing but also for making right political decisions especially concerning monetary or fiscal politics. Normally the economic growth is represented as the growth rate G of output per person (Aghion & Howitt, 2009, s.106). Kaldor (1957) stated that the fundamental purpose of a theory of economic growth is to capture the dependent non-economic variables, which explain the differences in the growth rate of different societies. As for the definition of economic growth it can be said in many ways. Nutter (1957) defines it as expansion in economic welfare and in productive capabilities whereas Kuznets (1973) describes it as a long-term rise in capacity of production, which follows from technological improvement and institutional functionality. These definitions are quite similar, and one might conclude that steady economic growth is seen universally as achievable state of improvement.

Now that economic growth is defined in concrete way as improvement in production capacity, it can be measured by a production index. This of course does not mean that Nutter's (1957) mentioned economic welfare would be less important measurement, yet its level is much more difficult to observe. Hence, that and some useful properties are the reason why production index is more commonly used. Movements in its level are quite easily interpreted: they indicate the direction and even velocity of growth (Nutter, 1957). However, these indications might be spurious when path of expansion faces temporary radical shift (wartime) or long-range adjustment due to major innovations (Nutter, 1957).

Gross domestic product (GDP) is the most commonly and widely used indicator concerning economic growth. It consists all the production from the corporations, governmental entities, households and all other non-profit institutions in a specific country during a given period, usually annually. (Lequiller & Blades, 2014).

Lequiller and Blades (2014) represent GDP as end value of three different equivalent equations:

$$\text{GDP} = \sum \text{Gross value added} = \text{Compensation of employees} + \text{Company profits} = \text{Consumption} + \text{Investment} + \text{Net exports} \quad (1)$$

In other words, GDP can be measured with three different methods: the output approach, the income approach or the final demand approach (Lequiller & Blades, 2014). When calculating value for GDP it must be taken in account whether to represent value as nominal or real. The main difference between nominal and real GDP is that real value is deflated with some price indicator. This

means that real GDP values are less vulnerable for misinterpretations than nominal values since real values are adjusted for inflation. One of the key points in measuring GDP is international comparison, yet total aggregate values must be modified to more comparable form. This is done by dividing the GDP of a country by its population so that the size (citizens) of the country is controlled. This is known as GDP per capita.

Economic growth itself arises from various component. Barro (1996) presents empirical findings on the determinants of economic growth in his study of conditional convergence. The growth rate is in normal circumstances augmented by better education, better preservation of the rule of law, higher life expectancy, lower birth rate, lower government expenditure and enhancements in the terms of trade (Barro, 1996). These and many others institutional and demographic factors are indeed major components while seeking growth, however improvements in these factors don't provide much more growth at certain level of real GDP per capita[2]. At this point economic growth can be enhanced with growth in productivity and/or growth in employment.

Lequiller and Blades (2014) state that strong GDP growth is combined with decline in unemployment. This result is somewhat obvious since more workers equal more production. Unfortunately, raising only employment level is not trouble-free solution because all factors of production have diminishing returns if all other factors are kept constant. This problem can be dodged with simultaneous capital accumulation but there still exists the problem of finite work force.

In the long-run, productivity growth through technological progress is the main force for driving the economic growth (Maliranta, 2003). In economics technological progress is a measurement of innovations – more precisely a process where new technology overcomes the old one. Hence the new technology is usually better in some way (e.g. more efficient), it enhances the productivity and therefore boosts economic growth. The effect of technological diffusion is most visible in the case of high leap technological improvements e.g. internal-combusting engine or information technology.

Over the time economists have tried to model the determinants of growth more and more precisely, which can be seen in forms of different theories. Crafts (1992) categorizes aggregate economic growth into four theoretical perspectives:

1. Traditional approach (Neoclassical growth theory)
2. New growth economics (Endogenous growth theory)
3. The catch-up hypothesis
4. Institutional influences on growth

Although these frameworks are widely recognized, Maliranta (2003) points out that there lies major shortage in this form of classification. These approaches focus on almost solely on macro-level and neglect the importance of micro-level

[2] For given values of independent variables, GDP growth is negatively related to the initial level of real per capita GDP (Barro, 1999). This is the concept of conditional convergence.

heterogeneity in development (Maliranta, 2003). While beforementioned models are used to study particularly macro-level determinants, micro-level components of economic growth are captured most commonly with Schumpeterian growth theory. This model is discussed later in this chapter.

The most known model of the economic growth is neoclassical growth model which is contribution of Robert Solow and Trevor Swan. This, so called Solow-Swan model concentrates on capital accumulation and treats technological progress as exogenous. The model that Solow (1956) presents has basic identity of constant savings rate so that net investments is equal to the rate of increase in community's stock of capital. Another important assumption in Solow's (1956) work is that both capital and labour have diminishing marginal productivity. In his model the output growth is intermediate between growth of labour and capital. Hence one of the most important variables here is the capital-labour ratio which defines the rate of growth. The model also states that there exists stable equilibrium value of capital-labour ratio in which the economy converges. This equilibrium is called steady state and it expresses the balanced growth at the natural rate. (Solow, 1956.)

In Solow-Swan model the steady state is eventually reached and the growth per capita stops in the absence of technological change. Romer (1990) states that neoclassical approach denies the role of private, maximizing behaviour in development of technological change since technological progress is considered as exogenous in Solow-Swan framework. Therefore, the nominal work of endogenous growth models by Romer (1986, 1990) and Lucas (1988) are based on this shortage.

Romer (1986) developed equilibrium model of endogenous technological change where long-run growth arises from the accumulation of knowledge, which is assumed to be product of research technology. In his model, knowledge is the basic form of capital. In contrast to neoclassical models where capital has diminishing marginal productivity, Romer (1986) proposed that knowledge (=capital) may in fact have an increasing marginal product so that it can grow without boundaries. In addition, investments in knowledge are assumed to have positive externalities since knowledge usage cannot be perfectly prevented. (Solow, 1986).

Lucas (1988) extends Romer (1986) model with so called human capital approach. The model has same assumptions, but it divides capital into two different subgroups - physical capital and human capital. The human capital is form of capital which accumulates through schooling and which has spill over effects (Lucas, 1988).

Romer (1990) presents one-sector neoclassical model with technological change, augmented to find the endogenous explanation of technological progress. In the absence of policies that could converge the differences between social and private returns to research, subsidizing physical capital accumulation is not the most efficient way to increase the incentives for research. Therefore, second-best policy would be subsidizing the accumulation of human capital. (Romer, 1990.)

Grossman and Helpman (1994) state that, even if there exist theories that emphasizes different factors of growth there is no need to choose between tech-

nology based and capital accumulation-based models. Despite the fact, that technological progress is the key driving force of long-run growth, capital accumulation is needed at least during transitional phase. This observation lies behind the idea that capital accumulation is needed for utilizing new innovations and technological improvements for the tangible production. (Grossman & Helpman, 1994.)

When neoclassical and endogenous growth theory focus on capturing aggregate macro-level determinants of economic growth, the one called Schumpeterian growth formalized by Aghion and Howitt (1992) concentrates on the micro-level dynamics. Aghion and Howitt (1992) embody Schumpeter's idea in their model of growth through creative destruction. Schumpeter (2003/1942, p. 83) defines creative destruction as a process that keeps the capitalist engine in motion with new innovations which unceasingly transforms the economic structure from within, incessantly creating new and destroying old. It is that the creative destruction is continuous development of the microstructures in which the most inefficient firms with weak productivity are ruled out from the market by more productive firms. The model in Aghion and Howitt (1992) is based on the technological progress, which results from competition among research companies. The creative destruction is illustrated in their model in the way that each innovation creation aims to capture monopoly rents but at the same time it also destroys the rents motivated in the previous creation (Aghion & Howitt, 1992).

The Schumpeterian model is centre of interest in this thesis because it makes possible to identify the micro-level determinants of productivity and labour share.

2.2 Functional income distribution

Economists have always been interested in functional income distribution and it has been very controversial subject in the field of economics (Koray, 1989). The topic has gathered even more interest during last three decades because this, so called distribution of national income, has changed substantially.

Burkhead (1953) describes the national income as a measurement of relative magnitudes of the factors of production, which he states are labour and property. Nowadays theoretical equations use capital, which is needed on the production, instead of property. So more commonly the functional distribution of income is the relative measure between labour share (=wages) and capital share (=profits) of income. However, output results also from intermediate products but since macroeconomic presentations use value added instead of raw output, input factor is possible to leave out (Lequiller & Blades, 2014). There are also other minor factors of production but hence the production function is homogenous of first degree it follows that there is no need to include scarce resources like land in the equation (Solow, 1956). These statements can be generalized to whole range of growth theories.

Functional income distribution must be segregated from the personal income distribution at the theoretical point of view even if they are closely related to each other. Bertola et al. (2005) state that in the neoclassical theory every individual gains a portion of aggregate output depending on how much they own factors of productivity. This forms personal income distribution. In proportion each unit of these factors is compensated with amount based on the marginal productivity (Bertola et al., 2005). So, altogether these compensations can be summed up to get incomes across factors of production to form the functional income distribution (Bertola et al., 2005).

Functional income distribution can be derived from the wide variety of the growth models since factor shares are playing major role in framework of economic growth. The relationships between economic growth and factor shares has confronted major change in the past. Where earlier theories suggested that the interest focused on the question how the functional income distribution could adjust to support technologically determined growth, more recent theories suggest a new perspective. In latter the interest lies in the question, how the rate of accumulation and growth are affected by distribution of income across factors (Bertola et al., 2005.)

The first systematic framework and analysis of economic growth, which especially add up the factor shares, is from early as 1939. This, so called Harrod-Domar framework lead the way on the road of the dynamic theory of economic growth. After their contribution Post-Keynesian framework handled these same factor shares as endogenously given in their theorems. Neoclassical growth theorem on the other hand pointed out that technological improvement is substitution of factors of production. However, work from Pasinetti (1962) and Samuelson and Modigliani (1966) should not be forgotten, which state that saving is linked only to the accumulated factor income since non-accumulated factor income is fully consumed (Bertola et al, 2005.)

Newer literature, endogenous growth models have also strong implications concerning the distribution of income. On the aggregate production level, these models have assumption of increasing returns to scale, as mentioned in previous chapter. Under these circumstances if factors of production are compensated by their marginal product, the total sum of the factor compensations exceeds aggregate output, hence the markets cannot be perfect. (Schneider, 2011.)

Bertoli and Farina (2007) point out that in endogenous growth models, such as Romer (1986), the capital owners are not compensated for the externalities in the situation where factors prices reflect only their marginal private productivity thus investments don't reach their socially optimal level. This leaves room for the political interactions, which determine the factor shares so that factor compensations are not equal to their marginal productivity (Schneider, 2011).

Next, this chapter presents fundamental background of factor shares from Cobb and Douglas's (1928) framework3, which Chiang and Wainwright (2005)

[3] See also Knut Wicksell

explain as following. Consider the generalisation from Cobb-Douglas production function:

$$Q = AK^{\alpha}L^{\beta} \tag{2}$$

Here Q denotes output, L labour, K capital, A is positive constant and exponents α and β positive fractions. There are some major properties, which make this function useful for economic analysis: i) homogeneity of degree (α+β); ii) linearly homogeneous in case where α and β sum up to 1; iii) for positively signed K and L, isoquants are negatively sloped and have property of strict convexity; and last iv) for positive K and L there exists strict quasiconcavity. (Chiang & Wainwright, 2005, p.386.)

Cobb-Douglas function itself is special case of the function 2, since it is linearly homogeneous and therefore constant returns to scale (Chiang & Wainwright, 2005, p.387). However, these properties are particularly strong and imply that any shock could not affect the income shares (Ripatti & Vilmunen, 2001). Even though Cobb and Douglas (1928) assumed constant factor shares, their theoretical contribution is still one of the most remarkable in the field of economics. Chapter 2.3 takes Cobb-Douglas production function and factor shares for a closer inspection.

2.3 Labour share of income

Labour share is one of the two factors in functional income distribution. Burda and Wyplosz (2013) define the labour share as the share of income that goes to labour. Commonly this share is known as wages, and it can be interpreted as compensation for work contribution. Recent chapter concluded that the value added is normally produced with the two factors of production, capital and labour. Chiang and Wainwright (2005) present the Cobb-Douglas production function as following:

$$Q = AK^{\alpha}L^{1-\alpha} = A\left(\frac{K}{L}\right)^{\alpha} L = LAk^{\alpha}, \tag{3}$$

in which k denotes capital-labour ratio. This function fulfils the condition of being linearly homogeneous (since α+(1-α)=1). Although condition's name might imply otherwise, one must remember that function is NOT linear. Given this property, the average physical products of the factors can be explicitly written as function of k ≡ K/L for the production function 3 (Chiang & Wainwright, 2005, p384-387.)

$$APP_K = \frac{Q}{L} = Ak^{\alpha} \tag{4}$$

$$APP_K = \frac{Q}{K} = \frac{Q}{L}\frac{L}{K} = \frac{Ak^{\alpha}}{k} = Ak^{\alpha-1}$$

and the differentiation of the function 3 gives marginal products respectively:

$$\begin{aligned} \frac{\partial Q}{\partial K} &= A\alpha K^{\alpha-1}L^{-(\alpha-1)} = A\alpha\left(\frac{K}{L}\right)^{\alpha-1} = A\alpha k^{\alpha-1} \\ \frac{\partial Q}{\partial L} &= AK^{\alpha}(1-\alpha)L^{-\alpha} = A(1-\alpha)\left(\frac{K}{L}\right)^{\alpha} = A(1-\alpha)k^{\alpha} \end{aligned} \quad (5)$$

now that both, average products and marginal products, are expressed as function of k alone, it follows from linear homogeneity that they remain constant if capital-labour ratio (k) keeps unchangeable. Moreover, these conditions imply also that functions 4 and 5 are homogeneous of degree zero. (Chiang & Wainwright, 2005, p384-387.)

Applying Euler's theorem into function 3 it yields (Chiang & Wainwright, 2005, p.388):

$$\begin{aligned} K\frac{\partial Q}{\partial K} + L\frac{\partial Q}{\partial L} &= KA\alpha k^{\alpha-1} + LA(1-\alpha)k^{\alpha} = LAk^{\alpha}\left(\frac{K\alpha}{Lk} + 1 - \alpha\right) \\ &= LAk^{\alpha}(\alpha + 1 - \alpha) = LAk^{\alpha} = Q \end{aligned} \quad (6)$$

The results from all this have somewhat important economic interpretation. Chiang and Wainwright (2005) point out that in the case where inputs are expected to be paid by their marginal products the relative factor shares can be expressed as:

$$\begin{aligned} \frac{(\partial Q/\partial K)}{Q} &= \frac{KA\alpha k^{\alpha-1}}{LAk^{\alpha}} = \alpha \\ \frac{(\partial Q/\partial L)}{Q} &= \frac{LA(1-\alpha)k^{\alpha}}{LAk^{\alpha}} = 1 - \alpha\,, \end{aligned} \quad (7)$$

where a is capital share and 1-a labour share of income. Conclusion can be drawn, that the exponents in the Cobb-Douglas production function (function 3) illustrate the relative factor shares in total production. These results are also extended to indicate partial elasticity of output. However, Chiang and Wainwright (2005) argue that this connection might not be exactly true in imperfect factor markets, since factors are rarely paid equal to their marginal productivity. Hence, Euler's theorem of factor share distribution does not hold in that situation. Despite that, linearly homogeneous production function's mathematical properties make them advantageous to use in economic theories. (Chiang & Wainwright, 2005, p.386-388.)

At macro level, labour share is determined by the employment, wages and the value added which on the other hand are dependent on the variables such as labour and product markets (Schneider, 2011). So, there are many macro level variables which may cause shift in the level of labour share. However, initial

sources of the movement depend on different factors whether considering short-run or long-run changes. In the short-run, the most depending factor is deviation in compensation and employment compared to total value of output (Schneider, 2011). The short-run movement is thus defined closely through business cycles and policy decisions according to labour markets while long-run movement on the other hand depends more on the institutional structures. Schneider (2011) states that in the longer-run, labour share movement is depending on the production function and the labour market structure as well as labour demand and supply.

At the macro-level the movement in labour share is seen mainly through major changes in the economy and in policy actions. However, macro-level point of view does not give much about information about the industry or firm level dynamics behind the change. Therefore, it is essential to understand origins of micro-level movement in labour share so that policy makers could implement right policies at the grass roots.

Observing the changes in real unit labour costs (RULC) is a good way to discover microstructural movements in the labour share. Kauhanen and Maliranta (2014) present the framework for micro-level origins of RULC movements in the following way:

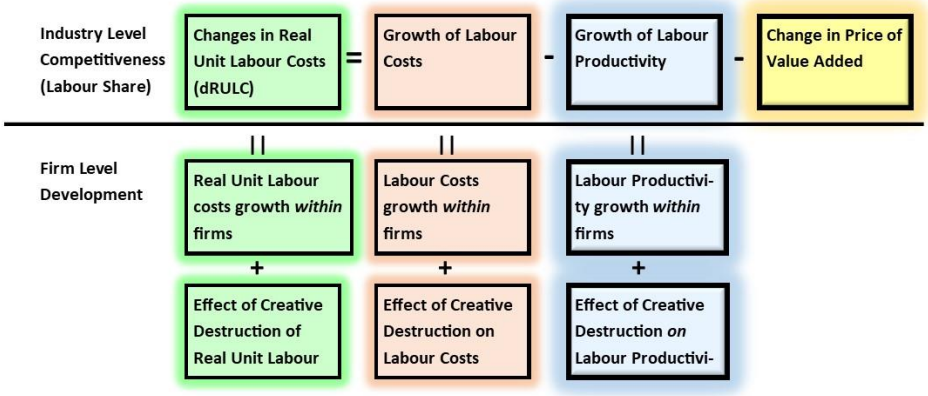


FIGURE 1 Framework of RULC as presented in Kauhanen and Maliranta (2014).

Their framework consists two steps: first they decompose the factors of RULC into industry-level components which can be seen over the horizontal line in the figure 1. The second stage is to decompose the firm level dynamics of competitiveness, labour costs and labour productivity. These decompositions are illustrated under the horizontal line in figure 1. (Kauhanen & Maliranta, 2014.)

Industry level dynamics are a pretty straightforward and they can be interpreted easily but the firm level components, from which the aggregate industry level is formed, need further explaining. "Within firms" effect means the average

growth in the firms (Kauhanen & Maliranta, 2014.). "Creative destruction" involves entries and exist of firms as well as between effect, which means labour reallocation between continuing firms (Kauhanen & Maliranta, 2014). Creative destruction here is the same firm level restructuring mechanism that Schumpeter defined in his nominal framework. This firm level restructuring and decompositions are explained more precisely later in this thesis.

Real unit labour costs can be calculated also for macro-level so that the RULC-levels can be compared between different countries. It is that the RULC can also be illustrated through macro-level components. Kauhanen and Maliranta (2014) derive the RULC for macro-level as following:

$$\ln RULC = ln\left(\frac{\frac{W}{E}}{\frac{(V/p)}{L}}\right) - \ln p \quad (8)$$
$$\Leftrightarrow \ln RULC = \ln NULC - \ln Price$$

W= Labour costs
p= Price of value added
E= Labour input of employees
L= Total labour input (including self-employed)
V= Value added

From here the equation can be easily modified with using logarithmic identities so that:

$$\ln RULC = \ln\left(\frac{W}{E}\right) - \ln\left(\frac{(V/p)}{L}\right) - \ln(p) \quad (9)$$
$$\Leftrightarrow \ln RULC = \ln Labour\ Costs - \ln Productivity - \ln Price$$

Now the equation consists three macro-level determinants of RULC. Important for this study is the fact which Kauhanen and Maliranta (2014) note about RULC: "RULC is the labour income share (W/V) corrected for the contribution of the self-employed". They present it as follows:

$$\ln RULC = \ln(\frac{W}{V}) + \ln(\frac{L}{E}) \quad (10)$$

This means that the RULC can be used for studying the micro-level movements in the labour share and having more robust results than NULC, since it handles the "self-employed problem". Böckerman and Maliranta (2012) propose sophisticated method for approaching labour share in their paper but this is dealt with later in this chapter.

2.4 Market competition and entry barriers

In economics market competition is universal and fundamental concept, which determines decisions in micro as in macro level. Basic theories of economics suggest that the markets are at the most effective state when there exists perfect competition between all market participants. Though sometimes it might be reasonable to regulate competition by government example in such cases where opening the market might cause immense harm to the population. Restrictions are also partly acceptable in industrial areas, which lean essentially on expensive infrastructure like power-distribution network. However, these situations are uncommon, and this thesis concentrates on industries where competition is important factor of labour share movements via restructuring of firms. Because of that, purely monopolistic markets are excluded from the inspection of the labour share dynamics.

The foundation of entry is based mainly on two aspects: 1) costs of entry and 2) regulations of entry. As mentioned, government can mandate the number of firms in the market, but it is more realistic to assume that in most cases regulations affect the number of entrants only indirectly (Alesina et al., 2005). Therefore, number of firms in each market is determined endogenously. Alesina et al. (2005) present condition for entry in regulatory environment:

$$V = \int_0^\infty e^{-rt}\left[\frac{P_i}{\bar{P}}F(K_i, L_i) - \frac{W}{\bar{P}}L_i - I_i - \frac{b}{2}\left(\frac{I_i}{K_i}\right)^2 K_i\right]dt = \bar{c}K_i \tag{11}$$

where $\bar{c}K$ is entry cost, K_i denotes capital, L_i labour and I_i investment, P price level and $\bar{P}$ average price level. $F(K_i, L_i)$ is linear and homogenous in capital and labour so that they face decreasing returns, respectively. W means nominal wage and r is the real rate of interest. The last term inside the square brackets that have linear quadratic form denotes the adjustment costs of the firm while b is just parameter. (Alesina et al., 2005.)

As speaking of competition, Boone (2008) contributes a robust measurement – relative profits (RP) – to this matter. He argues that normally used indices such as Herfindahl index (H) or price-cost margin (PCM) are inconsistent in some situations. RP-framework illustrates the idea of growing profit losses for inefficient firms as competition deepens, so that these firms face relatively higher losses than firms with better efficiency. (Boone, 2008.)

More precisely, Boone (2008) displays two-stage game, where fixed entry fee and profit possibilities (relative to competitors) determine the eventual number of firms and profit outcomes in the market. Figure 2 illustrates Boone's (2008) theoretical analysis in the case where fixed entry cost decreases:

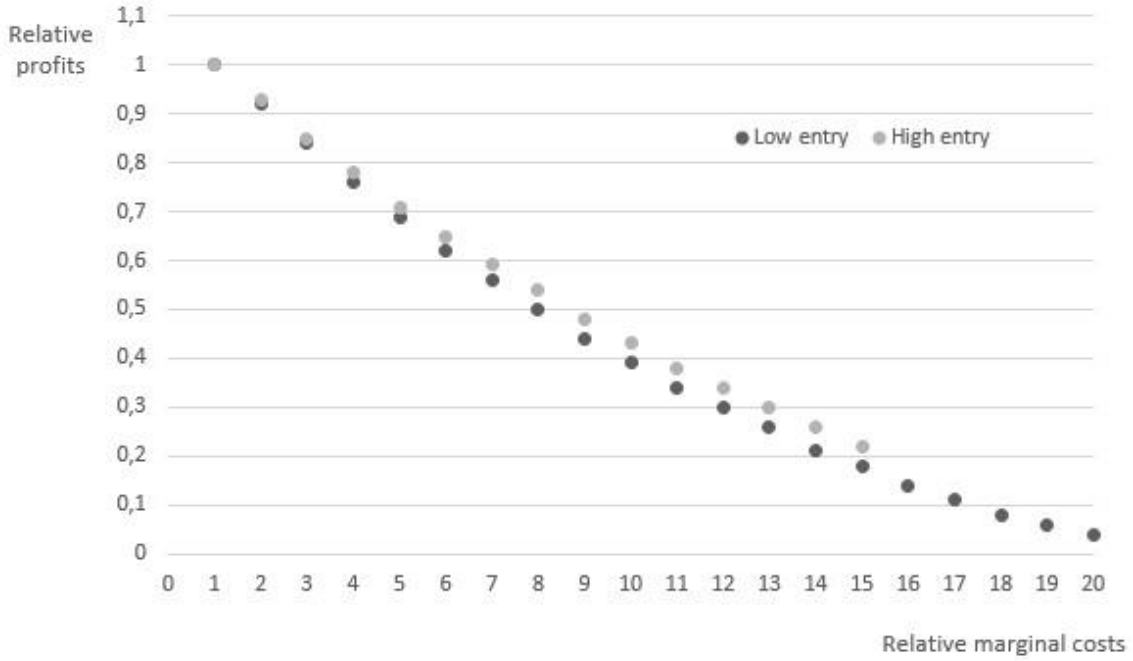


FIGURE 2 Boone's (2008) illustration of increased competition through falling entry barriers

Here dots represent individual firms, which decide to enter the market at low and high entry cost levels, whereas coordinates illustrate firms' relative profits (y-coordinate) and marginal costs (x-coordinate) towards the most efficient firm (1, 1). Figure 2 shows how competition increases as entry costs decrease. Thus, this can be seen from number of firms and graph's steeper curve in the low entry state. Boone's (2008) conclusion that inefficient firms lose more profits as competition deepens is also visible, since every firm has lower profits relative to the most efficient firm in low entry environment[4]. (Boone, 2008.)

Moreover, Boone (2008) gives examples about increased competition through firm interactions and production cost reductions. Next table introduced Boone's (2008) theoretical parameterizations of competition:

TABLE 1 Theoretical parameterizations of competition (Boone, 2008).

Competition becomes more intense as:	**Parameterized as:**
Number of firms in the industry rises	fixed entry cost ↓ (and hence number of firms ↑)
More aggressive interaction between firms	conjectural variation ↓; substitute level of goods ↑
Production costs are reduced (fall in import tariffs)	marginal costs ↓

[4] This is equivalent to the Boone's (2008) statement: "…more intense competition increases the profits of a firm relative to a less efficient firm" (Boone, 2008).

The table 1 is somewhat condensed version of Boone's (2008) work but it illustrates the main mechanisms behind rising competition level. As figure 2 already pointed, when exogenous entry cost decreases, more firms enter the market, which increases competition level. More aggressive interaction on the other hand, follows from the changes in conjectural variation and substitutability level of goods. In this case, it is possible that increased competition between incumbent firms force inefficient firms to exit the market. Hence, it is important to understand that as competition gets more intense, the number of firms in the market can either increase or decrease. Finally, if foreign firms' import tariffs decrease, it means more competition to domestic firms. (Boone, 2008.)

2.5 Productivity

Productivity is usually referred to labour productivity which is by its definition is output divided by labour force: y= Y/L. However, this measurement method lack in taking capital accumulation or technological progress account as productivity enhancing mechanisms. While these mechanisms indeed can raise output per worker it is usually desirable to measure productivity with total factor productivity (TFP). (Aghion & Howitt, 2009.)

Consider Cobb-Douglas function where output depends on two inputs, labour and capital.

$$Y = AK^{\beta}L^{1-\beta} \tag{12}$$

where A is state of technology and as usual L labour input and K capital input. From here output per worker can be derived by dividing both sides with L.

$$y = Ak^{\beta}, \qquad k = \frac{K}{L}, y = \frac{Y}{L} \tag{13}$$

It is clear from equation 13 that labour productivity depends positively on the capital stock per labour as well as technology parameter. In this specific equation the parameter A is called total factor productivity which not only indicates labour productivity but also how productively all the factors of productivity are used in economy. (Aghion & Howitt, 2009, s.106.)

Productivity is linked tightly to national income and thus income shares. Aghion and Howitt (2009, s.355) demonstrate these relations with Schumpeterian model in the closed economy. Let there be a single country with only one final produced final good. This is produced using intermediate goods with production function which is as following:

$$Y_t = L^{1-\alpha} \int_0^1 A_{it}^{1-\alpha} x_{it}^{\alpha} \, di, \qquad 0 < \alpha < 1 \tag{14}$$

Where L is now domestic labour force[5], A_{it} denotes the quality of intermediate good and x_{it} the flow quantity of intermediate good. Sub-index i means a specific intermediate good and t time. (Aghion & Howitt, 2009, s.355.)

With some assumptions[6] about markets, Aghion and Howitt (2009) derive the level of equilibrium final output to the equation:

$$Y_t = \varphi A_t L, \qquad in\ which\ A_t = \int_0^1 A_{it} di \ , \varphi = \alpha^{\frac{2\alpha}{1-\alpha}} \tag{15}$$

here A_t is average productivity.

As mentioned also earlier, there exists two kinds of income – wages and profits. From production function (equation 12) Aghion and Howitt (2009, s.356) provide with their assumptions wage share and profit share as well as aggregate national income.

$$W_t = (1-\alpha) Y_t \tag{16}$$
$$\Pi_t = (1-\alpha)\alpha Y_t \tag{17}$$
$$N_t = W_t + \Pi_t = (1-\alpha^2) Y_t \tag{18}$$

When combining equations 15 and 18 it follows that national income is strictly commensurate to productivity as well as to population (Aghion & Howitt, 2009, s.356).

$$N_t = (1-\alpha^2)\varphi A_t L \tag{19}$$

as this function is differentiated with respect to time the formed equation shows that the growth rate of national income equals the growth rate of productivity (Aghion & Howitt, 2009, s.357).

$$\frac{\dot{N}_t}{N} = \frac{\dot{A}_t}{A} = g_t \tag{20}$$

All these results indicate that national income and productivity are closely connected. Going back to Kauhanen and Maliranta (2014) and equation 9, which enlightens this scarcely. Taking differences in equation 9 it gives relationship between changes:

---

[5] Assumed here to be constant

[6] i) Every intermediate sector has a monopolist producer whose production is based solely on the final goods. ii) to produce one unit of intermediate good monopolist producer needs exactly one unit of final good. iii) final good sector is perfectly competitive so only profits are earner by monopolist producers (Aghion & Howitt, 2009).

$$\Delta \ln RULC = \Delta \ln Labour\ Costs - \Delta \ln Productivity - \Delta \ln Price \qquad (21)$$

which tells us that RULC is negatively related to industry labour productivity growth. (Kauhanen & Maliranta, 2014).

Maliranta (2002) states that in times of high rate of increase in technological possibilities innovation intensity and operating margins must to be high as well. This relates the high aggregate productivity growth to high R&D intensity and low labour share of income (Maliranta, 2002). However, according to results of Maliranta (2002) labour share is positively dependent on the learning-by-doing. Learning-by-doing means development of work force without significant capital investment by firms and it can be paralleled to the human capital at some level. Maliranta (2002) also points out that aggregate labour productivity growth, which exceed the real wage growth, decreases labour share of income. Although, Maliranta (2002) uses assumptions that new technology can be utilized only in new entrant firms, wages grow as much as productivity and similar jobs are paid equally, his results are robust and reliable. Equation 20 gives similar results since growth rate of national income is equal to the growth rate of productivity. Example if wage growth (part of national income) is proportionally lower than aggregate labour productivity growth (part of aggregate productivity growth) the equality does not hold anymore if other factor is paid normally, thus indicating decreasing labour share of income.

There arises one interesting question: how does jump in rate of productivity growth affect labour share of income. It requires thorough scrutiny of micro-level dynamics of productivity growth source to answer for this question. In example when positive technological shock arises new entrants are very profitable since they enter the market at state where wages have not yet reacted to higher level of productivity (Maliranta, 2002). Hence, this lowers the labour's share at first, before wages start growing (Maliranta, 2002). Also, as Autor et al. (2017b) clarify that the aggregate industry-level productivity growth – which is result from micro-level restructuring between firms – decreases aggregate labour share in that industry[7]. If productivity jump is caused due to low productivity firms exiting from industry, it means that labour share has also declined. This statement is based on the finding of Autor et al. (2017a) that highly productive firms have initially lower labour share.

2.5.1 Decoupling theory

Definition of decoupling is not exact, but it is usually recognized as the difference between wages and productivity. More commonly, wage growth is seen lagging behind productivity growth. This phenomenon can form through many different mechanisms: i) The balance can be deviated from its long-run equilibrium in

[7] This same observation can be applied to between industries inspection.

short run by various shocks, ii) profit margins can increase, iii) technology can replace labour, iv) labour can lose bargaining power or v) there might occur changes in effective labour supply. (Pessoa & Van Reenen, 2012.)

For decades, this phenomenon has been only a shadowy apparition, but recently it has gained some academic interest. Gil-Alana and Skare (2018) argue that there is seemingly happening a shift in paradigm towards "great decoupling theory", while importance of basic wage theories is challenged. They find that between 1950 and 2014 decoupling effect has been strongest in countries where wage markets are stiff and TFP growth high (Gil-Alana & Skare, 2018).

Dew-Becker and Gordon (2005) find interesting results concerning decoupling effect at micro level. According to their study from IRS data (U.S.), the productivity growth has exceeded wage growth in all except the top decile of the income distribution in 1966-2001. The common misbelief, that gains of productivity growth are added only to the capital share, is not the whole story. As Dew-Becker and Gordon (2005) argue: "it is not that all the gains went to capital and none to labour; rather, our findings is that most of the gains in labour income, too, went to the very top percentiles". (Dew-Becker & Gordon, 2005.)

From the Kauhanen and Maliranta (2014) RULC-framework, it follows that possible decoupling effect increases profits relative to wages at least in the short run. Thus, it is important to observe where the decoupling theory arises before implementing any political decisions throughout the labour markets. In example, take the case where firm has invested in new technology[8], which has increased productivity of workers. Here, the firm carried the risk and cost of the investment, while workers have not gained any productivity enhancing skills. If the investment is only cause for the productivity jump, the question is whether wages should have upward pressure at all.

Decoupling theory is vital point of view when income share changes are being researched. If the wage growth is really lagging behind productivity growth it is kind of automatic that labour share is decreasing. Difficulty in this approach is that normally only so called "gross decoupling" is visible to the public, which might cause distortion in political decision making. In this matter, Pessoa and Van Reenen (2012) do not find evidence of net decoupling in the UK over 1972-2010, even though gross decoupling is 42.5 % in the same time period. On the contrary Gil-Alana and Skare (2018) report results that decoupling is constantly increasing worldwide due to stagnating minimum wages, wage moderation policies and technological progress.

2.6 Firm and industry level dynamics

Economic fluctuations, aggregate shocks so as idiosyncratic shocks cause restructuring in the firm level as well as in the industry level. Gabaix (2011) present new type of perspective to aggregate shocks – granular hypothesis. According to

[8] Hypothetically, this technology does not require any new skills from workers.

it, idiosyncratic shocks to sufficient large firms might generate aggregate shock (Gabaix, 2011). One can conclude from this that aggregate shocks are not the only significant force in the macro-level (Gabaix, 2011). Hence, it is extremely important to have comprehensive understanding about micro-level dynamics.

There exists continuous competition at the industry level so that underachieving firms are forced to exit the market while at the same time new firms enter the market in hope of future profits. This constant motion, which also consists the time of possible growth between entry and exit, is called lifecycle of the firm. The lifecycle is in close relation with the productivity of the firm hence firms with the highest productivity might not face the exit.

In the industry level there exists also unceasing reallocation of resources between firms. It is that the firms compete against each other and try to gain more market shares in the expense of others. This is mostly seen when continuing and entering firms take the market share of exiting firms. Moreover, the firms are trying to be more and more profitable by growing their productivity. This collective chase of productivity affects for the industry level productivity.

Firm and industry level dynamics (e.g. productivity, employment, innovations) can be analysed through lifecycle, reallocation of resources and productivity growth which in fact are the determinants of creative destruction.

Hyytinen and Maliranta (2013) present sources of aggregate productivity growth through four branches. In the figure 3, there are four firms (firms a, b, c and d) which are demonstrated with blue balls so that bigger the ball, bigger the firm. The solid lines express the development of productivity in these four firms and the discontinuous purple line shows the industry productivity development altogether. There can also be seen that firm d is incumbent in the industry and rest of the firms are entering the market at time t (and firm c exits at time t+1). It should be noted that firm's d productivity (constant slope) mirrors the contrafactual of how productivity would have developed without new entrants. (Hyytinen & Maliranta, 2013.)

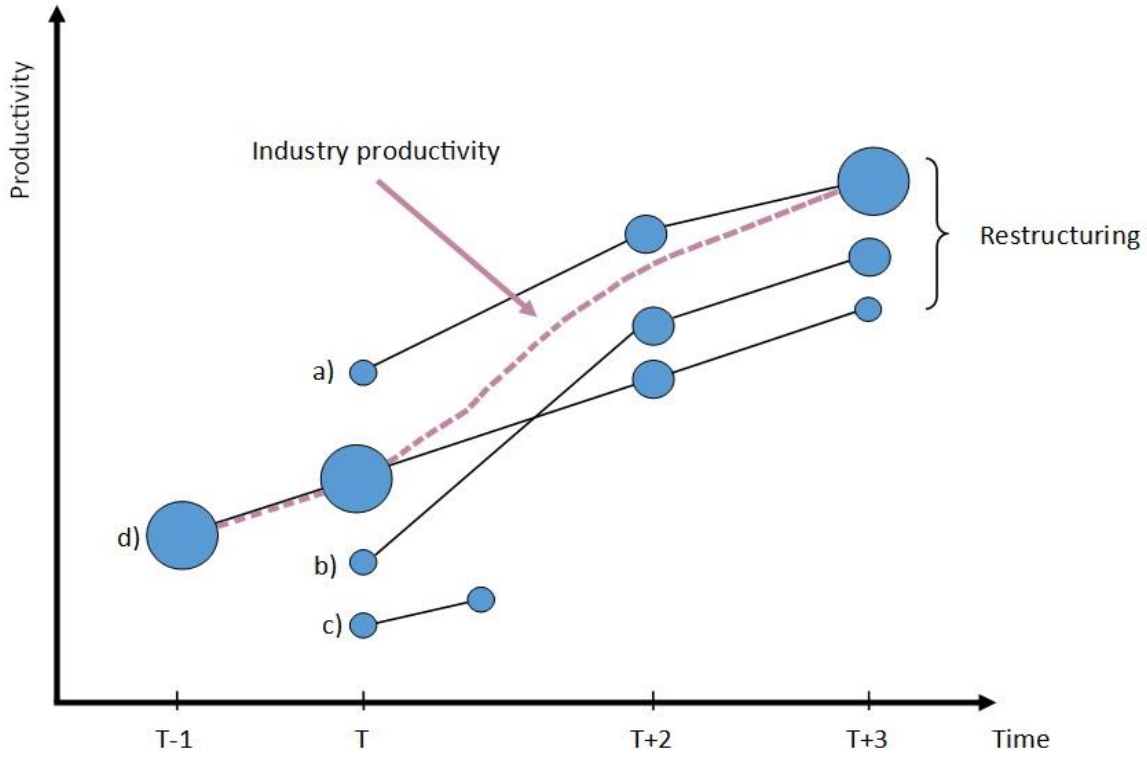


FIGURE 3 Sources of aggregate productivity by Hyytinen & Maliranta (2013).

All these mechanisms are essential to sustained productivity growth (Kauhanen & Maliranta, 2014). These dynamics have effect on the labour share due to close connection of changes in productivity and labour share. Next this paper introduces the micro-level components into which changes in the productivity and labour share can be decomposed.

2.6.1 Emergence and fall of the firms

When discussing about markets the key perspective lies within its base structure and how it is determined. The foundation of market structure is that there exist agents, which remodel the environment by entering and exiting based on the expectations of future profits (Dunne et al., 2013). Exit and entry decisions depend significantly on the competition level within the market (Dunne et al., 2013). These decisions are continuous so therefore markets can be considered dynamic at least most of the time.

It is somewhat natural that highly competitive markets have smaller profit gains than markets where are only few producers. Dunne et al. (2013) conclude that when competition increases through entries, both the value of the continuing and entering declines in this market which increases the probability of the exit and decreases the probability of entering. They point out that there are also several other factors such as exogenous costs and amount of demand, so outcomes vary a lot between different markets. (Dunne et al., 2013.)

Despite the differences in entry and exit rates between different markets there exists also some universal similarities concerning these mechanisms. In this matter Geroski (1995) proposes seven stylized facts about entry. First, he states

that entry is ordinary so that many firms enter in markets, however few of them succeeds. Secondly, he mentions that even if there is huge cross-section variation in entry, it doesn't endure long time. Next in line is fact that entry and exit correlate positively. This notice comes from the process, in which new entrant firms supersede incumbent firms at industry level. This process is in the centre of creative destruction and hence it is explained more precisely in later chapters. Geroski's (1995) fourth fact focuses on survival rates and it states that new entrants are not likely to survive very long. Moreover, it takes long time to catch up the incumbent firms in size even if the entrant succeeds in early stages. Fifth stylized fact is that *de novo* entry is much more ordinary than entry by diversification but not that successful. Sixth of the Geroski's (1995) points is that entry rate is not constant over time and that entrants' characteristics may be different in different time periods. Furthermore, the largest wave of entry is normally seen in the period when new market is formed. Last proposed stylized fact about entry tells that entry rates and successfulness of the entrants is damaged by the adjustment costs. (Geroski, 1995.)

However, Geroski (1995) points out that his "stylized facts" are not necessarily true in all situations and inevitably may include bias. These facts are by then just suggestive and give only rough approximations about market mechanisms in different situations. The summary from Geroski's (1995) findings can be quoted as following: "entry appears to be relatively easy, but survival is not".

Now that the entry has been discussed, it is natural to continue towards the exit component. Theoretically the most common result of high entry is naturally high exit (Geroski, 1995). According to Geroski's (1995) facts exit follows up from entering firms replacing the incumbent or the failure of entrants. This is called competitive market selection and it happens in the case where efficient firms force less efficient firms to exit the market (Hyytinen & Maliranta, 2013). This mechanism may be enhanced by the phenomenon, that Aghion and Howitt (2009) present. It is that, when competition intensifies, productive incumbents react positively by improving their productivity while firms with weaker capabilities might react quite opposite (Aghion & Howitt, 2009). This finding is discussed more later.

Figure 3 (Hyytinen & Maliranta, 2013) enlightens the entry and exit so that at time T new entrants a, b and c enter the market in hope of profits. The entrants differ in their level of productivity and hence are in different market positions. Firm a's productivity is above industry's average and it starts immediately to grow but firms b and c are not that productive while having their productivity level less than industry's average. However, firm b quickly adapts to the technological competition and soon bypasses the productivity of incumbent firm d. Firms a and b are examples of efficient entrants who survive the tough competition and eventually gain more market share in the expense of incumbent firm d. Nonetheless, firm c does not succeed in the same way and is forced to exit from the market due to its inefficient production.

Exit process is by no means always vast and painless. Griliches and Regev (1995) argue that exiting firms have witnessed poor productivity many years earlier, consecutively. Griliches and Regev (1995) call this phenomenon as the

"shadow of death" effect and it is widely studied thereafter. Almus (2004) confirms the findings of Griliches and Regev (1995) and gains statistically significant results that exiting firms have initially lower growth than surviving firms. In this matter, Carreira and Teixeira (2011) report much similar results as they conclude that exit is not precipitous scenario mainly because exiting firms encounter constant decline in productivity before actual exit. Despite the findings that most firms which exit are operating poorly, it must be remembered that not every low productivity firm will fail, or high productive firm will succeed, even if market selection is based tightly on efficiency (Carreita & Teixeira, 2011).

Moreover, when competitive market selection is main force denoting the lifecycle of the firms, it can be disrupted with barriers to entry. If there exists level of barriers, which prevent new firms entering the market, incumbent firms are somewhat protected. That is the incumbent firms do not encounter as high competitiveness level than they would in perfect market environment. Thus, inefficient firms can survive in industries where entry barriers are high, while in situation where barriers are low, high competition would enhance the competitive market selection.

2.6.2 Productivity and reallocation of resources

Firms operate in dynamic environment; in which they compete for market shares, productive labour, investors and many other factors. Last chapter contemplated micro-level restructuring mechanisms of entry and exit, but there exist two other major components in this matter. Reallocation of resources happens constantly between continuing firms and hence it is vital component in micro-dynamics of productivity (Hyytinen & Maliranta, 2013). Melitz and Polanec (2015) identify this as market share changes between continuing firms. Normally market share changes happen due to industry evolution such as emergence of new designs, stronger firms or maturing industry (Hyytinen & Maliranta, 2013). In the figure 3 (Hyytinen & Maliranta, 2013), this effect is seen through changing dot sizes. At time t, entrants a and b are relatively small, whereas incumbent d is massive. However, at time t+2 all of them are almost equal in size, which is result of a reallocation of resources. It is that firms a and b have benefitted at the cost of firm d (Hyytinen & Maliranta, 2013). Phenomenon is known also as between-component in micro-structural analysis.

Another component that is still yet to be discovered is internal restructuring of surviving firms – shortly, within component. This covers industry productivity, which is the result from average productivity changes inside individual continuing firms. The baseline productivity growth is explained thoroughly in the chapter 2.5. This restructuring is driven in many different ways: i) R&D, ii) strategical improvements, iii) implementation of new technologies, iv) employee training/education or in case of newly established firms v) imitation of more experienced competitors and vi) learning-by-doing. (Hyytinen & Maliranta, 2013.)

Hyytinen and Maliranta (2013) present evidence that average productivity growth within firm is the most significant component of industry productivity growth. It is mostly because incumbents, which possess large fraction of industries resources can boost their productivity by renewing their processes (Hyytinen & Maliranta, 2013). In the figure 3, y-axis denotes the productivity level of the firms and the growth itself can be seen as upward transition in time (steeper the curve slope, higher the growth). Firms A and B are identified to be faster growers than D and C. Moreover, firm D has rather stable growth speed whereas firm A takes growth spurt between t and t+2. Firm B's growth extends even A's between t and t+2; B has relatively low productivity when it enters the industry at time t but at t+2 its productivity is already higher than D's. In contrast to that, firm C has also low productivity level when it enters the market but it has not been able to grow its productivity level in order to keep its business profitable. Hence, firm C eventually exits the industry. Nevertheless, average industry productivity has grown in time, which is marked by dashed line in the figure 3. It is notable that both phenomena could happen at the same time. In example firm A and B grow their productivity between time t and t+2 but they also grow in size due to resource reallocation in expense of D and C.

Chapters 2.6.2 and 2.6.3 reviewed micro-structural productivity growth components. This is important subject in the productivity growth literature because of the large amount of heterogeneity across firms and industries (Bartelsman & Doms, 2000). Studies with the longidutinal micro-level data (LMD) have brought up some major discoveries about productivity: i) productivity levels differ largely between firms, ii) firms with high productivity have high probability to be highly productive in the future as well, iii) resource reallocation is one of the main elements of aggregate productivity growth and iv) regulations that limits the resource reallocation could be harmful for the productivity growth (Bartelsman and Doms, 2000.)

2.6.3 Creative destruction

The processes discussed in the chapter 2.6 happen continuously and simultaneously in the market. These all components link together in process called creative destruction. Aghion and Howitt (2013, p.85) describe creative destruction as innovations that destroy the results of previous innovations. It is that technological improvements replace older technologies, thus making old technology outdated (Aghion & Howitt, 2023 p.85).

The concept of creative destruction was first introduced by Joseph Schumpeter (1942). Schumpeter (2003/1942) defines it as process "that incessantly revolutionizes the economic structure from within, incessantly destroying the old one, incessantly creating a new one". The most essential mechanic of creative destruction lies in competition – the competition from the new technology, the new commodity or new *modus operandi*. It is the kind of competition that makes output

grow in long run while bringing prices down at the same time. (Schumpeter, 2003/1942.)

Destructive or "renewable" part of the concept comes from the fact that entry, exit and reallocation of resources force less productive firms to exit the market. It mostly comes from the fact that with the new innovations comes new vacancies that are likely to be more productive than existing vacancies. As a contrast, less productive vacancies are "destroyed" (Maliranta, 2014). Aftermath from this is that the industry productivity has risen but with the cost of weakly productive workers' jobs.

Mechanism of creative destruction plays significant role in productivity growth in micro as in macro level. The long run productivity growth through creative destruction is not painless road since in short run there exist cost of unemployment et cetera. But as Schumpeter (2003/1942) put it in words, in creative destruction there emerges situations in which many firms may have to cease their business even if they might be able to keep doing well without facing new innovative environment or increase in competition.

2.7 Decompositions of productivity

It is useful to observe productivity at aggregate level, but a more profound approach is needed in order to understand basic relation between lower level units. This chapter clarifies the framework of productivity decompositions which are formally presented in Balk (2016) and in Melitz and Polanec (2015). These methods have important implication in labour share dynamics since they decompose micro-level dynamics into pieces. Even if these tools are originally used for studying decompositions of productivity, they can be applied straight to labour shares (Autor et al., 2017).

Melitz and Polanec (2015) define aggregate productivity as "weighted average of productivity at the producer level." Aggregate productivity changes not only through distribution of producers-level productivity but also through composition changes between firms such as changes in market shares between continuing firms. Also, entries of new firms and exits of incumbent firms count as driving forces of aggregate productivity. (Melitz & Polanec, 2015.)

Interest in the micro-level development of aggregate productivity have generated various productivity decomposition methods which distinguish change in the aggregate productivity into four different components - distribution shifts between continuing firms, reallocation between continuing firms, entries and exits. (Melitz & Polanec, 2015.)

At first it is essential to present mathematical expression for aggregate productivity at time t:

$$\Phi_t = \sum_i s_{it}\varphi_{it} \tag{22}$$

where φ_{it} is average productivity of firm i and $s_{it} \geq 0$ denotes firm's share which sum up to 1 at aggregate level. However, the interest lies on the change in aggregate productivity over time $\Delta\Phi_t = \Phi_2 - \Phi_1$. (Melitz & Polanec, 2015.)

In this matter Baily, Hulten and Campbell (BHC) is considered as nominal work as they apply beforementioned aggregate productivity representation (equation 22) to their theory. BHC model decomposes aggregate productivity $\Delta\Phi$, $s_{i2}\varphi_{i2} - s_{i1}\varphi_{i1}$ into surviving entering and exiting firms. Entering firms don't have share in the period one hence $s_{i1} = 0$ and respectively $s_{i2} = 0$ for exiting firms. Next equation illustrates BHC decomposition where S denotes surviving, E entering and X exiting firms:

$$\Delta\Phi = \sum_{i\in S}(s_{i2}\varphi_{i2} - s_{i1}\varphi_{i1}) + \sum_{i\in E} s_{i2}\varphi_{i2} - \sum_{i\in X} s_{i1}\varphi_{i1} \tag{23}$$

$$= \sum_{i\in S} s_{i1}(\varphi_{i2} - \varphi_{i1}) + \sum_{i\in S}(s_{i2} - s_{i1})\varphi_{i2} + \sum_{i\in E} s_{i2}\varphi_{i2} - \sum_{i\in X} s_{i1}\varphi_{i1} \tag{24}$$

In the upper equation (23) the productivity change is decomposed across surviving, entering and exiting firms. The equation (24) on the other hand divides the contribution of surviving firms into two components – within-firms (1st term) and between-firms (2nd term). Here the within-component captures the productivity improvements *within* surviving firms whereas between-component tries to identify the market share change between *surviving* firms. (Melitz & Polanec, 2015.)

The Grilisches and Regev (GR) and Foster, Haltiwanger and Krizan (FHK) produced own contributions using BHC framework as basis on their decompositions. The only difference with BHC is that GR and FHK methods use reference average productivity level, Φ_{REF}, which can be used as benchmark while evaluating contribution between entering and exiting firms relative to surviving firms. (Melitz & Polanec, 2015.)

In the GR model Φ_{REF} is denoted as average aggregate productivity which gives by then:

$$\Delta\Phi = \sum_{i\in S}[\bar{S}_i(\varphi_{i2} - \varphi_{i1})] + \sum_{i\in S}(s_{i2} - s_{i1})(\varphi_i - \bar{\Phi}) + \sum_{i\in E} s_{i2}(\varphi_{i2} - \bar{\Phi}) - \sum_{i\in X} s_{i1}(\varphi_{i1} - \bar{\Phi}) \tag{25}$$

as can be seen, GR model captures strictly all the effects of same subcomponents as in seminal work of BHC model. Nonetheless the nominal similarity towards

BHC model, in GR model entry and exit components have straightforward impact on productivity. It is that entry has strictly positive impact while exit contributes negative effect despite the productivity of entrants and leavers. Yet, these assumptions are somewhat biased. (Melitz & Polanec, 2015.)

FHK model uses also reference level which in this case is defined as aggregate productivity level in first period.

$$\Delta\Phi = \sum_{i\in S}[S_{i1}(\varphi_{i2} - \varphi_{i1}) + \sum_{i\in S}(s_{i2} - s_{i1})(\varphi_{i1} - \Phi_1) + \sum_{i\in S}(s_{i2} - s_{i1})(\varphi_{i2} - \varphi_{i1}) + \sum_{i\in E} s_{i2}(\varphi_{i2} - \Phi_1) - \sum_{i\in X} s_{i1}(\varphi_{i1} - \Phi_1) \quad (26)$$

this model also handles all the same components but extends the latter models with "cross" firm component which is interpreted as covariance between changes in productivity and changes in market shares. As in GR model, FHK model also reports entry and exit components to be positive or negative towards changes in productivity. Only difference here is that now the impacts' direction depends on the productivity in these firms relative to reference level. The bias, which arose in the BH model, is vastly lower in FHK framework but it still doesn't eliminate all of it. (Melitz & Polanec, 2015.)

One of the most used method in this substance is called Olley Pakes decomposition (OP) by the framework of Olley and Pakes (1996). This model focuses on productivity on the aggregate level at every period.

$$\Phi_t = \bar{\varphi}_t + \sum_i (s_{it} - \bar{s}_t)(\varphi_{it} - \bar{\varphi}_1) = \bar{\varphi}_t + cov(s_{it}, \varphi_{it}), \quad (27)$$
$$where\ \bar{\varphi}_t = \frac{1}{n_t}\sum_i^{n_t} \varphi_{it}\ and\ \bar{s}_t = 1/n_t$$

normally the covariance term is multiplied by $1/n_t$ but hence market shares already take account the firm count division the function can be written as in equation 27. OP decomposition has only two components, productivity component and market share component. However, since OP decomposition covariance increases when correlation between market shares and productivity increases it is better to include entry and exit components in it. (Melitz & Polanec, 2015.)

One of the most recent method in terms of productivity decomposition is based on work of Vainiomäki (1999), Maliranta (2003), Diewert and Fox (2009) and Böckerman and Maliranta (2012). It goes by the name modified Vainiomäki-Diewert-Fox decomposition and it is given by:

$$\Delta\Phi_t = WH_t + BW_t + EN_t + EX_t + Crossterms \quad (28)$$

as in the previous models, this model also captures the effects of within, between, entry, exit and crossterms.

$$WH_t = \sum_{i \in C} \overline{w_{it}^C}\, \Delta \emptyset_{it} \tag{29}$$
$$BW_t = \sum_{i \in C} \Delta w_{it}^C \, [\overline{\emptyset_{it}} - \overline{\Phi_t^C}]$$
$$EN_t = S_t^E [\Phi_t^E - \Phi_t^C]$$
$$EX_t = S_{t-1}^D [\Phi_s^C - \Phi_s^D]$$

here the within component measures the changes in weighted average productivity of firms in the market between time periods. Between component captures the effect of reallocation of factors of production between firms and it can be either positive or negative. Lastly, entry and exit components tells us how much the industry's aggregate productivity level changes due to entering and exiting firms. Either of these effects can be positive or negative depending of the productivity of entrants and exiters. Even if crossterms' notations are not introduced here, they are important part of equation 28 for getting unbiased results. (Fornaro & Luomaranta, 2017.)

The difference of modified VDF model compared the ones explained earlier is that it treats time as symmetric. (Diewert & Fox, 2010.)

Böckerman and Maliranta (2012) provide decomposition for labour share by using productivity decompositions in their modelling. Their model is based vastly on the framework of modified Vainiomäki-Diewert-Fox decomposition which was introduced in the last paragraph. The aggregate labour share change is denoted by within effect and the micro-structural change (STR_t^F):

$$\frac{F_t - F_{t-1}}{\bar{F}} = \sum_{i \in C} \overline{s_i} \frac{f_{it} - f_{i,t-1}}{\overline{f_i}} + STR_t^F \tag{30}$$

where F_t is the aggregate labour share in period t; $\bar{F}$ is the average labour share (t-1 and t); f_i is the average labour share of firm i in periods t-1 and t and s_{it} the weigh share of aggregate value added among continuing firms (Böckerman & Maliranta, 2012).

Structural component comprises four different sub-components:

$$STR_t^F = S_t^E \frac{(F_t^E - F_t^C)}{\bar{F}} - S_{t-1}^D \frac{(F_{t-1}^D - F_{t-1}^C)}{\bar{F}} + \sum_{i \in C} \frac{\overline{f_i}}{\bar{F}} (s_{it} - s_{i,t-1}) + \sum_{i \in C} \overline{s_i} \frac{f_{it} - f_{i,t-1}}{\overline{f_i}} \left(\frac{\overline{f_i} - \bar{F}}{\bar{F}} \right) \tag{31}$$

Where F^X denotes aggregate labour share and S^X is the value added share so that $X \in \{E,C,D\}$ whereas $\overline{s_i}$ is the average of s_{t-1} and s_t. Here the subcomponents – en-

try, exit, between and cross-component - act very much similarly than in productivity decompositions. The higher the labour share of entering (exiting) plants the higher (lower) the aggregate labour share is in the next period. The model handles these mechanisms very robustly since both, exit and entry, are treated symmetrically. On the other hand, the between component is positive when market share movement flows towards high labour share firms and negative vice versa. This is the very same mechanisms which was discussed already in chapter 5.2. (Böckerman & Maliranta, 2012.)

Eventually the equations simplify to the form where structural components' relations can be seen clearly between labour share change, wage growth and productivity growth (Böckerman & Maliranta, 2012):

$$STR_t^F \approx STR_t^W - STR_t^P \tag{32}$$

the full derivation of the model can be found from the appendix A1.

3 EARLIER LITERATURE

3.1 Labour share of income

As Bentolila and Saint-Paul (2003) state, labour share is constant topic in political debate since it is considered as measurement of "how the benefits of growth are shared between labour and capital". Second interpretation for the labour share is division of income between workers and capitalists, which one might think as proxy for inequality (Elsby et al., 2013). Present literature has showed signs of decline in labour share as early as from 1980s in many developed countries and this phenomenon is roughly accepted throughout the field of economics. However, some studies argue that the decline depends highly on the perspective. According to Cho et al. (2017) there exists statistically significant but small decline in labour share across OECD countries due to rise in the gross capital share. This rise in the capital share is caused mainly by the rising depreciation rates, hence the labour share decline fades almost completely when measuring net income and taking depreciation into account (Cho et al., 2017).

The fact that labour share was uninteresting subject for many decades was based on the idea of Nicholas Kaldor (1957) who argued that labour share is universally constant, approximately two thirds of the factor shares. This indeed was the case for long time but nowadays research is trying to provide better understanding about its dynamics and determinants behind declining trend.

The declining trend has also been recognized by the public, thus labour unions use this as an argument against wage moderation policies and government legitimizes profit taxation (Bentolila & Saint-Paul, 2003). Sweeney (2013) argues that there have happened three major demographical changes due to decline in labour share: 1) shift in income distribution at the expense of labour, 2) increase in polarisation in the personal income distribution and 3) reallocation within labour share for the gain of high earners (Sweeney, 2013). Moreover, this chapter looks through the literature concerning labour share movements from the mid-1980s to today.

3.1.1 Ground research

"Ever since the investigation of Bowley and Douglas it has been widely believed that the share of national income accruing to labor is one of the great constants of nature, like the velocity of light or the incest taboo". (Solow, 1958)

The distribution of factor shares has always been interesting topic amongst economists. Functional income distribution literature goes back as far as to 18th century, when Adam Smith wrote his famous book "an inquiry into the nature and

causes of the wealth of nations". In his book Smith (2008/1776) writes that price of a product forms from three different "components" – rent, labour and profit. Rents in this context refer to the profits from land or other natural resource used in production. Although Smith (2008/1776) hinted, that this forms only a small fraction of factor distribution it was still considered as own component. The wage and profit levels on the other hand are revolving around "natural rate" in Smith's contribution. As for productivity, Smith (2008/1776) handles it as output per hours and analogously gives example between deer and beaver hunters. Despite that, even if he classifies factors, which cause differentiation of wages, the list does not include productivity at all.

Contribution to the factor shares from another notable economist Karl Marx do not vary fundamentally from Smith's. Yet, the ideology behind his work is considerably different. Moreover, it was Marx, whose work presupposed that the absolute labour share should fall in time (Schumpeter, 2003/1942). However, this "proposition" was not taken seriously either by Marxians or opposers because the constancy of relative shares was so widely believed.

In 1928 Cobb and Douglas introduced their nominal production function, which highlighted dichotomy of labour and capital as factors of production. Even though their paper illustrates factor shares as constant, they hypothesize that: "When the indices are refined, or the period is changed it may be that the constant ¾ will appear as a constant 0.7 or 0.6 or perhaps as a *variable*." (Cobb & Douglas, 1928). Cobb and Douglas (1928) indeed hinted that factor shares might not be constant. This hypothesis was supported by many top economists, example John Keynes and Robert Solow, nevertheless economic literature had to wait almost until 21st century before this came again into broader discussion.

In 1937 Arthur Bowley gave his statement on the national income share discussion. It was that the proportion of factor shares has changed only by a small fraction over the course of 1860 to 1935 (Bowley, 1937 p. xvi-xvii). This quantified discovery was later named as "Bowley's law" and was one of the fundamental statements in Kaldor's (1957) work. After Bowley's work, Keynes (1939) stated that this established result is one of the most intriguing statistic in the field of economics, and it is not only a short-run phenomenon.

All the way to the Kaldor (1957) factor shares were mainly handled superficially but the paradigm concerning factor shares was changed substantially over time. Kaldor (1957) states that prevailing view has shifted from the Marxian idea where profits were seen more like as capitalists' surplus over workers' benefit to the Keynesian view, in which tendency to save/invest is rewarded as profits. Moreover, in the Marxian time, the share of profits was seen mainly as residual after wages, whereas Keynesian ideology handled it somewhat other way around (Kaldor, 1947). Solow (1958) was on point at the time being and gave sceptical opinion about "relative stability" of the factor shares. He lists options in his paper which might have generated such statistical results. Solow (1958) reminds also that in terms of economic discussion, "relatively stable" might come from that the observed variance is significantly less than example what neoclassical theory suggests.

3.1.2 Capital-labour relationship

Recent chapters have presented economic growth theories, which are based on factors of income, capital and labour. Hence, relationship between capital and labour is extremely vital while discussing shares of these factors. Technical notation of this relationship, k=K/L, is seen in equations 3-7 and 13. In public it is widely believed that labour and capital are straight substitutes. It is approximately true but the puzzle behind this substitution is not that always straightforward since there lie several factors, which make this substitution intensity to change over time.

One of the most intriguing finding among economists concerning capital-labour relationship has been Griliches (1969) study about capital-skill complementary. He finds evidence that skilled workers are more complementary to capital compared to unskilled workers. Many studies (Fallon & Layard, 1975; Goldin & Katz, 1996; Duffy et al., 2004) report somewhat similar results, which support capital-skill complementary hypothesis. However, Duffy et al. (2004) point out that their results are not particularly strong. Krusell et al. (2000) report that technological change (=better physical capital) has lowered the wages of unskilled workers relative to skilled workers. Thus, from this fact it follows that unskilled work force is not only less complementary to capital than skilled labour but that capital might substitute unskilled workers. Arpaia et al. (2009) find evidence about this and state that skilled labour indeed complements the capital whereas unskilled labour is substitute. In addition to that, Acemoglu and Autor (2010) state that rapid technological diffusion might make capital substitute for labour even within moderately skilled workers.

Capital-to-labour substitution is also linked to Employment Protection Legislation (EPL). Cette et al. (2016) note that strengthening of EPL increases labour costs, which increases labour substitution towards capital. This substitution is relatively stronger within low-skill than high-skill labour, even if labour regulations are tried to implement in favour of low-skill workers (Cette et al. 2016).

Relationship between capital and labour is also important factor in factor share dynamics. Alvarez-Cuadrado et al. (2018) present results that capital-biased technical change alongside capital-labour complementary is one of the biggest reasons for declining labour share. Capital deepening would normally decrease marginal productivity relative to labour, yet capital-biased technological change prevails this effect eventually increasing capital share (Alvarez-Cuadrado et al., 2018). Moreover, Arpaia et al. (2009) find out that labour share tends to have larger decline when capital and skilled labour are highly complementary and vice versa (Arpaia et al., 2009).

3.1.3 Labour share and entry barriers

"The profit share – the share of factor income going to capital – has trended upwards since about the mid 1980s in most developed economies… The effect is larger where there is stronger labour and product market regulation". (Ellis & Smith, 2010)

Ellis and Smith (2010) argue that rate of capital goods obsolescence has been risen by the technological progress, and by then caused capital and jobs to churn faster, thus giving firms more bargaining power. Entry barriers can be considered as exogenous or endogenous obstacles which declines the rate of entering to the markets. Exogenous entry barriers are mainly regulations set down by authorities, example licensed trade and patents. Overcoming these obstacles is extremely hard since these regulations are juridical and mostly very costly. As for endogenous barriers, they are not legislative, in fact legislation tries to prevent formation of extreme case of these barriers by criminalizing example predatory pricing or cartel activity. A good example comes from Hyytinen et al. (2018) who provide insight of the Finnish economy that nearly all manufacturing sectors had some level of cartel activity by the end of 1980s. Whereupon, they conclude that averting this kind of activity by competition policies is extremely important (Hyytinen et al., 2018). As in general, barriers of entry provide many negative effects for the economy, even if they are acceptable/legal in some situations. Moreover, this chapter enlightens the question how these barriers might have effect on the labour share of income.

In this matter Aghion and Howitt (2009) divide the effect of entry rate of new firms on productivity growth for two different set of firms – initially less productive and more productive firms. Figure 4 illustrates these relationships.

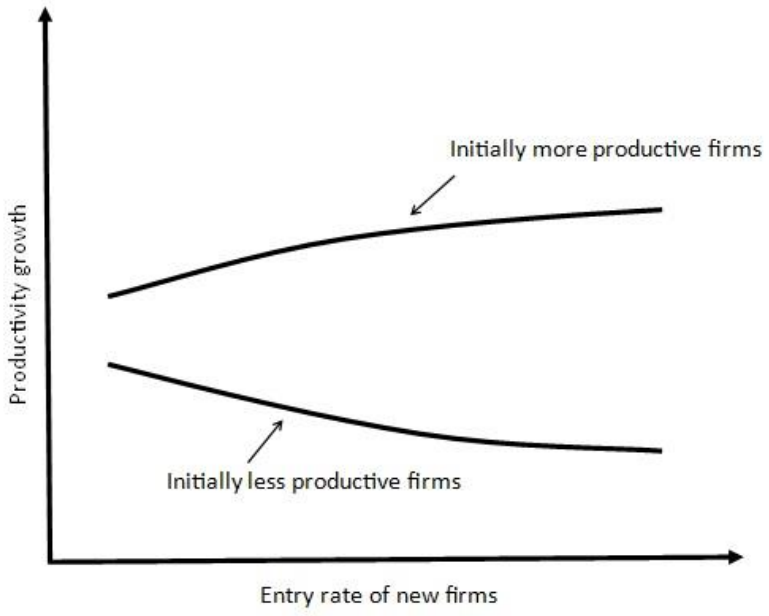


FIGURE 4 Entry and total-factor-productivity growth (Aghion & Howitt, 2009).

In this figure the upper (lower) line represents the average reaction of the initially more (less) productive firms when firms are separated by average productivity of the sector. According to figure 4, it can be noted that incumbent firms with higher productivity react positively when competition becomes more intense. Vice versa, the reaction of firms with less than average productivity of sector is negative. (Aghion & Howitt, 2009.)

As figure 4 points out it is seemingly true that the weakest incumbent firms do not have much of a competitive power at least in the situation that entrant firms are more productive. Aghion and Howitt (2009) state that firms' reactions vary depending on their distance from the technological frontier. They propose that liberalization boosts (dampens) innovation in industries that are close (far) to the technological frontier, thus productivity, output and profits increase (decrease) in more (less) advanced industries and firms (Aghion & Howitt, 2009, s. 279). Main reason behind this kind of dynamics is that falling barriers to entry incentivizes advanced industries and firms to innovate new products, production technologies and management practises (Aghion & Howitt, 2009, 281). Also, Aghion et al. (2015) state that effectiveness of entry towards growth is higher the closer the sector is to the technological frontier. Due to that, they predict that high entry barriers become more detrimental as technological frontier comes closer (Aghion et al. 2015). Contrary to this, weaker firms, which have less chances of competing, may respond reversely (Aghion & Howitt, 2009, s. 281). Bartelsman and Doms (2000) argue also that deregulation and antitrust laws changes motivation to invest as entry and exit barriers fade. Conclusion can be drawn that liberalization enhances the effect of creative destruction and creates foundation to a more innovative environment.

Dynamic competition is one of the key elements in economic growth but the question in this thesis is how it is related to the labour share of income. Boone (2008) states that decrease in entry costs is widely accepted as a factor, which increases competition. Since competition is important factor in labour share dynamics, there is a strong possibility that fading entry barriers also have some sort of impact through intensified competition. Azmat et al. (2012) argue in this matter that as entry barriers fall, labour's share increases due to eroding profit margins. Blanchard and Giavazzi (2003) present also same kind of results concerning the product market deregulation and find that in the long-run real wage and employment level get higher. It is that even if the workers' wages go down because of the lower profit margins, they gain relatively more from decreased product prices as consumers (Blanchard & Giavazzi, 2003). It is well known fact in field of economics that firms' profits in monopolistic markets exceed profits compared to a competitive market environment. Considering only this mechanism the hypothesis, that falling entry barriers increase labour's share, is reasonable. Nonetheless as competition deepens there exist other possible dynamics concerning about labour's share movement.

Autor et al. (2017a) present illustrative model of superstar firms in their paper. They propose the mechanics of monopolistic competitive environment as following:

1. New firms enter an industry and pay a sunk cost of entry.
2. Due to fixed cost of production some of the low productivity firms tend to exit.
3. In the situation where low productivity firms choose to stay, firms with high productivity use more inputs and thus gain more market share.
4. As labour cost is somewhat fixed the high productive firms will have higher revenue-based total-factor-productivity[9].

Based on their model and its market mechanisms Autor et al. (2017a) propose that more productive firms will gain higher profit shares in value added. Let it be noted that they use consumer sensitivity to prices as an indicator of degree of competition, which determines the degree of concentration. They state that this reallocation of market shares drives sales concentration towards more productive firms and hence decreasing the labour share of industry as whole. (Autor et al. 2017a.)

Vital assumption in this kind of mechanism is that highly productive firms have sufficiently low labour share. Autor et al. (2017b) state that firm will have low labour share in two different cases: (1) if firm's share of fixed costs in total revenues are low or (2) if firm's mark-up is high. Highly productive firms produce efficiently and have high share of total output in industry. Therefore, these firms have low share of fixed costs in total revenues. From this, it follows that highly productive firms have lower labour share than their less productive competitors. (Autor et al. 2017b.)

Despite the concentration hypothesis, Autor et al. (2017a) note that labour share tends to be positively related to increasing competition in a *firm-level* (=within effect) although the aggregate labour share falls. This follows from the downward pressure on the profit margins whenever competition intensifies. This statement is in line with Azmat et al. (2012) findings.

At the state where entry barriers are fading, the restructuring between and within firms in industry gets more intense. Dynamics, which affect labour share of income, are varying depending highly on the productivity level of incumbent firms and technological frontier of the industry. Recent studies suggest that even if firm-level labour share increases in more competitive environment the aggregate labour share decreases through the mechanism of sales concentration towards already highly productive firms. This mechanism is based on assumption, which Autor et al. (2017b) demonstrated, that highly productive firms have lower labour share than poorly productive firms. Taken from Aghion and Howitt (2009), in regulated market it is also highly possible that firms do not innovate as much as in more competitive environment. In this situation, the fading entry barriers enhance innovation near the technological frontier, further boosting productivity and dampening labour share. According to these findings, it is hard to say without further research whether the entry barriers indeed increase or decrease labour share of income in specific industry in specific country. This thesis tries to

[9] Autor et al. (2017b) base this argument on the Bartelsman et al. (2013).

answer in this question concerning various network sectors in Finland and Sweden.

3.1.4 Other determinants of labour share movements

Labour share has seen decline for over 30 years in most of the developed countries, whereupon it is no surprise that analysis of factor distribution has made comeback to the economic literature. Major contribution has been required for having better understanding behind the declining trend in the labour share and in this comprehensive literature it has turned up that dynamics behind labour share are not so simple as thought before.

Sweeney (2013) states that the reasons for the decline are complex. However, these movements have also been difficult to observe since national income has risen at the same time (Sweeney, 2013). There lie several factors which cause movement and restructuring in both factor shares. The effects can be divided roughly to the macro-level and micro-level based on their channel of effect. Micro-level determinants are mainly those introduced at chapter 2.6 whereas macro-level determinants cover up many variables such as technological change, globalisation, de-unionisation, financialisation, privatisation, outsourcing, offshoring and other institutional changes. However, from these perspectives role of labour market regulations and other institutional determinants have gained much attention while micro-level sources of industry wage growth not so much, hence systematic movement in labour share is understood poorly (Böckerman & Maliranta, 2012). This statement is supported by Gabaix (2011) and his granular hypothesis so as Cochrane (1994) who argue that most of the macroeconomic shocks fail to explain bulk of economic fluctuation.

Böckerman and Maliranta (2012) distinguish the labour share changes at industry level into two different micro-level mechanisms: Average plant level change and micro-structural change. Moreover, they find evidence that micro-level dynamics of the labour share are linked to the productivity growth and wage growth (Böckerman & Maliranta, 2012). These results imply the fact that micro-level dynamics are at important role when trying to understand the whole picture of this phenomenon. Though, there is only a thin line between micro- and macro-level determinants because they are closely related and affect each other.

One of the most important factors for driving labour share decline is globalisation which has gained much attention in the recent literature (e.g. Azmat et al., 2012; Böckerman & Maliranta, 2012; Dünhaupt, 2016; Autor et al., 2017). Böckerman and Maliranta (2012) argue that when volume of international trading grows, there occurs systematic micro-structural change in value added towards firms that have relatively low labour share. The labour share declines mainly because globalisation increases labour productivity which on the other hand is caused by the intra-industry restructuring. The major force in this restructuring is that the increased export results notably in exits of plants with high labour income. (Böckerman & Maliranta, 2012.)

When extending these findings to between industries the results seem to be somewhat similar. De Serres et al. (2002) show that the concentration is not only happening at intra-industry level but can be observed also at the inter-industry level. They provide information that labour share is declined partly because of shifts in sectoral compositions, mainly towards sectors with low wage share (De Serres et al., 2002).

Autor et al. (2017, b) present somewhat similar case as Böckerman and Maliranta (2012) that concerns the micro-level restructuring. Their study is based on the premise that globalisation and technological change benefits already productive firms the most. They find out that superior firms which have proportionally lower costs, better quality or are just more innovative, eventually gain more market power in expense of weak firms. As the market concentration deepens towards these high profit firms, the aggregate labour share declines. This follows up from the fact that usually high profit firms tend to have low share of labour in sales and value-added. Concerning this topic at the industry level, they manage to find support on several predictions: (1) sales will concentrate towards small number of firms, (2) higher the concentration the sharper the decline in labour share, (3) between-firm reallocation drives fall in the labour share more than fall in the unweighted mean labour share within firms and (4) the industries with high market concentration will face the highest between-firm component. (Autor et al, 2017, a.)

Autor et al. (2017) point alternative hypothesis for such concentration and fall in the labour share. They suggest that highly concentrated markets enable nowadays leading firms to lobby better and therefore create barriers to entry. This however is unlikely to be the complete explanation alone. A more plausible explanation is that high profit firms get more market shares by utilising innovations or their better efficiency, thus gaining market power to erect market barriers. (Autor et al., 2017.)

When thinking about labour's share is it somewhat obvious that union density plays proposedly key role in its movement. Fichtenbaum (2011) provides evidence on this matter by finding out that unions have positive effect on labour's share of income. On this matter Judzik and Sala (2013) find out that declining wages are associated with decrease in union density. There exists positive relationship between union power and labour's share (Judzik & Sala, 2013). From here it follows that de-unionisation/ decrease in union density supposedly lowers the wage level due to decrease in labour's collective bargaining power. Since wage is one of the endogenous variables in the labour's share equation, de-unionisation indeed lowers the aggregate income of labour. This topic can be widened to concern labour legislation since they are closely related to union power. Deakin et al. (2014) find support in that matter that labour protective laws have positive correlation with labour share of income.

One reason for that kind of decrease in workers' bargaining power is financialisation. Dünhaupt (2016) argues that increase in shareholder value orientation and lean towards short-run decisions in management alongside liberalisation in terms of finance and international trade have decreased the bargaining power of workforce. However, financialisation altogether has also other effects of channel

when speaking of decline in labour share. One of these channels is rise in the mark-up which is result from passing the increased overhead obligations on to wages (Dünhaupt, 2016). However, key argument here is the true foundation of financialisation. Dünhapt (2016) so as De Serres et al. (2002) find out that shift in sectoral composition towards financial sector drives the decline in labour share. This is mainly because financial, insurance and business services sector has relatively low share of wages and high share of profits (De Serres et al., 2002). Thus, De Serres et al. (2002) state that this effect was almost eliminated or significantly reduced in some of the sample countries when correcting for compositional bias.

However, Elsby et al. (2013) conclude that about one third of the U.S. labour share decline in past quarter century is caused by the understatement of the contribution of the self-employed. They provide evidence that self-employed have increased their relative wages significantly in contrast of payroll workers (Elsby et al., 2013). This might indicate that self-employment should be handled more accurately in academic research. One possible solution to this would be use of real unit labour costs (RULC) which was presented in the chapter 2.3.

The fundamental basics of labour share have been known for over century, yet the wide variety of mechanisms behind its movement makes the actual causalities hard to identify. Maybe this overflowing number of determinants is the reason for its popularity as research subject and what makes it so intriguing to study. Table 2 summarizes the results of labour share research introduced in this chapter.

TABLE 2 Background literature about mechanisms of labour share movement

Author(s); year	**Research subject**	**Data**	**Results**
Ripatti & Vilmunen (2001)	Change in the underlying production technology and declining labour share	Quarterly data from Finnish economy (1975 – 2001)	Technical elasticity of substitution is less than 1. Labour-augmenting progress ↓, capital- augmenting ↑. Main factor is the increasing mark-up.
De Serres et al. (2002)	Sectoral shifts and how they affect aggregate labour shares	Annual data from OECD International Sectoral Database (ISDC) from 1971 to 1998	Trend decline in observed countries is much of because the sectoral composition of the economy
Blanchard & Giavazzi (2003)	Product and labour market general equilibrium model		Market equilibrium model
Bentolila & Saint.Paul (2003)	Movements in the labour share and the technology-determined curve, the share-capital (SK) curve	Panel data on 13 industries and 12 countries (1972-1993)	(1) Movements along SK curve capture changes in factor prices (wage, interest rates) and labour-augmenting progress (2) Curve shifts by i.e. non-labour embodied progress (3) Movements off the SK curve are caused by deviations from MC pricing, labour adjustment costs, or

			changes in workers' bargaining power
Fichtenbaum (2011)	Unions and labour share	Panel data from 50 U.S. states and the District of Columbia (1997 – 2006)	Unions have positive impact on the labour share. Almost third of the decline can be explained with the deunionization.
Azmat et al. (2012)	Privatisation, entry barriers and labour share	OECD regulation database, OECD STAN database, Groningen Industry Productivity Database. (three sectors in the network industries from 18 countries between 1970-2001)	On average privatisation accounts for a fifth of the decline in labour's share. Effect comes mainly from lower employment but is offset by higher wage level and falling barriers to entry.
Böckerman & Maliranta (2012)	Globalization, creative destruction and labour share change	(1) Microstructural components: Longitudinal plant-level panel data constructed by Research Laboratory of Statistics Finland.; (2) Globalization: Micro-level components for 12 industries (1976-2007)	Declining labour share and increasing productivity are linked through micro-level restructuring. Increased international trade drives both of these shifts.
Elsby et al. (2013)	The decline of the U.S. labour share	Data from Fixed Asset Tables by the Bureau of Economic Analysis from 1987 to 2011. Also, same sample of 60 NAICS industries (in another section).	Third of the decline is caused by progressive understatement of the self-employed. Limited support for substitution of capital for (unskilled) labour. Weak support for unionisation for explaining decline. Offshoring might be potentially the biggest reason for the decline in U.S.
Judzik & Sala (2013)	Long-term wage effect of productivity growth, deunionization and international trade	Annual data from 1960-2010 from the OECD Labour Market Indicators and Economic Outlook	While controlling the productivity, declining union density and growing international trade are related to downward trend in wages
Sweeney (2013)	Summary and discussion concerning the declining labour share		Decline in labour's share has caused shift in factor income distribution at the expense of labour, polarisation in the personal income distribution and redistribution within labour share, with high earners gaining.
Deakin et al. (2014)	Labour laws, unemployment and labour share	Longidutional data on labour law in France, Germany, Japan, Sweden, UK and US (1970-2010)	Worker-protective labour laws in general are positively correlated with labour share of income.
Dünhaupt (2016)	Determinants of labou's income share	Cross-sectional dataset of 13 countries (1986-2007)	There is relationship between growing dividend and interest payments of non-financial firms and the declining labour share. Other factors: Globalisation and decrease in the bargaining power.

Autor et al. (2017a)	Superstar firm hypothesis and labour share	Datasets from six sectors (manufacturing, retail trade, wholesale trade, services, finance and utilities and transportation) from US economic census (1982-2012)	(1) Sales concentration within industries is mainly caused by private sector. (2) The larger the concentration in the industry the larger the decline in labour share.
Autor et al. (2017b)	Labour share and concentration in industry	Micro panel data from the U.S. Economic Census (1982-2012)	(1) Concentration declines the labour share, (2) labour share decline driven by between-component rather than within-component (3) between-component is larger the larger market concentration
Cho et al. (2017)	Whether the labour share has declined	National accounts data from OECD concerning 22 OECD countries between 1995-2014	The decrease in labour share is mainly caused by rising depreciation rates which has increased gross capital share.

4 EMPIRICAL APPROAH

Recent chapters shed light on the concepts of entry barriers and labour share of income. In order to test their relationship in Finland and Sweden, this thesis includes statistical testing in form of various linear models. First of all, data is described slightly and after that there is discussion about recent labour share trends and microstructural analysis. Lastly this chapter presents used methods at general level as also basic models of panel regressions.

4.1 Data

Data for this thesis is obtained from wide variety of sources. The main indicator of interest, barriers to entry (BTE) as well as private ownership (PO), come from OECD regulation database (see appendices Nicoletti et al., 2000; Koske et al., 2015). These indices are based on wide regulatory questionnaires with the help of relevant country specific departments and take account costs of entry through political environment and legislation. Moreover, BTE's values range between 0 (lowest level of barriers) and 6 (highest level of barriers) and it is reported at industry level. Respectively, PO index is also reported at industry level on a scale between 0 (no public sector ownership) and 6 (complete public sector control). Yet, the level of public ownership differs from barriers to entry because it rarely reaches zero level. This is due to fact that the government usually still keeps some stock ownership of the dominant firms, even if the industry itself has been privatized (Azmat et al., 2012). These indices are observed annually between 1975-2013 for five different network industries from energy, transport and telecommunication sectors (table 3). Motivation for using only network industries in this thesis comes from the fact that globalisation has played major role in shifting labour share (see Azmat et al., 2012; Böckerman & Maliranta, 2012; Dünhaupt, 2016; Autor et al., 2017). Since network industries are not traded (example power grids in D35, railroads in D49 etc.) globalisation has very little to do with their functional income distribution, even if the global trade affects for the whole country. This allows capture of more robust results concerning relationship between entry regulation and labour share of income.

TABLE 3 Industry list

STAN Isic Rev 4. ID	**Industry**
D35	Electricity, gas, steam and air conditioning
D49	Land transport and transport via pipelines
D51	Air transport
D53	Postal and courier activities
D61	Telecommunications

Data for the dependent variable labour share (SHARE) is gathered from OECD STAN database. The labour share per industry is derived from two variables, the sectoral compensation of employee and sectoral value added. Let it be noted that labour compensation includes also social security contributions by the employer. However, there were some concerns while using all employer's costs because labour share is, according to the data, over 100 % in postal and courier sector in Finland for early periods. Therefore, years 1975-1981 are excluded for D35 in Finland as outliers.

Data is also used from two other datasets as source of instrumental variables. More specifically data used includes observed country specific government administration and socio-political values drawn from population wide questionnaires. First political variable, the largest party in current government, is provided from World Bank's Database of Political Institutions (DPI). This variable indicates whether the current government leader party is left, centre or right-wing, and it is further converted into dummy variable for statistical analysis. Other two instruments are from The World Value Survey (WVS): "self-positioning in political scale" and "competition is good" indices, which both range between 1 to 10. In self-positioning low (high) index values mean that population leans to left (right), when in competition acceptance index low (high) values indicate population to be in favour of competition (against competition). Self-positioning comprises years between 1981-2005 for Finland and 1981-2010 for Sweden. As for acceptance of competition, it consists only years 1994-2010 for both countries. Motivation for instrumental variable approach and usage of these specific variables are discussed in detail later. Table 4 below illustrates descriptive statistics of presented variables. More specific illustration of data and sources can be found from data appendix A2.

TABLE 4 Descriptive statistics

Variable	**Obs**	**Mean**	**Std. Dev.**	**Min**	**Max**
Year	390	1994	11.269	1975	2013
Share	281	0.476	0.191	0.164	0.983
Barriers to entry	380	2.798	2.471	0	6
Public Ownership	380	4.769	1.474	0.702	6
Self-positioning in political scale	275	5.522	0.168	5.261	5.855
"Competition is good or harmful" -indicator	145	3.616	0.272	3.280	4.035

Notes: Means and standard deviations from sample.
Variables: **Year** – time variable which contains years from 1994 to 2013. **Share** is %-variable and denotes labour share of value added in each year. **Barriers to entry** and **Public ownership** vary potentially between 0 and 6 so that 0 (6) means zero market entry barriers (that market entry is prohibited) and full public ownership (full private ownership). **Self-positioning** and **Competition is good or harmful** can range from values 1 to 10; in "Self-positioning in political scale", 1 represents complete left values and 10 complete right values – In "Competition is good or harmful" value 1 means "competition is , good" and 10 "competition is harmful".

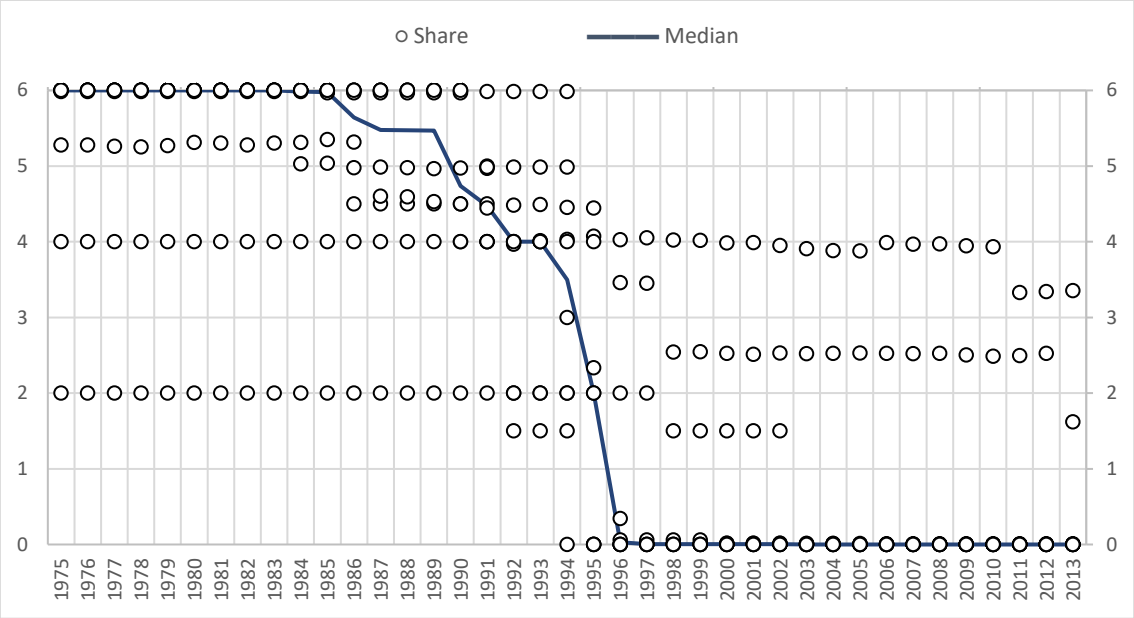


FIGURE 5 Change in the entry regulation in the network industries in Finland and Sweden, 1975-2013. Data: OECD STAN database for structural analysis.

Figure 5 captures Finnish and Swedish network industries' trend of the barriers to entry, which is subject of interest in this thesis. One can state clearly that entry regulation has seen majorly decreasing trend with many industries facing as drastic change as drop from index value 6 (the most restrictive) to 0 (the least restrictive environment).

4.2 Trends and micro-structural mechanisms in labour share

Recent trend in labour share movement in Finland and Sweden is somewhat varying (Figure 6). According to figure 6, from the late 1970s all the way to early 1990s labour share in Finland has seen some major increase. After passing over 65 % threshold level in 1991, labour share starts dropping sharply, which might be connected to the fall of the Soviet Union at some extent. After this, labour share keeps almost constant up until 2007 when there occurs almost five percentage point growth in few years. More recent data shows that labour share in Finland is slowly decreasing. For Sweden, it is noticeable that labour share is lower than in Finland for the whole time period except in years 1978-1980. Moreover, in the early periods labour share grows steeply in Sweden and crosses over Finland only to start decreasing after that. After 1986 labour share starts growing again steadily but as in Finland 1991 seems to be the break point of that growth. From there starts somewhat unstable period where labour share grows and declines

from time to time. From 2007 onwards labour share seems to move almost identically compared to Finland. Aftermath of the turmoil labour share movements in Finland and Sweden shows that labour share is over 4 percentage points lower in 2016 than it was in 1975.

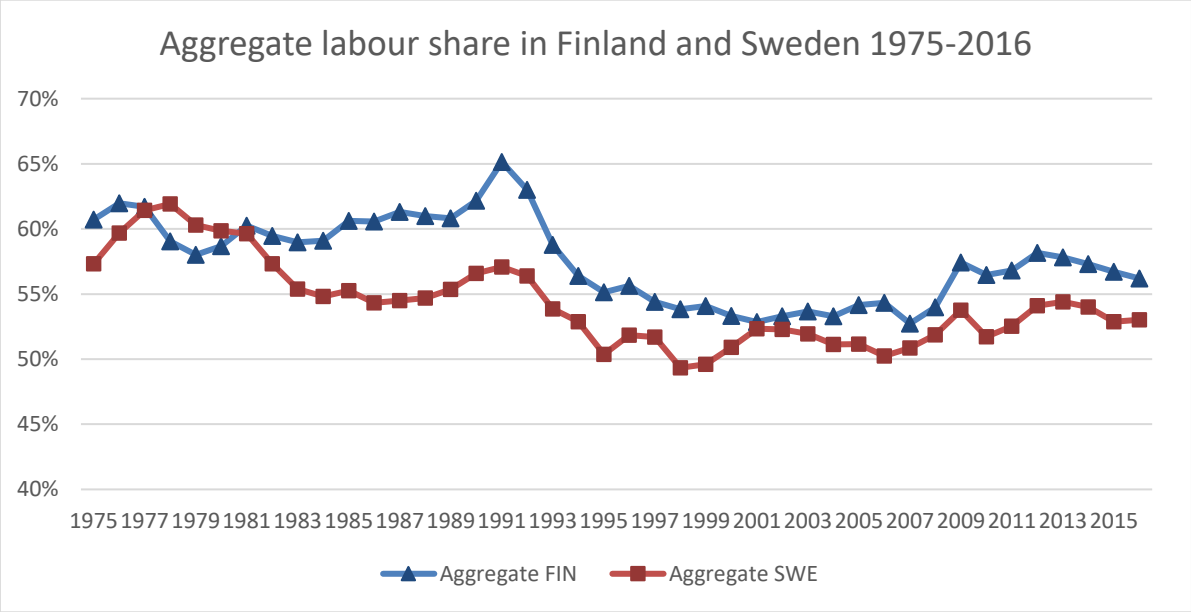


FIGURE 6 Labour share movement and trends in Finland and Sweden according to OECD data (1975-2016)

Now that the total aggregate movement in Finland and Sweden is introduced, more in-depth analysis can be taken into discussion. Figure 7 illustrates labour share of network industries in Finland and Sweden generally.

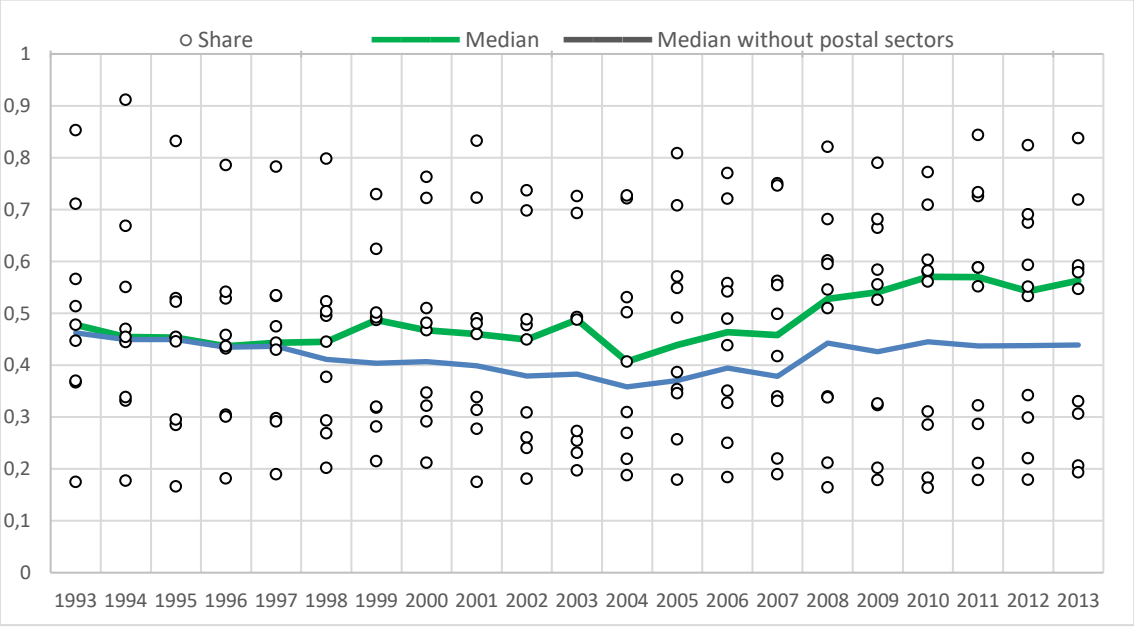


FIGURE 7 Change in the labour share in the network industries in Finland and Sweden, 1993-2013. Data: OECD STAN database for structural analysis

In figure 7, dots represent labour share % in network industries in Finland or Sweden, whereas the line covers annual medians of the dots. Labour share is derived from OECD data as explained in chapter 4.1 and data appendix. Two median lines are added: (1) one that accounts all network industries and (2) one excluding postal sectors. Reason for this is that postal sector in Sweden has data only for the year 2005-2013. In addition to that, Finnish and Swedish postal sectors have very high labour share compared to other industries. This observation is also visible in the figure itself since median without D53FIN and D53SWE is at lower level but follows the same trend at some extent. Country specific figures 10 and 11 can be found at the appendix A3.

TABLE 5 The decomposition of labour share growth rates in Finland, annual averages for the period 1996-2014, %. Source: unpublished and updated tables from the study by Kauhanen and Maliranta (2014)

Growth rates and components	D35	D49	D51 (2006-)	D53	D61
Aggregate labour share for whole industry (A-E)	0.02	1.04	0.03	0.11	-1.76
A. Within component	-0.31	1.84	3.72	0.77	1.06
B. Between component	0.07	-0.67	0.65	-0.18	-0.41
C. Entry component	-0.72	-1.16	-2.31	-0.59	-10.10*
D. Exit component	0.98	0.78	-0.09	0.08	5.02*
E. Other components	0.01	0.25	-1.95	0.02	2.67
Net Entry effect (C-D)	0.26	-0.38	-2.39	-0.51	-5.08

Notes: Computations are based on decompositions, which prof. Mika Maliranta generously provided. Parentheses point out that the same result should also appear when summing up given components inside the parentheses. However, components might not always add up exactly due to rounding. In D51 there are missing observations between 1996-2006, and therefore it is calculated only 2006 onward.

From table 5 it can be seen that Finland's network industries have increased their labour share on average when measuring annual growth. Note that this does not tell much about aggregate growth during whole period. There are also some major outliers in D61 entry and exit components (*) but otherwise the results are robust. Within and entry components seems to be most important source in labour share fluctuations, however other components should not be overlooked. Moreover, within components are consistently positive (except in D35) whereas entry components are all negative. According to competitive framework entrant (exiting) firms are usually more (less) productive than incumbent ones. From this point of view negative entry components and positive exit components are very plausible.

TABLE 6 The decomposition of labour share growth rates in Sweden, annual averages for the period 1997-2013, %. Source: unpublished and updated tables from the study by Kauhanen and Maliranta (2014)

Growth rates and components	D35	D49	D51	D53	D61
Aggregate labour share for whole industry (A-E)	-3.56	0.13	-1.26	-0.28	-0.81
A. Within component	-0.51	0.58	-0.53	-0.12	-2.81
B. Between component	0.05	-0.31	-0.10	-0.10	0.60
C. Entry component	-3.71	-0.14	0.63	-0.05	2.35
D. Exit component	1.08	-0.02	-1.36	0.02	-0.34
E. Other components	-0.46	0.02	0.09	-0.03	-0.60
Net Entry effect (C-D)	-2.63	-0.17	-0.73	-0.03	-0.94

Notes: Computations are based on decompositions, which prof. Mika Maliranta generously provided. Parentheses point out that the same result should also appear when summing up given components inside the parentheses. However, components might not always add up exactly due to rounding.

In Sweden (Table 6) components vary a lot more. Contrary to Finland, Aggregate labour share has been decreasing annually in network industries on average excluding D49. However, there are some similarities such as relative magnitudes of components.

TABLE 7 decomposition of labour share growth rates in Finland and Sweden, annual averages, %. Time period for Finland is 1996-2014 and for Sweden 1997-2013. Source: unpublished and updated tables from the study by Kauhanen and Maliranta (2014)

Growth rates and components	1. Aggregate labour share (2-3+4)	Aggregate employment wages (2)	Aggregate labour productivity (3)	Self-employed (4)
D35 FIN	0.02	3.23	3.21	0.00
D49 FIN	1.04	2.66	1.71	0.09
D51 FIN (2006-)	0.03	4.67	4.60	-0.04
D53 FIN	0.11	2.09	1.96	-0.02
D61 FIN	-1.76	0.87	2.89	0.27
D35 SWE	-3.56	3.01	6.52	-0.04
D49 SWE	0.13	2.12	1.99	0.00
D51 SWE	-1.26	3.78	5.05	0.00
D53 SWE	-0.28	1.95	2.23	0.00
D61 SWE	-0.81	2.75	3.54	-0.02

Notes: Computations are based on decompositions, which prof. Mika Maliranta generously provided. Parentheses point out that the same result should also appear when summing up given components inside the parentheses. However, components might not always add up exactly due to rounding.

Table 7 provides upper level decomposition of the labour share. It follows the RULC-framework from Kauhanen and Maliranta (2014), which is presented in equation 9 in chapter 2.3. According to RULC, labour share can be decomposed into changes in wage-level and labour productivity so that wages are positively and productivity negatively connected to labour share. Table 7 takes also account self-employed people, who normally are not included in labour share statistics, even if the magnitude of their impact is quite miniscule. Moreover, labour productivity and wages have increased phenomenally in both countries within the given time period (see figures 12 and 13 in appendix A3). Eventually labour share movement is almost solely defined through these upper level components and their subcomponents. In this matter, decoupling theory discussed earlier in chapter 2.5.1 is by then vital theory while studying labour share.

4.3 Methods

For readers' information, this thesis mostly replicates Azmat's et al. (2012) statistical procedures and uses somewhat same data variables. However, while Azmat et al. (2012) concentrate more on private ownership as independent variable, the main independent variable in this thesis is barriers to entry. As discussed, various data sets are used to conduct industry wide panel data for Finland and Sweden concerning labour share and market regulation.

There are two different methods, which can be applied to the panel regression – fixed or random effects. Normally, random effects estimators are inconsistent if data has individual effects, which makes fixed effects estimation more favourable in these cases (Cameron & Trivedi, 2005 p.788). However, fixed effects model estimation is not as efficient even if it might be more robust (Cameron & Trivedi, 2005 p.788). Moreover, random effect estimator $\widetilde{\beta_{RE}}$ is inconsistent if individual effects are fixed, which implies that the within estimator $\widetilde{\beta_W}$ should be used (Cameron & Trivedi, 2005 p.717)10. Formal procedure in order to choose between these two methods is called Hausman test. It can be used to observe if there exist fixed effects by testing whether these two estimators are statistically significantly different from each other (Cameron & Trivedi, 2005 p.717). While Hausman test proposes random effects for collected data, fixed effect model is also used to control time and industry-varying trends.

To understand fixed and random effect models it is essential to introduce the individual-specific effects model. First and the foremost, these models allow different intercept terms for each cross-sectional unit so that all the slopes are the same: $Y_{it} = \alpha_i + x'_{it}\beta + \varepsilon_{it}$ (Cameron and Trivedi, 2005 p.700). There are two variants of this model – one that treats α_i as an unobserved random variable, which might be correlated with the observed X_{it} and one that assumes them to be independently distributed random variables (Cameron and Trivedi, 2005 p.700). These models are called fixed effects (FE) model and random effects (RE) model respectively (Cameron and Trivedi, 2005 p.700). Despite the terminology, α_i is random variable in both models, even though it might be confusing (Cameron and Trivedi, 2005 p.701). In this thesis basic models are as following:

$$\boldsymbol{RE}: SHARE_{cit} = a_i^S BTE_{cit} + u_{cit}^S \quad (33)$$

$$\boldsymbol{FE}: SHARE_{cit} = a_i^S BTE_{cit} + \eta_{ci}^S + (t * v_i^S) + u_{cit}^S \quad (34)$$

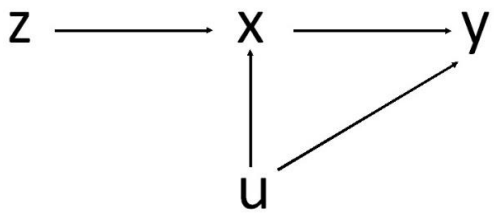
In where SHARE is labour share of value added in country "c" for industry "i" at time "t". BTE denotes barriers to entry in the same way and u is error term, which is assumed to be uncorrelated with the independent variable(s). Compared to RE-model, FE-model takes also account set of industry and country spe-

[10] "Here B refers to the vector of coefficients of just the time-varying regressors" (Cameron & Trivedi, 2005 p.717).

cific effects (η_{ci}^{S}) so as year effects ($t * v_i^S$). Furthermore, these models are extended to include public ownership (=PO) in order to mitigate possible omitted variable bias. Basic models are pooled over industries so that $a_i = a$ but every industry is also checked individually. Newey-West technique is introduced in industry specific regressions since barriers to entry might have some serial correlation.

However, serial correlation and omitted variables are not the only concerns of the models. By far the biggest issues here are endogeneity and simultaneity of the variables. For this matter, Azmat et al. (2012) state that these concerns are unlikely because policy variables such as BTE or PO are nationally decided rather than impacted by individual industry-specific shocks. However, the next example is based on Azmat et al. (2012) reasoning for testing instrumental variable approach in their research. One can imagine industry specific shock that increases the labour share within that industry, hence possibly giving more power to labour union in monetary terms. This increased union power can be example utilised in resisting the market liberalisation (e.g. strikes against governmental decisions to reduce barriers to entry). In this kind of scenario, high labour share would be related to higher entry barriers through reverse causation. Regardless of all this, statistical testing reveals that there exists some simultaneity between barriers to entry and labour share. Because of these concerns, instrumental variable approach is taken into statistical repertoire.

Put simply, if variables in OLS are not exogenous, it follows that independent variables are connected to error term, thus results are not robust. Instrumental variables provide tool for endogenous variable and simultaneity problem. Following diagram from Cameron and Trivedi (2005, p.96) sheds light in the instrumental approach:



Picture 1 Instrumental variable approach (Cameron & Trivedi, 2004, p.96).

In the picture 1, Y is dependent variable, X endogenous independent variable, U error term and Z instrumental variable. Handiness of instrumental variables come in situations where independent variable is correlated with the error term or there exists simultaneity between X and Y. It is that X is instrumented with variable Z, which has two main assumptions: 1) Z does not correlate with error term U and 2) Z is correlated with X (Cameron & Trivedi, 2005, p.97). With these both assumptions holding, X is no more endogenous when it is estimated through variable Z. This methodology also resolves the simultaneity problem.

In this thesis two-stage least squares method is used instead of regular IV estimator, since the model is over-identified. Two step GMM estimation is pro-

ceeded alongside normal 2SLS estimation. This should give the most robust results concerning the model, nevertheless one more robustness check must be done. It is because default standard errors might cause estimators to be more precise than they really are while inspecting different industries (Cameron & Miller 2015). This can be dealt with standard error clustering, which could normally be done within the model (in Stata). However, in this thesis the number of clusters is too small for that, so therefore wild bootstrap post-estimation is used instead.

Instruments in the model are basically reflecting countries' political environment and public opinion about competition. However, public ownership is also included as instrument. This might appear to be contradictory according instrumental variable assumptions, since coefficient of public ownership is statistically significant while explaining labour share as only regressor. Nevertheless, when public ownership and barriers to entry are both included in baseline panel regression, public ownership loses its significance. This is most probably due to better explanatory power of barriers to entry variable. In addition, state owned enterprises are widely considered as indirect instrument of regulation that may deter market entry of private firms in mixed markets (Harris and Wiens, 1980; Cremer et al., 1989; De Fraja and Delbono, 1989; Brandão & Castro, 2007).

Azmat et al. (2012) argue that privatisation is linked to the labour share through job shedding, higher wages and falling entry barriers. There is no doubt that public ownership is a major element in labour share but whether it is linked straightforwardly or via barriers to entry is without a doubt an interesting question. Labour share movement is based on the changes in wage level, employee count or in productivity as discussed in earlier sections. It is widely believed that private sector is profoundly more efficient at most parts and its wage level differs slightly from the public sector. Whether the wages are higher or lower on the public sector depends on the industry and employee's skill level needed. Fundamentally, the main differences in productivity and wage level come from competitiveness as a whole - specifically in labour markets. It is also important to note that if market liberation is to happen first, public ownership is going to decrease due to that. This mechanism can be reached with practical anecdote: 1) assume that entry regulation and private ownership are as high as possible 2) now market liberalisation makes it possible for privately owned firms to enter the market, thus relative public ownership will decrease. In this light, it might be that public ownership is not directly linked with the labour share but instead through barriers to entry or vice versa. Moreover, instrumenting barriers to entry with private ownership is at least worth trying.

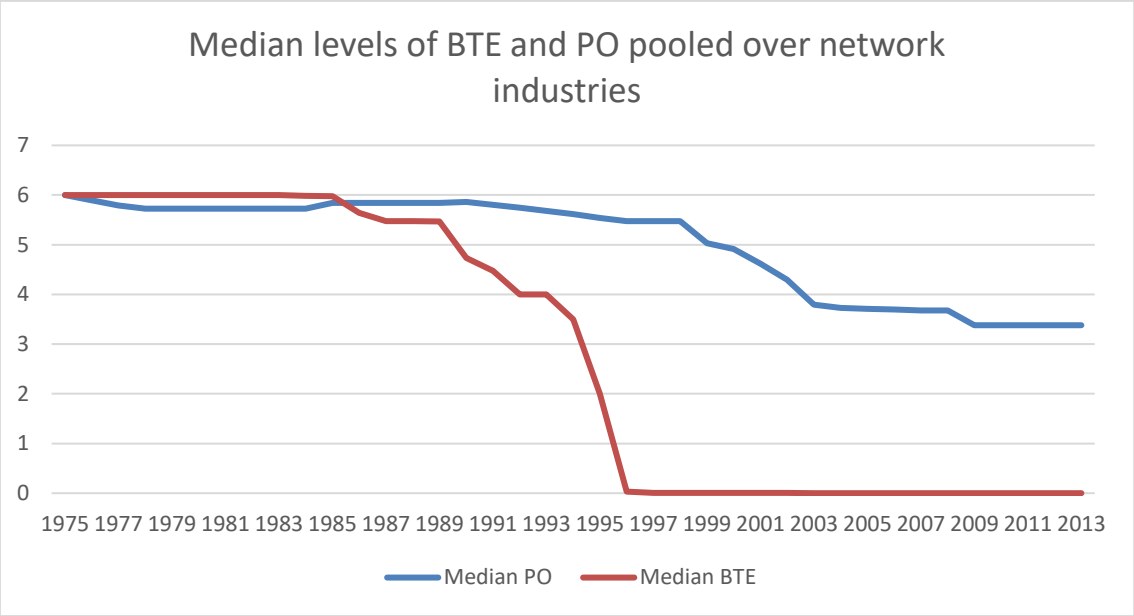


FIGURE 8 Change in the entry regulation and public ownership in the network industries in Finland and Sweden, 1975-2013. Data: OECD STAN database for structural analysis.

The figure 8 shows that both indices tend to be downward sloped almost whole period. Moreover, barriers to entry has gone down much more drastically than public ownership. In this light it seems that when barriers to entry goes down, public ownership is about to decrease as theorised. Even if the figure tells this kind of story, it does not fully mitigate the possibility of public ownership being the instrument that somewhat controls the market liberalisation. This is because the fact that information about the public ownership sales is available way before the actual sale date. According to this information, firms might enter the market even though they might not enter without this information. If this is the case, public ownership could much possibly be an indirect instrument of barriers to entry.

The baseline instrumental variable model used in thesis is as following:

$$SHARE_{cit} = \beta_0 + a_1^S \widehat{BTE_{cit}} + u_{cit}^S \tag{35}$$

$$\begin{aligned} \widehat{BTE_{cit}} = {} & \pi_0 + \pi_1^S PO_{cit} + \pi_2^S SELFPOS_{cit} + \pi_3^S COMPEAGR_{cit} \\ & + \pi_4^S GOVERDUMMY1_{cit} + \pi_5^S GOVERDUMMY3_{cit} \\ & + v_{cit}^S \end{aligned} \tag{36}$$

where equation 36 is the first stage and 35 is the second stage of the model. SHARE, BTE and PO are same as in the equations 33 and 34, whereas SELFPOS denotes self-positioning in the political scale, COMPEAGR is "pro-competition indicator", GOVERDUMMY1 and 3 are dummy variables, which represent the political party in power (1 = centre and 3 = right). Subindices c, i and t denotes country, industry and year respectively. $\widehat{BTE}$ is predicted value of endogenous covariate BTE from the first stage (equation 36) and u is the error term.

5 RESULTS

In this chapter, data and methods described in the sections 4 are used to conduct empirical analysis. Furthermore, basic regressions include fixed and random effects estimations and two-stage least squares IV-estimation. Basic regressions are also expanded to take care of autocorrelation with Newey-West standard errors. Interest of this study is to observe whether barriers to entry can explain variation in labour share at any extent. Two-tailed H_0 is disposed in the following form:

$$H_0: \beta_1 = 0$$
$$H_1: \beta_1 \neq 0 \tag{37}$$

In which B1 is the coefficient of barriers to entry in regression with labour share as dependent variable. The empirical analysis is approached with the two-tailed hypothesis testing instead of one-tailed because regulation's sign is unclear at least for Finland and Sweden. Panel data itself is set so that 10 "panelgroups" are made from data. This basically means grouping industries for each country so that group 1 consists of sector D35 data from Finland whereas group 2 displays Swedish data for same industry and so on. Panel methods in the results section utilize these settings.

5.1 Fixed and random effects estimations

While comparing fixed and random effect methods with the data, Hausman test concludes that there is no systematic difference in coefficients. In other words, random effect estimation is theoretically ideal option for this thesis. However, fixed-effects estimation is conducted for comparison and to make extensive estimations. Table 8 illustrates main results of panel regressions with three different panels A, B and C. More precisely regressions in columns 1, 3 and 5 are computed using random effect estimators while fixed effect estimators are used in columns 2, 4 and 6. Fixed effect regressions features full set of time and industry fixed effects. Panel A comprises both Finland and Sweden, whereas panels B and C are country specific. Columns 1 and 2 include only barriers to entry, columns 3 and 4 private ownership and columns 5 and 6 both of these as independent variable(s).

TABLE 8 Econometric results of fixed and random effect regressions (pooling over network industries)

Panel A: Share (labour share of value added), pooled over country	**[1]**	**[2]**	**[3]**	**[4]**	**[5]**	**[6]**
Barriers to entry (BTE)	0.016***	0.027***			0.014**	0.023**
	(0.004)	(0.007)			(0.007)	(0.009)
Public ownership (PO)			0.020***	0.020*	0.005	0.012
			(0.006)	(0.010)	(0.009)	(0.008)
Fixed effects (45)	No	Yes	No	Yes	No	Yes
Observations	281	281	281	281	281	281
Panel B: Share (labour share of value added), Finland	**[1]**	**[2]**	**[3]**	**[4]**	**[5]**	**[6]**
Barriers to entry (BTE)	0.017***	0.034**			0.014	0.028
	(0.005)	(0.007)			(0.009)	(0.014)
Public ownership (PO)			0.025***	0.026	0.006	0.011
			(0.006)	(0.013)	(0.012)	(0.014)
Fixed effects (44)	No	Yes	No	Yes	No	Yes
Observations	188	188	188	188	188	188
Panel C: Share (labour share of value added), Sweden	**[1]**	**[2]**	**[3]**	**[4]**	**[5]**	**[6]**
Barriers to entry (BTE)	0.004	-0.005			0.005	-0.007
	(0.007)	(0.007)			(0.007)	(0.008)
Public ownership (PO)			-0.001	-0.000	-0.001	-0.003
			(0.004)	(0.006)	(0.004)	(0.007)
Fixed effects (26)	No	Yes	No	Yes	No	Yes
Observations	93	93	93	93	93	93

Notes: Tests use robust standard errors, which are reported in the parentheses. Moreover, significance levels are also included so that ***p < 0.01, **p < 0.05 and *p < 0.1. The sample is pooled across five industries (1. electricity and gas, 2. air transport, 3. rail and road transport, 4. post and 5. telecommunications). Computations include full set of time and industry fixed effects: 5 industries (in all panels), 39 years (in panel A and B) and 21 years (in panel C). **Variables**: BTE and PO are indices ranging from 0 to 6; Share is %-variable and denotes labour share of value added.

In panel A barriers to entry is statistically significant in every regression where it is included. The results are somewhat similar in both RE and FE separately whether the public ownership is included or not. Although in RE regression the coefficient is lower than in FE. The most interesting result by far is that all statistically significant coefficients are positive, meaning that labour share is positively related to entry regulation and private ownership levels. Moreover, barriers to entry is statistically and economically highly significant (null hypothesis is rejected at 1 % level of significance) whereas public ownership's significance varies. Magnitude of the effect is economically significant in light of the results: decrease from maximum level of entry regulation to the lowest (from 6 to 0) would cause almost 10 percent point decrease in labour share. The magnitude of public ownership coefficients is smaller. Note that labour share decreased over 4 percentage points in Finland and Sweden between 1975-2013 altogether (figure 6). However, results apply only for network industries and by then cannot be compared to aggregate results. Similarly, private ownership is also significant in both RE and FE but only when it is only independent variable. Barriers to entry explains labour share better than public ownership despite their similarity and that is the most probable reason for the transition in public ownership statistical significance from regressions 3 and 4 to 5 and 6.

Panel B takes only Finnish network industries into inspection. Here the results change compared to panel A so that BTE coefficients in columns 5 and 6 are no longer significant. Nevertheless, coefficient values hardly differ. As for Sweden (Panel C) none of the coefficients are statistically significant. This might be the case because the labour share data is available for shorter time period than in Finland. Moreover, Swedish data does not count the period of 1975-1993 where main deregulation has happened (see figure 5). Hereby results concerning the effect of deregulation in Panel C are not convincing.

Some of the former studies concluded that labour share should be negatively related towards barriers to entry (see Azmat et al. 2012; Blanchard and Giavazzi, 2003). However, Aghion and Howitt (2009) demonstrate that fading entry regulation boosts innovation in the most productive firms. While testing this theory, Autor et al. (2017a) conclude that highly productive firms use more inputs to gain market share when competition intensifies. According to Autor et al. (2017a) level of entry regulation has positive relationship towards the labour share since the reallocation of market shares towards the more productive firms when competition increases. In this thesis results are in line with the latter theory.

However, public ownership is at very high level in almost every industry before 1990s. It can be assumed that at full level of public ownership the markets are monopolistic when leaving aside the exact ownership structure. In this situation market concentration hypothesis is not valid since monopoly's market share cannot increase, yet the data shows that market liberation decreases labour share. There are few other possible explanations for this phenomenon. Firstly, new established entrants might have higher productivity than incumbent monopoly, and thus them gaining market share would decrease the industry's aggregate labour share. Secondly, monopoly usually do not want to lose market power, and therefore it might react to a new situation. It might lower prices for example, but it would eventually increase the labour share. In order to fit the framework of decreasing labour share, it is much more reasonable to assume that the "monopolies" enhance their activities, which boost their productivity. However, since network industry monopolies are usually publicly owned (restricted by a government), these monopolies most probably do not rule out market liberation[11]. Therefore, the first explanation would be more probable in this situation. In the end this thesis concentrates only observing the labour share movement on the aggregate level, thus these propositions are not tested. Nevertheless, that would be an interesting object to study for further.

Although, the results so far are quite clear, regulation indices have autocorrelation according to "Wooldridge test for autocorrelation in panel data". In order to achieve heteroscedasticity- and autocorrelation-consistent results Hoechle et al. (2007) propose the use of Newey-West standard errors. Because this is the case, models in table 9 are computed with newey-west standard errors, which consider autocorrelation. However, Newey-west standard error procedure is originally meant to be used for time series data, it can be used with force

[11] If government itself decides to liberate markets, they most probably do not restrict that with their monopoly power.

command for panel data (Hoechle et al. 2007). Despite that, it is not possible to obtain comparable results for random effect panel regressions while using Newey-West standard errors since normal regression cannot be extended to include random effect estimator. Therefore, table 9 contains only fixed effect estimations with Newey-West standard errors [12] which are then compared to columns 2, 4 and 6 in table 8.

TABLE 9 Econometric results of fixed effect regressions with Newey-West standard errors (pooling over network industries)

Panel A: Share (labour share of value added), pooled over country	**[1]**	**[2]**	**[3]**
Barriers to entry (BTE)	0.027***		0.023***
	(0.005)		(0.006)
Public ownership (PO)		0.020***	0.012**
		(0.005)	(0.006)
Fixed effects (45)	Yes	Yes	Yes
Observations	281	281	281
Panel B: Finland's Share (labour share of value added)	**[1]**	**[2]**	**[3]**
Barriers to entry (BTE)	0.034***		0.028***
	(0.006)		(0.007)
Public ownership (PO)		0.026***	0.011
		(0.006)	(0.008)
Fixed effects (43)	Yes	Yes	Yes
Observations	188	188	188
Panel C: Sweden's Share (labour share of value added)	**[1]**	**[2]**	**[3]**
Barriers to entry (BTE)	-0.005		-0.007
	(0.008)		(0.009)
Public ownership (PO)		-0.000	-0.003
		(0.008)	(0.009)
Fixed effects (26)	Yes	Yes	Yes
Observations	93	93	93

Notes: Tests use Newey-West standard errors with second-order correction for serial correlation (reported in the parentheses). Moreover, significance levels are also included so that ***p < 0.01, **p < 0.05 and *p < 0.1. The sample is pooled across five industries (1. electricity and gas, 2. air transport, 3. rail and road transport, 4. post and 5. telecommunications). Computations include full set of time and industry fixed effects: 5 industries (in all panels), 39 years (in panel A and B) and 21 years (in panel C). **Variables**: BTE and PO are indices ranging from 0 to 6; Share is %-variable and denotes labour share of value added.

As can be seen, standard errors differ slightly in table 9 compared to table 8. Only notable difference in standard errors come up in Panel A estimations 1 and 2, which are at lower level than in previous table columns 2 and 4. Moreover, other standard errors do not chance in scale of rounding by 3 digits. From this it can be concluded that autocorrelation do not skew the results that much even if some coefficients improve their statistical significance (PO in panel A, column 3; BTE in Panel B, column 3). Note that coefficient values stay exactly same, as it should be.

[12] In Stata, normal regressions can be extended to include fixed effects with syntax "i.variable". Same outcome (as in fixed effects panel regression) is approached here while fixing the year and panel variable in normal regression with Newey-West standard errors.

Another concern is that the model is somewhat static. Therefore, this thesis reports same computations as in table 8 with extension of policy variables with lag structure of 1, which can be found in appendix table A3 (table 14). The results are not very statistically significant and standard errors are huge compared to coefficients at least in country specific panels B and C. In this light, more dynamic model is not very efficient. One thing why the static model is seemingly better might be that market liberation in network industries is mainly implemented by the government. This allows agents to have information beforehand since governmental decisions are normally publicly available. Azmat et al. (2012) also argue that in this kind of situation agents have time to start preparing their response to the future with their information.

5.2 Instrumental variable approach

As Azmat et al. (2012) propose while studying same effects that one concern is possibility of omitted variables. This thesis concentrates solely on entry regulation as main policy variable and thus parsimonious models were chosen in that matter. Even if the possible omitted variables would bias coefficients, the reduced form models are seen more efficient. The second issue arises from the endogeneity. Even if Azmat et al. (2012) see that barriers to entry and private ownership are unlikely to have this issue, this thesis negates the issue with instrumental variable approach.

In matter of endogeneity, barriers to entry is instrumented with policy variables: 1) governing dummy, which indicated the prime minister party in left-centre-right axis; 2) sociopolitical variables from questionnaires and 3) private ownership (see more appendix A2).

Instruments in 1 and 2 are chosen according to Azmat et al. (2012), however they state that these instruments are not perfect since there might be some hidden factors in these policy variables, which can cause shift in labour share itself. Let it be noted that Azmat et al. (2012) use these instruments for public ownership. Nevertheless, both PO and BTE are strictly influenced by the political environment, these instruments can be used also for barriers to entry. Moreover, public ownership can be considered as indirect instrument for entry regulation at some extent. For this reason, it is used as instrument for barriers to entry. Motivation for this decision is explained at chapter 4.3. Table 10 and 11 illustrate RE and FE instrumental variable regression results. Baseline in these iv-regressions is that the first stage shows, which instruments are used to instrument barriers to entry. Example all five are included in column 1. F-test threshold in the first stage is chosen to be 10.00. Furthermore, every combination from instrument pool is reported and used in further models, which exceed this threshold in G2SLS (table 10).

TABLE 10 Econometric results of random effects instrumental variable regression (pooled over country and industry)

G2SLS random-effects IV regression Group variable: panelgroup Dependent variable: Share	**[1]**	**[2]**	**[3]**	**[4]**	**[5]**
Barriers to Entry	0.019	0.017***	0.017*	0.018***	0.020**
	(0.013)	(0.005)	(0.009)	(0.005)	(0.007)
Observations	134	281	202	281	202
First-stage G2SLS regression	**[1]**	**[2]**	**[3]**	**[4]**	**[5]**
"Competition is good" indicator	-5.932***				
	(1.277)				
Public Ownership	0.060	1.063***		1.108***	1.057***
	(0.091)	(0.073)		(0.066)	(0.085)
Government dummy (Centre party)	0.707**	-0.553**	-0.265		0.342
	(0.280)	(0.252)	(0.393)		(0.309)
Government dummy (Right party)	1.456***	0.257	0.888**		1.214***
	(0.352)	(0.243)	(0.436)		(0.403)
Self-positioning on political scale indicator	-0.853		8.055***		8.527***
	(1.545)		(1.653)		(1.443)
F-test	17.26	72.72	13.67	206.65	36.51

Notes: Tests use robust standard errors (reported in the parentheses). Moreover, significance levels are also included so that ***p < 0.01, **p < 0.05 and *p < 0.1. The sample is pooled across five industries (1. electricity and gas, 2. air transport, 3. rail and road transport, 4. post and 5. telecommunications).
Variables: "Competition is good" (=compeagr) and "self-positioning on political scale" (=selfpos) are indices ranging from 1 to 10. "Barriers to entry" (=bte1) and "public ownership" (=po1) are also indices but ranging from 0 to 6. Government dummies (=goverdummy_1, 2 and 3) represent the main political party in government. F-test threshold is set to 10.00 and this table includes all the combinations of these variables that exceed this limit in the first stage.

Table 10 provides results from random effect two-stage least squares computation. From first stage F-tests it can be seen that chosen instrument combos are valid for instrumenting the BTE statistically. However, this stage does not give any information about omitted factors, which was already concern in Azmat's et al. (2012) study. When all instruments are included (column 1) result appear to be statistically insignificant, although this might be due to that compeagr-variable restricts the range of observations drastically. Apart from that, results in other computations are more or less significant: the most significant results are obtained when public ownership is used as only instrument (column 2) or with government dummies (column 4). Main finding is that the results are consistent since the BTE coefficient values range between 0.017-0.020 regardless the used instruments. Results also indicate positive relationship between BTE and labour share in every column. It also comes out that coefficients are slightly higher in instrumental variable approach compared to normal RE model (0.016). In addition to statistical significance, results are also economically significant as one unit change in BTE index value predicts around 2 % change in labour share.

The different numbers of instrument observations make results slightly spurious. This conclusion comes from second stage computations where the most statistically significant results are witnessed only when maximum number of available observations are used (columns 2 and 4). Note that these computations also have largest F-test results in first stage regression. Due to WVS variable observation scarcity, it might be that "selfpos" or at least "compeagr" are not the best instruments for this thesis.

TABLE 11 Econometric results of fixed effects instrumental variable regression (pooled over country and industry)

Fixed-effects (within) IV regression Group variable: panelgroup Dependent variable: Share	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
Barriers to Entry	0.019	0.018***	0.017*	0.018***	0.020***
	(0.013)	(0.005)	(0.007)	(0.005)	(0.007)
Observations	134	281	202	281	202
First-stage G2SLS regression	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
"Competition is good" indicator	-6.456***				
	(1.479)				
Public Ownership	0.030	1.064***		1.109***	1.059***
	(0.141)	(0.265)		(0.250)	(0.254)
Government dummy (Centre party)	0.691	-0.555	-0.269		0.342
	(0.379)	(0.308)	(0.523)		(0.504)
Government dummy (Right party)	1.555***	0.264	0.893***		1.217***
	(0.339)	(0.281)	(0.436)		(0.272)
Self-positioning on political scale indicator	-0.813		8.032		8.527***
	(1.941)		(5.541)		(1.443)
F-test	4.95	55.02	8.39	19.74	24.53

Notes: Tests use robust standard errors (reported in the parentheses). Moreover, significance levels are also included so that ***p < 0.01, **p < 0.05 and *p < 0.1. The sample is pooled across five industries (1. electricity and gas, 2. air transport, 3. rail and road transport, 4. post and 5. telecommunications).
Variables: "Competition is good" (=compeagr) and "self-positioning on political scale" (=selfpos) are indices ranging from 1 to 10. "Barriers to entry" (=bte1) and "public ownership" (=po1) are also indices but ranging from 0 to 6. Government dummies (=goverdummy_1, 2 and 3) represent the main political party in government. F-test threshold is set to 10.00 and this table includes all the combinations of these variables that exceed this limit in the first stage.

Results in fixed-effect iv-regression differ considerably compared to normal fixed effects panel regression. Basic panel regression with fixed effects gave approximately coefficient value of 0.027 whereas iv-regressions provides information that effect is closer to 0.020. About the first stage F-tests, fixed effect iv-regression has much lower F-statistics. Nevertheless, the most significant result are found in those computations, which use maximum number of base variable observations available. Notable is that despite the difference in coefficients with normal

fixed effects regression, they turn out to be very similar with the normal and iv random effects regressions.

Both previous iv-models propose inspiring results. Advantage of the iv-models is that instrument usage eliminates the possible endogeneity of the BTE variable. However, downfall here is that without debatable public ownership variable, the instrumental variable approach would be very limited. Even if the usage of it is theoretically justified, concern here is that it might be multicollinear with barriers to entry variable, and that it turned out to explain labour share in normal random effect regressions. The possible multicollinearity is visible in the first stage regressions, where public ownership has coefficient values of nearly 1 in every regression that it is used.

As a side note, there can be seen interesting political observation between right and left parties in the first stage regression in both fixed and random effects iv-regressions. That is, right party dummy has positive coefficient in every column, where government dummies are used. Because it is compared to left party dummy, this means that when prime minister party comes from right in terms of political spectrum, barriers to entry are likely to be higher than in case of left party. This dummy is also highly significant almost in every column, thus the difference between these political extremes is statistically significant. This is rather odd while kept in mind that main results indicate positive relationship between barriers to entry and labour share: normally right wing tries to maximize profit share whereas left wing is enhancing labours share. One such reason for this might come from the idea that political implementation is related much to pressure of interest groups – lobbying. It is possible that these interest groups do not have idea how market regulations affect on share dynamics in long time range. Optionally, there might be some lag between implemented politics, which shed entry barriers and its effect on labour share[13]. Other possible explanation for this is that these political variables are only illustrating left-right axis of political spectrum and leave aside the liberalism-conservatism point of view.

In order to obtain IV-results that are more comparable, there should be exactly same number of observations in normal panel regressions. Now only columns 2 and 4 are straightforwardly comparable. In appendix A3 (Table 15) there is revision of random and fixed effect panel regressions with same observation count for the panel A table 8. There observation count is restricted with the instrument with least observations so that results are strictly comparable between normal FE/RE and iv-regressions. Once again results show that larger samples enable more significant results as it was the case in iv-regressions.

The previous instrumental variable models discussed are over-identified, which might slightly bias the results. Normally in 2SLS-models instrument count would be reduced to the point where number of instruments equals the number of endogenous variables. However, models in this thesis test only one endoge-

[13] Due to this, the real effect of fading entry barriers on labour share might be witnessed in the time when political power has shifted to party from the opposite wing. Although this was vaguely tested with a more dynamic model approach.

nous variable (BTE) so reducing instrument count to one would basically invalidate most of the results. Luckily, there is model available that negates identification issue without the need of instrument reduction – Instrumental variable GMM approach. While Hausman test proposed earlier the use of random effects regression for the data, the fixed effect method is also used in this thesis. One such reason for that choice is the fact that random effects are not available to use in 2-step GMM-estimation. The next table introduces results of this method with some additional statistics.

TABLE 12 2-Step GMM fixed effect estimation

2-Step GMM estimation (Fixed effects estimation) **Estimates efficient for homoskedasticity only** **Statistics consistent for homoskedasticity only**	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
Barriers to Entry	0.017**	0.018***	0.017***	0.018***	0.020***
	(0.007)	(0.002)	(0.004)	(0.005)	(0.003)
Observations	134	281	202	281	202
Hansen J statistic (overidentification test of all instruments)	13.580***	5.551*	2.305	Equation exactly identified	2.885
Chi-sq(4) P-val	0.009	0.062	0.316	-	0.410
Weak identification test (Cragg-Donald Wald F statistic)	17.282	70.106	12.913	-	34.511
Stock-Yogo weak ID test critical values, [Maximal IV relative bias]	18.37 [5%]	13.91 [5%]	13.91 [5%]	-	16.85 [5 %]
Endogeneity test of endogenous regressors	0.571	0.887	0.189	1.894	0.094
Chi-sq(1) P-val	0.450	0.346	0.664	0.169	0.760
Regressors tested:	BTE	BTE	BTE	BTE	BTE

Notes: Tests use robust standard errors (reported in the parentheses). Moreover, significance levels are also included so that ***p < 0.01, **p < 0.05 and *p < 0.1. The sample is pooled across five industries (1. electricity and gas, 2. air transport, 3. rail and road transport, 4. post and 5. telecommunications). Null hypothesis in Hansen J statistic test is that J=0. The null hypothesis in Endogeneity test of endogenous regressors is that variable is exogenous. In Stock-Yogo weak identification test, critical values' relative bias toleration levels are reported in square brackets. Null hypothesis in Weak identification test is that the instruments are weak. Test use same variables as in other IV-regressions (see first stage variables in tables 9 and 10).

These additional measures include Hansen J statistics, Cragg-Donald Wald F statistics and endogeneity test of endogenous regressors. Hansen J statistic tests whether the overidentification restrictions are valid in current model. According to J statistics in table 12, instrumental variable pool in columns 3 and 5 fulfill these restrictions while in column 1 the null hypothesis of valid restrictions is rejected at 1 % and in column 2 at 10 % level. Second additional test - Cragg-Donald Wald F test – identifies if the instruments are weak. Critical val-

ues define the threshold value at 5 % relative bias toleration level, which F statistic should exceed in order to reject the null hypothesis of weak instruments[14]. According to J-statistics the null is rejected in columns 2 and 5 while in columns 1 and 3 the instruments are identified as weak (although null is also rejected in 1 and 3 at 10 % relative bias toleration level). In column 4 there is not critical value available, since the model should have at least two overidentifying restrictions, at least three instruments in case of one endogenous variable (Cameron & Trivedi, 2010). Endogeneity test, as the name implies, tests whether the variable of interest is endogenous. As null here is that variable is exogenous, the results imply exogeneity of barriers to entry variable in every column. Although this is the case the instrumental variable approach gives much more consistent results than normal RE/FE panel regressions. What comes for the actual barriers to entry coefficient statistics, they are almost identical compared to normal RE and FE instrumental variable estimations – the effect changes between 1,7 % to 2 % per BTE index point. Difference is that now coefficient in column one is statistically significant at 5 % level while in every other column significance is at 1 % level. In addition to that, standard errors are quite some smaller.

There is still one more concerns to be dealt with. Normally when working with panel data sets errors within industries or even within individual company's observations are assumed to be uncorrelated even if they might be correlated in time. Failure in controlling these within cluster correlations might end up leading the standard errors to be too small and therefore too narrow confidence intervals and low p-values (Cameron and Miller, 2015.) One such way to solve this is to cluster the standard errors but since there are too few clusters, boottest postestimation is used instead. This is conducted for the data set to handle beforementioned possible bias in table 13.

[14] Stock and Yogo critical values vary within the largest relative bias level as well as number of endogenous regressors and instruments (Cameron & Trivedi, 2010).

TABLE 13 Comparison of 2-step GMM estimation and boottest postestimation statistics

2-step GMM estimation (Fixed effects estimation) statistics	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
t	2.29	7.70	3.82	7.79	6.17
P>|t|	0.023	0.000	0.000	0.000	0.000
95 % conf. Interval	[0.002, 0.032]	[0.014, 0.023]	[0.008, 0.026]	[0.014, 0.023]	[0.013, 0.026]
Observations	134	281	202	281	202
Boottest postestimation statistics	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
t(x)	2.43 (123)	7.32(270)	3.79 (191)	7.79 (270)	6.29 (191)
P>|t|	0.015	0.000	0.001	0.000	0.000
95% confidence set for null hypothesis expression	[0.004, 0.036]	[0.013, 0.022]	[0.008, 0.026]	[0.014, 0.023]	[0.013, 0.027]

Notes: In boottest, data is clustered by industry and country so that there are 10 clusters altogether. Boottest type used is wild. Clustering is done by "bootcluster" command, which is one-way clustering of bootstrap errors by the intersection of industry and country.

Bootstrap methods are used widely in situations where there are example too few clusters, clusters are unbalanced or there are weak instruments (in case of iv-esstimation). In these situations, tests that rely on large-sample theory might give different kind of results, hence when the assumptions of asymptotic theory are not satisfied, bootstrap-based methods should be preferred because of their better finite-sample properties. (Roodman et al. 2019.) In table 13, all the five sets return similar 95 % confidence intervals compared to their original ones, which implies, according to Roodman et al. (2019), that performance of the original tests and intervals is quite possibly close enough their asymptotic behaviour. In other words, 2-step GMM iv regressions results are must likely robust enough even without clustering.

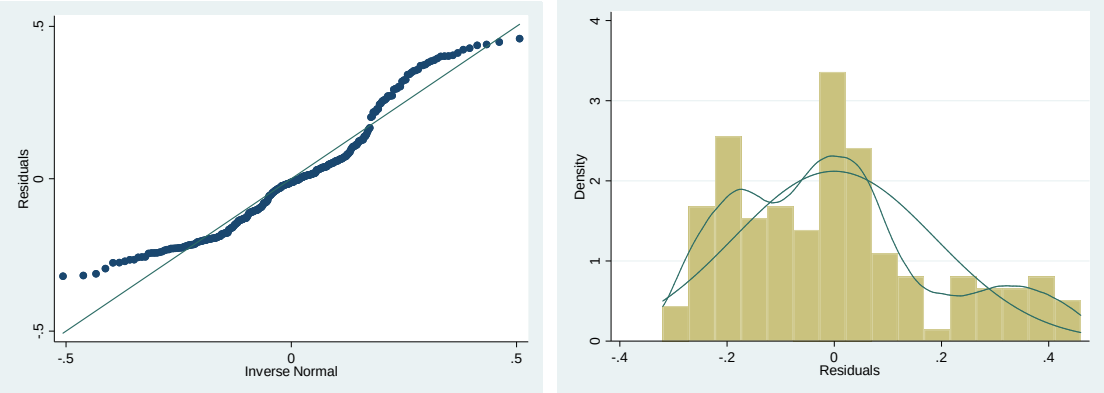
In this chapter, random effect and fixed effect instrumental variable methods were tested in various ways in order to mitigate endogeneity bias. The results are very similar to the normal RE and FE panel regressions, yet statistical significance level is better in iv methods. Moreover, results indicate that entry barriers have positive relationship with labour share; one point change in BTE index predicts around 1.7 percentage point change in labour share.

5.3 Robustness

This thesis has wide variety of statistical testing; hence models' robustness has to be taken also account. Figure(s) 9 shows distribution of residuals from normal panel regression. In actual vs. predicted residual figure, it can be seen that tales of the residual plot are little bit upward biased, hence the plot as a whole is looking acceptable. Same observation is seen in histogram, in which residual values

centre around left tale. Nevertheless, even if residuals are not evenly distributed, they act quite well and further analysis is possible.

FIGURE 9 Residual plots



As for other robustness checks, this thesis includes also some additional testing of the possible bias causing factors. Autocorrelation of the variables – which was observed by the Wooldridge test - raised some concerns about the robustness of the results. This thesis uses Newey-West standard error technique to see how much the autocorrelation is biasing the results. Final verdict from usage of Newey-West standard errors is that: Although there exists some autocorrelation in the data, the results are not affected by a much from it. In case of political variables, the effect of change might not be seen straight away, thus lag structure was highlighted in the comparison between static and dynamic models. It turned out that static model without any lags was somewhat more precise.

The second part of statistical testing focuses on instrumental variable methods, which were conducted because of the data related concerns – endogeneity of barriers to entry. Although the instrument validity raised some concerns, the results of iv-regressions turned out to be quite useful. Whereas normal FE and RE panel regression results suggested considerable effect, the results through instrumental variable panel regressions were much more moderate. Identification issues were taken care of with using 2-step GMM instrumental variable method. Last robustness check was done with boottest postestimation, which clusters the standard errors.

Reliable and accurate results are corner stone of economic research in order them to be valid for helping in political decision making. Therefore, many robustness checks are performed in this thesis. These inspections implicate that results are quite robust as they are, even though there are some inconveniences at some extent. However, if the models are to be changed, they would most probably lose some efficiency i.e. due to variable scarcity, lack of proper instruments or too few observations.

6 CONCLUSION

Functional income share dynamics have been trendy research topic since the phenomenon of decreasing labour share was discovered. Moreover, many factors are considered to have impact on labour share such as globalization, decoupling effect, technological progress, concentration, outsourcing and so on. This thesis is trying to answer the question whether there exists any kind of connection between labour share of income and market entry barriers in Finnish and Swedish network industries. Topic is rather newly discovered since the effect of entry barriers is hard to isolate from other effects. Nevertheless, this thesis focuses on network industries because they cannot be traded, and thus controlling the effect of globalization.

The topic is very important in political point of view: If decreasing labour share has not been properly researched, the political decisions could damage the economy. Therefore, it is vital to know what is driving the shift in factor shares. As Ellis and Smith (2010) state that if increase in profit share is due to widening margins, it could stimulate investment or set inflationary pressure. Vice versa inflationary pressure should be accurately analysed also if labour share is rising (Ellis & Smith, 2010). The significance of proper information is crucial or else the wrong political implications might indeed cause economic disruption.

Importance of the labour share studies comes also up in the challenge to change the paradigm in public opinion to more positive regarding labour share dynamics. That is because, decreasing labour share is considered widely in public as losses of the employees. Yet, if the mechanism behind that is growing productivity, it is beneficial for everyone since the wage level is eventually to be set at its right level relative to productivity. Although let it be noted that it is important to observe the fundamental mechanism of the productivity growth since not all growth is worker based.

The results in this thesis shed light to connection between labour share and barriers to entry in Finland and Sweden. It turns out that level of entry barriers is positively connected with the labour share, so that if level of barriers decreases, labour share tends to decrease. These results are statistically as well as economically significant. Moreover, results suggest that one-point change in BTE index indicates 2 %-point change in labour share. The magnitude is notable while considering the fact, that labour share has decreased around 4 percentage point in Sweden and Finland over the period of 1975-2016. Although, it is possible that this effect might smoothen in time via decoupling effect. Findings are in line with Autor et al. (2017a) who conclude that even if the deregulation increases labour share at firm-level, the aggregate industry labour share falls because market concentration deepens towards more productive firms. Although the results are harmonious with Autor et al. (2017a), contradictory studies can be found. To wit, earlier literature suggests that the effect between labour share and entry barriers could be other way around. In that matter, Azmat et. (2012) find that as entry barriers fall, labour share tends to increase because profit margins are decreasing.

Also, Blanchard and Giavazzi (2003) argue that when increased competition dampens profit margins, wages tend to decrease. However, real wages increase because consumers get relatively more from decreased product prices than they lose wage, thus labour share increases (Blanchard & Giavazzi, 2003).

What comes for policy implications, from these results it is hard to give specific guideline. In order to do so, the link between barriers to entry and labour share should be more specified, for which this thesis does not take stance. After all, this thesis studies mainly aggregate industry level labour share and the question whether the falling barriers to entry affect through market concentration, fading profit margins, productivity enhancing policies of the biggest companies or through incumbents'/entrants' productivity level, should be tested more profoundly. However, the thesis argues that entry barriers are positively linked to labour share, which reflects policy implementation that competition enhancing policies (in terms of decreasing entry barriers) dampens share going to workers due the leap in productivity.

This study gives motivation for further analysis within the topic of regulation policies and labour share. Since the very fundamental mechanism of the connection between labour share and entry regulation remains unanswered, it would be fascinating to discover more in that matter. The research could also be extended to include larger set of industries with more precise control of globalization.

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APPENDIX

A1 - Böckerman and Maliranta (2012) labour share decomposition:

The following derivation is based solely on Böckerman and Maliranta (2012). Labour share is denoted in plant i in period t as $f_{it} = w_{it}/v_{it}$ so that w_{it} is aggregate wage in the plant and v_{it} is value added. The decomposition uses notation from period t-1 to period t and captures the effect of labour share changes in mi cro dynamic changes. Plants are categorized as C (continuing plants), E (Entering plants and D (Disappearing plants).

The aggregate labour share change is denoted by within effect and the micro-structural change (STR_t^F):

$$\frac{F_t - F_{t-1}}{\bar{F}} = \sum_{i \in C} \bar{s_i} \frac{f_{it} - f_{i,t-1}}{\bar{f_i}} + STR_t^F \tag{A1}$$

where $F_t = \sum_i w_{it} / \sum_i v_{it}$ is the aggregate labour share in period t; $\bar{F} = 0{,}5(F_{t-1} + F_t)$ is the average labour share (t-1 and t); $\bar{f_i} = 0{,}5(f_{i,t-1} + f_{it})$ is the average labour share of firm i in periods t-1 and t and $s_{it} = v_{it} / \sum_{j \in C} v_{jt}$ the weigh share of aggregate value added among continuing firms. It is also that:

$$\frac{F_t - F_{t-1}}{\bar{F}} \cong log \frac{F_t}{F_{t-1}} \; ; \; \frac{f_{it} - f_{i,t-1}}{\bar{f_i}} \cong log \frac{f_{it}}{f_{i,t-1}} \tag{A2}$$

Structural component comprises four different sub-components:

$$STR_t^F = S_t^E \frac{(F_t^E - F_t^C)}{\bar{F}} - S_{t-1}^D \frac{(F_{t-1}^D - F_{t-1}^C)}{\bar{F}} + \sum_{i \in C} \frac{\bar{f_i}}{\bar{F}} (s_{it} - s_{i,t-1}) + \sum_{i \in C} \bar{s_i} \frac{f_{it} - f_{i,t-1}}{\bar{f_i}} \left(\frac{\bar{f_i} - \bar{F}}{\bar{F}} \right) \tag{A3}$$

where FX denotes aggregate labour share and SX is the value added share so that X∈{E,C,D} whereas $\bar{s_i}$ is the average of st-1 and st. Here the subcomponents – entry, exit, between and cross-component - act very much similarly than in productivity decompositions. The first component here denotes entry and it captures the effect of new firms entering the market. Its sign is positive when entrants have labour share more than average labour share in market at time t-1 and negative when the share of entrants are below average level. Similarly, the sign of the second component – exit – depends on the labour share of the disappearing plants so that higher than average labour share has negative impact on

the industry's labour share and vice versa. The third component, between component, measures the labour share movements caused by value added share changes. This phenomenon is called reallocation of resources. This component is negative when market shares move towards firms with low labour share and positive when firms with high labour share increase their market shares, respectively. The fourth component is called the cross-component.

Equation A4 can be derived from equations A1 and A3 so that it gives relationship of industry productivity and wage growth at the aggregate level:

$$\frac{F_t - F_{t-1}}{\bar{F}} \approx \frac{W_t - W_{t-1}}{\bar{W}} - \frac{P_t - P_{t-1}}{\bar{P}} \Leftrightarrow \sum_{i \in C} \bar{s}_i \frac{f_{it} - f_{i,t-1}}{\bar{f}_i} + STR_t^F \approx \sum_{i \in C} \bar{s}_i^* \frac{w_{it} - w_{i,t-1}}{\bar{w}_i} + STR_t^W - \sum_{i \in C} \bar{s}_i^* \frac{p_{it} - p_{i,t-1}}{\bar{p}_i} - STR_t^P \quad \text{(A4)}$$

where $\bar{s}_i^* = 0{,}5(l_{i,t-1}/\sum_{j \in C} l_{i,t-1} + l_{it}/\sum_{j \in C} l_{jt})$ is labour input, l_i is labour share, f_i is wages, w_i is social security payments per labour input and p_i is value added per labour input in plant i. W follows from the sum of f_i and w_i and is denoted as aggregate wages and P is aggregate value added per labour input. STR^X terms are once again structural components when X∈(W,P).

The representation of A4 can be applied to firm level:

$$\frac{f_{it} - f_{i,t-1}}{\bar{f}_i} \approx \frac{w_{it} - w_{i,t-1}}{\bar{w}_i} - \frac{p_{it} - p_{i,t-1}}{\bar{p}_i} \quad \text{(A5)}$$

and it follows that

$$\sum_{i \in C} \bar{s}_i \frac{f_{it} - f_{i,t-1}}{\bar{f}_i} \approx \sum_{i \in C} \bar{s}_i^* \frac{w_{it} - w_{i,t-1}}{\bar{w}_i} - \sum_{i \in C} \bar{s}_i^* \frac{p_{it} - p_{i,t-1}}{\bar{p}_i} \quad \text{(A6)}$$

inserting A6 into A4 from which equation 20 follows:

$$STR_t^F \approx STR_t^W - STR_t^P \quad \text{(A7)}$$

(Böckerman & Maliranta, 2012.)

A2 – Data:

Variable	Source (exact references in reference section)
Labour share of income decomposed into between, within, entry and exit components 1990-2014 (nonlog %-change)	Prof. Mika Maliranta (Finnish Competition and Consumer Authority, JSBE)
Barriers to entry per industry 1975-2013 (index variable)	OECD regulatory database, STAN
Labour share of income per industry 1975-2013 (% of the functional income distribution)	OECD STAN database for Industrial Analysis
Public ownership per industry 1975-2013 (index variable)	OECD regulatory database
Self-positioning in political scale index	World Value Survey longidutinal database (WVS)
Pro-competitiveness index	World Value Survey longidutinal database (WVS)
Government political scale (biggest party in government)	World bank database

Industry and Regulation Data: STAN OECD Database

This appendix concludes data sources from which data was drawn. Main dataset used is originally compiled by Nicoletti et al. (2000) and later expanded by Koske et al. (2015). The expanded dataset can be found in OECD regulatory database and it includes country-wide regulation indicators which are reported annually between 1975-2013 for 35 countries. These indicators are found for seven network industries (electicity, gas, telecom, post, rail, airlines and road) which are combined for five different indicators in this thesis. The main focus in this thesis concentrates on barriers to entry (BTE) and public ownership (PO). BTE and PO are represented as values ranging between 0-6 so that the higher the value higher the market restriction. Precise method, how the indices have been calculated, can be found from Nicoletti et al. (2000).

Other variables used in this thesis are segmented according the STAN ISIC Rev. 4 listing (see table 3). Hence, therefore regulatory indices must be combined into same level of industry classification. In this matter, electricity and gas indices are combined into upper segment index (Electricity, gas, steam and air conditioning) by weighting index values with average sectoral turnover between 2008-2017. "Manufacture of gas; distribution of gaseous fuels through mains" (D352) sector in Finland and Sweden are relatively small while "electric power generation, transmission and distribution" (D351) accounts almost all the sectoral turn-

over. “Steam and air conditioning supply” (D353) subsector in D35 is not included in index, because there exists no regulation data for it. Although this might skew the true index for D35, it is not a major issue since air conditioning accounts only about 10 % in Finland’s and 17 % in Sweden’s D35 sectoral turnover. Data for turnover weights is available at Eurostat annual detailed enterprise statistics for industry (NACE Rev. 2, B-E).

Same issue arises in case of the regulation indices in “land transport and transport via pipelines” (D49) sector. Here, the index is again calculated from two different subindices (road freight and rail transport). There were no available sectoral turnovers for D491, D492 and D494 in Eurostat database, hence OECD database for freight and passenger transport is used to calculate weighted index. The data for this database comes from ITF Transport Statistics: Goods transport/Passenger transport, which reports kilometre statistics of subsectors D491 and D494. Overall railroad usage is comprised of rail freight (tonne-kilometres) and passenger transport (passenger-kilometres). This is summed up with road freight tonne-kilometres. Subsectoral kilometre volumes are used as weights for every year between 1975-2013. There are no regulation data in OECD concerning subsectors D493 (Other passenger land transport) and D495 (transportation via pipelines), thus these are not included in the index.

Dependent variable “sectoral labour share” is calculated for each country by using OECD STAN database for industrial analysis. Share’s value (labour costs/ value added) is determined by the aggregate variables - sectoral compensation of employee and sectoral value added. In this matter, Finland’s data is more comprehensive as starting from year 1975 while Sweden only has proper data from 1993 onwards. Data used is measured in current prices and presented in national currency. Let it be noted that different currency is not an issue, since the share itself is %-variable. Here compensation of employees includes not only wage but also supplements to social security, private pensions, health insurance and life insurance. Although, this gives more accurate indicator for labour’s benefits compared to capital owners, one issue arises: That is, in years 1975-1981 postal sector reportedly has “labour share” over 100 %. Reason for this can vary from low profit making to high wages (+ other social benefits) relative to productivity. However, labour share should theoretically range between 0 to 100 %. Thus, these years are treated as outliers in Finnish postal sector (D53FIN). For Finland, labour share can be calculated annually for years 1975-2013 excluding postal sector (1982-2013). Swedish data is a bit scarcer in OECD database and is observed from 1993 to 2013 for every sector except D53SWE, which has data only from 2005-2013.

Database of Political Institutions: World Bank Database

As for instrumental variable approach, two more databases are used. World Bank’s Database of Political Institutions (DPI) database 2017 provides data about political environment in form of 97 variables for 181 countries between 1975-2017 (see more from data appendix Cruz et al. 2017). Major party in governmental composition is used as instrumental variable to provide some insight

about political legislation values. DPI database reports the largest party in government, which is converted into three categories: 1) left if party represent mostly socialist values, 2) centre for parties that define themselves as such or can be best fitted into this category and 3) right for parties that are conservative. In Finland observed parties in these years are SSDP (left), Suomen Keskusta (centre) and Kansallinen Kokoomus (Right). For Sweden, parties in this matter are Sveriges socialdemokratiska arbetarparti (left), Centerpartiet (centre), Liberalerna[15] (centre) and Moderata samlingspariet (right). This information is composed into dummy-variables.

Socio-political Attitudes: World Value Survey

World Value Survey is a global institute, which conducts surveys about social and political values throughout the world. Data includes variables from almost 100 countries with nationally representative sample sizes of the public. Therefore, data can be generalized to represent average public opinions. There are hundreds of variables but the ones used in this thesis are: (1) "Competition good or harmful" which ranges from 1 to 10 with value 1 being "competition is good" and 10 "competition is harmful"; (2) "Self-positioning in political scale" where 1 represents complete left values and 10 complete right values. These variables are chosen because these questionnaires mirror individuals' values in terms of political spectrum. While self-positioning is quite clear indicator, competition variable represents the idea that higher the value the more likely people are voting person who restricts or reduces competition.

WVS surveys use sample sizes of at least 1000 in each country and there have been six waves of data gatherings 1981-1984, 1990-1994, 1995-1998, 1999-2004, 2005-2009 and 2010-2014. To make sure data is nationally representative, given weights (found in dataset) are applied to Finnish and Swedish data. Furthermore, average indices are calculated so that data is interpolated linearly over the missing years since each questionnaire wave gives only observations for the starting year. For Finland, self-positioning index has data between 1981 and 2005, while competition index is available only from 1981 to 2004. For Sweden, starting years are the same but the data is available up to year 2010. Competition value index is slightly scarcer since it contains only years 1994-2005 for Finland and 1994-2010 for Sweden.

Decomposed Labour Share Data: Prof. Mika Maliranta

Prof. Mika Maliranta generously provides in depth data for labour share in Finland and Sweden. This data contains aggregate labour share changes and micro-structural mechanics in mentioned industrial sectors. Moreover, share changes are reported in form of labour productivity and employment wages. Aggregate change in these two categories are divided further into entry, exit, within

[15] Liberalerna was known as Folkpartiet liberalerna in 1990-2015 and as Folkpartiet before that.

and between effects. Additionally, effect of self-employed is included for Finnish industries. Changes are reported in non-logarithmic scale. (Unpublished and updated tables from the study by Kauhanen and Maliranta, 2014)

A3 – Tables and figures:

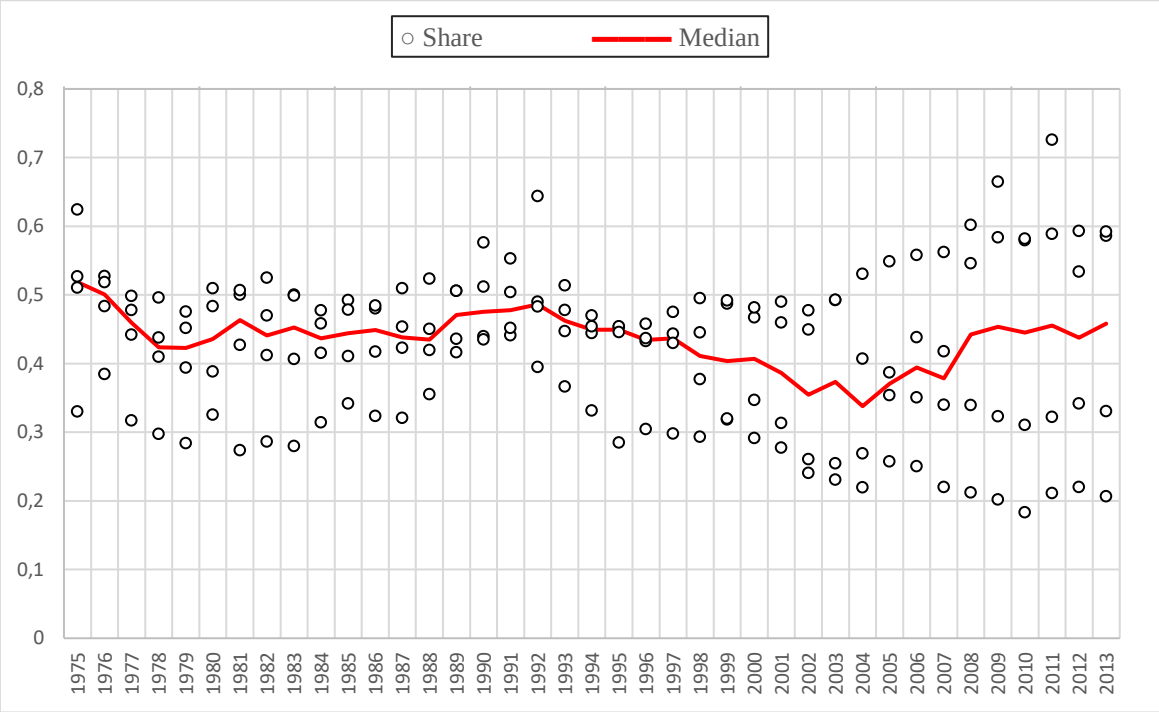

FIGURE 10 Change in the labour share in the network industries in Finland, 1975-2013. Data: OECD STAN database for structural analysis. Postal sector (D53) is excluded.

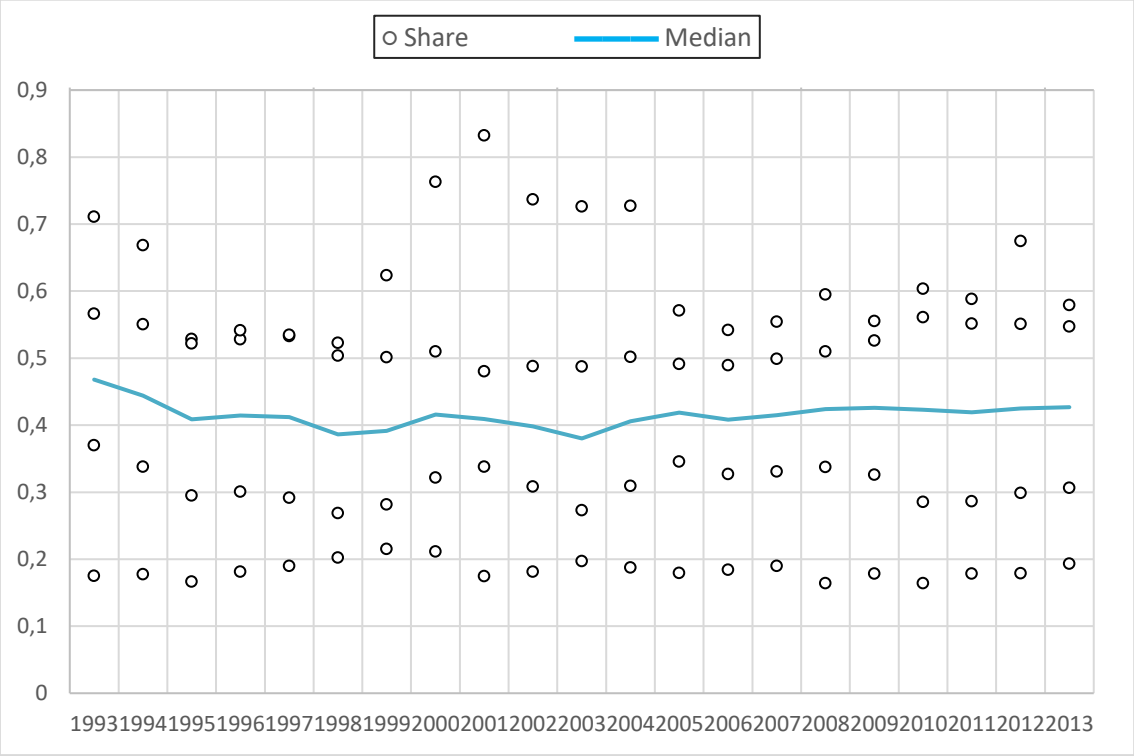

FIGURE 11 Change in the labour share in the network industries in Sweden, 1993-2013. Data: OECD STAN database for structural analysis.

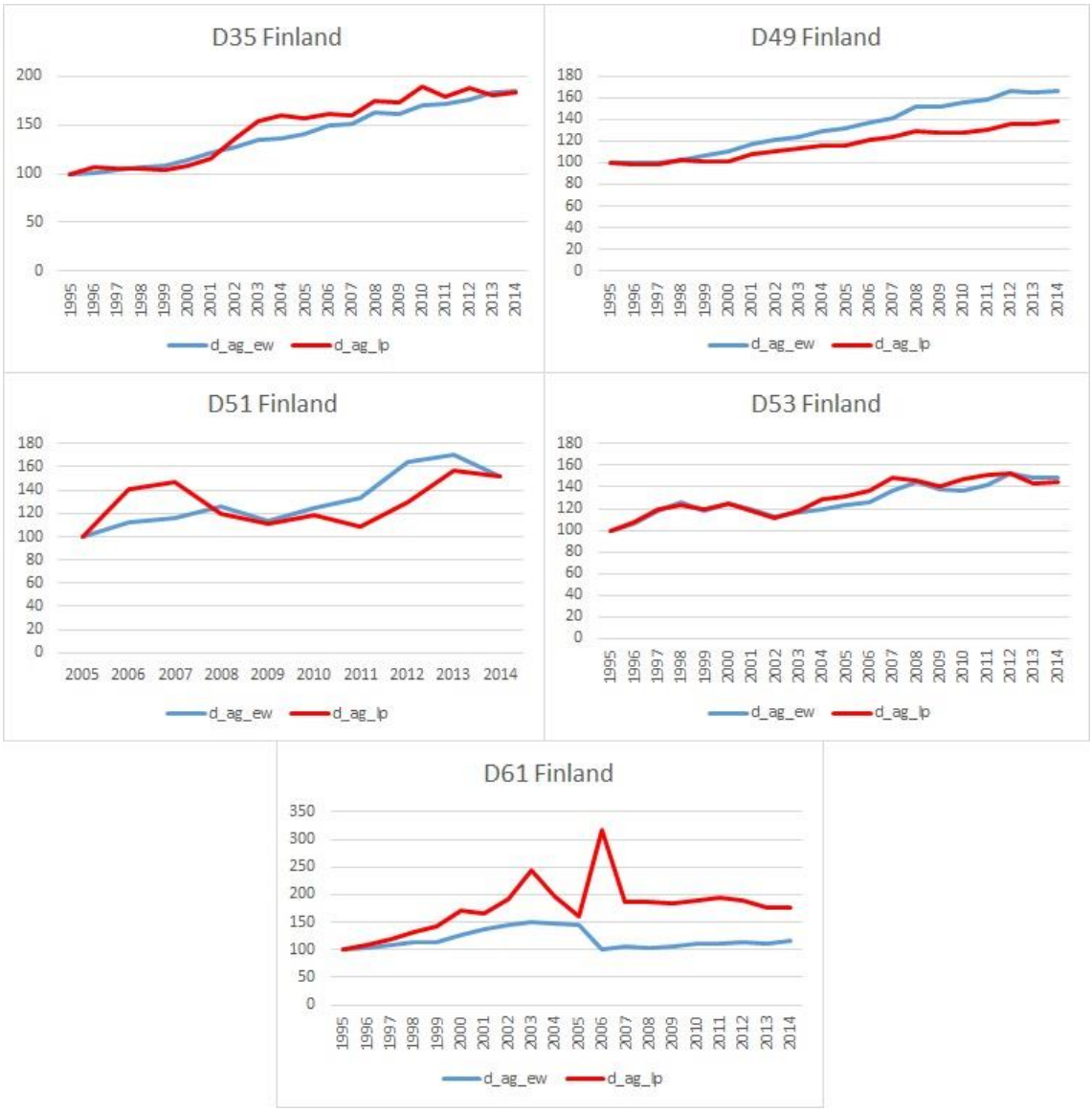

FIGURE 12 Cumulative[16] change in aggregate employment wages and labour productivity in Finland network industries (1996-2014), 1995=100

[16] The cumulative effect can be calculated with the index $IND_t = IND_{t-1} * (1 + 0.5 * at) * (1 - 0.5 * at)^{-1}$, in which at is annual growth rate in year t and IND is the value of cumulative growth in given year (Böckerman & Maliranta, 2007).

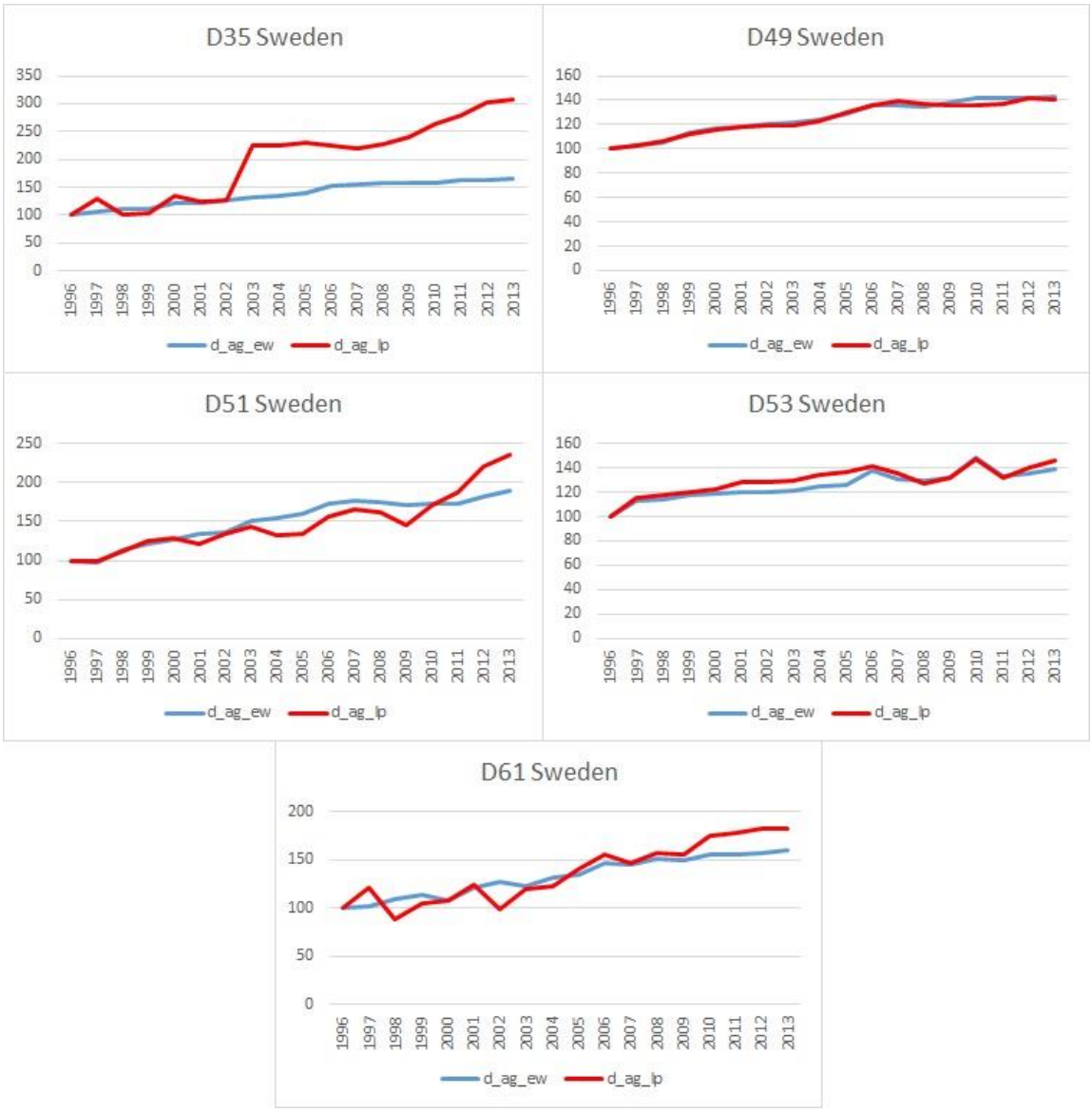

FIGURE 13 Cumulative change in aggregate employment wages and labour productivity in Finland network industries (1997-2013), 1996=100

TABLE 14 Econometric results of fixed and random effect regressions extended with lagged variables (pooling over network industries)

Panel A: Share (labour share of value added), pooled over country	**[1]**	**[2]**	**[3]**	**[4]**	**[5]**	**[6]**
Barriers to entry (BTE)	0.012***	0.015*			0.011**	0.011
	(0.004)	(0.007)			(0.005)	(0.006)
T-1 Barriers to entry (BTE)	0.003	0.014			0.002	0.013
	(0.007)	(0.008)			(0.08)	(0.008)
Public ownership (PO)			0.033	0.021	0.013	0.018
			(0.044)	(0.035)	(0.045)	(0.037)
T-1 Public ownership (PO)			-0.014	-0.002	-0.010	-0.007
			(0.044)	(0.035)	(0.043)	(0.036)
Fixed effects (45)	No	Yes	No	Yes	No	Yes
Observations	277	277	277	277	277	277
Panel B: Finland's Share (labour share of value added)	**[1]**	**[2]**	**[3]**	**[4]**	**[5]**	**[6]**
Barriers to entry (BTE)	0.007	0.019			-0.014	0.015
	(0.005)	(0.010)			(0.019)	(0.010)
T-1 Barriers to entry (BTE)	0.009	0.016			0.001	0.015
	(0.009)	(0.011)			(0.200)	(0.012)
Public ownership (PO)			0.087*	0.049	0.200***	0.039
			(0.046)	(0.038)	(0.077)	(0.043)
T-1 Public ownership (PO)			-0.065	-0.024	-0.163*	-0.031
			(0.052)	(0.040)	(0.087)	(0.043)
Fixed effects (44)	No	Yes	No	Yes	No	Yes
Observations	184	184	184	184	184	184
Panel C: Sweden's Share (labour share of value added)	**[1]**	**[2]**	**[3]**	**[4]**	**[5]**	**[6]**
Barriers to entry (BTE)	0.013	-0.010**			0.067***	-0.011*
	(0.015)	(0.003)			(0.014)	(0.004)
T-1 Barriers to entry (BTE)	-0.008	0.006			-0.016	0.005
	(0.009)	(0.007)			(0.021)	(0.009)
Public ownership (PO)			-0.038	-0.029	-0.096	-0.031
			(0.054)	(0.047)	(0.065)	(0.047)
T-1 Public ownership (PO)			0.039	0.030	0.032	0.031
			(0.052)	(0.047)	(0.044)	(0.047)
Fixed effects (26)	No	Yes	No	Yes	No	Yes
Observations	93	93	93	93	93	93

Notes: Tests use robust standard errors, which are reported in the parentheses. Moreover, significance levels are also included so that ***p < 0.01, **p < 0.05 and *p < 0.1. The sample is pooled across five industries (1. electricity and gas, 2. air transport, 3. rail and road transport, 4. post and 5. telecommunications). Computations include full set of time and industry fixed effects: 5 industries (in all panels), 39 years (in panel A and B) and 21 years (in panel C). **Variables**: BTE and PO are indices ranging from 0 to 6; Share is %-variable and denotes labour share of value added.

TABLE 15 Results from random and fixed effect regressions that are comparable to IV-estimations

Panel A: Share (labour share of value added), pooled over country	**[1]**	**[2]**	**[3]**	**[4]**	**[5]**	**[6]**
Observation	134	134	202	202	281	281
Barriers to entry (BTE)	0.013*	0.010	0.019***	0.018*	0.016***	0.027***
	(0.008)	(0.010)	(0.005)	(0.009)	(0.004)	(0.007)
Observations restricted with variable	Compeagr	Compeagr	Selfpos	Selfpos	-	-
Estimation procedure	RE	FE	RE	FE	RE	FE

Notes: Tests use robust standard errors (reported in the parentheses). Moreover, significance levels are also included so that ***p < 0.01, **p < 0.05 and *p < 0.1. The sample is pooled across five industries (1. electricity and gas, 2. air transport, 3. rail and road transport, 4. post and 5. telecommunications). Variables: "Competition is good" (=compeagr) and "self-positioning on political scale" (=selfpos) are indices ranging from 1 to 10. "Barriers to entry" (=bte1) and "public ownership" (=po1) are also indices but ranging from 0 to 6. Government dummies (=goverdummy_1, 2 and 3) represent the main political party in government.