LUND UNIVERSITY
School of Economics and Management

Master programme in Economic Growth, Innovation and Spatial Dynamics

The Development of Labour's Share in the Swedish Transport and Communication Sector 1920-2000

Julia Ekberg
gpo10jek@student.lu.se

Abstract: Most OECD-countries, including Sweden, have during the last decades experienced a declining trend in the labour's share – the ratio of incomes from employment in relation to the economy's total income (GDP). This thesis analyses the declining labour's share of the Swedish transport and communication sector 1920-2000. The transport and communication sector has gone through changes of importance to the total economy due to the introduction of railways, automobiles and telecommunications. The sector has also transformed from being a sector of large public-control into becoming a more competitive and liberalized market. The causal effect of openness of trade, competition, GDP growth and inflation to labour's share is analysed through regressions of OLS and maximum likelihood. The result indicates that GDP growth and inflation have a negative impact on labour's share, while no econometric relation can be stated between openness of trade, competitiveness and the declining labour's share.

Key words: Factor shares, labour's share, transport and communication sector, Sweden, time series analysis

Acknowledgements

With a completed thesis in my hands I feel the need of thanking the people who have helped me along the way and made this possible. First, I would like to thank my supervisor Tobias Karlsson for all the valuable comments and advises and for supporting me throughout the thesis. I would like to thank Erik Bengtsson at Gothenburg University for the interest in my subject.
I would also like to thank my friends and family for the support and positive comments and encouragement along the way. A special thanks to Melina Athanasiadi, Lillit Ottosson and David Gustavsson for their valuable comments and their interest in my research.

Finally, I would like to thank Anton for believing in me and supporting me throughout my emotional ups and downs.

Julia Ekberg
Lund University
May 2014

List of abbreviations

ADF   Augmented Dickey-Fuller

GDP   Gross domestic product

ICT   Information and communication technologies

IMF   International Monetary Foundation

OECD   Organisation for economic cooperation and development

OLS   Ordinary least squares

TFP   Total factor productivity

VAR   Vector auto regressive

VEC   Vector error correction

Table of content

List of figures

List of tables

1   Introduction

Why should we be interested in how the national income is distributed between capital and labour in terms of profits, wages and rents? This is a question with many answers. The distribution of national income between capital and labour can be considered measurements of economic inequality. The factor shares may help understand inequality in terms of the individual distribution of income (Atkinson, 2009). The classical distribution of factor shares is between capital and labour. The labour's share in aggregate economies is measured as the ratio of incomes from employment in relation to the economy's total income (GDP). If the average labour productivity rises slower than the real wages the labour's share will increase. A faster growth in the labour productivity compared to real wages will generate a decline in the labour's share. Most European economies, including Sweden, have since mid-1980s experienced a declining trend in the labour's share. The redistribution from labour to capital does have an effect on the rising income inequality, concluding that a higher labour's share is associated with a lower Gini-coefficient of income inequality (Glyn, 2009:102-103). Thomas Piketty is a researcher in the field of inequality and today one of the important names in the debate on inequality. In his book *'Capital in the Twenty-First Century'* Piketty argues that modern economic growth and knowledge diffusions have made it possible for us to avoid inequalities. Piketty claims that the structures of capital and inequality have not been modified as we though and the tendency of returns on capital to exceed the rate of economic growth is the main driver of inequality (Harvard University Press, 2014). The International Monetary Foundation (IMF) and the OECD have studied the recent declines in the labour's share, arguing that the declines can be seen as an effect of increasing globalization and its effect on workers (Glyn, 2009:102-103).

In the end of the twentieth century an intensified globalization appeared. The international trade expanded and economies developed. Transports and communications had an important role in the economic development and the shaping of societies (Krantz, 2000). The expansion of transports made distances smaller in order to generate larger markets which helped create the international trade. The development would have been impossible without the introduction of railways, shipping, telegraph, and later the telephone as well as the introduction of motor vehicles (Andersson-Skog, et al. 1998:xv). Today we are experiencing the phase of the Third Industrial Revolution – the ICT revolution – where new innovations and companies are created. Sweden is one of the largest countries in Europe seen to surface and many of the natural resources are spread across the country. The formation of Sweden as an industrialized country occurred together with improvements in infrastructure, transports and communications and falling relative costs. The introduction and increased usage of computer and the Internet have changed the efficiency and the cost of information flows, a process that is still going on (Andersson-Skog, et al. 1998:217-219). Today Sweden is an economy dependent on international trade and collaborations where the export is an important source of income (Krantz, 1987).

In the beginning of the twentieth century the Swedish transport and communication sector was a subdivision with focus on the domestic market. The last years has the sector been more affected by globalization and increased trade openness which have made the sector more exposed of international competition, both in terms of transports and communications. The sector has also transformed from being a sector with large state-ownership and state-regulation with low self-employment into becoming a liberalized market with more actors (Kaijser, 1998:230-238).

1.1   Aim, justification and research questions

Factor prices and the relation between wages and productivity are of importance in order to analyse the distribution between capital and labour (Feldstein, 2008). The subject need to be further investigated in order to get a better grasp and insight in how and why factor prices are changing, and why many industrialized countries, including Sweden, have experienced a fall in the labour's share. Markets have changed in relation to the growing importance of globalization and technological changes which have enabled into reach new markets and integrate with more actors besides the closest neighbours. It has also made the markets more exposed to competition where import, export and growth effect all markets in order to generate profits and rich labour markets. Different markets can be affected in different ways of globalization.

This thesis wishes to answer the question of how the labour's share in the Swedish transport and communication sector has developed and been affected by globalization changes. The transport and communication sector is of interest since it is a sector that has transformed from being a state-owned and controlled sector into becoming a liberalized and expansive market. The sector has also been more and more exposed to international competition when new companies, both domestic and foreign, enter the Swedish market. These changes make it interesting to investigate the development of the labour's share.

The aim of this thesis is to investigate the development of the labour's share in the Swedish transport and communication sector out of the impact of openness of trade, competition, GDP growth, inflation and welfare state generosity. Here, the analysis will only investigate one sector, in Sweden in contrast to previous research where mainly total economies have been studied. The analysis will also discuss the possible effect of openness of trade and increased competition which rarely have been analysed together. The stated research questions of the thesis are;
How did the labour's share in the Swedish transport and communication sector develop during the time period of 1920-2000? Can the labour's share in the Swedish transport and communication sector be explained by economic growth, openness of trade and competition?
Since Sweden's economy is dependent on international trade it is presumable that openness of trade and economic growth in terms of GDP growth will affect the development of the labour's share. The Swedish transport and communication sector's development from state-controlled to more liberalized in its structure, makes competition an interesting factor of impact. Inflation and welfare state generosity will be used as control variables.

The hypothesis is that openness of trade, increased competition, GDP growth and inflation will all effect the labour's share of the sector negatively, whilst, welfare state generosity is expected to have a positive impact on the labour's share.

1.2 Method

There are different ways to measure the labour's share but the most used measurement in the literature is the ratio of total labour compensation of workers to aggregate value added.

$$Labour's\ share = \ Total\ labour\ compensation/Aggregate\ value\ added \qquad (1.1)$$

The measurement can be reflected on as a broader definition of labour's share since it use total employee compensation in terms of wages, salaries and all social benefits for workers. A more narrowed definition could be applied were only wages are included in the measurement. Though, the main argument of using the broader definition is that all compensation to labour is of importance, and not only wages (Fichtenbaum, 2009).

Another important discussion regarding the measurement of labour's share is whether the labour compensation should be measured against gross or net value added. The difference between gross and net value added is that gross value added takes the depreciation into consideration, where depreciating is considered the usage and wear out of capital assets (Morel, 2005).

$$Gross\ value\ added = Net\ value\ added + Depreciation \qquad (1.2)$$

Main part of the literature favours the usage of gross value added in the measurement of labour's share. This analysis will thereof measure labour's share as the sum of labour compensation as share of gross value added, where labour compensation is wages, salaries and all social benefits.

$$Labour's\ share = \ The\ sum\ of\ total\ labour\ compensation/Gross\ value\ added \quad (1.3)$$

The analysis method and creation is in line with previous research, with the exception that it focuses on changes of labour's share in only one sector in a specific country compared to the more common way of creating panel data analysis. This analysis does also include new parameters to the analysis that have rarely been investigated together. The analysis does not request to generalize, but rather to investigate the changes of labour's share in the specific sector of transport and communications. The analysis involves a literature review and econometric time series analysis where one model is estimated by OLS, and a second estimated with maximum likelihood in order to control the robustness of the model. The analysis does also examine if the series are cointegrated, if they move together over time. Thus, the result indicates that the series are not cointegrated.

1.3 Delimitations

In order to conduct a well specified and clear analysis and due to limitations of time and resources the thesis needs delimitations. The analysis discusses the development and possible explanations of changes in the labour's share in the Swedish transport and communications sector during the time period of 1920-2000. The analysis holds labour's share in transport and communication sector in Sweden as the dependent variable throughout the analysis. The investigated time period cover the years of 1920-2000. The 1920s represent the introduction of automobile vehicles and the start of growing international trade after the World War I, why the year of 1920 becomes a natural starting point. The endpoint of year 2000 is due to the fact that there is no data available for later years, why the year of 2000 becomes an accepted endpoint.

The thesis will discuss unions and their impact, but union density or unions' bargaining power will not be included in the econometric analysis but discussed in the literature review. Increased unemployment may have a negative impact on labour's share. Though, the thesis will not include the variable of unemployment due to unreliable data. Previous researchers (Bengtsson, 2013a; Roine et al., 2008:2012) have discussed the impact of capital on labour's share. Though, the thesis will not discuss the impact of capital or the capital share, due to unreliable data of the sector's capital share. The competition and privatization of the market will be measured by the variable of self-employment. Thus, barriers to enter the market or dummies for public compared to private companies within the sector will not be included in the analysis due to time limitations. Since the analysis investigates the changes within the only sector of transport and communication in Sweden the thesis does not wish to make any generalization or comparison.

1.4 Outline of the thesis

The introductory chapter is followed by chapter two which includes a shorter presentation of the most relevant and influential research within the field. Chapter two does also include a disclosure of the development of the total Swedish labour's share in 1850-2000 and finishes with a discussion of the development and changes within the Swedish transport and communications sector. In chapter three is theoretical considerations and determinants of the labour's share discussed in order to understand the development of the sector and its declining labour's share. The data and variables used in the empirical analysis are discussed in chapter four. The chapter does also include a presentation of the descriptive statistics, motivations of why the variables are chosen, and possible measurement and data problems. Chapter five includes a discussion of the methodological framework of the thesis. The empirical results of the econometric time series analysis are presented in chapter six. The seventh chapter includes a discussion of the results in accordance to presented theory and previous research, and finally chapter eight concludes the thesis.

2   Previous Research and Background

Chapter two begins with a presentation of the most influential previous research within the field of labour's share. This section also includes a short overview of research combining factor shares and economic inequality in order to better understand the background of the subject. The latter part contains description of the historical background, where the first part is an overview of the development of Swedish labour's share, followed by a presentation of the development of the transport and communication sector. The chapter ends with an ocular inspection of the labour's share in the sector of interest.

2.1   Previous research

2.1.1   Economic inequality

The largest components of household incomes are wages, why growth of wages can be said to provide an important trend in the households' standard of living. Western and Healy (1998) analyse panel data covering OECD countries, where the results show that European real wages rose from the mid-1960s to the 1970s. However, most OECD countries experienced a negative wage growth in the 1980s and 1990s. The slow wage growth can be traced to impact of high inflation, unemployment and slow productivity growth, but also to the declining power of the labour movements (Western and Healy, 1998). The argument of wages as the only or main indicator to understand the inequality and distribution of factors has met critique. Labour's share and capital share as parts of the total national income distribution, can be argued to be used as measurements of inequality in the society. Whether this is a good measurement of inequality or not depends on the concentration and the ownership of capital in the country (Bengtsson, 2013a). Atkinson et al. (2011) investigate inequality in Europe out of top income shares. They argue that a large share of the developed countries experienced a decline in the top income shares in the first half of the twentieth century, mainly due to shocks to top capital shares (Atkinson et al. 2011). Roine and Waldenström have applied a resembling study in order to investigate Swedish inequality. They analyse the correlation between the capital share and top income percentiles of total incomes in Sweden 1903-2004, where their results shows a correlation between capital share and the top income percentile (Roine and Waldenström, 2008:2012).

2.1.2 Labour's share

The researchers Bentolila and Saint-Paul (2003) have in parity with Western and Healy studied the OECD countries using panel data, but instead of only focusing on wages, they focus their study on the evolution of labour's share. Their analysis show a relationship between labour's share, the capital-output ratio and the TFP, where the relationship is shifted by factors of the technological progress, the price of imported materials, changes in employment, and a labour conflict rate measured as the number of strikes and lockouts divided by employees. The results show that imported goods and negative changes in employment such as unemployment and strikes have a negative impact on labour's share making it decline (Bentolila and Saint-Paul, 2003). Fichtenbaum (2009) further investigates the effect of labour unions and their impact on labour's share. The model is tested using data covering the US manufacturing sector from 1949-2006 where the analytical model is based on imperfect competition. The econometric results, holding all other factors constant, show that stronger unions have a positive effect on the labour's share (Fichtenbaum, 2009). Imperfect competition and declining labour's shares is further investigated by Azmat et al. (2011) who investigate the cause of the decline of labour's share in OECD countries by exploiting a number of policy experiments in the network industries (i.e. roads, railways, telecommunications, postal services, gas, electricity and airlines). They present empirical evidence that privatization and market competition are important factors of the declining labour's share. They empirically test the variables of public ownership and barriers to enter the market out of the main argument that privately owned firms have a large profit interest while companies in public ownership do have higher preferences of increased employment. Market competition will lower the profit margins why increased market competition would decrease the labour's share (Azmat et al., 2011).

2.1.3 Swedish labour's share

Karl Jungenfelt was one of the first to analyse the development of the Swedish labour's share. Series of employment, wages and wage shares covering the period 1870-1950 are presented and analysed in relation to labour's share (Jungenfelt, 1966). Jungenfelt's presented statistics have been further investigated and expanded by researchers like Edvinsson and Schön. Edvinsson (2005) has expanded the data by Jungenfelt and investigates the Swedish factor shares in relation to macroeconomic variables such as growth, accumulation and crises, out of the perspective of national accounts. The Swedish functional income distribution and labour's share are analysed by Lennart Schön. The analysis indicates that Sweden and the Swedish labour's share have developed in cycles of 40 years, where each cycle consists of a transformation and a rationalization phase. When new inventions enter the market in the rationalization phase the market actors (companies) need to rationalize their production and the labour's share increases. Increases in the labour's share make it tougher for weakly profitable companies on the market (Schön, 2001:25-28). Decreases and pressed profits can be met politically by different reforms of labour market institutions, devaluations or different reforms to increase company profits. In a more competitive market companies with low or no profits are damaged or disappears when new inventions enter the market, leading to falling labour's share (Schön, 2001:498). Erik Bengtsson (2013) conducts an exploratory time series analysis of the Swedish manufacturing sector. The

study analysis the effects of GDP growth, inflation, and imports as share of GDP, unemployment, welfare effects and capital intensity in relation to the development of the labour's share. The main findings are that labour's share in the Swedish manufacturing sector does positively covary with generosity of the welfare state and negatively with imports as share of GDP (Bengtsson, 2013a).

2.1.4 Summary of previous research of relevance

Researchers (Bentolila et al., 2003; Atkinson, 2009; Fichtenbaum, 2009; Azmat, et al., 2011) have analysed the falling labour's share of OECD-economies by the usage of panel data. They all come to the conclusion that the labour's share has experienced a decline, but they differ in their way of explaining the decrease. Azmat et al. (2011) conclude that increased market competition generates a decline in the labour's share. Bengtsson (2013a,b), Roine and Waldenström (2008) and Schön (2001; 2004; 2008) have investigated the labour's share in the Swedish market. They all come to the insight that the labour's share have started with an increase in the early twentieth century, but experienced decrease in the late part of the twentieth century. Azmat et al. (2011) and Bengtsson (2013a) differ from other researchers in their analyses since they only investigate one sector. Bengtsson conclude that the Swedish labour's share in the sector of manufacturing have fallen due to increased globalization. Though, Bengtsson does not control for market privatization or increased market competition in terms of more actors entering the market. Most studies analyses the changes of total economies. In line with Azmat et al. (2011) the increased privatization and globalization need to be further investigated in order to fully understand the sudden decrease in labour's share. By combining the different studies of Azmat et al. and Bengtsson we can get a broader understanding of the development of the Swedish labour's share in terms of increasing markets.

2.2   Historical background

The historical background is important in order to understand why the labour's share have developed the way it has. The first part of this section contains a description of the total Swedish labour's share. The latter part describes the development of the transport and communication sector. This section ends with an ocular inspection of the labour's share of the transport and communication sector.

2.2.1 The movements of Swedish labour's share

The graph 2.1 plots the labour's share of the total Swedish economy. The series indicate that the labour's share has experienced changes and fluctuations discussed in the following section.

Figure 2.1
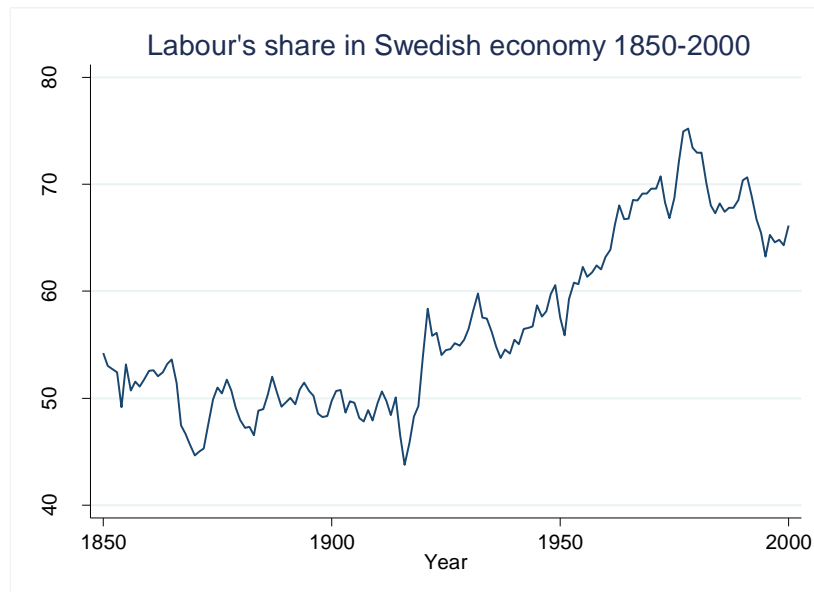
Note: Labour's share measured in percentage shares.
Source: Author's own compilation of data in Edvinsson (2005).

The Swedish labour's share 1850 – 1950

Sweden transformed from being an agrarian 'classic' economy into becoming an industrial economy in the period of 1850-1910. The 1870s was the decade of increased production of industrial goods and activities. The industrialization increased and the decades of 1910s and 1920s can be considered periods of trade patterns transformations. During the World War I increased the Swedish export which made Sweden less dependent financially of foreign capital and Sweden converted from being an importer dominated by foreign capital into becoming an exporter. The Swedish real wages were in the beginning of the century low compared to other European economies and the increase generated a more stable level of real wages in accordance to productivity (Edvinsson, 2010). In the 1910s the labour's share had a declining trend and in 1916 reached the Swedish labour's share its lowest value of the twentieth century. The declining trend of the labour's share experienced a turn-over in the end of the 1910s with the introduction of the universal suffrage and the establishment of labour movement as well as with the increased export during World War I (Bengtsson, 2013a). The larger structural break around the year of 1920 can also be a reaction to the reform in 1920 where the work hours were regulated (Lundh, 2002:159). In the period from 1930 up till 1970 the labour's share increased. In the years 1975-1977 the labour's share reached its highest level of the twentieth century (Edvinsson, 2010).

The Swedish labour's share after 1950

The Swedish labour's share can during the second half of the twentieth century be said to follow the shape of an inverted U. The labour's share increases during the period of 1950 to the end of the 1970s. After mid-1970s the growth in labour's share stagnate, before it turns and decreases from the 1980s up till mid-1990s (Bengtsson, 2013b).
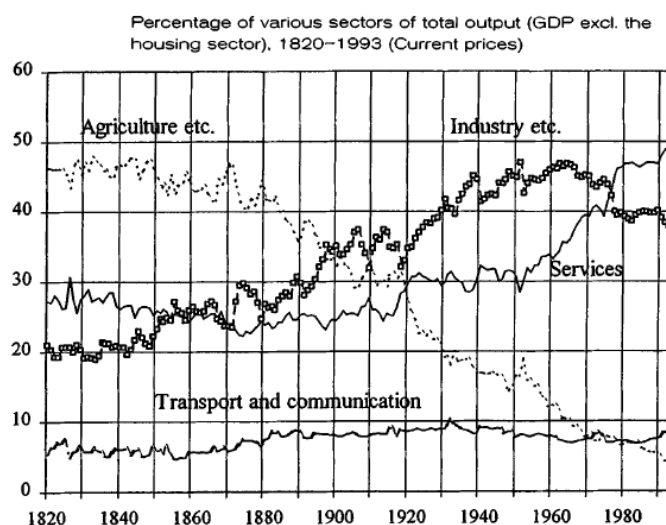
The development of the Swedish labour's share is in line with the later discussed 'power resource perspective' where welfare state and unions have an effect on the development of labour's share.[1] The Swedish Social Democratic Party (Socialdemokraterna) is in consistent power from 1932 up to 1976. In the 1982-election regains the Swedish Socialistic Democratic Party the power after a structural crisis in the Swedish economy. The structural crisis generated a slower economic growth and a decline in the Swedish export. The Social Democratic Party was therefore assertive that the profit shares of the Swedish firms had to increase in order for Sweden to maintain a competitive actor on the world market. The increase of firm profits had to be at the extent of the labour forces' wages. With lower wage shares would the efficiency and profits of the Swedish companies' increase, all in order to maintain the Swedish international strength (Bengtsson, 2013b). The Swedish Trade Union Confederation (LO) has since the 1950s had a significant part in the central wage bargaining. This has helped lowering the differences between workers in terms of wages and work conditions, and probably changed the functional income distribution in advantage of the workers (Bengtsson, 2013b: Pontusson et al, 2002). The member shares of unions who are part of the LO-federation have been decreasing since 1950. Though, it is important to illuminate that it is the share of union members that are members of a LO-connected union that have decreased. When observing the total number of members of all unions in Sweden the total union membership rate was the same in year 2010 as it was in 1970, namely 68%. Though, the decreasing concentration leads to a more heterogeneous view of interests, ideology and identification. In a broader sense this means that there is no longer 'one voice' speaking for all members. This make the unions more spread in their opinions and it makes it harder to generate a clear influence of the development of the society when all unions have their specific interests (Bengtsson, 2013b: Pontusson et al, 2002). Different branches experienced different productivity growth which made it hard to negotiate wages for all branches and sectors at ones. The decentralizations in the Swedish economy during the 1980s changed the wage structure, but were also intended to restore the Swedish competitiveness in an international perspective (Bengtsson, 2013b). Since 1983 Sweden has a non-centralized wage bargaining system, which today partly consists of a coordinated bargaining system. The negotiation does not specify any specific rate of increase in wages, or any guaranteed increases to all members, why the wage structure often is kept the same (Granquist and Regnér, 2008).

2.2.2 The transport and communication sector in Sweden

The transport and communication sector does not, per definition, include all transport and communication services produced in the society. In accordance to the conventional definition includes the sector all commercial transports and communication services. Services provided by privately owned and privately used automobiles, or trucks owned and used by firms for their own transportation are not included in the definition, and are included as part of the production process within the specific firm (Krantz, 2000).

---

[1] The power resource approach will be explained in section 3.2.

Figure 2.2

Percentage of various sectors of total output (GDP excl. the housing sector), 1820–1993 (Current prices)

Source: Krantz, 2000.

The graph 2.2 is gathered from Krantz (2000) and presents the percentage share of GDP of various sectors in Sweden 1820-1993. The years between 1850 and 1970 show great changes of the sectors contribution, with a decline of the agricultural sector while the industry increases. The share of the transport and communication sector is rather constant over time with figures around 5-8%. Thus, the transport and communications sector has experienced large changes within the sector (Krantz, 2000).

The 1850s to the 1920s – expansion of the railway
The period of 1850-1920 was the period of industrialisation in Sweden. Agriculture still had a large part in the Swedish production, but manufacturing and the industrial outputs increased in productivity and in market importance. Together with the industrialisation came wider markets and a growing importance of functional infrastructure, why the transport and communication sector came to experience larger changes (Krantz, 2000). In 1856 the Royal Electric Telegraph Administration (Televerket) was established to manage all national telegraphic processes (Andersson-Skog, 1998:253). In 1850 leading politicians proposed that mainline railways were to be financed and built by the state, and in 1854 the parliament decided to build national railways financed by the state. Regional railways were to be built and financed by private industries since these railways were considered mainly to be of private interests. In the following decades railways and telegraph lines were built between Sweden's largest cities (Kaijser, 1998:223). The governmental agency of Swedish State Railways (SJ) was created and controlled all state-owned railways (Andersson-Skog, 1998:247-248).

The 1920-1950 – the automobile traffic and its breakthrough
The period of 1920-1950 was an unstable period internationally, including both the economic crisis in the early 1930s and the World War II and the turbulent aftermath. Countries experienced very different economic growth, where Sweden was growing relatively fast. The railways were still the dominant transportation sector in Sweden, and the fastest and cheapest way of transportation covering longer distances (Krantz, 2000). In the beginning of the 1920s experienced the railways growing competition from the new automobile traffic. The outcome was that many railway

companies went bankrupt and disappeared in the interwar period (Kaijser, 1998:235). The regional and local railways were the big losers. They operated in relative short distances were the automobile traffic became more flexible in the shorter transportations to and from the larger national railways (Andresson-Skog, 1998:249-251). The automobile traffic came to grow in importance even in longer distances, were the usage of trucks and lorries increased the most. New car services were introduced, such as busses and taxis, and telecommunications and postal services increased. The entire transport and communication sector had experienced modernisation (Krantz, 2000). The development led to a decline in the railway subdivision why the parliament in 1939 decided that all private railways, both the railways of better and worse economic situation, should be nationalized. The nationalization of railways meant that the Swedish State Railways gained and controlled the entire railway network and gained a strong monopolistic situation. During the period 1920-1940 telephones became more common all over Sweden, mainly due to the growing real wages and the increased importance of communications in business and industries and between households (Andersson-Skog, 1998:251-258).

*The 1950-1980 - the dominance of road transportation*
Sweden had a fast economic growth in the 1950s and 1960s, and a decreasing growth in the 1970s. In the 1980s were many economies, including Sweden, exposed to an intensified globalization. Foreign and domestic shipping as well as railway transportation experienced a declining trend, which gave the automobile sector an even larger share. During the period increased the usage of private car traffic, such as taxi services. The choices of transportation, both of commercial and private usage, were mainly measured out of other factors than the price where time, efficiency and flexibility were considered. The total period was exposed to a declining trend in shipping and railway transportation, while the truck traffic increased (Krantz, 2000).The telecommunications went through large changes due to technological shifts. The largest shift was probably the growing interaction between telecommunications and computer technology, with the development of mobile phones and the Internet. The technological changes have gradually challenged the state controlled situation of the telecommunications in Sweden. The State Telephone Board developed into the state-owned company of Telia AB with freedom to operate commercially in the beginning of the 1990s. Today the Swedish market is one of the most liberalized telecom markets in the world. Other previous state-owned services and companies have experienced the similar transformation. The State Power Board, The State Railway Board and the State Post Board have all gone through the transformation of becoming state-owned companies with greater freedom of action and later transform into more liberalized competitive markets (Kaijser, 1998:237-238).

Self-employment in the transport and communication sector
From the 1920s onwards the numbers of self-employed grew. In the late 1960s and early 1980s the sector reached its highest points of self-employed. Between the 1980s and the year of 2000 the self-employment has experienced a slow moving decline. The graph 2.3.a displays the development of self-employment in the transport and communication sector. The graph 2.3.b displays the self-employment rate of the three sectors of transport and communication; manufacturing and handicraft; and agriculture in addition to the self-employment of the total Swedish economy. The graph 2.3.b demonstrates that the self-employment has declined in the total economy and the sectors of agriculture and manufacturing, but increased in the transport

and communication sector. Still, the graph indicates that self-employment in the transport and communication sector is only a small part of the total number of self-employed in the total Swedish economy (Data: Edvinsson, 2005). The graph 2.3.a indicates that the self-employment in the sector was non-existing before 1916. This is not truly realistic, and it can therefore be assumed that the statistics is somewhat misleading. It is possible that the self-employment was rather small and therefore not calculated, or that the way of calculate and classify self-employment changed after 1920.

Figure 2.3.a
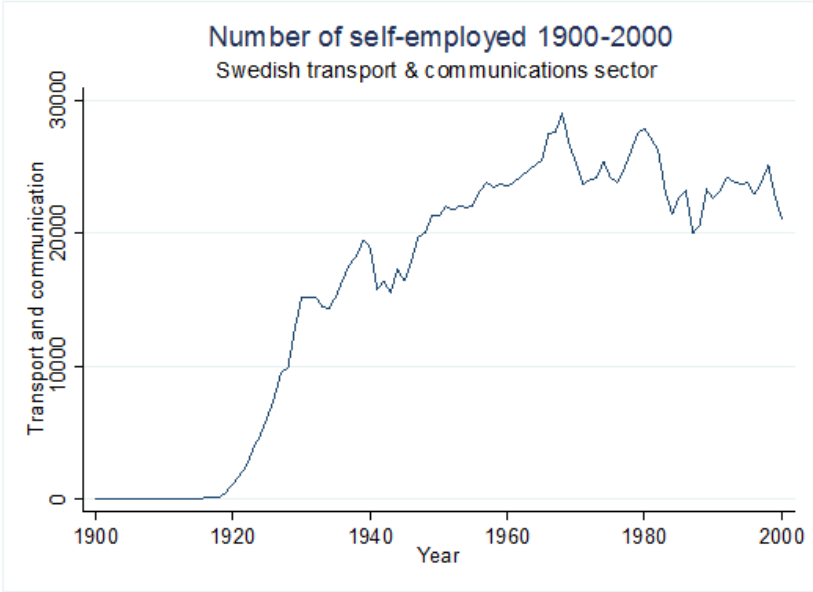
Note: Series measured in real numbers.
Source: Author's own compilation of data in Edvinsson (2005).

Figure 2.3.b
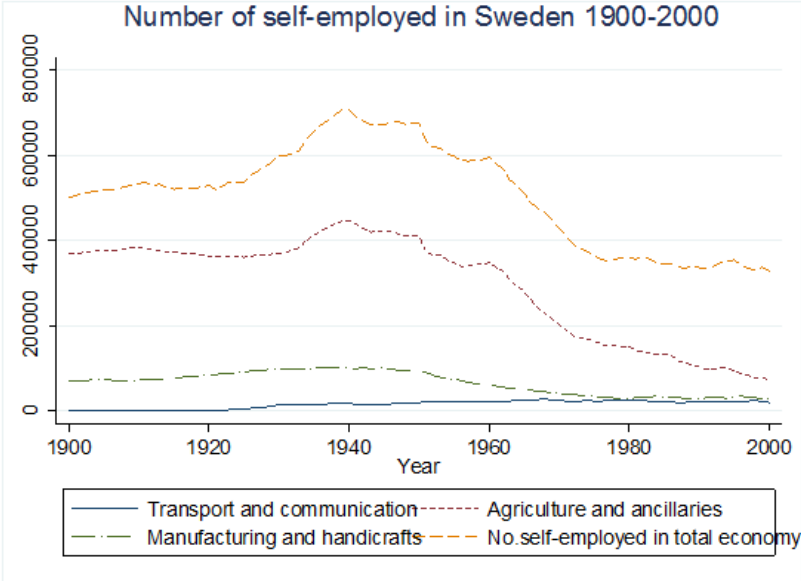
Note: Series measured in real numbers.
Source: Author's own compilation of data in Edvinsson (2005).

12

Today the transport and communication sector have two large unions, Swedish Transport Workers Union, and SEKO – The Union of Service and Communications. Both unions are members of The Swedish Trade Union Confederation (LO). The Swedish Transport Workers Union includes workers in the branches of lorries and trucks, security, taxi-services, flight maintenance, newspaper distribution, waste and recycling, gas stations and petrol handling, tire shops and some more smaller branches. The union was founded in 1879, and has today about 62,000 members representing 60-70% of all workers in the branches of interest (Transportarbetareförbundet, 2011). SEKO was created 1937 when the Postal-service Association (Postförbundet) merged together with the Railway Association (Järnvägsmannaförbundet), and the Telecommunications Association (Teleförbundet). The association changed its name to SEKO in 1995 when the union merged with the Seafarers association. The name change was a reaction of the deregulation of state companies, where many members went from being state-employees to instead become employees in a privatized competitive market. Today SEKO includes employees within the branches of civil (services within universities, authorities), the energy sector, postal services, seafarers, telecommunications and IT, traffic branches (locomotive engineers, conductors, station staff, airport personnel) and roads and railway workers. The union has about 122,955 members (SEKO, 2014). The branches do not have minimum wages according to law so one of the main tasks of the two unions are to monitor all members collective arrangements (kollektivavtal) and to defend the workers' rights and obligations (SEKO, 2014:Transportarbetareförbundet, 2011).

2.2.3 Labour's share in the transport and communication sector – ocular inspection

Graph 2.4.a displays the labour's share in the transport and communications sector, and graph 2.4.b displays this together with the labour's share of the total Swedish economy, both covering the period of 1900 to 2000. The ocular inspection of the series indicates that both series have large fluctuations over time and includes some structural breaks. The transport and communication sector experiences the first and largest structural break in the late 1910s and in the beginning of the 1920s. This is the period when the automobile traffic is introduced in Sweden and begins to compete with the earlier dominant branch of railway transportations and shipping (Krantz, 2000). This period is also characterized by increased self-employment. The labour's share of transport and communication sector reaches its highest level in the beginning of the 1920s. This is the highest point of the entire time period. Graph 2.4.b presents that the labour's share of the total Swedish economy also experiences a sharp decrease in 1915 followed by an even larger increase around 1919 and 1920. This indicates that something occurred in the total economy and not only in the sector of transport and communications.

In the period after the 1920s the labour's share decreases both in the sector of interest and in the total economy. In the 1940s, during the World War II, the labour's share in the transport and communication sector experiences another large structural break where the labour's share

decreases sharply. The sector was once more heavily affected by the decrease in international transportations and the mangled world economies which were the effects of the World War I. The international transportations fell back and affected the supply and demand of transportations, which also affected the labour's share (Krantz, 2000). The labour's share of the total economy did not experience the same large decrease during the World War II. After the Second World War and in the beginning of the 1950s the labour's share increased once more, both in the specific sector and in the total economy. Sweden's economy was growing and the real wages were increasing. The upward trend was broken in the middle of the 1950s, and was followed by a period of small fluctuations of the labour's share. In the 1970s the labour's share experienced a third structural break. This is also a period where the two series convergence before the series once more divergence. In the late 1960s drops the labour's share in the transport and communication sector for the first time to a level below the labour's share of the total economy. This could be a reaction to the decreasing state-monopoly in the transport and communication sector, since state-monopoly has a tendency to keep the wages and therefore the labour's share on a higher level compared to privet competitive firms (Azmat et al., 2011). Since the 1970s the labour's share of the sector has gone through a sharper total decline compared to the labour's share in total. In the end of the 1990s the labour's share of the transport and communication sector reached one of its lowest points, the same dimension as during the 1940s.
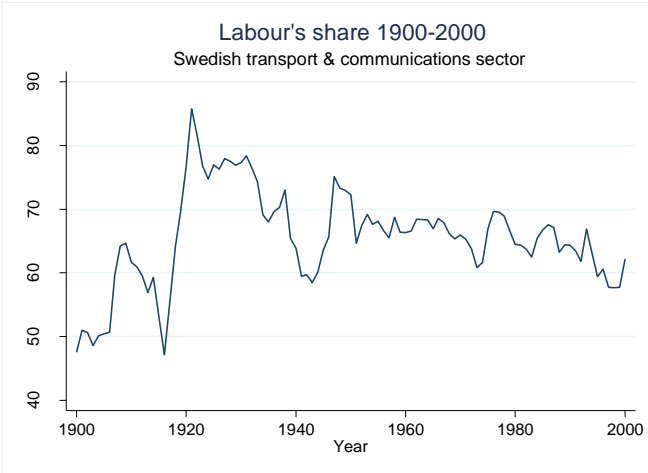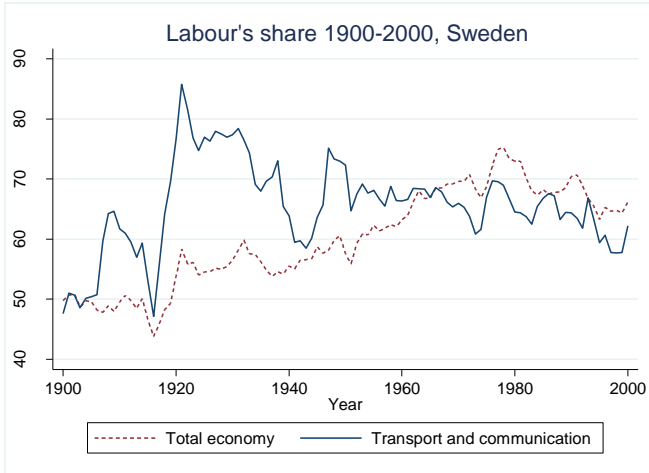
Figure 2.4.a

Figure 2.4.b

Note: All series measured in percentage shares.
Source: Author's own compilation of data in Edvinsson (2005).

3 Theoretical Framework and Determinants of Labour's Share

In the theoretical part the most influential theories within the discussion of labour's share are presented. The two first presented theories are of importance in order to understand the possible impacts and development of labour's share, but will be given a smaller part in the analysis, where the two latter presented theories are given a larger part. The section ends with a discussion of the theories and other possible factors of influence.

Labour's share of national income can be related to the struggle of labour against capital. Many classical economic models of factor endowments consider mainly two categories of factors; labour and capital. This is a modest conclusion since incomes can differ and be received or generated from different groups, in terms of wages and rents. Charles Cobb and Paul Douglas (1928) created the constant-returns production function, today considered the Cobb-Douglas production function of:

$$Y = A(L^{\alpha}K^{1-\alpha}) \tag{3.1}$$

where A is the level or the index of technology used in the production, L is labour, K is physical capital and alpha is the contribution (elasticity) of each factor. The production function has received a lot of critique of being too modest, but is still considered one of the main ideas and the basis for many other economic theories (Atkinson, 2009). The simplification of factor endowments has laid the ground of development of economic theories within the fields of growth, trade and inequality.

3.1 The Kuznets curve of income inequality

Simon Kuznets (1955) is considered a pioneer within the economic-structural perspective on long-run inequality. The Kuznets' theory is often discussed within topics of economic growth and inequality and has generated a grounding of most theories within the field of economic inequality. Kuznets argued that factor shares were not to be considered constant over time. When a country industrializes and transforms from a classic agrarian economy into becoming an industrialized economy, the inequality will increase in the beginning if the transformation due to investments in real capital. These investments will lead to higher average incomes and productivity in the new industrial sectors in comparison to the classical agricultural sectors. The income inequality will increase in line with that people move out from the classical agricultural sector and into the new manufacturing sector. When the industrialisation of the country is completed most people will be active in the industrial sectors and the inequality will tend to

invert due to equalizing tendencies. The productivity gap between the different sectors becomes less important when the low-income groups become more integrated in the society due to the increase in per capita income and political power through democratisation and the rise of the welfare state. The theory and the development of inequality follows a curve with the shape of an inverted U, called the Kuznets curve (Kuznets, 1955). The theory of the Kuznets curve is best used within analysis of the total economy, and can be somewhat skewed in the analysis of a single sector. This theory is not directly related to the development of labour's share but is still an important theory in the discussion of distribution of factors. The Kuznets curve will therefore not be the main theory of the analysis but helps create a good understanding of the development of inequality and factor distributions.

3.2   Power resource approach

The so called 'power resource approach' has been developed in order to analyse the distribution of power – political and union based – and economic resources in democratic welfare states. The sociologist Walter Korpi and his works *The Working Class in Welfare Capitalism* (1978) and *The Democratic Class Struggle* (1981) are often discussed within the field of power resources. Korpi argue that the power of the labour force depends on their will and ability to act collectively which can be expressed by unions (Korpi in Bengtsson, 2013a). The approach stresses that a welfare state of great generosity will decrease income inequality. A longer time of leftist governments is associated with more generous welfare states, less poverty and lower levels of income inequality. Stronger trade unions, in terms of stronger bargaining power and larger member rates are associated with lower wage inequalities. In accordance to the power resource approach the labour's share will increase when the power resources of the working class increases, such as when unions have a high level of members and stronger bargaining power, and when the welfare state expands. Contrary, will the labour's share decrease in times of weakening bargaining power of the labour force, such as lower influences of the unions and mass unemployment (Pontusson et al, 2002; Bengtsson, 2013a).

3.3   Openness of trade and the Hecksher-Ohlin model

Previous analyses of factor shares have indicated that globalization and the increased international competition may have a role in the falling labour's share. Openness of trade and increased globalization can harm the bargaining power of labour relative to capital, since globalization often tend to raise the level of competition and increases the market size. The increased competition will lower the prices of imported goods and will thereby lower the marginal value of an additional unit of labour within the domestic market (Ortega and Rodriguez, 2002).

The Hecksher-Ohlin model is often used in order to analyse trade and patterns of international trade between countries. The model was developed by the economists Eli Hecksher and Bertil Ohlin at the Stockholm School of Economics and builds on David Ricardo's theory of comparative advantages. The model assumes that all countries have identical production technology why a country's relative advantages are stated by its factor endowments. All markets have constant returns to scale and are in perfect competition. A capital-abundant country will specialize in producing capital-intensive goods, and then trade the own produced goods on the market in order to receive labour-intensive goods. As countries become more open to trade they will focus their production in the area where they have comparative advantages. In the long term this will lead to factor price equalization across trading countries (Bond et. al, 2012). Since most industrialized countries, so even Sweden, are considered capital abundant countries the outcome of increased trade could therefore lead to a fall in the returns to labour in the aggregate labour market, thus decline of the labour's share. The effects within the markets are ambiguous, since the fall in wages will make labour relatively cheaper than capital and increase the demand of labour within the sector. In a capital abundant country like Sweden the more capital-intensive subsectors will expand which will lead to a decrease in the total labour's share of the country (Azmat et al. 2011).

3.4   Privatization and market competition

The market can have various forms, where the simplified economic theory substantially distinguishes between perfect competition and monopoly. Within the market form of perfect competition is the single company affected by the total market and is therefore a price-taker, the company cannot itself affect the price of the product why all production is in line with the costs. Thus, the labour demand will be in accordance with the relation between wages and the value of one more hour of production. The company will demand a labour force where the value of the marginal product is equal to the wages. In monopoly, on the other hand, will the actor themselves set the price of the good and their production in order to maximize the mark-ups (Björklund et al., 1996). A larger degree of monopoly will therefore lead to higher mark-ups of the specific company. If the monopoly situation is in private conception higher mark-ups will generate a raise of the prices and profits within the sector, higher than the cost of wages. Therefore, a raising degree of private monopoly would over time lead to a slow growth of real wages, slower than the growth of productivity where the outcome is raising profit shares (Glyn, 2009:105-106).

Azmat et al. (2011) argue that firms in a publicly owned and state-controlled concept have, in comparison to the privatized firms' profit interest, preferences of employment over profits and objectives of protecting jobs. A state-controlled or public monopoly would therefore keep the level of wages relatively high, leading to a higher labour's share. Increased privatization will lead to raising wages and therefore a decrease in employment, since high wages decrease the demand of labour making capital relatively cheaper. Due to the fact that privatization generates incentives

towards maximizing the shareholder's value market privatization will lead to a decline of the labour's share (Azmat et al. 2011).

3.5   Discussion of presented theories

The presented theories have different aspects of importance. With exception of the Kuznets theory, which does not discuss the labour's share, the theories all predict increased competition to have a negative impact on the labour's share. Increased competition could be increasing number of labour unions with different agendas, enlarged competition on the market and openness of trade. Previous research have proven that other variables than stated by theory may also affect the labour' share. Bengtsson (2012:2013a) argue that inflation can tend to have a sticky impact on wages since the labour market can have problems of quick reactions of adjust wages upward in times of inflation surprises, why labour's share tend to fall in times of high inflation. The labour's share does also tend to fall in occasions with high economic growth and increase in times of lower economic growth (Bengtsson, 2012:2013a). In critique to the presented theories it cannot always be assumed that a high level of labour's share will lead to low dispersion. The labour's share does not guarantee that all employees will have the same contribution of the share and that there will be no inequality among the labour force.

4   Data and Variables

In this section are the data and the variables used throughout the econometric analysis presented. The section starts with a description of the data and descriptive statistics, followed by a discussion of possible problems and critique towards the chosen variables and possible alternative measurements.

4.1   Description of data

The analysis uses annual data covering the transport and communication sector in Sweden. The labour's share of the Swedish transport and communication sector has experienced some structural breaks, where one of the larger structural breaks occurs in the beginning of the 1920s.[2] In order to avoid conflicting results due to the large structural break the study will cover the period of 1920-2000. The 1920s is characterized by the introduction and expansion of the automobile traffic, but also the period of increased market competitions and self-employment. The year of 1920 is therefore a natural starting point of the study. Thus, it would be of interest to investigate the effects of trade openness and market competition in relation to labour's share further on after year 2000 in order to analyse the impact of the ICT revolution, but due to the lack of collected and processed data the analysis got to stop at the year of 2000.

The most important variable of the study, the dependent variable, is the labour's share of the Swedish transport and communication sector. The variable consists of the series of total labour compensation and gross value added both drawn from the dataset provided by Edvinsson (2005). The variable is then calculated as labour compensation in terms of wages and salaries as well as social benefits divided by gross value added of the total economy. The labour compensation of the self-employed is included in the measurement of labour's share. Since all labour compensations are included the measurement will be considered labour's share, and not the wage's share of the sector.

In order to analyse different factors impact on the labour's share the model needs independent variables. In order to control the importance and impact of openness of trade the value of import + export as share of GDP will be used. This will then generate the total impact of trade openness including both import and export. Bengtsson (2012:2013a) only uses the import as share of GDP as a measurement of the openness to trade when investigating the Swedish manufacturing sector. I argue that the measurement will be more trustworthy and of higher interest by including both

---

[2] See graph 2.4a in section 2.2.3, displaying the labour's share in the Swedish transport and communication sector.

import and export as share of GDP when analysing openness of trade. The variable is compiled by data collected from Edvinsson (2005), and is expected to have a negative impact on the dependent variable of labour's share.

Privatization and competition will be estimated by the variable of self-employment in the transport and communication sector. The series presented here are the self-employment in real numbers. The series is collected from the database of Edvinsson (2005). In order to smooth the series and to adjust it to the analysis the series is transformed into natural logarithms. This will reduce the large fluctuations that otherwise will affect the analysis of the series to strongly. The variable is expected to have a negative impact on labour's share.

In order to control the impact of macroeconomic aspects the variables GDP growth and inflation will be used, where labour's share tends to fall in occasions with high GDP growth and increase in times of lower GDP growth. Inflation tends to have a negative impact on labour's share due to the slow upward adjustments of wages in times of high inflation. Labour's share will therefore fall in times of quick inflation increases. Though, as Bengtsson argues, this can be seen as problem of reverse causality since higher wages and labour's share can trigger inflation to higher levels (Bengtsson, 2012). The inflation variable is collected from Statistics Sweden (SCB) and is expressed as the percentage change in consumer prices measured on an annual basis. The variable GDP growth is gathered from Edvinsson (2005). Both GDP growth and inflation are expected to impact the labour's share negatively.

The generosity of the welfare state is an important aspect within the power resource theory. A more generous welfare state will decrease inequalities and benefit the workers (Lindert, 1994). However, generosity of the welfare state is a rather hard variable to measure. Though, there are alternative ways of measurement, and I will in line with Bengtsson's (2012:2013a) studies of the labour's share, use the variable of public consumption as share of GDP as a measurement of the generosity of the welfare state. This measurement can be argued to be a rather weak measurement of the welfare state generosity, but the variable is available over the entire time period and already a recognized measurement. The variable of public consumption is collected from the database of Edvinsson (2005), and is expected to have a positive impact on labour's share.

4.2   Descriptive statistics

In order to get an overview of all variables used in the econometric time series analysis descriptive statistics are presented in table 6.1. All variables are measured annually covering the period of 1920-2000. All series are measured in shares and therefore transformed into percentage, with exception of the variable of self-employment which is measured in real numbers and transformed into natural logarithms.

The dependent variable of the analysis, labour's share in transport and communication sector, takes the lowest value of 57.67 percent of total GDP and the highest value of 85.76 percent of

total GDP. Openness of trade variable shows a large variation, with the highest value of 16.59 and the lowest of 90.45. The variable of self-employment is measured in real numbers. The lowest value of self-employment is 1,148. At most the sector had 29,000 self-employed, which also is the highest value of the series. The variable of self-employment is transformed into logarithms when used in the analysis, why also this series is presented in table 6.1. The variable of GDP growth does show large variation over the time period, where the lowest growth is the negative value of minus 9.26 and the highest growth rate is the positive value of 11.26. The statistics proves that Sweden have experienced some large fluctuation of the inflation rate, both in positive and in negative numbers. The lowest inflation rate is minus 18.50 and the highest value is the positive inflation of 16.90. The public consumption is measured as share of GDP, where the highest value is nearly 30% of GDP and the lowest value is 8.36%. All variables do show great fluctuations which can be explained out of the historical events of the World Wars, economic crises, political shifts and the expanding globalization.

Table 6.1
Descriptive Statistics

	Mean	Standard deviation	Minimum	Maximum	Observations
Labour's share	67.76	5.90	57.67	85.76	81
Openness of trade	48.30	15.04	16.59	90.45	81
Self-employment	20070.3	6484.28	1148	29000	81
Ln Self-employment	9.79	.59	7.046	10.275	81
GDP growth	3.02	3.24	-9.26	11.26	81
Public consumption	18.69	7.14	8.36	29.97	81
Inflation	3.49	5.58	-18.50	16.90	81

4.3   Data critique and measurement problems

The variables of labour's share and self-employment are measured specifically within the transport and communication sector. The variables of openness of trade, GDP growth, inflation and public consumption are all measured of the total economy. Since the transport and communication sector represents a rather small share of the total Swedish economy together with the fact that the variables are measured on different levels of the economy, problems of skewness of the results can occur. Though, this is not believed to generate difficulties of larger extent since the analysis does not demand to generalize the results.

The transport and communication sector has experienced a history of low market competition and large state influences and has the last decades experienced development towards a more competitive and liberalized market with many actors. A state-controlled market with fewer actors will, in line with previously presented theory, have positive effects on the labour's share while a more competitive market would affect the labour's share negatively. The analysis would be benefitted by including a variable which measures the market competition in terms of public ownership against private ownership as well as possible barriers to enter the market. Though,

corresponding variables are lacking and therefore not possible to include in the model. The self-employment in the sector is measured in real numbers. Though, this measurement does not necessarily measure the influence of the actors on the market. In order to fully measure market competition it would be of interest to measure the size in terms of market power, or number of employees or the turnover of the companies. Unfortunately, this was not possible to generate within the limits of the thesis.

Previous studies have proven that the bargaining power and union density is considered to have a positive impact on the labour's share. Welfare generosity and 'left sided' government power do also tend to benefit the workers (Pontusson et al, 2002; Bengtsson, 2013a). The variable of governmental power in terms of 'left' or 'right' could be introduced as a dummy variable in the analysis. Though, this variable would have little variation due to the fact that the Social Democrats have been in power for a majority of the time period why the variable will have little variation, and is therefore expected to be of minor importance why this variable is not included in the econometric analysis. It is also hard to generate a trustworthy measurement of the power of unions. One way to measure this could be to analyse the membership rates. Studies have been made where the density of unions and the labour's share have been analysed together where the result indicate that both series decreases (Fichtenbaum, 2011). However, the membership rates do not specifically measure the power of the union. The two largest unions of the sector, SEKO and Swedish Transport Workers Union, do not present data of membership rates covering the total investigated period. Data in order to measure the power or density of the unions are therefore missing, why these measurements are not possible to include in the analysis. The variable is also expected to generate little annual variation, and is therefore of minor interest. High unemployment is predicted to have negative effect on labour's share due to the fact that high unemployment rate increase the supply of workers on the market (Bengtsson, 2013a). Consistent measurements of the Swedish unemployment covering the investigated time period are not possible to fetch. Instead the measurement need to be collected from different sources, and will still have gaps. Due to low reliability of collecting the variable from different sources and the fact that Bengtsson's (2013a) study do not generate statistically significant result, the variable of unemployment will not be included in the econometric analysis.

5   Methodological Framework

This section describes the methodological framework applied in this thesis. The chapter begins with a discussion of how to generate a good and well specified model by avoiding problems of unit-roots and to control the order of integration of the series. Subsequently, methods for investigating long-run relationships are described, where the concept of cointegration is explained. The chapter concludes with a discussion of different methods to generate trustworthy regressions.

5.1   Unit-root test

This thesis will use time series econometrics in order to analyse the shifts in labour's share in the Swedish transport and communications sector. When working with time series data it is of importance to investigate whether the series consist of unit-roots or not in order to create trustworthy analyses. In order to conduct valid and reliable models it is important that the series are stationary, meaning that they do not suffer from unit-roots. Time series are said to be stationary when the series fluctuates around a constant long-run mean, and the variance and covariance is constant for all time observations. When a shock occurs in stationary series the series will over time move back to its long-run mean, while a non-stationary series will be affected by the shock in a way that will make it impossible for the series to move back to its mean. When a series is non-stationary it is impossible to generate good estimates over time why the estimated relationships is said to be spurious or non-sense relationship, and the regressions will lack meaning (Asteriou et al., 2011:267).

To control whether series are stationary or not an ocular inspection can be done of the series. Thus, in order to truly identify whether the series are stationary or not the Augmented Dickey-Fuller (1981) test for unit-root can be conducted. The Augmented Dickey-Fuller (ADF) test has the three possible forms:

$$\Delta Y_t = \gamma Y_{t-1} + \sum_{i=1}^{p} \beta_i \, \Delta Y_{t-i} + u_t \qquad\qquad (5.1)$$

$$\Delta Y_t = \alpha_1 + \gamma Y_{t-1} + \sum_{i=1}^{p} \beta_i \, \Delta Y_{t-i} + u_t \qquad\qquad (5.2)$$

$$\Delta Y_t = \alpha_1 + \gamma Y_{t-1} + \alpha_2 t + \sum_{i=1}^{p} \beta_i \, \Delta Y_{t-i} + u_t \qquad\qquad (5.3)$$

where t is the time index, α_1 is a constant or intercept, α_2 is the coefficient of a time trend, γ is the coefficient of focus of the test (examines whether this consists a unit root or not), Y_t is the variable of interest (e.g. labour's share) and u is an independent and identically distributed

disturbance term. The aim of the ADF-test is to investigate whether γ is equal to zero, which then indicates that the series is non-stationary. The null hypothesis of ADF-test is $\gamma = 0$ meaning the series is non-stationary against the alternative hypothesis $\gamma < 1$. The three different equations indicate that the series can have three different forms. The first equation (5.1) is the most restricted model and excludes both a constant and a trend. The second equation (5.2) consists of a constant but excludes the trend and third equation (5.3) represents the least restricted equation including a trend and a constant. It is important to specify the model correctly since the model may lose in power by including irrelevant regressors. In order to avoid problems of autocorrelation, dependence of previous values, the model might need to be lagged and the optimal lag-length needs to be specified (Asteriou et al., 2011:342-344). This is best conducted using a correlogram which is plotting the lags and thereafter adopt the 'testing down-procedure' where start testing the model using many lags and reduce insignificant lags until all lags are statistically significant. This way the model will be the best specified and parsimonious model. The order of integration of the series is decided by how many times the model needs to be differenced in order to become stationary. If a series need to be differentiated one time in order to become stationary, the series are said to be integrated of order one, or I(1) (Asteriou et al., 2011:335-338).

5.2   Cointegration

Cointegration can be explained as if two or more time series move together over time. Time series that are non-stationary and integrated of order one can be put together and if a combination of their error terms becomes stationary the series are said to be cointegrated. According to theory cointegration does only occur when there is a true relationship linking the series together, why cointegration becomes a powerful way to analyse economic structures. The interpretation of cointegration is that there is a long-run relationship between the series (Asteriou et al., 2011:356-357).

Cointegration can be tested using different methods, for example the Engel-Granger approach. This approach can only test two variables at a time and the order of the variables is of importance. The model is considered complex why other methods have been more common to use. The analysis will use more than two variables, why the Engel-Granger approach will not be applied since it only allows for one relationship. The Johansen approach is nowadays probably one of the most common methods to use in order to control for cointegration, and also the approach that will be used in this analysis. The Johansen approach can control for more than one cointegration relationships and is conducted out of a VAR model (Asteriou et al., 2011:364-369). The Vector Autoregressive Model (VAR) was developed and purposed by Sims (1980). Sims argued that it should be possible to treat all variables as endogenous and to investigate macro models as unrestricted (Sims, 1980). Today the VAR model is frequently used in time series analysis since the model is easy to work with, leaves good estimates and treats all variables as endogenous. However, the usage of a VAR model does also implicate some possible problems. With a non-correct specified model the VAR can generate misleading estimates, why the

specification of the VAR is of importance (Asteriou et al., 2011:320-321). When a well-constructed VAR model is conducted post-estimation tests for normality, skewness and kurtosis of the residuals should be carried out. Problems of non-normally distributed residuals or kurtosis in the residuals are of minor problem, but problem of skewness should be taken seriously. If the residuals do suffer from skewness the entire model can become skewed meaning that it will not leave trustworthy results (Asteriou et al., 2011).

When using the Johansen approach it is important to choose the correct model in terms of deterministic components. This is best conducted by usage of the Pantula Principle. The procedure involves estimation of five models, where the first and the fifth model are excluded. The Pantula Principle starts by testing the second and most restricted model which includes an intercept but no trend, and ends with the least restricted model, model four with unrestricted intercept and restricted trend. The test statistics generated out of the test is compared to the critical values at each and every step, and the test is accomplished the first time the null hypothesis cannot be rejected. If one or more cointegration relationships are found a Vector Error Correction Model (VECM) need to be conducted in order to account for the non-stationary variables and to allow for the cointegration relation (Asteriou et al., 2011:364-375).

5.3   ARDL and ARIMA models

If cointegration is not to be found, a VEC-model cannot be conducted. The relation and effect of the variables can instead be analysed throughout regressions. Here, two possible models are discussed, the ARDL and the ARIMA models.

5.3.1   ARDL-model

An autoregressive distributed lag model includes lags of the dependent (and independent) variable in the model. The model is considered as ARDL (p, q) where p indicates the number of lags of the dependent variable and q the number of lags of the independent variables. An ARDL (1, 1) model looks like:

$$Y_t = \gamma + \alpha_1 Y_{t-1} + \beta_1 X_t + \beta_2 X_{t-1} + \varepsilon_t \qquad (5.4)$$

In order to decide the number of lags of the dependent and the independent variables the 'Hendry approach' will be applied. This approach starts by using a large model and test down in order to end up with the best specified model. Information criteria is often used in order to specify the optimal lag length where the best specified model will generate a low value of the information criteria. There are three commonly used information criteria when deciding the lag-length, the Schwarz Bayesian Criterion (SBIC), the Akaike Information Criterion (AIC) and the Hannan-Quin Criterion (HQIC) criteria. After specified the model it should be controlled of consisting autocorrelation. If the model does suffer from autocorrelation more or less lags can be introduced to the model in order to avoid the problem. When a well specified and parsimonious

model is conducted the chosen model will be estimated by the usage of an OLS (Ordinary Least Squares) regression. The ARDL-model need to be conducted on stationary time series in order to generate well estimated results from the OLS regression (Asteriou et al., 2011:364-375).

5.3.2 ARIMA-model

A significant share of the data used in order to conduct economic analysis includes unit-roots, which means that the series need to be differenced in order to become stationary. The ARIMA-model (autoregressive integrated moving average) is considered as (p, d, q) where p defines the number of lags of the dependent variable (the AR term) and d the order of integration of the series used in the model. If the series are integrated of order one the series needs to be differenced once in order to become stationary and d will be equal to 1. The q is the number of lagged terms of the error term (the MA terms). In comparison to the ARDL-model the ARIMA-model will be estimated using maximum likelihood-estimates instead of OLS (Asteriou et al., 2011:364-375).

6   Empirical Results

In this section are the results of the econometric time series analysis presented. The results are presented in accordance to each and every testing procedure. The section ends with a sensitivity analysis where openness of trade and competition are estimated in alternative ways.

6.1   Unit-root test

The order of integration can, as discussed in section 5.1, be interpreted by making an ocular inspection of the series. All used series are plotted in levels and presented in appendix 1. The large fluctuations of the series and the fact that some series seem to be trending indicate that the series are non-stationary. Appendix 1 does also include diagrams where the first differenced series are plotted. After differencing the series once they seem to become stationary. Despite the ocular inspection, the series need to be formally tested by the Augmented Dickey-Fuller test in order exclude the possibility that the series suffer from unit-roots and to state the order of integration. The results of the ADF tests of the series in levels are presented in table 6.2. The results from the ADF tests show that the null hypothesis cannot be rejected for any of the series indicating that all series are non-stationary. Still, the series are controlled if suffering from autocorrelation within the residuals by using the Breusch-Godfrey test. The result of the test indicates that the series of GDP growth and public consumption suffer from autocorrelation at a 5% significance level.

Table 6.2
ADF Test in levels

Variable	No. Of lags	Specification	Test statistics	5% critical value	No. Of obs.	B-G test, p-value	Conclusion
Labour's share	0	Constant	-2.391	-2.906	80	0.7611	Cannot reject Ho
Openness of trade	0	Constant & trend	-3.147	-3.470	80	0.2933	Cannot reject Ho
Self-employment	1	No constant & no trend	0.809	-1.950	79	0.4410	Cannot reject Ho
GDP growth	3	No constant & no trend	-1.596	-1.950	77	0.0066	Cannot reject Ho
Public consumption	1	Constant & trend	-2.787	-3.471	79	0.0003	Cannot reject Ho
Inflation	4	Constant	-2.653	-2.909	76	0.0441	Cannot reject Ho

To state the series' order of integration all series are differenced one time and once more tested by the ADF test. The results of the ADF test of the first differenced series are presented in table 6.3. The results indicate that after taking the first difference of the series the null hypothesis can

be rejected for all series, indicating that the series have all become stationary. The Breusch-Godfrey testing of autocorrelation indicates that all series, except the self-employment, do not suffer from autocorrelation. Still, the self-employment variable does have some problem of autocorrelation. The variable has been lagged more times in order to avoid the problem. Though, the problem of autocorrelation does not disappear with the usage of more lags which is important to keep in mind for further investigation. All series can be concluded to be integrated of order one since they all need to be differenced on time in order become stationary.

Table 6.3
ADF Test 1st differenced data

Variable	No. Of lags	Specification	Test statistics	5% critical value	No. Of obs.	B-G test, p-value	Conclusion
Labour's share	0	No constant & no trend	-9.355	-1.950	79	0.1371	Can reject Ho
Openness of trade	0	No constant & no trend	-9.166	-1.950	79	0.0903	Can reject Ho
Self-employment	1	No constant & no trend	-4.190	-1.950	78	0.0013	Can reject Ho
GDP growth	1	No constant & no trend	-10.180	-1.950	78	0.7285	Can reject Ho
Public consumption	0	No constant & no trend	-5.591	-1.950	79	0.0945	Can reject Ho
Inflation	1	No constant & no trend	-10.233	-1.950	78	0.9450	Can reject Ho

6.2   Cointegration

All used series are integrated of order one, meaning that cointegration can be tested. In order to control if the series are cointegrated the Johansen approach is conducted. When testing for cointegration a VAR model is constructed. The lag order is decided by usage of information criterions where all information criterions suggest the usage of two lags, which is used. The Pantula Principle is applied in order to determine the model restrictions. This means to start by estimate model 2, and move on until the null hypothesis cannot be rejected at 5% significance level. The results from the testing procedure are presented in table 6.4. The results show that the null hypothesis of no cointegration relationship cannot be rejected at any of the three tested models at 5% significance level, indicating that the series are not cointegrated. This means that the series do not move together over time. Since no cointegration relationship among the variables can be found a Vector Error Correction Model cannot be conducted.

Table 6.4
Johansen approach

Ho	H1	Rank	Model 2		Model 3		Model 4	
			Trace statistics	5% critical value	Trace statistics	5% critical value	Trace statistics	5% critical value
No relationship	At most 1	0	15.1642*	19.96	11.9123*	15.41	23.9727*	25.32
At most 1	At most 2	1	3.0164	9.42	0.2524	3.76	6.0774	12.25
No. Obs.			79		79		79	
Lags			2		2		2	

The star* marks the rank-condition.

6.3 ADRL-model

OLS will only generate trustworthy results when regressed on stationary data. Since all series are integrated of order one the series is differenced one time before estimated. The estimated model looks like:

$$Labour's\ share = \alpha + \beta_1 Openness\ of\ trade + \beta_2 Self employment + \beta_3 GDP growth + \beta_4 Public\ consumption + \beta_5 Inflation + u_t \quad (6.3.1)$$

The definition of the best fitting ARDL-model is stated by using information criteria where the best model has the lowest value of its information criteria. The best fitting model is an ARDL (0,0) model, and will therefore not include any lags on either the independent or the dependent variables. The result of the ARDL-model is presented in table 6.5. The result of the estimated model 3 (6.3.1) is presented in table 6.5 and indicates that neither of the variables openness of trade or self-employment is generating statistically significant results. Therefore, the model is conducted in three steps. The first model only includes openness of trade as the independent variable against the dependent variable of labour's share (6.3.2).

$$Labour's\ share = \alpha + \beta_1 Openness\ of\ trade + u_t \quad (6.3.2)$$

The estimated results of model 1 (6.3.2) show that openness of trade does have a negative effect on the labour's share that are statistically significant. Model 2, which estimates the impact of openness of trade and GDP growth on labour's share generate a negative result of the openness of trade variable, though, it is not statistically significant. The third model generates a positive result of the openness of trade variable which is not statistically significant. The shifting result of the variable indicates that the robustness of the variable is low, why the result cannot be analysed even when significant. The self-employment variable has been tested the same way, but does not generate any statistically significant results why the models are not presented here.

Model 3 (6.3.1) is of greatest interest since it includes all independent variables. The coefficients of model 3 indicate that GDP growth has a negative impact on the labour's share. Also the inflation variable shows a negative impact on the labour's share. The variables negative results are in line with stated previous research and theoretical framework that increase in GDP growth and inflation will have a negative impact on labour' share. The variable of public consumption as share of GDP shows a negative effect on labour's share. The negative result is in conflict with previous research and theoretical frameworks. The adjusted r-square of model 3 is 0.3196.

The shifting result of the variable of openness to trade and the high standard errors of the variable of self-employment could indicate problems of correlation between the variables. Though, all variables have been tested of correlation by the usage of Pearson's correlation test. The result is presented in appendix 2 where it can be seen that none of the variables indicate to be highly correlated.

It is important to comment on the fact that the model used and tested is a first differenced model, meaning that the results cannot be interpreted as long-run effects. The results from the first differenced model can only be interpreted as the relationship from year-to-year.

Table 6.5
ARDL (0,0,0,0), First difference model

Labour's share	Model 1	Model 2	Model 3
Openness of trade	-.145 **	-.062	.041
	(.059)	(.064)	(.079)
Self-employment		.874	-.793
		(2.82)	(2.533)
GDP growth		-.210 ***	-.251 ***
		(.078)	(.083)
Public consumption			-.639 **
			(.326)
Inflation			-.303 ***
			(.077)
Constant	-.116	-.191	-.032
	(.313)	(.320)	(.303)
No. Obs. (Sample)	80	80	80
R-squared	0.0734	0.1556	0.3627
Adjusted R-square	0.0615	0.1223	0.3196

*Standard errors in brackets. * significant at 10%, **significant at 5%, ***significant at 1%.*

The third and final model is post-estimated tested by the Breusch-Godfrey test of autocorrelation in order to control that the lags of the model do not suffer from autocorrelation. The null hypothesis of the test is no autocorrelation. The result in table 6.6 shows that the null cannot be rejected at all five lags, indicating that the model does not suffer from autocorrelation.

Table 6.6
Breusch-Godfrey test of autocorrelation

Lags	p-value
1	0.9791
2	0.7341
3	0.7991
4	0.7861
5	0.6773

6.4   ARIMA-model

In order to control the robustness of the results a second regression is conducted. The second regression will have the form of an ARIMA and is regressed by maximum likelihood instead of OLS. The model has the same form as the one conducted in section 6.3:

$$Labour's\ share = \alpha + \beta_1 Openness\ of\ trade + \beta_2 Self employment +$$
$$\beta_3 GDP growth + \beta_4 Public\ consumption + \beta_5 Inflation + u_t \quad\quad\quad (6.4.1)$$

The model will have the form of an ARIMA (0,1,0), meaning that there will be no lags of the dependent variable, the used series need to be differenced one time, and that there will be no lags of the error terms.

In order to generate significant results the ARIMA is, like the ARDL-model, constructed into three models, where the first model is a simple model with labour's share as the dependent variable and openness of trade as the only independent variable. Model two includes both openness of trade and GDP growth as independent variables and finally model three consists of all independent variables. As with the estimates of the ARDL, the variable of self-employment generates no significant result.

The result of the ARIMA-model is presented in table 6.7. The results express very similar results as the one from the ARDL-model in section 6.3, where the coefficients and the signs are more or less the same and only the standard errors have changed marginally. Since the results are almost identical conclusion can be made that the model is robust in its testing.

Table 6.7
ARIMA(0,1,0)

Labour's share	Model 1	Model 2	Model 3
Openness of trade	-.145***	-.061	.041
	(.037)	(.047)	(.067)
Self-employment		.874	-.793
		(2.32)	(2.950)
GDP growth		-.210***	-.251***
		(.068)	(.083)
Public consumption			-.640**
			(.268)
Inflation			-.303***
			(.078)
Constant	-.116***	-.191	-.032
	(.158)	(.364)	(.303)
No. Obs. (Sample)	80 (1921-2000)	80 (1921-2000)	80 (1921-2000)
Log likelihood	-194.486	-190.7687	-179.5136

* significant at 10%, **significant at 5%, ***significant at 1%.

6.5   Sensitivity analysis

Some of the variables have been operationalised in order to fit the presented model, why it is of importance to control the sensitivity of the model. In order to do this two new variables have been generated where openness of trade is measured as import as share of GDP instead of import + export as share of GDP used in the previous models. The competition within the sector is in section 6.3 and 6.4 measured as self-employment. Here, it instead will be measured as self-employment as share of total employment, both measured in the transport and communication sector. All series are tested for stationarity the same way as earlier described. The new variables (import/GDP and self-employment/employment) are also integrated of order one, why it has to be differenced one time in order to be estimated using OLS. The model will have the same form as the previous estimated model, but with the new measurements of openness of trade and competition.

$$Labour's\ share = \alpha + \beta_1 Openness\ of\ trade + \beta_2(\frac{Self\ employment}{employmnet}) +$$
$$\beta_3 GDP growth + \beta_4 Public\ consumption + \beta_5 Inflation + u_t \qquad (6.5.1)$$

The model will have the form of an ARDL (0,0) model and is regressed with the usage of OLS. The modelling is made in three testing procedures as before. The variable of competition (self-employment/employment) does not generate significant results. The result of the sensitivity analysis is presented in table 6.8. The result show very alike results as the model of section 6.3.

Still, openness of trade and competition measured as self-employment as share of total employment do not generate statistically significant results in the third and final model.

The model of this section is also tested of cointegration. No cointegration relationship is found why the testing procedure is not presented.

Table 6.8
ARDL (0,0,0,0), First difference model

Labour's share	Model 1	Model 2	Model 3
Openness of trade	-.196 **	-.061	.087
	(.099)	(.105)	(.133)
Self-employment		.949	-1.710
		(2.83)	(2.647)
GDP growth		-.227 ***	-.260 ***
		(.077)	(.080)
Public consumption			-.596 *
			(.337)
Inflation			-.312 ***
			(.075)
Constant	-.151	-.213	-.022
	(.316)	(.320)	(.291)
No. Obs. (Sample)	80	80	80
R-squared	0.0479	0.1491	0.3677
Adjusted R-square	0.0357	0.1155	0.3250

Standard errors in brackets. * significant at 10%, **significant at 5%, ***significant at 1%.

7 Discussion and Implications

The aim of this section is to combine the previous research, background, theoretical frameworks and empirical evidence presented throughout the thesis in order to analyse the declining labour's share in the Swedish transport and communication sector.

Previous research within the field of labour's share have found evidence that increased effects of globalization in terms of increased markets size and competition have a negative impact on labour's share, and that welfare state generosity and powerful unions have a positive impact on labour's share. The theory of the Kuznets curve indicates that the economic inequality will convert in accordance as the economy transforms from being a classical economy into a modern industrialized economy. Sweden has gone through the large transformation from classical to modern economy. The transport and communication sector is in constant transformation and now in the phase of one of its larger transformations due to the so called Third Industrial Revolution. The sector has experienced a declining trend of the labour's share since the 1920s. The real wages have increased but not in line with the faster increasing productivity, all together generating declining labour's share. The labour's share within the total Swedish economy has also experienced a decline, though, not as sharp as in the transport and communication sector. So why do we allow this development and why do the employees in the sector of interest tolerate the decline? The power resource approach claims the importance of unions in order to keep the strength of the labour force. Stronger unions with large amount of members will generate a higher bargaining power and better conditions of the labour force. The transport and communication sector has evolved into include mainly two unions. The division can generate a lower power of the unions since they represent different members and therefore have different interests. The bargaining power and strength of the unions is hard to measure, why the effect of unions is not controlled for in this analysis. However, previous research have indicated that the falling power of labour unions will have a negative impact on labour's share, why this argument is reasonable even in the Swedish transport and communication sector, even though it is not specifically controlled for.

The lowering of the labour's share within the total Swedish economy was an active decision in the 1980s. The profit shares of the Swedish firms had to increase in order for Sweden to maintain a competitive exporter. Since the 1980s the labour's share has continued to decline. How can the decline be explained, and can the labour's share in the Swedish transport and communication sector be explained by economic growth, openness of trade and competition?

7.1 Literature and descriptive analysis

The transport and communication sector has during the investigated period of 1920-2000 experienced large changes and moved through an enormous modernisation. The introduction of the railway and motor vehicles came to change the entire sector. Transportations became cheaper and more efficient which made it possible to reach larger markets. The growing efficiency of the automobile vehicles in the late 1920s affected the competitiveness of the older transportations like shipping and railways negatively. Communications became cheaper and more efficient with the introduction of the telecommunications, and even more so with the Third Industrial Revolution and its innovations. New ways of communication were introduced which made communications and the spread of information easier and to a lower price manly together with the breakthrough of the Internet. The introduction of new inventions came to affect and change the structure of the market. The sector has transformed from being a rather state controlled sector with public-control into a more liberalized and competitive market. The transformation began with the change of public monopoly against more liberalized state-owned companies, and has now reached a more competitive and commercial market with a higher level of self-employment.

Privatization and competition of the market will in line with the presented theory lead to declining labour's share. High share of public-controlled market or public-monopoly will tend to keep the labour's share on a high level. With privatization moves the interest of job protection into profit interest, why wages are pressed down and the labour's share will decline. The labour's share in the transport and communication sector were on a higher level compared to the labour's share of the total Swedish economy during the end of the 1910s till the 1960s. The sector has during this period experiencing a market of low competition due to low rate of self-employment and high public-control of the sector with large public actors. Thus, the self-employment in the sector experiences an increase in the period of 1920-1960, but the increase has still much smaller than the total number of self-employment in Sweden, indicating that the sector is less competitive in its market structure than the rest of the economy.[3] In the late 1960s declines in the labour's share of the transport and communication sector and reaches for the first time a level below the one of the total Swedish economy. The decline of labour's share occurs in line with the increased competition and settlement of public-monopoly and public-control and the increase in the self-employment. The development is in the modest analysis in line with the stated theory of privatization and Hecksher-Ohlin that the labour's share will decrease with a higher competition (domestic and international) and increased privatization.

---

[3] See graph 2.3.a of self-employment in transport and communication sector

7.2 Econometric time series analysis

The variables of openness of trade, self-employment, growth of GDP, inflation and public consumption are all empirically tested against the labour's share of the transport and communication sector. The variables were all tested for cointegration, where the result indicates that the series are not cointegrated and are accordingly not dependent over time. The variables and their impact on labour's share are further tested by regressions out of ARDL and ARIMA models. The results of the regressions indicate that GDP growth and inflation do have a negative impact on labour's share of statistical significance. The result is in line with the stated hypothesis. Results of previous studies state that the labour's share tends to decrease with high GDP growth and increase with low GDP growth. Inflation is in line with GDP growth expected to have a negative impact on labour's share. In times of increased inflation the wages can have a hard time to adjust upwards and inflation tends to have a sticky impact on the wages making the wage earners losers in times of high inflation.

Generosity of the welfare state is in accordance to the power resource approach considered to have positive impact on income inequality, and thereby also the labour's share. Here, welfare state generosity is measured as the public consumption as share of total Swedish GDP. Public consumption is therefore expected to have a positive impact on labour's share. Thus, the result of the econometric testing presents a negative result of the public consumption. Even though the result is of statistical significance it is not trustworthy. It should be mentioned that the variable wishes to measure the welfare state generosity exemplified by public consumption. Since the testing generates a negative coefficient it can be concluded that the result is not reliable, and will therefore be overlooked and not further analysed.

The result of the empirical time series analysis present a negative statistical significant result in the simple model (model 1) where openness of trade is the only independent variable against the labour's share. When more independent variables are included in the model the variable of openness of trade stops showing significant results and the coefficient changes into becoming positive when all variables are included in the model. The problems of the variable openness of trade leads to the conclusion of that the first negative significant result is unlikely to be estimated in a correct way and the result is therefore not to be interpreted. Market competition and privatization, here measured as self-employment, is through theoretical framework expected to have negative impact on labour's share. Though, the econometric testing does not generate any statistical significant result of the variable of self-employment, not even in the sensitivity analysis were other measurements are tested. It can be argued whether this measurement really measures market competition or not. It might be that with another measurement of market competition, like the total number of companies on the market or the turnover, size and influence of the companies, the result of the measurement would have been significant. The variable of labour's share includes the labour compensation of self-employed. The variable has not been tested without the compensation of self-employed. It could be argued that the variable of self-employment can be misleading since the labour's share does include compensation of the self-employed, and that the result therefore would be different if the compensation to self-employed

were to be excluded and instead calculated under the capital share. Thus, this is not to be believed to cause problems since the share of self-employed is rather low in the sector.

The variables do not indicate to be correlated to one another and the model does not suffer from autocorrelation. Since the ARDL and ARIMA models had to be estimated on first differenced data in order to become stationary the long-run relationship between the variables cannot be analyses. The presented results are only the relationship between the year-on-year bases. The long-run relationship was aimed to be analysed by the usage of cointegration modelling. Thus, the series present no cointegration relation indicating that the series are not moving together over time. The result of missing cointegration and the results of the first differenced model makes it impossible to analyse the long-run relationship among the variables why we do not know for sure how the variables move and affect each other in the long-run.

Finally, it can be argued that the contribution of the transport and communication sector to the total Swedish economy is rather small, and much smaller than the previously (Bengtsson, 2013a) investigated sector of manufacturing. This can lead to misleading results, such as the non-significant results of the variables of openness of trade and self-employment or the negative relation between public consumption and labour's share.

We live in a globalized world with large impact from other countries and markets where we need to be flexible. The markets need to have quick adjustments to new innovations and structures in order to keep the strength and to be competitive. The transport and communication sector is a sector within large changes due to new innovations and structures such as the Internet, but also in terms of new market structures. The changes and the increased opportunities and new ways of fast communication make the market move faster and experience higher competition. The settlement of public-control of the sector and the movement towards a more competitive and privatized market have and will continue to affect the labour's share. The descriptive situation indicates that the labour's share has been falling in line with the increased competition and settlement of public-monopoly and state-control of the sector. Sweden is considered a capital abundant country and has thereby comparative advantages in the production of capital abundant goods. This will generate a vulnerable position of workers compared to capital, where the wages will be kept on a low level. The variables of openness of trade and self-employment do not generate statistical significant results in the econometric time series analysis. However, the variable of GDP growth does generate a significant negative result. Sweden is a small and open economy with high dependence of a rich export market since export will generate economic growth. A high level and dependence of export does also imply increased openness of trade. The negative relation between GDP growth and labour's share of the transport and communication sector might, in a certain sense, be interpreted as a negative relation between increased openness of trade, competition and labour's share of the transport and communication sector. Maybe, we need to keep the labour's share of the transport and communication sector on a lower level in order to maintain a strong and competitive market were new ways of transportation and communication can grow.

7.3   Limitations of the study and further research

Even though this study has been carefully created and developed it has some shortcomings. The study has been limited to analyse the specific time period of 1920-2000 in the specific sector of transport and communications. The development in this sector is rather specific, which makes the results hard or even impossible to generalize over other sectors, or even alike sectors within different regions. Thus, this was never the aim of the analysis. The sector of transport and communication has a rather small economic contribution to the total economy, why it can be argued that the result might be misleading. This could have been remedied by examining more sectors of the economy and compare the results to one another. Further, the chosen time period of the analysis can be discussed. The investigation starts after the large structural break of the labour's share in the late 1910s. Even if the structural break is avoided there could be some lagging problems. The transport and communication sector is currently in the phase of transformation due to technological changes. The analysis ends in the year of 2000 due to the availability of data. With more time and resources it would have been of interest to collect and process data in the period after year 2000 in order to fully see the effects of the changes due to the fast moving technology. With this in mind it can be argued that the analysis might have presented different results of another investigated time period.

Due to time restrictions and limited resources has the investigated variables been limited to already collected data. The generated study could be improved by collecting more data and include more variables of possible influences. The two main parts of factor shares are the labour's share and the capital share. This thesis have not further analysed the capital share or the possible impact this may have on the falling labour's share. Since arguments have been put forward to keep the labour's share down in order to generate higher profits, the capital share would be of interest of the analysis. Neither has the bargaining power and strength of unions been econometrically analysed within the thesis. In line with the power resource approach it is believable that unions do have an (positive) impact on the labour's share of the transport and communication sector, why it would be of importance to analyse the effects of unions further. Also barriers to enter the market may have a possible impact on the labour's share and would therefore be of interest to analyse further.

8   Conclusion

Factor prices and the relation between wages and productivity are of importance in order to analyse the distribution between capital and labour. Most OECD countries, including Sweden, have experienced a declining trend in the labour's share the past decades. The Swedish economy has transformed from being a classical agrarian economy into becoming a modern economy, where transports and communications have had an important part. The introduction of the railways, automobiles and the telecommunications changed the total sector. The sector is under constant transformation and has developed from being a sector of large public-control into becoming more privatized and liberalized in its market structure. The real wages have increased, but not in line with the faster increasing productivity, generating a declining trend in the labour's share. The labour's share within the total Swedish economy has also experienced a decline, though, not as sharp as in the transport and communications sector. During the period of 1920s to the 1960s was the labour's share in the transport and communication sector on a higher level compared to the labour's share of the total Swedish economy. This is a period of lower market competition in the sector, due to low self-employment and high state-control. The self-employment in the sector experienced a rather stable and sharp increase in the period of 1920-1960, thus, still smaller than the total number in Sweden. The period after the 1960s the labour's share of the transport and communication sector declined, and fell to a level below the labour's share of the total Swedish economy for the first time.

This thesis aimed to investigate the development of the labour's share in the Swedish transport and communication sector with regard to the impact of openness of trade, self-employment, GDP growth, inflation and welfare state generosity. Two research questions were presented;
How did the labour's share in the Swedish transport and communication sector develop during the time period of 1920-2000? Can the labour's share in the Swedish transport and communication sector be explained by economic growth, openness of trade and competition?
The hypothesis of the analysis was that there were to be a negative relation between the labour's shares in the transport and communication sector and the openness of trade, increased competition, inflation and GDP growth. Welfare state generosity was expected to have a positive impact on the labour's share.

The econometric analysis was conducted with the model where labour's share in the transport and communication sector was estimated as the dependent variable and all other presented variables were estimated as independent variables. The analysis estimated if the variables were dependent of each other over time through testing for cointegration. Thus, no cointegration relationship was found. Instead, the model was estimated through regression by OLS and maximum likelihood by the usage of ARDL and ARIMA-models. All series indicated to be integrated of order one why the models needed to be tested on first differenced data, meaning that the presented results only could be interpreted on a year-on-year basis and that the long-run

relationship between the variables were not to be analysed. The econometric time series analysis generated negative significant results of GDP growth and inflation in line with the stated hypothesis. This means that the labour's share were to be negatively affected and to decrease in times of high GDP growth and inflation. The variable of public consumption generated a negative result of significance. Thus, a negative result of welfare generosity is non-trustworthy and were therefore not further analysed. The variables of openness of trade and self-employment did not generate significant results and were therefore not possible to interpret. The presented descriptive analysis indicates that the decline of the labour's share of the sector is in line with the increase in the self-employment and the settlement of the public-owned companies. This is in line with the presented theory that the labour's share will decrease with a higher market competition. Thus, Sweden is considered a capital abundant open economy with high dependency of exports. The negative relation between labour's share and GDP growth in relation to the historical development might therefore be interpreted as that the labour's share has been negatively affected by increased export (openness of trade) and settlement of state-control of the sector. Sweden has experienced an increased globalization which partly can explain the declining trend in the labour's share of the transport and communication sector.

References

Andersson-Skog, Lena. 1998. "Political Economy and Institutional Diffusion: The Case of Swedish Railways and Telecommunications up to 1950". In Lena Andersson-Skog and Olle Krantz, *Institutions in the Transport and Communications Industries: State and Private Actors in the Making of Institutional Patterns, 1850-1990.* Massachusetts, USA: Science History Publications, pp. 245-266.

Andersson-Skog, Lena - Krantz, Olle. 1998. "Preface". In Lena Andersson-Skog and Olle Krantz, *Institutions in the Transport and Communications Industries: State and Private Actors in the Making of Institutional Patterns, 1850-1990.* Massachusetts, USA: Science History Publications, pp. xv-xix.

Andersson-Skog, Lena - Krantz, Olle. 1998. "Transport Institutions Used as Politics: The Swedish Case". In Lena Andersson-Skog and Olle Krantz, *Institutions in the Transport and Communications Industries: State and Private Actors in the Making of Institutional Patterns, 1850-1990.* Massachusetts, USA: Science History Publications, pp. 217-221.

Asteriou, Dimitros - Stephen G. Hall, 2011. *Applied Econometrics*, Palgrave, McMillan, 2nd edition.

Atkinson, Anthony B. 2009. "Faktor Shares: The Principal Problem of Political Economy?", *Oxford Review of Economic Policy 25 (1): 3-16.*

Atkinson, Anthony B. – Piketty, Thomas – Saez, Emmanuel. 2011. "Top Incomes in the Long Run of History". *Journal of Economic Literature* 49 (1): 3-71.

Azmat, Ghazala - Manning, Alan - Van Reenen, John. 2011. "Privatization and the Decline of Labour's Share: Intenational Evidence from Network Industries". *Economica* (2012) 79, 470-492.

Bengtsson, Erik. 2012. "Labor's Share in Sweden, 1850-2000". *Institutionen för ekonomisk historia*, Göteborgs universitet, 1-33.

Bengtsson, Erik. 2013a. *Essays on trade unions and the functional income distribution.* Gothenburg Studies in Economic History 9.

Bengtsson, Erik. 2013b. *Den sänkta löneandelen: Orsaker, konsekvenser och handlingsalternativ.* 1st edt. Stockholm: Premiss Förlag.
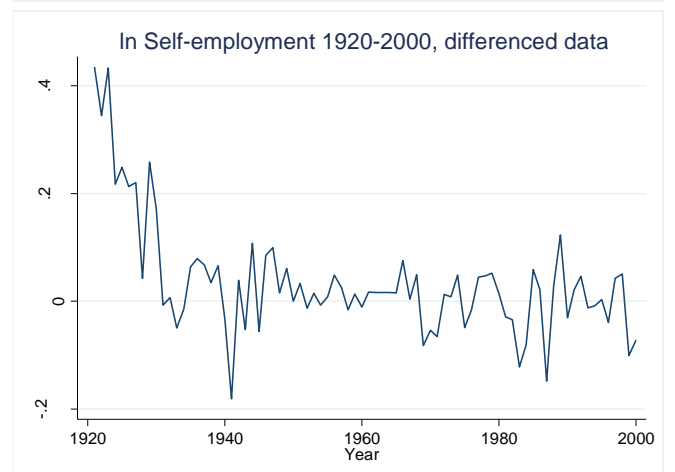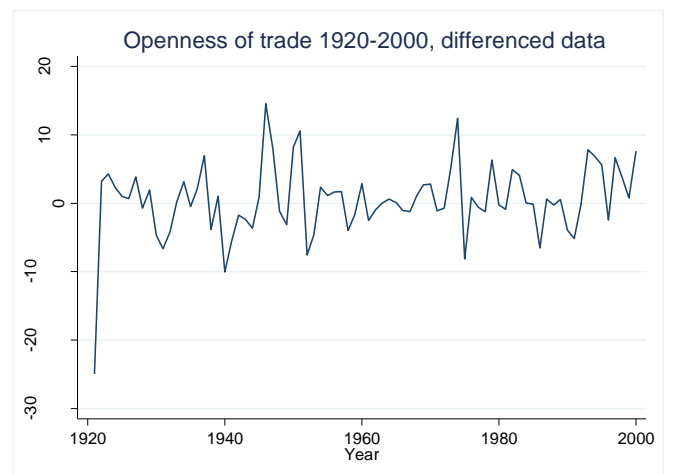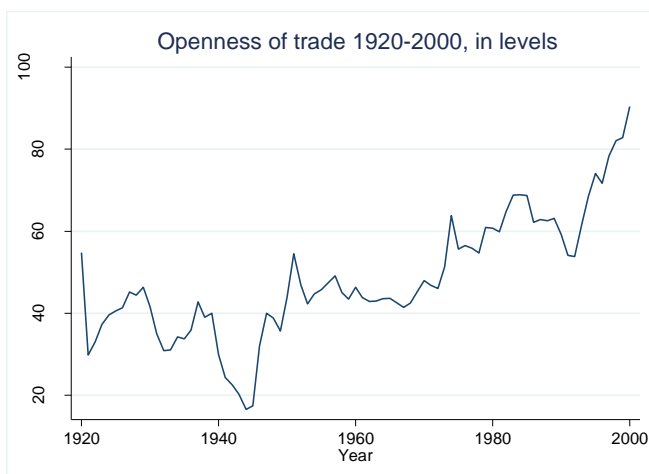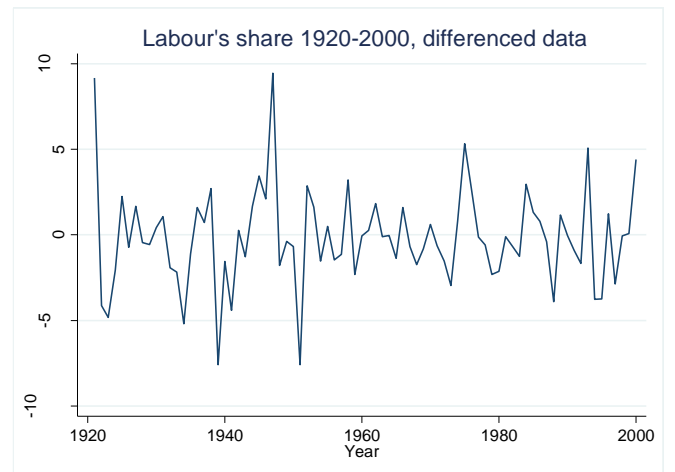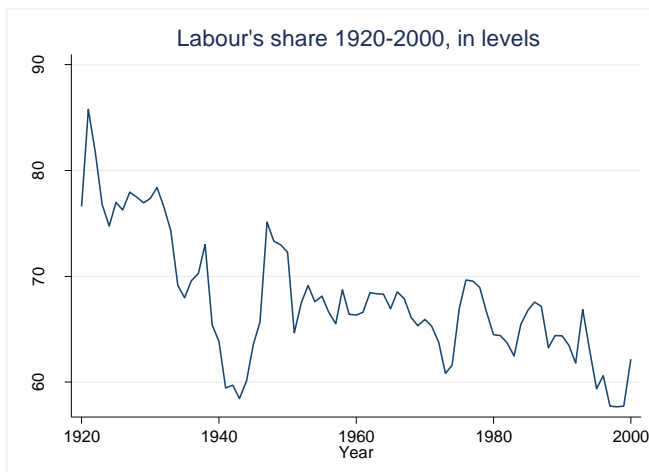
Bentolia, Samuel - Saint-Paul, Gilles. 2003. "Explaining movements in the Labour Share". *Contributions to Macroeconomics*, 3 (1). Article 9.

Björklund, Anders - Edin, Per-Anders - Holmlund, Bertil - Wadensjö, Eskil - Åslund, Olof. 1996. *Arbetsmarknaden*. 3rd edition. Tallinna Raamatutrukikoda, Estland: SNS, printed 2006.

Bond, Eric W. - Iwasa, Kazumichi - Nishimura, Kazuo. 2012. "The Dynamic Hecksher-Ohlin model: A diagrammatic analysis". *International Journal of Economic Theory,* 8 p: 197–211.

Dickey, D. A. - Fuller, W. A. 1981. "Likelihood Ratio Statistics for Autoregressive Time Series with a Unit Root". *Econometrica*, (4):1057.

Edvinsson, Rodney. 2005. *Growth, "*Accumulation, Crisis. WithNew Macroeconomic Data for Sweden 1800-2000". Department of Economic History, Stockholm University. Stockholm: Acta Universitatis Stockholmiensis.
Database: Web page. [Electronic] 2013-05-04. "*historia.se – portalen för historisk statistic – historia i siffror".* Avaliable: http://historia.se/.

Edvinsson, Rodney. 2010. "A Tendency for the Rate of Profit to Fall? From Primitive to Flexible Accumulation in Sweden 1800-2005". *Review of Radical Political Economics,* 4.

Feldstein, Martin. 2008. "Did wages reflect growth in productivity?" *Journal of Plicy Modeling* 30.pp. 591-594.

Fichtenbaum, Rudy. 2009. "The Impact of Unions on Labour's Share of Income: A Time-Series Analysis". *Review of Political Economy*. 21 (4),pp. 567-588. October 2009.

Fichtenbaum, Rudy. 2011. "Do Unions Affect Labour's Share of Income: Evidence Using Panel Data". *American Journal of Economics and Sociology*. 70 (3). July 2011.

Glyn, Andrew. 2009. "Functional Distribution and Inequality". In Salverda, Wiemer – Nolan, Brian – Smeeding, Timothy M., The Oxford *Handbook of Economic Inequality*. Oxford: Oxford University Press, pp.101-126.

Granqusit, Lena - Regnér, Håkan. 2008. "Decentralized Wage Formation in Sweden". *British Journal of Industrial Relations* (3).
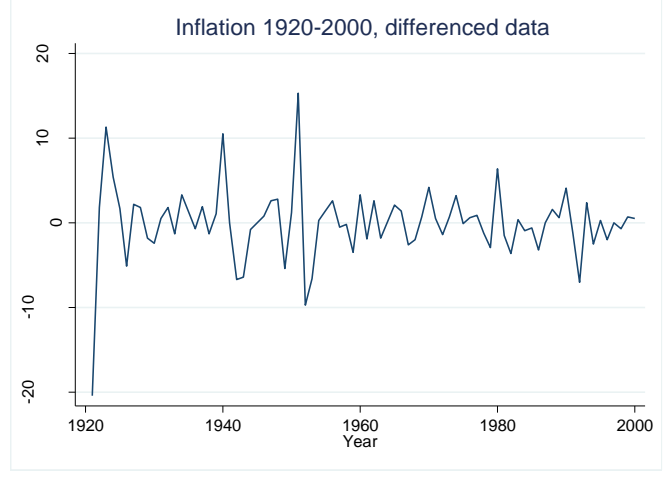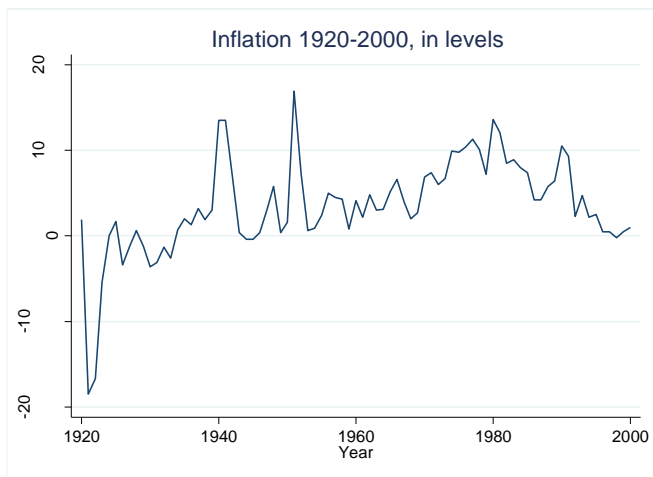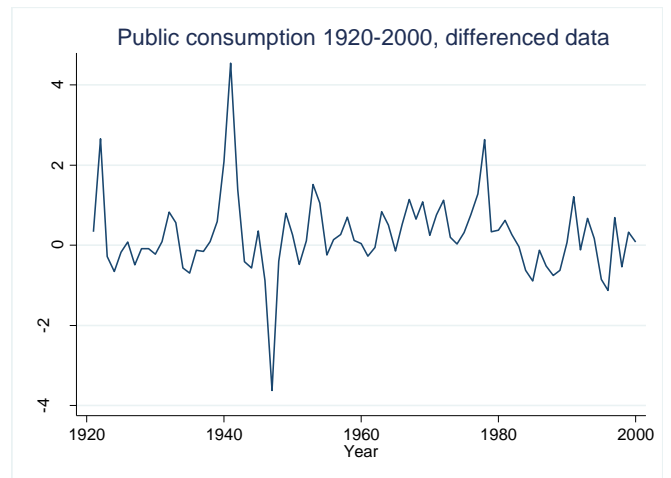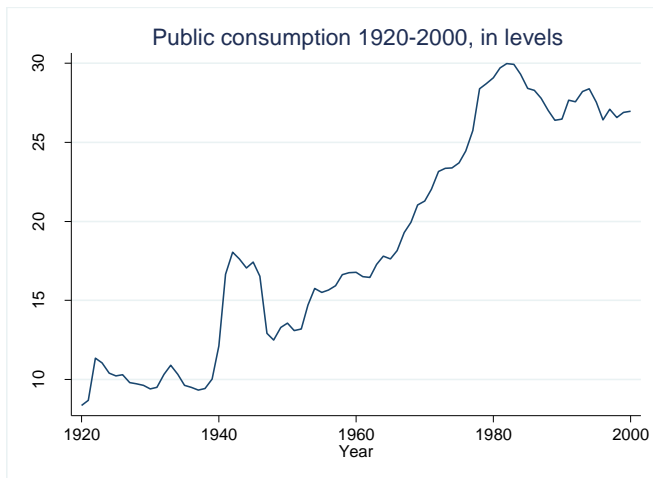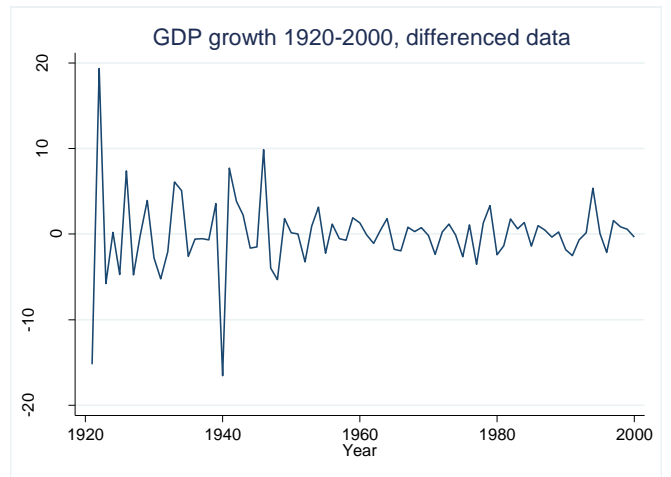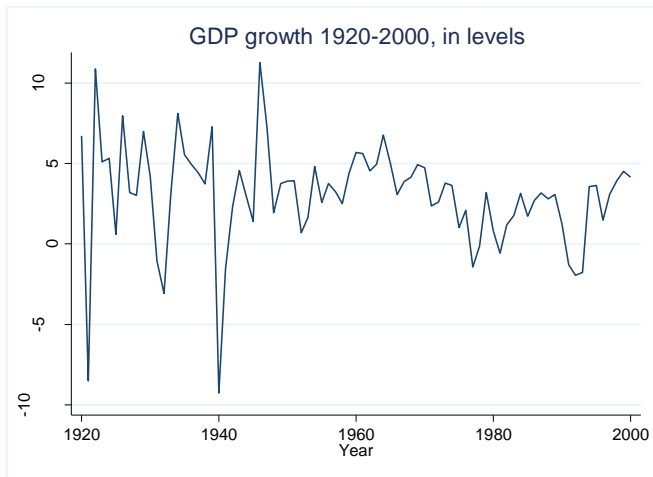
Harvard University Press, 2014. Web page. [Electronic] 2014. "Capital in the Twenty-First Century, About the book". Available: http://www.hup.harvard.edu/catalog.php?isbn=9780674430006. Collect date: [2014-05-19].

Jungenfelt, Karl. 1966. *Löneandelen och den ekonomiska utvecklingen: En empirisk-teoretisk studie.* Uppsala.

Kaijser, Arne. 1998. "The Helping Hand: In Search of a Swedish Institutional Regime for Infrastructural Systems". In Lena Andersson-Skog and Olle Krantz, *Institutions in the Transport and Communications Industries: State and Private Actors in the Making of Institutional Patterns, 1850-1990.* Massachusetts, USA: Science History Publications, pp. 223-244.

Krantz, Olle. 1987. *Utrikeshandel, ekonomisk tillväxr och strukturförändringen efter 1850.* 1st edit. Malmö: Liber.

Krantz, Olle. 2000. "The Transport and Communications Sector in Economic Development: Views from the historical national accounts". *Scandinavian Economic History Review*, 48 (2).

Kuznets, Simon. 1955. "Economic Growth and Income Inequality". *The American Economic Review* 45(1):1-28.

Lundh, Christer. 2002. *Spelets regler, Institutioner och lönebildning på den svenska arbetsmarknaden 1850-2012.* 2nd edit. Stockholm: SNS Förlag.

Lindert, Peter. "The Rise of Social Spending, 1880-1930". *Explorations in Economic History* 31: 1-37.

Morel, Louis. 2005. "A Sectoral Analysis of Labour's Share of Income in Canada". *Research Department, Bank of Canada.* November.

Ortega, Daniel - Rodriguez, Francisco. 2002. "Openness and Factor Shares", *Office of Economic and Financial Advisors (OAEF)*, National Assembly, Venezuela, October 2002.

Pontusson, Jonas - Rueda, David - Way, R. Christopher. 2002. "Comparative Political Economy of Wage Distribution: The Role of Partisanship and Labour Market Institutions". *British Journal of Political Science*, 32, pp 281-308.

Roine, Jesper – Waldenström. Daniel. 2008. "The Evolution of Top Incomes in an Egalitarian Society: Sweden, 1903-2004". *Journal of Public Economics* 92: 366-387.

Roine, Jesper – Waldenström, Daniel. 2012. "On the Role of Capital Gains in Swedish Income Inequality". *Review of Income and Wealth* 58(3):569-587.

Schön, Lennart. 2001. *En modern svensk ekonomisk historia: Tillväxt och omvandling under två sekel.* Stockholm: SNS.

Schön, Lennart. 2004. "The Wage Share, Cycles and the Kuznets Curve of Income Distribution". In Lundh, Christer – Olofsson, Jonas – Schön, Lennart – Svensson, Lars (eds.). *Wage Formation, Labour Market Institutions and Economic Transformation in Sweden 1860-2000.* Lund Studies in Economic History, 52.

Schön, Lennart. 2008. "Technological Waves and Economic Growth - Sweden in an International Perspective 1850-2005". Paper presented at the seminar The Economic Structure and Performance of Nations, Groningen 21-22 February 2008.

SEKO, 2014. Web page. [Electronic] 2014. "Om oss". Avaliable: http://www.seko.se/Om-SEKO/. Collect date: [2014-05-14].

Sims, C. A. 1980." Macroeconomics and Reality". *Econometrica*, 48 (1):1-48.

Statistics Sweden, Statistiska centralbyrån (SCB), 2014. Web page. [Electronic] 2014-01-14. "Inflation i Sverige 1831-2013". Avaliable: http://www.scb.se/sv_/Hitta-statistik/Statistik-efter-amne/Priser-och-konsumtion/Konsumentprisindex/Konsumentprisindex-KPI/33772/33779/Konsumentprisindex-KPI/33831/Collect date: [2014-05-07].

Transportarbetarförbundet, 2011. Web page. [Electronic] 2011-12-15. "Det här är Svenska Transportarbetareförbundet". Avaliable: http://www.transport.se/Om-Transportarbetareforbundet/. Collect date: [2014-05-14].

Western, Bruce - Healy, Kieran. 1998. "Explaining the OECD Wage Slowdown: Recession or Labour Decline?" Princeton University.

Appendices

Appendix 1

GDP growth 1920-2000, in levels

GDP growth 1920-2000, differenced data

Public consumption 1920-2000, in levels

Public consumption 1920-2000, differenced data

Inflation 1920-2000, in levels

Inflation 1920-2000, differenced data

Note: All series are measured in shares, with exception of self-employment which is measured in real numbers.
Source: All diagrams: author's processing of data in Edvinsson (2005).

46

Appendix 2

Pearson's correlation test						
	d_Labour's share	d_Openness of trade	d_lnSelf-employed	d_GDP growth	d_Public consumption	d_Inflation
d_Labour's share	1.0000					
d_Openness of trade	-0.2708	1.0000				
d_lnSelf-employed	0.0714	-0.0909	1.0000			
d_GDP growth	-0.3792	0.4738	-0.0874	1.0000		
d_Public consumption	-0.2759	-0.2806	-0.1579	0.2217	1.0000	
d_Infation	-0.3890	0.4960	-0.0869	-0.0309	-0.0951	1.0000