Decomposing the Dutch Productivity-Wage Gap

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Executive Summary

In recent years, many Dutch workers have experienced a stagnation of wages. In particular, imbalance between labour productivity and labour compensation growth has resulted in a divergence of the two terms, often referred to as the productivity-wage gap. The productivity-wage gap is defined here as real gross labour productivity growth minus real average wage growth. The gap relates to the distribution of income between factors of production, which is one of the classical problems of political economy. The productivity-wage gap can be viewed as a policy challenge in both moral and economic terms. The divergence between productivity and wages implies that the potential for a broad-based increase of living standards for workers, enabled by growing labour productivity, has not been fully utilized, but instead, capital income has expanded disproportionately to labour income. Currently, dissatisfaction with the growth of labour compensation is building up and expressed increasingly. The resulting social instability has made inclusive growth a topical 'grand challenge' for governments around the world (IMF, 2017; OECD, 2017; OECD, 2018). The resentment among middle- and lower-class workers is argued to have given rise to populist leaders in both the US and parts of Europe (Tooze, 2018). The growing socio-economic divide may harm societies, undermining social cohesion and resulting in foregone opportunities for many. It also weakens the social trust in institutions, which fuels political and social instability (OECD, 2017). In addition, the growing divergence poses a threat to sustainable economic growth. In general, stagnating labour compensation limits the growth of consumption, resulting in a shortfall of demand, which could hamper future growth and aggravate financial instability through increased debt financed spending. Therefore, the rising productivity-wage gap represents both a social-political challenge and an economic grand challenge.

This thesis provides a macroeconomic and sectoral perspective on the co-movement of productivity growth and wage growth throughout time. It aims to inform policy makers on the current stagnation of wages, on the productivity-wage gap in more detail, and how this fits in the long-term developments of productivity and wage growth.

An extensive overview of the development of labour productivity and wages in recent Dutch social-economic history, indicates that four separate time periods can be distinguished. Broad political and economic events demarcate these four periods, having an impact on the development of the productivity-wage gap. The period 1969-1982 is characterized by high wage growth and a rapid increase of the labour share in national income. Workers enjoy a strong bargaining position. The government takes on an expansionary (Keynesian) approach towards fiscal and monetary policies. At the end of this period, the economy is confronted with stagflation, which puts pressure on profits and wages. In this period, the productivity-wage gap declined slowly, at an average annual rate of 0.04%. In 1982, labour unions, employers and the Dutch government agree on a policy of wage moderation (Wassenaar Akkoord, 1982) with the aim to counter stagflation and instigate economic growth. In 1982, labour productivity recovers while wage growth remains limited due to the agreed moderation of wage claims. However, around 1990, wage growth accelerates and quickly catches up with the growth of productivity. Over the period 1982-1993, the productivity-wage gap grew with 0.26% per year. In 1993, policy makers respond by implementing a new wage moderation policy, "Een nieuwe koers". This policy demarcated the beginning of the third period 1993-2007, characterized by a rapid increase of the productivity-wage gap (2.02% per year), which lasted until the outbreak of the financial crisis. This period is characterized by significant political and economic changes. The introduction of the Euro narrowed the margins of fiscal and monetary policy, which made labour costs the most effective method for enhancing international economic competitiveness. Increased focus on unit labour costs compared to other economies reduced Dutch value added inflation relative to CPI inflation

resulting in a terms of trade loss for workers. Meanwhile, increased competition in capital markets possibly induced firms to peruse a shareholder value perspective, which has tilted the distribution of value added in favour of capital. Increased financialization empowered shareholders and rentiers to receive a larger share of corporate profits in the form of interest and dividend payments, which put additional pressure on wages. Also, increasing capital mobility versus less mobile labour has resulted in a stronger position of the corporate sector vis-á-vis labour stakeholders, due to the ability of the former to exploit arbitrage opportunities generated by differences between regulatory regimes on the basis of their impact on labour costs. These developments resulted in a rapid increase of the productivity-wage gap. Over the fourth period that we distinguish, 2007-2016, both labour productivity growth and wage growth remained rather limited. Still, the productivity-wage gap grew by an annual average rate of 0.76%.

Next, we provide a sectoral perspective, identifying substantial differences between production sectors regarding the divergence of labour productivity and wages. Still, most of the Dutch economy's sectors follow the macroeconomic trends sketched above. That is, up to 1993, wage and productivity increased more or less in tandem across sectors, while thereafter a substantial divergence set in. Sectoral differences in the productivity-wage gap are mainly driven by diverging rates of labour productivity growth, while differences in wage growth rates are less sizeable. Over the period 1969-2016, sectoral real wage growth ranges between 0.65% and 2.04%, while gross labour productivity growth ranges between -0.17% and 3.39%.

In general, across sectors, higher labour productivity growth is associated with higher wage growth. One could observe two groups, the innovative/high productive sectors (Manufacturing, Trade & Transport, Information & Communication, Financial services) and the low productive sectors (Construction, Business services, Culture & Recreation). In the high productive group, labour productivity grows steadily which enables the growth of wages. However, since 1993, the rate of wage growth is structurally below the growth rate of labour productivity, resulting in a divergence of the two terms. Wage growth is possibly suppressed by earlier mentioned factors such as offshoring, negative policy competition, competition on unit labour costs, automation and financialization. In the low productive group, labour productivity has stagnated, which limits the possibilities for growth of compensation for both capital and labour. As a result, the growth of wages has been fairly low compared those in the more productive sectors. However, the productivity-wage gap has remained fairly stable because labour productivity has been low too. These findings suggest that, in the more productive sectors, the opportunity for wage growth has not been fully utilized and gains in productivity have not been shared proportionately between capital and labour. Meanwhile, in the less productive sectors, productivity growth has been very low, limiting the growth of wages.

The findings presented above, suggest that, for most sectors, the co-movement of productivity growth and wage growth has deteriorated since 1993. We investigate this divergence in an empirical analysis for the period 1972-2016, using a distributed lag model with real average wage growth as dependant variable. The independent variables are real gross labour productivity growth and the change in the minimum wage level. The estimated regression coefficient for productivity growth differs among sectors and ranges between 0.32 and 0.67. The regression coefficient for minimum wage growth also differs among sectors and ranges between 0.46 and 0.83. The higher coefficient for wage growth with minimum wage growth, compared to productivity growth, raises questions about what is the most effective way to raise wages. Van Tilburg & Suyker (2018) advocated for stimulating productivity growth with the aim to stimulate wage growth. However, the findings of this thesis are more in line with Bivens & Mishel (2015), who argue that minimum wage growth is an important policy tool to secure broad based sharing of productivity gains among workers.

The econometric analysis presented in this thesis confirms that the statistical association between productivity growth and wage growth has deteriorated since 1993, resulting in a productivity-wage gap. On an aggregate level, the potential for broad-based increases of living standards, enabled by productivity growth, has not been fully utilized since 1993. Instead, gains in value added have been shared disproportionately between capital and labour. The underlying sectoral differences can be categorized in two groups. Firstly, the high productivity sectors that display above average productivity growth (manufacturing, trade & transport, information & communication and financial services). In these sectors, room for wage increase has not been utilized fully, resulting in a productivity-wage gap. Secondly, the low productivity sectors that display a stagnation or decline of productivity growth (business services, culture & recreation and construction). These sectors offer little room for wage increase. Stagnation of both wage and productivity has resulted in a stable productivity-wage gap.

These findings have several policy implication. The deteriorated association between productivity growth and wage growth on an aggregate level stresses the importance of social institutions that secure a proportionate growth of wages in relation to increasing productivity of workers. The rapid growth of the productivity-wage gap in recent years indicates that in the current situation labour is not able to receive a proportionate share in value added gains. Within the new European political and economic context, the Dutch government needs new ways to stimulate a proportionate sharing of value added gains between capital and labour.

Content

1. Introduction

One of the classical problems of political economy has been to understand the distribution of income between factors of production. At the core of the income distribution is the relation between labour compensation and labour productivity. Labour productivity growth provides the basis for rising living standards as it enables the growth of real labour compensation. When the two grow in tandem, workers benefit fully from their increased productivity, resulting in a constant labour income share in the long run. However, in the past decades, the labour income share has been on a downward trend in many advanced economies (Pasimeni, 2018; Karabarbounis & Neiman, 2014). This development indicates that labour productivity growth has outpaced labour compensation growth and as a result, the distribution of national income has shifted to the benefit of capital (IMF, 2017; Fleck, Glaser, & Sprague, 2011). The growth imbalance between labour productivity and labour compensation has resulted in the divergence of the two terms, often referred to as the productivity-wage gap.

The growing productivity-wage gap results in a societal challenge in both moral and economic terms. The divergence between productivity and wage implies that the potential for a broad-based increase of living standards, enabled by increased labour productivity, has not been utilized, but instead, economic growth has disproportionately benefitted the owners of capital, who make up a small percentage of the population. In the past decades, capital income has grown significantly faster than labour income in most advanced economies (Piketty & Saez, 2013). As a result, wealth accumulates around the owners of capital (Pozsar, 2011). The productivity-wage gap can be interpreted as an indicator for income inequality. In addition, the growing divergence poses a threat to sustainable growth. In general, stagnating labour compensation limits the growth of consumption resulting in a shortfall of demand which could hamper future growth (Storm, 2017). In the Netherlands, household have maintained their level of consumption by deploying their financial reserves or by debt-financed spending (Eggelte, Jansen, Schotten, & Dicou, 2014). A number of economists have argued that rising income inequality spur household debt and thereby directly contributes to increasing fragility of the financial system (Betrand & Morse, 2013; Kumhof & Ranciere, 2010; Piketty & Saez, 2013). The rising productivity-wage gap also results in a political challenge. Dissatisfaction with the current growth of labour compensation is building up and expressed increasingly. The resulting social instability has made inclusive growth a topical grand challenge for governments around the world (IMF, 2017; OECD, 2017; OECD, 2018). The resentment among middle- and lower-class workers has already given rise to populist leaders in both the US and parts of Europe (Tooze, 2018). The growing socio-economic divide harms societies as it undermines social cohesion and results in lost opportunities for many. It weakens the social trust in institutions and fuels political and social instability (OECD, 2017). In Europe, the growing perception of injustice and distrust is tangible. Also in the Netherlands, known for its efforts to fight inequality, this is a topical issue. There is an important role for public policies to support a broader sharing of the benefits of productivity gains in the economy. Dutch wage setting institutions emphasize the importance for proportionate wage growth, but in recent years, public policies have been less effective as before (Hemerijck & Vail, 2004).

There is an ongoing discussion on the cause of the growing productivity-wage gap. Bivens & Mishel (2015) argue, based on US data, that labour productivity growth is no longer translating into real wage growth. From this "delinkage" perspective, the pace of productivity growth is no longer the main factor in determining the growth of wages. They argue that the weakened bargaining position of labour and social institutions is at the core of this divergence. In response, Stansbury & Summers (2017) employ linear regression methods on US data to analyse to what extent this argument holds true. They find that in the US, the strength of the positive association between productivity and wage growth varies over time. Nevertheless, productivity remains the main driver for the growth of wages. Under this

"linkage" view, productivity growth does translate into pay, but a variety of other factors have been putting downward pressure on workers' compensation even as productivity growth has been acting to lift it (Stansbury & Summers, 2017). Often discussed developments that are argued to give rise to the productivity-wage gap are automation, globalisation and financialization. The divergence between productivity and wages, though less profound, is also visible in European countries (Schwellnus, Kappeler & Pionnier, 2017; Sharpe & Uguccioni, 2017). Labour has become more productive, but since the mid-1980s this has not been matched by broad based real wage growth. The discussion on the growing divergence between productivity and wage is highly sensitive to the different perspectives with which stakeholders approach the wage bargaining process.

This thesis provides an extensive analysis of the Dutch productivity-wage gap throughout time and over sectors. In sights presented in this analysis, support policy makers in future decision making on wage policies. This thesis proceeds as follows. Chapter 2 discusses the academic literature on the causes for the growing productivity-wage gap. Developments that are often presented as the foundation of the divergence are globalisation, financialization, robotization and institutional/political changes. Chapter 3 presents the analytical framework used in this thesis to decompose the productivity-wage gap. In addition, it provides an overview of the definitions used in this analysis. The gap between real average wage growth and real gross labour productivity growth is composed by three components, (1) gross labour share, (2) labour terms of trade and (3) real social contributions by employers. Chapter 4 discusses the development of the Dutch productivity-wage gap through the framework established in chapter 3. The data analysis is substantiated with an overview of political and macroeconomic events that have possibly shaped the movement of both productivity and wage. This results in four time periods demarcated by three structurally significant events, 'Het Wassenaar Akkoord' (1982), 'Een Nieuwe Koers' (1993) and the Financial Crisis (2007). In chapter 5, the productivity-wage gap is analyzed in more detail through a sectoral perspective. Sector specific developments make up a large part of the divergence between productivity and wage. Chapter 6, examines the co-movement of productivity and wage with the aim to identify to what extend productivity growth is associated with real average wage growth and how this association has changed over time. This is done for the Dutch economy in general as well as specific sectors. Chapter 7 presents an overview of the findings of the analysis and discusses several policy implications that can be derived. This chapter also includes several more speculative discussions with the aim to stir a political debate.

This thesis finds that, in the Netherlands, the great divergence between productivity and wage started around 1993. From 1994 onwards, wage growth stagnated in most sectors while productivity grew steadily, though at a low rate compared to post-WWII standards. This coincides with the wage moderation policy 'Een Nieuwe Koers' (1993) which was closely related to the unification of Europe and the deregulation of capital markets. The growth of the productivity-wage gap grew rapidly, especially in the sectors manufacturing and transport, trade & hospitality where it had already set in during the early 80s but accelerated in the early 90s. The information & communication sector saw a rapid divergence between wage an productivity in the period 1997-2003. The financial sector is characterized by a very accurate co-movement of both growth rate. However, this changed after the crisis of 2007 after which wage growth stagnated. The construction sector witnessed a fast decline of the productivity-wage gap, mainly due to high value added inflation, resulting in a gain of the labour terms of trade. The strong positive association between productivity growth and wage growth deteriorated after 1993.
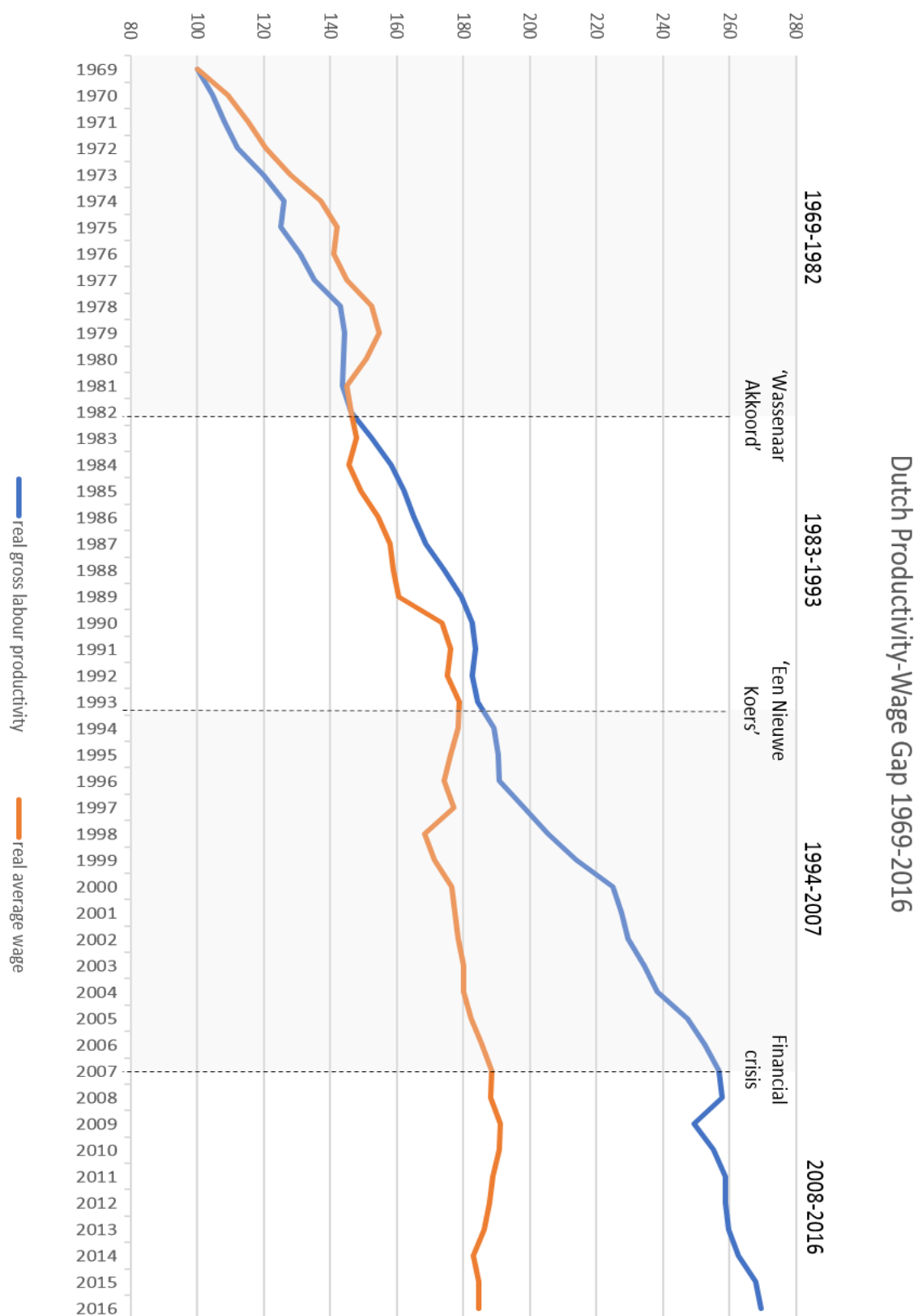
Figure 1. Development of the aggregate Dutch productivity-wage gap over the period 1969-2016 (excluding non-market sectors, primary sectors and real estate sector). Period demarcation is based on macroeconomic developments that had a significant impact on the Dutch productivity-wage gap Real gross labour productivity is calculated as value added over hours worked and is corrected for GDP inflation. Real average wage is calculated as total labour compensation over hours worked corrected for CPI inflation. Labour compensation for self-employed is assumed to equal employees. Own illustration. Data source: CBS.

2. Introduction to the productivity-wage gap

SUMMARY *The productivity-wage gap is a term used to describe the discrepancy between the growth of labour productivity and wages. In a number of countries, the growing divergence between the two growth rates has led to a decoupling of labour productivity from wage* (OECD, 2018). *In this situation, labour productivity growth no longer translates in to broad based wage growth. As a result, the allocation of value added is increasingly benefitting capital which has led to a decline of the labour share in many countries, also in the Netherlands* (Schwellnus, Kappeler, & Pionnier, 2017; OECD, 2018; Sharpe & Uguccioni, 2017). *This chapter discusses several factors that are argued to have contributed to the stagnation of wages and the growth of the productivity-wage gap. Automation is argued to accelerate the substitution of machines for labour which in addition puts pressure on the bargaining position of labour. Globalisation has a similar effect as it allows multinational to offshore labour intensive processes to countries with weak employment protection legislation and low wages. This limits the possibility for wage claims by employees. Public policies and institution can protect workers, but in most countries, also in the Netherlands, collective wage bargaining has become more decentralized and institution such as employment protection and minimum wage have eroded. Financialization is argued to drive a wedge between productivity growth and wage growth as it induces a shareholder value orientation which results in the extraction of profits from the economy to the benefit of capital. The above discussed developments are received very differently by the different stakeholders involved in the productivity-wage nexus. It can be argued that the bargaining position of workers has deteriorated significantly.*

2.1 The balance between productivity and wage growth

The productivity-wage gap is a term used to describe the discrepancy between the growth of labour productivity and wages. It relates to the distribution of income between factors of production which is one of the classical problems of political economy. At the core of the income distribution is the relation between labour compensation and labour productivity. Labour productivity growth provides the basis for rising living standards as it enables the growth of real labour compensation. In recent years, the gap has gained growing attention because it challenges the the predominant view in macroeconomics, since Kaldor (1957), that the labor share tends to be stable over the long run. When wage growth lags behind productivity growth, the allocation of value added is increasingly benefitting capital. This has led to a decline of the labour share in many countries, also in the Netherlands (Schwellnus, Kappeler, & Pionnier, 2017; OECD, 2018; Sharpe & Uguccioni, 2017). This means that room for broad based growth of living standards has not been utilized. The theoretical argumentation for equal growth rates of wage and labour productivity is discussed in chapter 5.

The (in)balance between productivity growth and wage growth is set in a context with multiple stakeholders. A main element is the wage bargaining process between employers and employees (employees unions). This process has been studied extensively but for simplicity we assume that both stakeholders aim to maximize compensation for respectively capital and labour. Thus, labour productivity growth increases profitability and in response, employees bargain for an increase of wages. In this process, the bargaining position of both stakeholders is of great importance. Unionization, low unemployment and legal protection are elements that strengthen the bargaining position of workers and therefore allows them to attract a higher compensation. This chapter will identify several developments that have affected the bargaining position of both parties and thereby balance between productivity and wage growth. The Dutch government acts as a context setter since

it sets the legal rules in which the bargaining process takes place. Employment protection legislation, minimum wage and unemployment benefits are examples of legal institutions that enforce a balance between capital and labour compensation. However, the Dutch government is also charged with securing prosperity, economic stability and international competitiveness for its citizens, now and in the future. Therefore, it sometimes intervenes in the wage bargaining process by implementing wage moderation policies. In recent years, the European union has become more involved in the Dutch productivity-wage context. Monetary and fiscal rules have changed the context in which a balance is sought between productivity growth and wage growth.

In the Netherlands, wage growth has not kept up with labour productivity growth. As a result, the labour share has declined with five percent points in the past seven year. Many workers experience a stagnation or even a decline of their purchasing power. Recently, CPB published a policy brief that aims to decompose the slow wage growth in the Netherlands. They come to the conclusion that slow productivity growth is at the core of the sluggish wage growth (van Tilburg & Suyker, 2018). However, this conclusion glosses over the fact that, even though productivity growth was limited, the two terms diverged, implying the slow productivity growth did not materialize in wage growth (Lukkezen, 2019). This suggests that gains in productivity are no longer sufficient to boost broad based wage growth as workers fail to bargain for wage increase. This is in line with the 'delinkage' perspective proposed by Bivens & Mishel (2014). The gap has been a much debated topic in recent years and the academic literature brings forward several macroeconomic developments that have possibly strengthened the divergence.

2.2 Automation and robotization

Automation and robotization are often discussed developments in relation to the widening productivity-wage gap. There has been some concern about the employment-displacing effect of automation. Early studies predicted that persistent automation will result in the shedding of jobs, especially in the transport and logistics occupations, together with office and administrative support workers (Frey & Osborne, 2013). Also jobs in production occupations were predicted to be at risk. The educational and wage levels of a job were found to have a strong negative relationship with the probability of a job being automated. Low-skilled and low-wage workers were expected to be mostly effected by increasing automation (Frey & Osborne, 2013). Later studies temper these dramatic claims and argue that automation also creates new employment opportunities that previously did not exist (Acemoglu & Restrepo, 2016). Also, the intensity of employment displacement was disputed on the basis of factor prices. When the long-run rental rate of capital relative to the wage is sufficiently low, automation will continue to displace labour (Acemoglu & Restrepo, 2016). However, further automation is discouraged when it suppresses the cost of labour. In this case, long-run equality of factor prices will result in a balanced growth path in which robots and labour complement each other. However, the negative causal effect of the automation on labour compensation remains intact (Acemoglu & Restrepo, 2016). Later studies confirm that although automation has not been employment-displacing, it has reduced labour's share in value-added. The labour share-displacing effect of productivity growth was almost absent in the 1970s, but has become more pronounced over time (Autor & Salomons, 2018). This implies that automation has a negative effect on the ability of workers to bargain wage growth and not so much on the rate of unemployment. From this one could argue that the threat of automation, and possibly the fear of unemployment, has convinced workers to take a more moderate stand in the wage bargaining process. Declines in investment prices that result from technological progress tend to reduce the labour share (Schwellnus C. e., 2018; Karabarbounis & Neiman, 2014). Also, low interest rates reduce the cost of capital and tend to suppress the gross labour share as the share of depreciation increases (Karabarbounis & Neiman, 2014). In the Netherlands, automation has led to a polarisation in the job market (van den Berge & ter Weel, 2015).

Medium-skilled jobs that are often routine based jobs are most susceptible for automation. Meanwhile, labour demand is growing in both the high- and low-skilled sectors. Wages in the high-skilled sectors are growing while those in low-skilled sectors are under pressure, partly due to an influx of employees from medium-skilled sectors.

2.3 Globalisation and global value chains

Globalization has led to a dramatic change in international trade relations. Multinationals have increasingly distributed their activities around the globe as trade integration has led to growing competition on the labour market. Access to cheap labour markets in upcoming economies have induced many Western firms to offshore labour intensive activities. For example, the integration of the US and the much-poorer global economy was damaging for US workers (Bivens, Gould, Mishel, & Shierholz, 2014). One can argue that the possibility of offshoring has a significantly negative effect on the bargaining position of workers in high wage countries such as the Netherlands since high wage claims could induce firms to offshore production. Workers in manufacturing sectors are more prone to this threat than those in service related sectors or geographically fixed sectors such as construction. Recent OECD analysis suggests that global value chain expansion has compressed labour shares (Schwellnus C. e., 2018). This results mainly from pressure on wage growth, and not so much on growing unemployment. The pressure on wage growth leads to a growing divergence between productivity and wage. In addition, trade integration also appears to play a role in increased wage inequality. At the aggregate level, the ratio of median to average wages is negatively associated with value added imports, especially from China (De Serres & Schwellnus, 2018). In the US, increased trade integration with China has reduced labour demand more among low-skilled workers than among high-skilled workers (Autor et al., 2015; Autor et al., 2016). In the Netherlands, globalization has led to a shift in job availability between sectors (Euwals & Meijerink, 2018). The number of jobs in knowledge intensive sectors is growing while import from low-wage countries has put pressure on the number of jobs in labour intensive sectors. Despite these shifts in the Dutch labour market there is no significant impact of offshoring on unemployment (Groot, Akçomak, & de Groot, 2013). However, offshoring does lead to growing income inequality. Compensation for high-wage earners has been growing faster than the compensation for low-wage earners. For now, the progressive tax system in the Netherlands has been able to redistribute the growing income inequality so that the inequality in net disposable income has remained fairly stable.

2.4 Public policies and institutions

Public policies are crucial for ensuring that productivity gains are shared within the economy. Labour market policies that strengthen the bargaining position of workers may raise wages, especially for lower-wage workers. However, in the medium term, higher wages may induce the substation of capital for labour thereby reducing the labour share (OECD, 2018). Minimum wage legislation and active labour market policies come out negatively correlated to earnings inequality (Salverda & Checchi, 2015). In contrast to minimum wages and employment protection rules which are often set at a national level, centralized collective bargaining typically takes place at the industry level, which may allow workers to appropriate industry-specific rents with minimal impact on capital-labour substitution (Delsen & Poutsma, 2005). A downside of centralized collective bargaining is reduced flexibility in wage setting for individual firms, which may reduce long-run productivity growth (OECD, 2018). In the Netherlands, collective wage bargaining has become increasingly decentralized, leaving more room for sector, or even firm-level specifications. The introduction of market forces and more freedom of choice has greatly changed the unique Dutch social-economic order. The intentions of these institutional changes can be summarized by decentralization, individualization, flexicurity and differentiation in working conditions, hence tailor-made solutions. This Anglo-Saxonization implies an increase in flexible

working practices and less stable employment relationships (Delsen & Poutsma, 2005). Deregulation of labour market institutions has weekend the bargaining position of labour. Deregulations of the past decades mark a fundamental break with post-war developments and represent a reassertion of the power of capital over organized labour in North America and Western Europe (Peters, 2008). The growing divergence between productivity and wages can partly be attributed to the weakening bargaining position of labour. Since a considerable part of the wage costs in continental Europe are taxes and premiums, there is a direct link between macro-economic competitiveness and social protection (Delsen & Poutsma, 2005). Policies of wage cost moderation became even more effective in improving a country's competitive position after the introduction of the Euro. Countries engaged in negative policy competition in order to attract or retain foreign investment and to protect domestic jobs. Examples of measures that were assumed to be effective are competitive deregulation and flexibilization, tax cuts and privatization explaining the development. These measures resulted in a more liberalized market system. Despite the intention to deregulate and decentralize the wage bargaining process, collective labour agreements are still the main vehicle establishing the terms of employment in the Netherlands. (Delsen & Poutsma, 2005)

2.5 Financialization

In response to stagflation and the pressure on profits in the 70s, financial interests planned efforts against the postwar Keynesian compromise. This translated in a cluster of neoliberal policies that increased the power of finance in the world economy (Dumenil & Levy, 2004). As a result, the past decades are characterized by an 'unprecedented expansion of financial activities, rapid growth of financial profits, permeation of economy and society by financial relations, and domination of economic policy by the concerns of the financial sector' (Lapavistas, 2013). This phenomenon is often labelled 'financialization'. Financialization has many dimensions, including financial deregulation, securitization, shareholder value orientation, and increasing household debt (Kohler, Guschanski, & Stockhammer, 2018). The growing prominence of financial interest can be illustrated by the rise of institutional cash pools. Globalization and growing income inequality have resulted in large, centrally managed cash pools, that, enabled by financial deregulation, are moved around the globe (Pozsar, 2011). At the same time, interest rates have declined which reinforces the liquidity preference that has partly induced the growth of these cash pools. Köhler *et al.* (2015) discuss three channels through which financialization affects the distribution of income between capital and labour, (1) firms have more exit options and increasingly receive their operating surplus from financial transactions which makes it less likely for them to strike a deal with labour, (2) financialization has empowered shareholders and rentiers to extract a bigger share of corporate profits in the form of interest and dividend payments which has put pressure on wages, (3) financialization has increased competition on capital markets which has encouraged firms to pursue shareholder values as their primary goal and shifted firms priorities from growth to profitability (Köhler, Guschanski, & Stockhammer, 2015). Through these three channels, increasing capital mobility has led to the stagnation of wages and the transfer of surplus in the direction of finance (Stockhammer, 2017).

3. Analytical framework

SUMMARY *The analysis of the productivity-wage gap is highly susceptible to the use of specific statistical indicators, each one providing a slightly different perspective. This chapter identifies different methods to present the development of the divergence, and their applicability in different situations. This study uses the gross productivity-wage gap which is defined as the log change of real gross labour productivity minus the log change of the real average wage. Gross productivity is defined as total value added over total hours worked by employees and self-employed. Depreciation is included in value added even though it does not create room for wage increase because the Dutch national accounts do not provide statistics for depreciation on a sector level. Gross labour productivity is corrected for GDP inflation while average wage is corrected for CPI inflation. The difference between both deflators is defined as the labour terms of trade. The productivity-wage gap is decomposed in log change of labour terms of trade, log change of the gross labour share and the log change of social contributions made by employers. This study excludes farm and commodity sectors because these are very volatile and therefore skew national statistics. In addition, this study excludes the government and health care sector because these are non-market. The first formula gives the basic definition of the productivity-wage gap.*

Δlog Gap = Δlog Gross Labour Productivity - Δlog Average Wage

The decomposition of the productivity-wage gap leads to the following formula which states that the difference between the log change of gross labour productivity and average wage is equal to the log change of social contributions minus the log change of the labour share minus the log change of the labour terms of trade.

Δlog Gap = Δlog Social Contributions - Δlog Labour Share - Δlog Labour Terms of Trade

3.1 Empirical approach to the productivity-wage gap

Initially, the productivity-wage gap consists of two main terms, one is labour productivity growth and the other is an indicator for wage growth. This study uses average wage growth[1]. When studying development over time one has to translate the nominal values to real values. The composition of the productivity-wage gap begins with the following identity:

$$\left(\frac{Y_l}{P_c * L}\right) = \left(\frac{Y}{P_y * L}\right) * \left(\frac{Y_l}{Y}\right) * \left(\frac{P_y}{P_c}\right) \qquad (1)$$

Here, Y_l is nominal labour compensation, P_c the consumer price inflation (CPI) and L is total labour input in hours worked. Y is nominal value added (GDP) and P_y the value added inflation. This equation identifies how *real average labour compensation* equals the product of *gross real labour productivity, labour share* and *labour terms of trade*. When expressing equation (1) in growth rates we obtain:

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[1] In the literature it is common to use median wage because this provides an indication of the development of wage inequality, the difference between median and average wage growth. However, the data set used in this study does not include a measure of median wage.

$$\Delta log \ Average \ Hourly \ Compensation = \Delta log \ Labour \ Productivity \qquad (2)$$
$$+ \ \Delta log \ Gross \ Labour \ Share + \Delta log \ Labour \ Terms \ of \ Trade$$

This goal of this thesis is to study the gross decoupling of labour productivity and wage growth. The productivity-wage gap is identified as follows:

$$\Delta log \ Gap = \Delta log \ Real \ Gross \ Labour \ Productivity - \Delta log \ Real \qquad (3)$$
$$Average \ Hourly \ Wage$$

Rearranging (2) and using (3) to eliminate labour productivity, we obtain:

$$\Delta log \ Gap = \Delta log \ Average \ Hourly \ Compensation - \Delta log \ Average \qquad (4)$$
$$Hourly \ Wage - \Delta log \ Labour \ Share - \Delta log \ Terms \ of \ Trade$$

The following step is to relate average hourly compensation to average hourly wage. The difference between these two measures of income reflects the impact of changes in social contributions by employers.

$$\Delta log \ Average \ Hourly \ Compensation = \Delta log \ Average \ Hourly \qquad (5)$$
$$Wage + \Delta log \ Social \ Contributions$$

Substituting (5) into (4) gives the final decomposition of the productivity-wage gap.

$$\Delta log \ Gap = \Delta log \ Social \ Contributions - \Delta log \ Labour \ Share - \qquad (6)$$
$$\Delta log \ Terms \ of \ Trade$$

3.2 Labour compensation

Workers provide input to the production factor labour, this includes employees and self-employed. The compensation these workers receive is one of the three elements that makes up a countries value added (GDP). The other two are capital compensation and depreciation. In general, labour compensation can be divided in two elements, wage and social contributions by employers. Employers and employees view labour compensation from two different perspectives. Companies tend to focus on total labour compensation in relation to the productivity of workers. Workers on the other hand, focus on their purchasing power, their wage in relation to the consumer price level. This paragraph discusses the relevance of both measures of labour compensation for the study on the productivity-wage gap. Most employees are compensated in the form of wage. Wages, can vary widely and depend on many factors including educational level, sector of employment, geographical location, age, gender, ethnicity, etc. The influences of these specific factors can be significant and worth investigating. However, this thesis focusses on the evolution of wages at the country level and therefor neglects these factors. The average hourly wage earned by employees is obtained from the national account statistics by dividing the aggregate wage bill over the total number of hours worked. This measure overlooks the earnings from self-employed workers because these are not employed and therefore they do not receive wage. Popular believe is that this part of the labour force includes entrepreneurs who own their own business. But in recent years, there is a growing number of employment contracts, for non-entrepreneurial occupations, that are constructed as self-employment contracts. Well-known examples are Uber and Deliveroo. In the Netherlands, the construction sectors has experienced a rapid

increase of self-employed personal. This study follows the general assumption that self-employed workers receive the same hourly earnings as employees. An important measure beside average wage is the median wage. The difference between average and median wage is a good indication for wage inequality. When the average wage grows relative to the median wage, there is a concentration of wages at the top 50% wage earners. This implies that labour income of low income earners grows at a slower pace than those of the high income earners. For this reason, some economist include a measure of wage inequality in their study on the productivity-wage gap. However, this thesis excludes the wage inequality component because earlier studies have shown that the growth differential between median and average wage is very limited in the Netherlands (Schwellnus, Kappeler & Pionnier, 2017; Sharpe & Uguccioni, 2017). In addition, it is excluded for the more practical reason that median wage statistics per sector are not available in the CBS database. In order to compare the wage level over time, one needs to account for the change in the price level of consumer products. The purchasing power of workers remains constant when nominal wage growth equals consumer price inflation (CPI). In this case, real wage growth is 0. Real wage growth is an important measure for the increase in living standard. The CPI deflator is an often used price index. The CPI is computed with a fixed basket of goods that includes the prices of the goods and services bought by consumers. This is a better representation for the cost of living than the GDP deflator.

The second element of labour compensation are the social contributions made by employers. These come to the benefit of employees in the case of for instance unemployment or medical related issues. The level of social contributions made by the employers depend on the political context and can differ between economic sectors. Most often, the terms for social contributions are made in collective labour agreements (CAO's) at the sector level. Growing social contributions is consistent with a higher productivity-wage gap which might sound counter-intuitive. However, as the share of social contributions in total labour compensation increases and the share of wages decreases. Therefore, the gap between wage growth and productivity growth increases.

3.3 Labour share

The labour share is the portion of GDP that goes to the production factor labour, total labour compensation over total GDP. The labour share includes social contributions made by employers. A second definition is the wage share which equals total wage bill over total GDP. The wage bill excludes social contributions by employers and is therefore a better representation of the share of disposable income in value added. Changes in the labour share give an indication of the growth of labour compensation in relation to economic growth. This paragraph points out the most relevant aspect of the labour share. The labour share is likely to differ between sectors, capital intensive sectors such as mining have a relatively low labour share while labour intensive sectors have a high labour share. In macro-economic studies it is customary to exclude certain sectors from the analysis. The Dutch policy debate has focused mainly on the labour share for market sectors[2] (Eggelte, Jansen, Schotten, & Dicou, 2014). Labour compensation is one of the three elements that makes up a countries value added (GDP), together with capital compensation and depreciation. Technological progress can raise the level of output per units of input. Profit maximizing firms choose to balance the level of capital and labour in the most profitable way. The ease of substitution between labour and capital depends on the elasticity of substitution. This elasticity could differ between sectors. In theory, the demand for production

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[2] This study excludes governmental sectors, mainly because it is non-profit and does not reward capital. Primary sectors such as agriculture and mining also excluded because these are extremely volatile which makes the study on structural developments very difficult. In general, these sectors are capital intensive which results in a low labour share. The real estate sector is excluded because it is very sensitive to speculation which will make analysis of long-term trends more difficult.

factors (labour and capital) adjust to its supply as mismatches lead to changes in the relative factor price which will induce substitution. In this way, the direction of technological progress is partly influenced by the relative factor price. An increase of the cost of labour induces firms to substitute labour for capital, resulting in labour productivity growth. Cheap labour on the other hand, induces firms to attract more labour, hence labour productivity growth stagnates. In theory this is a balanced process as an increase or decrease of demand for labour will affect the relative factor price of labour. For this reason, the labour share is assumed to be fairly stable over time. In the short-term, the business cycle can result in fluctuations in the labour share (Krueger, 1999). The share of labour compensation in national GDP increases when economic activity declines. This is the result of "labour hording" and rigid labour contracts. Labour hording arises when firms keep workers on their payroll, despite declining economic activity, because they anticipate on economic recovery and the thereby increasing labour demand. Employment protection regulations make it difficult to fire employees which affects the flexibility of the wage bill.

One can make a distinction between the gross labour share and the net labour share, which excludes depreciation form GDP. The net labour share is simply the share of labour compensation in total compensation (capital and labour). One could argue to exclude depreciation because it is simply an accounting statistic that does not create room for an increase of compensation for either capital or labour (Cho, Hwang, & Schreyer, 2017; Bridgeman, 2018; Baker, 2017). This could lead to misleading figures when studying the relation between labour and capital compensation. One could argue that when the gross labour share declines, a larger share of value added has gone to the compensation of capital. However, a decline of the gross labour share could also be caused by an increase of depreciation as part of value added. In fact, it is possible that the gross labour share declines while the net labour share increases. Depreciation as a share of value added fluctuates in response to changes in the composition of capital and changes in the capital-output ratio. An increase of depreciation as portion of GDP causes the gross labour share to decline relative to the net labour share (Karabarbounis & Neiman, 2014). In general there are two important factor that influence the share of depreciation. First, the price of investment goods. Technological progress reduces the cost of investments goods and in response the share of depreciation declines proportionately. Labour-capital substitution increases the capital intensity. It is plausible that as the capital stock grows, the increment of output produced declines slowly, but there can be no question that depreciation increases proportionally. Secondly, the real interest rate. A decline in the real interest rate causes the capital-output ratio to rise, which increases depreciation as a share of gross value added. Reduction in the real interest rates causes the net labour share to increase despite a decrease in the gross labour share. By contrast, gross and net labour shares always move in the same direction in response to technology-driven changes in the relative price of investment goods (Karabarbounis & Neiman, 2014). This study makes use of the gross labour share because the Dutch national accounts do not include statistics for depreciation on sector level.

3.4 Labour productivity

Labour productivity is defined as the value of output that is produced per unit of labour input. Most commonly, labour productivity is computed per hour of labour input. Labour productivity is directly linked to improved standards of living in the form of higher consumption. As a countries labour productivity increases, it produces more for the same amount of labour input. This makes it possible to consume more at relatively reasonable prices. For analysis on a general level, for example country level, and across time it is important to make use of a comparable concept both output and labour input. This paragraph discusses how labour productivity is defined an measured in the study on the productivity-wage gap.

Gross output is a straightforward measure and frequently used to calculate productivity growth. However, the normalization of gross output by labour input could result in non-comparable measurements because it does not account for the intensity of intermediate input use. For this reason, GDP is often used for calculation of labour productivity. Comparison between nominal output values across time is only possible when measures are taken to control for the average evolution of the price level. Value added is often deflated by use of the GDP deflator. Also the producer price index is used to deflate value added, but this could result in misleading figures when the price index for output and material inputs differ. Price deflators often incorporate adjustments for quality changes (Van Biesebroeck, 2015). The denominator for calculating labour productivity is some measure of labour input. The number of employees is straightforward but inaccurate as the number of hours worked could differ widely between employees and across time. Therefore, the most common measure for labour input is hours worked. At the country level, an often used measure is total labour volume. This is the product of the active labour force and average hours worked. The total labour volume includes both employees and self-employed persons. In the discussion on the productivity-wage gap, economists make an important distinction between gross labour productivity and net labour productivity. Gross labour productivity is simply total value added over total labour input in hours worked. However, depreciation, which a part of value added, does not create room for wage increase. Therefore it would be more applicable to use net labour productivity, value added net of depreciation over total labour input in hours worked[3].

3.5 Terms of trade

In general, terms of trade refers to the relative price of exports in terms of imports and is defined as the ratio of export prices to import prices. At a macroeconomic level, an increase of a countries terms of trade means that it can buy more imports for a given level of exports. In the same way, the labour terms of trade is the ratio of value added prices over consumer prices. When the price of unit output increases relative to the price of consumption goods, the input of labour can buy a labour more consumption goods. However, this only holds when value added inflation is driven by an increase of labour compensation. For further understanding this paragraph presents a decomposition of value added inflation. GDP inflation is the increase of the price of unit output. There is inflation when value added increases in monetary terms but remains constant in unit terms. In other words, the produced units are sold against a higher price. Production has not increased. When considering GDP as the sum of labour and capital compensation, it must be true that the higher value added in money terms must be divided between capital and labour. The growth of GDP inflation can therefore result from increasing unit labour cost or from increasing profit mark-ups. Employers and workers enter the wage bargaining process from different perspectives. Employers are concerned with the growth of labour compensation in relation to labour productivity growth. When wage growth exceeds labour productivity growth, their profit mark-up decreases. Workers on the other hand, are interested in their purchasing power which depends on nominal labour compensation and inflation. Workers focus on consumer price inflation (CPI) because they are only confronted with the price increase of consumption goods. Employers on the other hand, deflate their value added with the value added deflator. As a result, real wage growth might lag behind the room for wage increase when consumer price inflation (CPI) exceeds value added price inflation. This is also referred to as 'terms-of-trade' loss. Labour terms of trade is measured as the ratio between CPI index and GDP index. The growth rate of this ratio is an indication on how consumer prices develop in relation to value added prices. A negative growth rate indicates that consumer prices have grown faster than value added, thus resulting a worsening of the labour terms of trade. The labour terms of trade indicate how an inflation based increase of nominal wage relates to increasing consumer prices.

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[3] Often, economists use gross labour productivity because depreciation is not directly measured in national accounts.

4. The Dutch Productivity-Wage Gap, 1969-2016

SUMMARY *The growth of labour productivity and wages has changed greatly over the period 1969-2016. In this chapter, the development of these two terms is placed in a broader economic and political context. It discusses how the labour share, social contributions by employers and the labour terms of trade have influenced the growing divergence between productivity and wages. The analysis is divided in four periods which are demarcated by influential political or economic incidents that have had a structural impact on the productivity-wage gap. First, the wage moderation agreement 'Het Wassenaar Akkoord' in 1982. Second, the wage moderation agreement 'Een Nieuwe Koers' in 1993. Third, the financial crisis of 2007. The first period is characterized by the fast growth of wages which could not be supported by the stagnating growth of productivity. In order to counter stagflation, the government, employers and social partners agreed on wage moderation. This policy successfully suppressed the growth of wages while productivity growth accelerated. However, in the late 80s, wages caught up with productivity. In the early 90s, macroeconomic perspectives changed drastically. The Netherlands introduced a second round of wage moderation in 1993. In addition, the wage bargaining process became more decentralized which undermined the bargaining position of labour. Around the world, central banks obtained more independence and strict monetary policies limited fiscal stimulus by governments. Meanwhile, the unification of Europe led to increased competition on the capital market and as a result governments engaged in negative policy competition, which put pressure on the bargaining position of labour. As a result, wage growth was very limited while productivity growth remained fairly stable. On a global level, the 90s and early 00s are characterized by financialization which led to a shareholder value orientation by firms. The focus on short-term profit led to increasing dividend payments and share buy backs. The real economy was drained from its profits as it had to compete with the high rates of return in the financial sector. Also in the Netherlands, the interests of capital were dominant and the bargaining position of labour was eroding further. In the late 90s and early 00s, the Dutch productivity-wage gap grew dramatically. Growing income inequality, low interest rates and declining returns in the real economy resulted in global cash pools that were managed by shadow banking system. The growing demand for securities eventually led to the US housing market crash in 2007. Shortly after, the economic uncertainty led to the Eurozone crisis. Thereafter, both productivity growth and wage growth have been very limited in the Netherlands.*
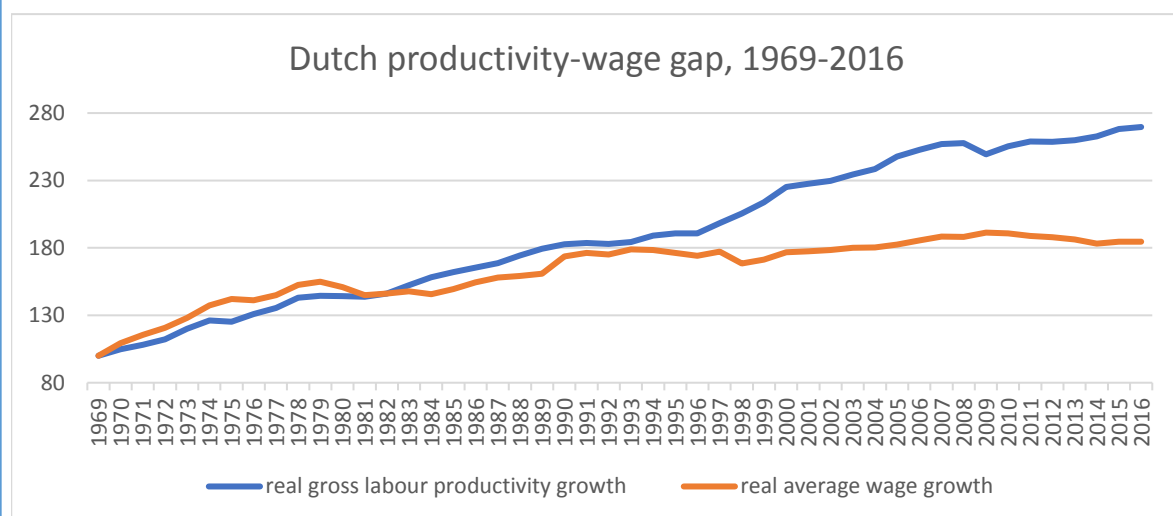

Figure 2. Dutch productivity-wage gap, 1969-2016. Own illustration. Data source: CBS.

4.1 Overview productivity-wage gap, 1969-2016

4.1.1 Period demarcation

The analysis is divided in four time periods, demarcated by significant political or economic incidents that have had a structural impact on the development of the productivity-wage gap. The first period, 1969-1982 is characterized by high wage growth and a fast increase of the labour share. Workers enjoy a strong bargaining position. The government takes on a Keynesian approach towards fiscal and monetary policies. At the end of this period, the economy is confronted with stagflation which puts pressure on profits and wages. In 1982, the Wassenaar Akkoord sets in a new period characterized by wage moderation. In 1982, labour productivity recovers while wage growth remains limited due to the agreed upon moderation of wage claims. However, around 1990, wage growth accelerates and quickly catches up with the growth of productivity. In 1993, policy makers respond by implementing a new wage moderation policy, "Een nieuwe koers". Meanwhile, the treaty of Maastricht sets new rules for monetary and fiscal policy making. Wage moderation agreements are increasingly based on the fear for unemployment and less on mutual agreement. The unification of Europe let to increased competition on capital markets and countries engage in negative policy competition with the aim to attract or retain foreign investment. Financialization empowered shareholders and rentiers to extract a bigger share of corporate profits in the form of interest and dividend payments which put pressure on wages. The growing dominance of financial interests encouraged firms to pursue shareholder values as their primary goal and shifted firms priorities from growth to profitability. This led to the stagnation of wages and the transfer of surplus in the direction of finance. As a result, wage growth was limited to a minimum while productivity growth remained fairly stable. As a result, productivity and wage diverge rapidly, resulting in fast increase of the productivity-wage gap. The fourth period begins with the financial crisis of 2007. The global economic recession results in a decline of labour productivity while simultaneously suppressing the growth of wages. The Dutch economy is slowly recovering but real wage growth remains limited.

4.1.2 Decomposition method and data

Macro-economic studies at a national level are faced with great disparities between economic sectors. As discussed earlier, this study excludes non-market sectors[4], agriculture sectors, mining sectors[5] and the real estate sector[6]. As discussed in chapter two, the productivity-wage gap consists of three components. An increase of social contributions as part of total labour compensation will increase the productivity wage gap as the share of wages in total labour compensation declines. A decline of the labour share will increase the gap as workers receive a smaller portion of total value added. Finally, productivity-wage gap increases when the growth of consumer prices exceed the growth of value added prices.

4.1.3 Data 1969-2016

Table 1 provides an overview of how the productivity wage gap has developed over time. On average, the annual growth differential between gross labour productivity and real average wage is 0.80%. During the period 1969-2016, real average wage grew on average with 1.35% while gross labour productivity grew with 2.15% on average. The period 1969-1982 shows a decline of the productivity-wage gap, mainly caused by a rapid increase of the labour share. The three successive time periods show an increase of the productivity-wage gap. When decomposing the productivity-wage gap three components we see that the labour terms of trade has had the most significant impact. On average, the annual increase of consumer prices outpaced the annual increase of value added prices by 0.68%.

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[4] Profitability is excluded from non-market sectors which skews the relation between productivity and wage.
[5] Commodity sectors are very volatile which affects the data significantly and will result in great outliers.
[6] Real estate sector is very volatile due to speculation.

The labour share has declined on average with 0.17% per year. However, the impact of the labour share on the productivity-wage gap differs greatly between the four periods.

The period 1969-1982 poses an interesting question. Real wage and labour productivity grew proportionately resulting in a small decline of the productivity-wage gap. However, the labour share grew rapidly, which put pressure on the profitability of firms. This seems counter-intuitive, but can be explained by the terms of trade component. The labour share is calculated with the nominal values of labour compensation and value added while wage and productivity are deflated by the CPI and GDP index. CPI inflation outpaced GDP inflation, which means that real wage growth could only keep up with productivity growth at the cost of the capital share, hence the labour share increases. The period 1994-2007 shows a faster increase of the productivity wage gap. Both the wage share and the labour terms of trade declined rapidly. Real wage growth was very weak, 0,39% per year. The following period, 2008-2016, shows a decline of real wages. Meanwhile, the economic recession, resulting from both the financial and Eurozone crisis, suppressed productivity growth dramatically.

Table 1. Decomposition of the productivity-wage gap with average annual growth rates per time period. Data source: CBS

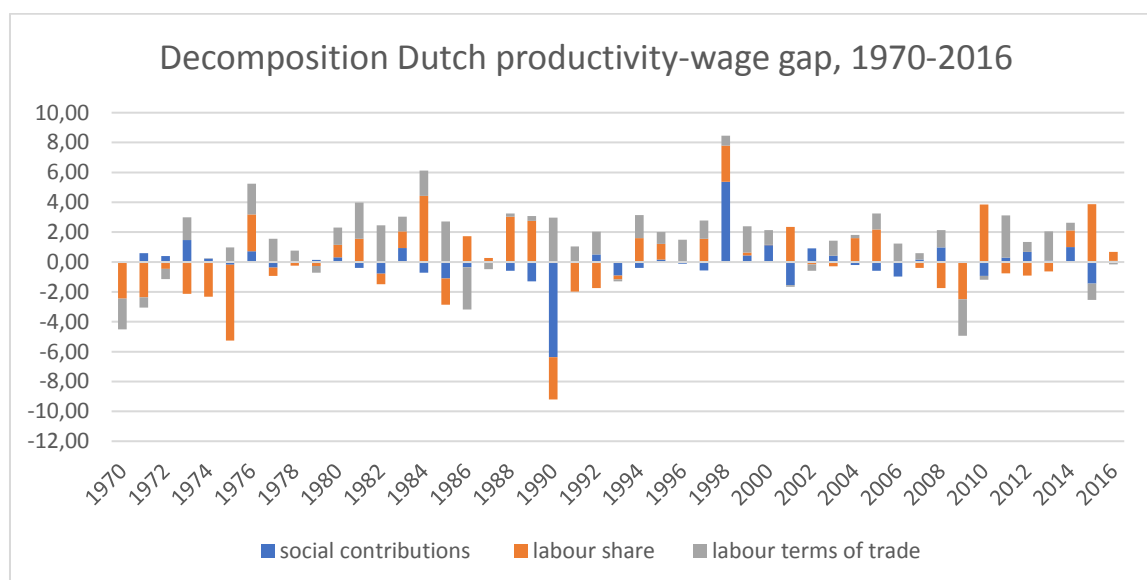|	1970-1982	1983-1993	1994-2007	2008-2016	1970-2016
gross labour productivity	2.99	2.14	2.41	0.55	2.15
real average wage	3.03	1.88	0.39	-0.22	1.35
productivity-wage gap	-0.04	0.26	2.02	0.76	0.80
social contributions	0.16	-0.90	0.30	0.09	-0.06
labour share	0.90	-0.43	-0.87	-0.32	-0.17
labour terms of trade	-0.70	-0.73	-0.85	-0.35	-0.68

Figure 3. Decomposition of the productivity-wage gap, 1970-2016. Average annual growth rates decomposed into social contributions growth, labour share growth and labour terms of trade growth. Own illustration. Data source: CBS

4.2 Stagflation and strong wage bargaining, 1969-1982

The period 1969-1982 is characterized by great economic and political changes. It succeeded a period of rapid economic growth and global economic stability during which workers enjoyed a strong bargaining position resulting from a high degree of unionization and low rates of unemployment. This changed dramatically as stagflation set in and full employment policies were abandoned. This paragraph gives an overview of this very dynamic period.

4.2.1 WWII aftermath

In the aftermath of World War II, the Dutch government focused on economic recovery. It instated het 'College van Rijksbemiddelaars' who kept a strong grip on wage development in the Netherlands (Eggelte, Jansen, Schotten, & Dicou, 2014). Wage moderation was expected to kick-started investment, stimulate economic growth and increase international competitiveness. This period was characterized by high economic growth which was mainly driven by high labour productivity growth. Technological advancement from WWII were commercialized and especially in the USA, the innovation push was high. Around the world, countries caught up as new technologies spread around the globe. Simultaneously, increased specialization stimulated mass production which boosted productivity as well. Production processes were cut up in specific tasks and workers became more specialized. As a result of the social contract between employers and employees, wages grew in accordance with the gains in labour productivity. The profit rate increased fast, despite the fast growth of wages, because the capacity utilization grew fast as a result of increasing GDP. The combination of high productivity growth and economic growth led to a reinforcing cycle through the Kaldoor-Verdoorn effect. High economic growth in the Netherlands allowed the development and expansion of the welfare state. Collective agreements like the AOW and WW were introduced and expanded. In addition, the economy gained largely from increasing world trade. International stability was secured by the Bretton Woods system which was implemented after WWII. Fixed exchange rates limited uncertainty to a minimum. During the 1960s, active wage moderation policies were abandoned, lifting the LIR to more normal levels. In the Netherlands, workers were enjoying the stable economic growth. In the period 1970-1975, real wage growth exceeded the growth of labour productivity by a large margin while at the same time, the total number of hours worked decreased every year. Figure 4 illustrates how gross labour productivity and real average wage have developed during the period 1969-1982. The graph shows how wage growth outpaced productivity growth up to 1975. The decline of the productivity-wage gap was mainly due to the increase of the labour share. Workers were able to appropriate significant wage increases despite economic stagnation. In 1970 unemployment was only 1,6% but slowly crawled up to 5% in 1975. The system of automatic price indexation shifted the burden of inflationary shock to employers. The combination of both factors put pressure on the profitability of firms. The wage share grew from 0.57 in 1969 to 0.62 in 1975. In response, firms tried to curtail wage growth.

4.2.2 Stagflation

In the late 70's, the first cracks became visible in the post-WWII era. Stagflation set in as productivity growth and economic growth declined, while simultaneously inflation remained high. Unemployment was increasing at a steady pace to 10.1% in 1982. This phenomenon was not in line with the, at the time well accepted, Phillips curve which described a trade-off between inflation and unemployment. The economy experienced an outward shift of the Phillips curve, raising both inflation and unemployment. The depression that set in was a product of problems in the real economy such as the oil crisis and the breakdown of the international economic system (den Bakker, 2008). Most important was the emancipation of commodity producing countries. They became more vocal and demanded a new international economic order with higher compensation for primary products. Most famous is the

establishment of the OPEC, with the aim to get more control over the oil price which was previously controlled by a hand full of Western multinationals. In 1973 and 1979, the OPEC demonstrated its power by cutting oil production and boycotting several Western countries. This was not only a demand for higher prices, but also a protest against the dominance of Western countries in the world economy. The Netherlands was hit hard by the sudden reduction of oil imports. Rising prices of primary products pushed consumer price inflation up. CPI inflation outpaced GDP inflation, which means that real wage growth could only keep up with productivity growth at the cost of the capital share, hence the labour share increased. Equal growth rates between real labour productivity and real average wage became increasingly difficult due to the discrepancy between CPI and GDP inflation. As a result, the labour terms of trade declined fast. Around 1975, wages and productivity started to converge again (See figure 4). This was mainly due to rising commodity prices after the oil crisis of 1979. The oil crisis had a significant impact on the stagnation of productivity growth. The convergence of both variables was achieved by a decline of real wages. Workers had to give in after the disproportionate growth of wages a few years earlier. Simultaneously, the world economy witnessed a gradual break down of the post-WWII economic order. The Bretton Woods Systems, established in 1944, prescribed a system of fixed exchange rates, with the US dollar as anchor backed by gold. This system contributed greatly to the quick recovery after WWII. However, around 1970, the dominant position of the US dollar became to be a vulnerability. During the Vietnam war, the US rapidly increased the supply of Dollars. The growing deficit on the US's balance of payments undermined the stability of the dollar since it was mainly based on the trust in prudent monetary policy by the US (Eggelte, Jansen, Schotten, & Dicou, 2014). The Netherlands, like many other countries, began to exchange their dollar reserves for gold. In 1973, the US could no longer guarantee the gold standard, and the system of fixed exchange rates collapsed. The Dutch economy was hit relatively hard because it maintained the gold standard longer than most Western countries. Consequently, the Gulden became more expensive and Dutch export was hit hard (den Bakker, 2008). The new system of floating exchange rates was inherently less stable. In search of stability after the break-down of the Bretton Woods system, the Dutch pegged the guilder to Deutschmark. The absence of exchange rate instruments required the labour market to absorb new economic shocks. Wage restraint and flexible workers were proposed in order to escape the deep economic crisis in early 1980's. In the Netherlands, traditional fiscal and monetary policies were not effective in countering stagflation. High rates of inflation resulted in the claim for higher wages by workers. However, slow economic growth could not support these wage claims. In the Netherlands, organized labour unions did manage to negotiate higher wages that compensated workers partly for the increased price of living. As a result, wage growth outpaced labour productivity growth which put pressure on the profitability of firms and eventually led to a profit squeeze. Lower aggregate demand, as a result of reduced world trade and inflation, had a negative effect on the capacity utilization of Dutch firms. This suppressed the profit rate. At the same time, labour productivity growth lagged behind the growth of wages which reduced the profit share. Stagflation became a self-reinforcing process as wage claims pushed inflation up even further.

4.2.3 Wassenaar akkoord

During the first years of the 80s, the unemployment rate had risen to 10.1%. Simultaneously, real wages declined, as did the labour share. In just a decade, the position of workers had changed dramatically. Unions were divided by the insider-outsider problem. Employed union members (insiders) demand compensation for the rising price level while unemployed union members (outsider) where desperate for a job. This persuaded unions to take a more lenient approach to wage claims. Firms were also experiencing difficulties. Labour productivity declined and weak economic growth put pressure on the profitability which strengthened the support for wage moderation. In 1982, Dutch employers, labour unions and the Government signed the Wassenaar Akkoord, an agreement that

documented the terms for wage moderation, a reduction of labour hours and the removal of automatic price indexation for most CAOs. The goal of this agreement was to restore the profitability of Dutch firms and the international competitiveness of the Dutch economy. Consequently, the unemployment rate was expected to decline. Increased uncertainty and international competition seemed to have broken the harmonious growth of labour and capital compensation.
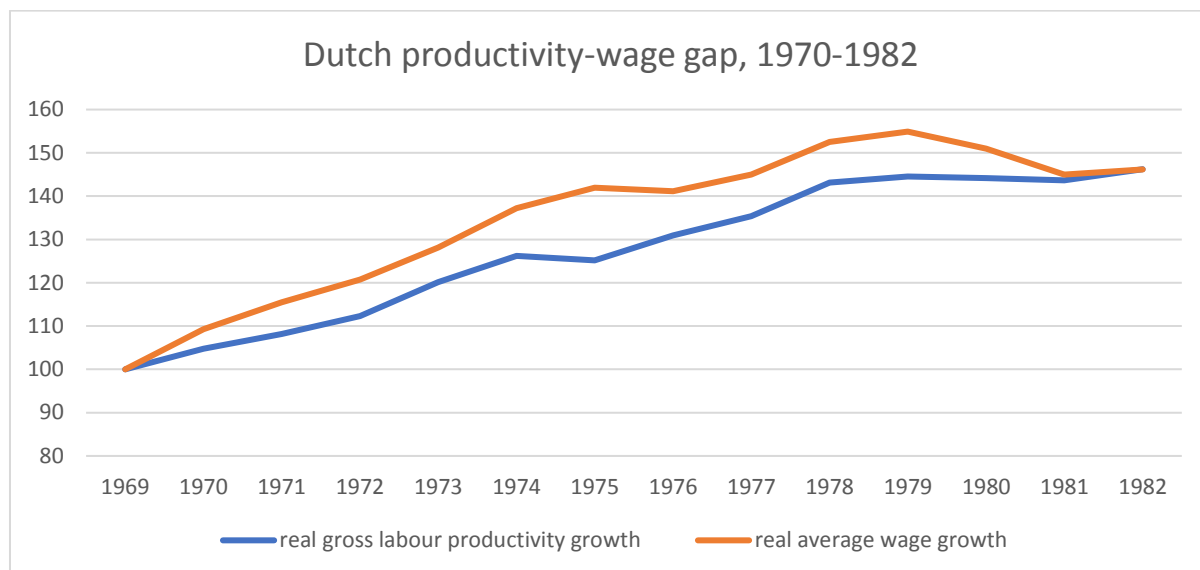

Figure 4. The productivity-wage gap, 1970-1982. Own illustration, data source: CBS. wage growth outpaced productivity growth up to 1975. The decline of the productivity-wage gap was mainly due to the increase of the labour share. Workers were able to appropriate significant wage increases despite economic stagnation. Around 1975, wages and productivity started to converge again. The CPI was growing much faster than the GDP prices, resulting in a decline of the labour terms of trade. This was mainly due to rising commodity prices after the oil crisis of 1979. The oil crisis had a significant impact on the stagnation of productivity growth. The convergence of both variables was achieved by a decline of real wages. Workers had to give in after the disproportionate growth of wages a few years earlier.

Figure 5. Decomposition of the productivity-wage gap, 1970-1982. Average annual growth rates decomposed into social contributions growth, labour share growth and labour terms of trade growth. Own illustration, data source: CBS. The rapid decline of the workers terms of trade around 1975 resulted in the convergence of labour productivity and wage. Up to 1975, the labour share grew significantly resulting in a decline of the productivity-wage gap. After 1975, the labour share decined, resulting in convergence of productivity and wage.

4.3 Neoliberalism and restrictive monetary policy, 1983-1993

The golden age of capitalism was dramatically ended by a period of stagflation and the breakdown of the social pact between employers and employees. In the Netherlands, the Wassenaar Akkoord had a somewhat positive effect on the Dutch economy as it recovered slightly. Total hours worked grew throughout the 80s. The stagnation of labour productivity growth in the late 70s was ended and labour productivity grew at similar rates as during the early 70s (see figure 6). However, the stagnation of productivity in the late 80s and early 90s casts some doubt on the effectiveness of the labour market reforms during the early 80s. Countries throughout the world abandoned Keynsian policies and moved towards strict monetary policies.

4.3.1 Neoliberalism

In the Netherlands, stagflation set in a new phase of weak productivity growth, wage moderation and high unemployment rates. These trends were very similar across countries, and so was the response by financial actors. Neoliberalism was a planned effort by financial interest against the postwar Keynesian compromise (Dumenil & Levy, 2004). Neoliberal policies such as privatization, austerity, liberalization of world trade and reduction in state welfare benefits are expressions of the power of finance in the world economy. State interventions in the economy are minimized, while the obligation of the state to provide for the welfare of its citizens are diminished (Harvey, 2006). In the Netherlands, fiscal policy was restraint by government budget rules set in the treaty of Maastricht. Meanwhile, the government lost its monetary policy instrument as central banks became increasingly independent, and national monetary policy was centralized at the European level.

4.3.2 Monetary policy

Throughout the 70s, wage restraint agreements had been an effective method for European countries to fight macroeconomic difficulties (Eggelte, Jansen, Schotten, & Dicou, 2014). For example, wage restraint ensured high-employment levels when the oil shock triggered high rates of inflation. Figure 6 shows how moderation policies suppressed wage growth successfully, resulting in a fast growth of the productivity-wage gap in 1983 and 1984. However, wage restraint policies could possibly have had a negative long term effect on labour productivity growth. Figure 6 shows that productivity growth slows down in the late 80s and early 90s. Labour market reforms are found to have a negative impact on productivity growth (Vergeer & Kleinknecht, 2014). We see that up to 1990, the labour share declines, resulting in a growing productivity-wage gap. In 1990 we see a sudden increase of wage growth, consequently the labour share increases with almost 3.5% (see figure 7). As a result, labour productivity and wage converge again. Meanwhile, the unemployment rate declines from 12.3% in 1983 to 7.5% in 1992 but would never return to the full employment levels of the early 70s. Dutch macroeconomic policies were based on fiscal and monetary autonomy of the government which could employ both instruments (Hassel, 2003). This changed when central banks gained more independence and countries moved towards inflation targeting through monetary policy. The universal shift towards restrictive monetary policies began with the Bundesbank which increased its interest rate in response to stagflation in the late 70s. In the 80s, it became clear that these strict monetary policies were more effective in countering stagflation than the Keynesian policies. German trade unions had moderated their wage claims. In Europe, countries began to copy the German macroeconomic policies. Some countries, like the Netherlands, pegged their currencies to the Deutschemark (Hassel, 2003; Eggelte, Jansen, Schotten, & Dicou, Wage Development Considered, 2014). In the 80s and 90s, monetary policies became an instrument of great impact on the wage bargaining process as the room for real wage increase was tightly constrained by hard currency policies (Hassel, 2003). The credibility of central banks was of great influence. Unions had to consider to what extend central banks were willing to uphold their monetary policies and thereby punish wage bargainers for excessive wage agreements

by increasing the interest rate, resulting in higher rates of unemployment. While the Keynesian condition of the 70s was based on mutual agreement and cooperation, the succeeding monetarist condition of the 80s and 90s was based on the capacity of the government to point out the consequences of excessive wage agreements and the capacity of central banks to commit to non-accommodating monetary policy (Hassel, 2003). In these years, the strictness of monetary policies and the degree of independence of central banks were both inversely related to labour costs but positively related to unemployment levels (Kittel, 2000; Hall & Franzese, 1998).

4.3.3 The treaty of Maastricht (1991)

The unification of Europe took a next step after the treaty of Schengen a year earlier. In economic terms, the treaty of Maastricht was of significant importance. It was a blueprint for the Economic and Monetary Union with the goal to introduce one currency and one central bank. However, the monetary unification was difficult due to growing cross-country differences. Optimism had covered up the underlying discrepancies between European countries. However, these came to surface around 1992. Germany was experiencing high rates of inflation, mainly caused by money creation that was needed for the unification of Germany and the extreme wage claims. The Bundesbank maintained a high interest rate and seemed to be willing to put Germany through a small recession to push back inflation (Eggelte, Jansen, Schotten, & Dicou, Overwegingen bij de loonontwikkeling, 2014). Germany, being the economic motor of continental Europe, had a great economic impact on its surrounding countries. International currencies continued to fall relative to the Deutsche Mark. The difference in interest rates between the US and Germany pushed up the value of the Mark. It became clear that other European currencies were unable to catch up with the Mark. For five years, the exchange rates between European currencies had remained constant while inflation and government deficits had diverged dramatically. Growing uncertainty about the future of the EMU introduced a second threat for European economics, the currency market. Speculators exploited the differences between countries as effective capital controls had become virtually abolished. In response, Germany tried to support other European currencies by printing billions of Deutsche marks. However, European currencies continued to devaluate which aggravated inflationary pressure arising from the high level of intra-EU trade. In contrast to most currencies, Dutch gulden gained in weighted value, mostly due to strong export. Nevertheless, the European troubles had a significant effect on the Dutch economy. The European unification limited the possibilities in national wage bargaining processes as monetary policies, capital controls and to some extent fiscal policies had all been surrendered to the European Monetary Unions (Hassel, 2003). By participating in the EMU, European governments forced themselves to deploy restrictive monetary policies in order to comply with the requirements of international capital markets. In addition, they had to ensure that the cost of these restrictive policies remained low in order to comply to the fiscal requirements set by the treaty of Maastricht. It was precisely the conflict between hard currency policies and their effects on the labour market that governments faced during the 90s and 90s (Hassel, 2003).

4.3.4 Een Nieuwe Koers

The Dutch government, together with the European Commission, expressed their concerns about the European economic performance and its international competitiveness. Under pressure of a government intervention, unions and firms agreed on a central agreement with wage moderation and employment as main target point. This agreement was named "een nieuwe koers" because it sketched a new way forward for the Dutch economy. The involved parties voiced their concern regarding the worrying economic situation and potential for economic growth in the future (Stichting van de Arbeid, 1993). It was argued that, once again, structural changes were needed to restore the Dutch economic competitiveness and profitability (Eggelte, Jansen, Schotten, & Dicou, 2014). In addition, the unemployment rate remained high, despite the low labour participation. Unions had a difficult time

navigating between wage growth and the unemployment rate. The main element of "Een nieuwe Koers" was the introduction of flexibility in the labour market. Increased international competition and new technologies had created the need for firms to be more flexible. Following the Japanese example, by working with a system of (permanent) core and 'peripheral' workers working flexible working hours, employers tried to increase productivity and reduce labour costs (Goslinga & Klandermans, 1996). In most respects, employees were not unwilling to more flexibilization. It allowed for flexible terms in the labour agreement that suit the individual needs of the employee (Goslinga & Klandermans, 1996). This agreement paved the way for more decentralized CAO negotiation with more possibilities for differentiation and customization. Unions aimed that flexibility would reduce the unemployment rate while keeping intact the collective employment protection of the CAO. "Een nieuwe Koers" marked the beginning of a slow breakdown of central employment agreements. Decentralization of labour contracts between sectors continued to increase. Companies have more possibilities to deviate from central agreements and more often employers choose

Figure 6. The productivity-wage gap, 1983-1993. Own illustration, data source: CBS. Wage moderation policies suppressed wage growth successfully, resulting in a fast growth of the productivity-wage gap in 1983 and 1984. We see that up to 1990, the labour share declines, resulting in a growing productivity-wage gap. In 1990 we see a sudden increase of wage growth, consequently the labour share increases with almost 3.5%. In the late 80s and early 90s, productivity growth stagnates which is possibly a result of labour market reforms in the early 80s. Meanwhile, the unemployment rate declines from 12.3% in 1983 to 7.5% in 1992 but would never return to the full employment levels of the early 70s. In the Netherlands, as did other European countries, transitioned to a new macroeconomic conditions that were characterized by strict monetary policies and limited fiscal policies. This transition was partly induced by greater independence of central banks and the integration of the European Monetary Union. The social pact of 1993 would usher in a new dynamic in the bargaining process. Wage restraint agreements were no longer prompted by trust in the economic growth strategy of a left-wing government, but by the implications of a credible restrictive monetary and fiscal strategy.

Figure 7. Decomposition of the productivity-wage gap, 1983-1993. Average annual growth rates decomposed into social contributions growth, labour share growth and labour terms of trade growth. Own illustration, data source: CBS

4.4 Financialization and the unification of Europe, 1994-2007

The shift in macroeconomic policy making during the 80s and 90s had a observable effect on the development of wages in the Netherlands. Real wages declined for five successive years in response to the implementation of "Een nieuwe Koers" (see figure 8). Meanwhile productivity continued on a stable growth path. In the following years, the productivity-wage gap would increase dramatically.

4.4.1 European Monetary Union

The social agreement of 1993 "een nieuwe koers" entailed a reduction on taxes and premium burdens for firms while workers had to settle for wage moderation. This new agreement was strongly influenced by the integration of Europe and the establishment of the European Monetary Union (EMU). EMU institutions and policymaking itself also had a great impact on the changing wage setting process in the Netherlands as it effects the bargaining power of labour and capital. The architecture of the EMU has an in-built deflationary bias, which is also reflected in policymaking. This acts in various ways as a lever for the suppression of labour's bargaining power on the one hand and the enhancement of financial capital's power on the other (Galanis, 2013). As a result, wages have stagnated over the period 1993-2007 (see figure 10). The EMU reflects the New Consensus framework with inflation targeting and constrained fiscal policy as its main institutional features. The insulation of the ECB from political influences combined with the power granted to it for setting its own inflation target makes it the most independent central bank in the world (Arnone, Laurens, Segalotto, & Sommer, 2007). Initially, during the late 1990s future members of the Eurozone strived to achieve the inflation criterion for EMU entry, inflation at a maximum range of 1.5% above the best three performers, by adopting government instigated wage moderation agreements with employer and worker representative organizations ("Een Nieuwe Koers"). However, even after full EMU entry, the issue of competitiveness still remains important for maintaining employment levels, especially when fiscal policy is neutral under the Stability and Growth Pact (SGP) and monetary policy is delegated to the ECB (Galanis, 2013).

Within the EU, capital is fully mobile, while labour has proven to be significantly immobile in practice, despite the positive stance of EU law in favour of worker mobility under the free movement of persons provisions of the Treaty. This has resulted in a significant power increase of the corporate sector vis-á-vis labour stakeholders due to the ability of the former to exploit arbitrage opportunities generated by differences between regulatory regimes on the basis of their impact on labour costs (Galanis, 2013). The introduction of the euro has enhanced the effect of capital mobility on bargaining power differentials, as national unit labour costs have become more transparent without the protective veil of national currencies. While nominal exchange rates could defuse to some extent the impact of labour costs on national competitiveness in the pre-EMU era, the introduction of the common currency by definition excludes this function. The only way for maintaining competitiveness is by controlling unit labour costs as a means of real exchange rate devaluation. (Galanis, 2013). These institutional changes have had a great impact on the growth of wages over the period 1994 to 2007. This period is characterized by stagnant wages, a decline of the labour share and a rapid growth of the productivity-wage gap with an annual average of 2% (See figure 10 and 11). Due to the SGP's fiscal policy constraints, the only way for Eurozone members to ease the unemployment problem is by controlling unit labour costs at national level as a means of real exchange rate devaluation. Thus, national governments have an interest in competitive corporatism as a way of attracting business investment and thus by exporting their unemployment problem to their euro-peers. In this respect, the Netherlands did very well. The rate of unemployment dropped from 9,7% in 1994 to 4.0% in 2001, the lowest it had been since 1974. The cost for this was a decline of real wages. The strong link between macroeconomic competitiveness and social protection led to increased flexibility and deregulation on the labour markets. After the introduction of the Euro, policies for wage cost moderation became

effective in improving a countries competitiveness. In Europe, countries engaged in negative policy competition with the aim to attract or retain foreign investment (Delsen & Poutsma, 2005). In Europe, continental stakeholder capitalism was slowly being replaced by Anglo-Saxon shareholder capitalism. Financial markets had a strong grip on the Dutch economy which forced firms to strive for maximum profitability and competitive dividends. The focus shifted to short-term financial results. Deregulation of financial markets, especially in the US and the UK, increased the competition between firms and financial instruments. Investments in the real economy decreased while the demand for financial instruments increased rapidly.

4.4.2 Financialization

The 90s and early 00s were characterized by an 'unprecedented expansion of financial activities, rapid growth of financial profits, permeation of economy and society by financial relations, and domination of economic policy by the concerns of the financial sector' (Lapavistas, 2013). This phenomenon is often labelled 'financialization'. Financialization has many dimensions, including financial deregulation, securitization, shareholder value orientation, and increasing household debt (Kohler, Guschanski, & Stockhammer, 2018). The focus on maximum profitability and growing capital share (consequently a declinging labour share, see figure 8 and 9) had resulted in a concentration of income at the top 1%. The world witnessed a rise of enormous cash pools that are managed in the shadow banking system (Pozsar, 2011). These cash pools were invested in the financial sector which offered competitive rates on return. Meanwhile, the real economy was growing slowly and rates of return were relatively low. In response, firms tried to attract investment through share buybacks and high dividends. The financial system was flushed with savings from high incomes, partly due to the low interest rate that had led to a huge liquidity preference. The increasing loan supply was not used by firms to increase productive capacity, but by households. The stagnation that had set in during the 70s was obscured by debt financed spending (Fadda & Tridico, 2013). Throughout Europe, private debt surged and a shortfall in aggregate demand, resulting from growing income inequality, was covered up by growing debt-based consumption. While the real economy was growing slowly, the financial sector was booming. Technological advances had enabled the integration of a worldwide financial system. The European banking sector grew disproportionately as it moved cash around the world seeking a quick rate of return. The liabilities of Dutch banks were 400% of national GDP (Tooze, 2018). Europe was the spill in global finance, it's banks moved cash between Asia, the Middle East and the US. The risk of these multi-currency balances was significant. Köhler *et al.* (2015) discuss three channels through which financialization affects the distribution of income between capital and labour, (1) firms have more exit options and increasingly receive their operating surplus from financial transactions which makes it less likely for them to strike a deal with labour, (2) financialization has empowered shareholders and rentiers to extract a bigger share of corporate profits in the form of interest and dividend payments which has put pressure on wages, (3) financialization has increased competition on capital markets which has encouraged firms to pursue shareholder values as their primary goal and shifted firms priorities from growth to profitability (Köhler, Guschanski, & Stockhammer, 2015). Through these three channels, increasing capital mobility has led to the stagnation of wages and the transfer of surplus in the direction of finance (Stockhammer, 2017).

4.4.3 Financial crisis 2008

Some economists argue that stagnating wages and growing income inequality, partly implied by the productivity-wage gap, resulted in growing financial fragility that eventual led to the financial crisis of 2007 (Kumhof & Ranciere, 2010; Betrand & Morse, 2013; Piketty & Saez, 2013). The combination of global cash pools, that originated from growing income inequality, and strong liquidity preference, resulting from low interest rates, led to a new dynamic in the financial sector. Cash pool managers sought short-term securities while at the same time making a return. Soon, the supply of high quality

securities, such as German and US government bonds, could no longer cover the rapidly growing cash pools. Together, mortgage providers, banks, securitization trusts and insurers introduced new financial products to satisfy the growing demand for collateral. In the US, mortgage backed securities (MBS) were originated on a large scale. The demand for credit by households was partly a result of stagnating or even declining real wages in the US. Households tried to maintain their level of consumption through debt-financed spending. The newly created MBSs were perceived to be just as safe as government bonds, especially because they were given a AAA status by the four biggest rating agencies. High demand for MBS's induced banks to extend mortgages on a large scale, only to offload them immediately in the financial system. The enormous increase of debt creation was unsustainable because most loans were not invested in productive capacity, but mainly used for household consumption. The huge supply of mortgage loans led to a rapid growth of house prices. Meanwhile, European banks joined in on the US mortgage market. Central banks stuck to the low interest rates because measures of inflation did not include stock and house prices. Eventually, the central bank did increase the interest rate following the MPR rule. Inflation in the mid-00s was mainly caused by increasing commodity prices. In 2002, the commodity markets were opened for financial speculators which led to a small commodity bubble. The increase of commodity prices did show up in the inflation statistics. The interest rate increases led to immediate bankruptcies, foreclosures and defaulting households. Companies and households had taken on too much leverage, banks had taken too much risk. Eventually this led to the financial crisis of 2008.
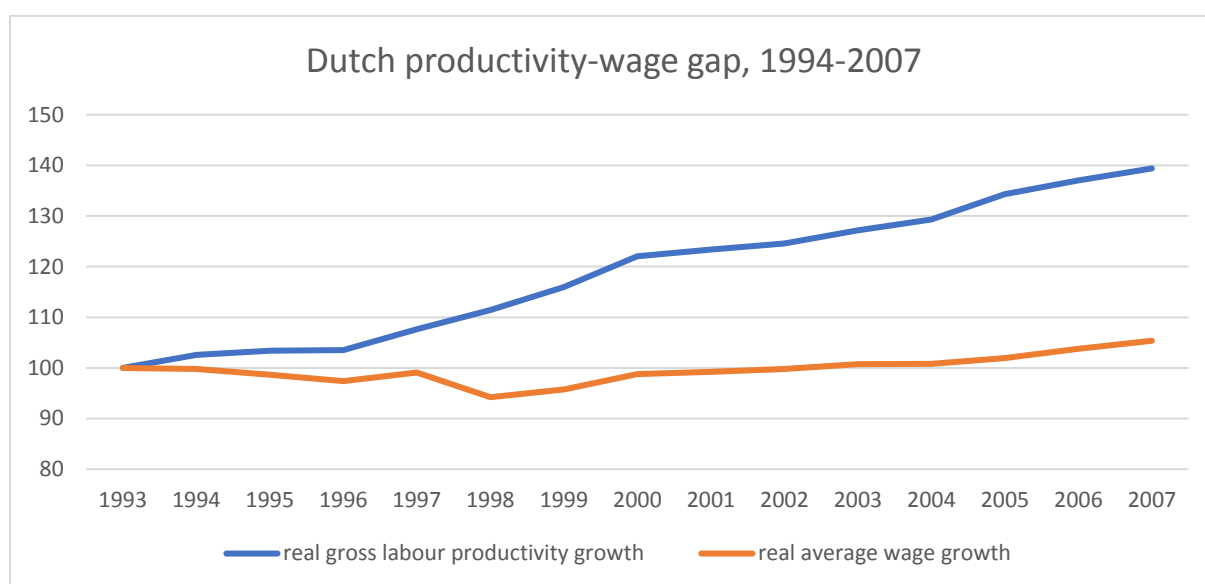

Figure 8. The productivity-wage gap, 1994-2007. Own illustration, data source: CBS. After "Een Nieuwe Keors", for three successive year, real wages declined. Meanwhile, productivity growth was restored. The following period from 1994 to 2007 is characterized by stagnant wages, a decline of the labour share and a rapid growth of the productivity-wage gap with an annual average of 2%. The labour share declined from 0.65 to in 1994 to 0.56 in 2007. At the same time, the rate of unemployment dropped from 9,7% in 1994 to 4.0% in 2001, the lowest it had been since 1974. The trade-off between wage and employment was tilting in favor of the unemployed. Strict monetary policy was successful in discouraging wage claims. Meanwhile, rising consumer prices resulted in a declining labour terms of trade. Financialization and the shift to shareholder capitalism empowered shareholders and rentiers to extract a bigger share of corporate profits in the form of interest and dividend payments which reduced the labour share and has put pressure on wages.
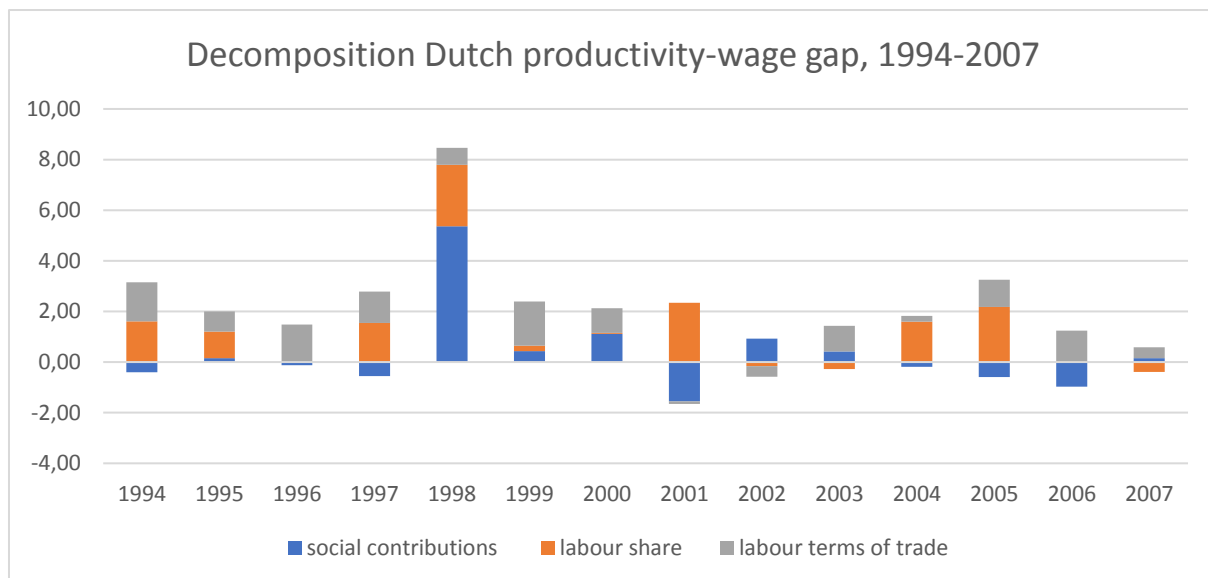
Figure 9. Decomposition of the productivity-wage gap, 1994-2007. Average annual growth rates decomposed into social contributions growth, labour share growth and labour terms of trade growth. Own illustration, data source: CBS

4.5 Crisis and recovery, 2008-2016

The financial crisis had a great impact on the Dutch economy. Both productivity growth and wage growth stagnated. As a result, there is little development in the productivity wage gap.

4.5.1 Spring agreement 2009

In 2008, the financial crisis seemed to be confined within the US. However, after the CAO negotiation in the fall of 2008, CPB published adjusted prognoses for the economic growth in the Netherlands. Nominal growth expectations were lowered from 3.5% to 1% (Harteveld, 2012). This rapid change forced social partners and the Dutch government to agree on new terms for wage growth. In the Spring agreement of 2009, both parties agreed on a nominal wage increase of max 1%. CAO agreements made before the Spring agreement were left intact, but in the following years, wage growth was limited as to retroactively comply with the new terms. The Dutch government and social partners reacted quick to the change in economic prospects.

4.5.2 Eurozone crisis

Up to the crisis of 2008, financial markets were positive about the development of the European Monetary Union which led to the convergence of interest rates within the Eurozone. Banks perceived that the EMU had reduced the risk on investment in southern European countries which were previously perceived to be more risky, and therefore yielded a higher interest rate. This led to an increasing flow of capital towards the 'periphery' of Europe as banks were trying to profits from the relative high interest rates compared to e.g. Germany and the Netherlands. Countries in the 'periphery' experienced a rapid increase of debt, as the capital push had resulted in relative low interest rates compared to the pre-EMU rates. In addition, the interest rate set by the ECB was relatively low as it was strongly biased towards Germany. This contributed to the relative low interest rates in the EU 'periphery' compared to pre-EMU rates. The growth of debt led to a real-estate boom in Spain, Ireland, Greece. European banks were hit hard by the financial crisis. Their multi-currency balance sheets had created additional risks, beside the high leverage and the maturity-mismatch between assets and liabilities. When the crisis hit, the European response was indecisive compared to that of the US. This led to unrest in financial markets. In response, financial markets moved their capital to safety which

illustrated that the cross-national difference within the EMU were not gone. Germany and the Netherlands experienced a reduction of the interest rates while the 'periphery' was confronted with rising interest rates. This made is more difficult for countries such as Greece and Spain to service their debt. As a result, the investments by European bank in these countries were at risk. The recession in Europe continued. Economic growth was sluggish, unemployment increased and productivity growth stagnated. In response, Dutch real wages declined up to 2014 after which they stabilized.

Figure 10. The productivity-wage gap, 2008-2016. Own illustration, data source: CBS. Since 2007, the Dutch productivity-wage gap has grown with an annual average of 0.75%. The labour share declined with an annual average of 0.29%, despite its counter-cyclical character. The labour terms of trade declined with 0.38% on average. Social contributions increased slightly. The unemployment rate rose to 9% in 2014 in response to the slowdown of economic growth. Remarkable is the decline in the labour share

Figure 11. Decomposition of the productivity-wage gap, 2008-2016. Average annual growth rates decomposed into social contributions growth, labour share growth and labour terms of trade growth. Own illustration, data source: CBS

5. Sectoral decomposition of the Dutch productivity-wage gap

SUMMARY *The productivity-wage gap has developed differently throughout time, but also between sectors. This chapter discusses how the productivity-wage gap has developed within different sectors of the market economy. The sectoral composition of the Dutch economy has changed in the period 1969-2016. In general, the service related sectors have grown at the cost of the manufacturing and construction sector. The manufacturing sector shows the highest increase of the productivity-wage gap (annual average of 1.84%), mainly driven by low value added inflation which results in a fast decline of labour terms of trade. Also, wage growth in the manufacturing sectors has been nihil since 1994. In contrast, the construction sector shows the fastest decline of the productivity wage gap (-1.61%) resulting from stagnating labour productivity, high value added inflation and consequently an increase of the labour terms of trade. The fastest growing sector has been the business services sector. However, the productivity-wage gap changed little (0.06%). Productivity growth and wage growth were balanced at a relative low rate. This is very different to the financial sector that has also experienced a growth of its share in national GDP. The period 1969-2016 shows an annual average real wage increase of 2%, the highest of all sectors. Also, this wage increase is fairly balanced with the productivity growth in this sector, resulting in a relative small increase of the productivity-wage gap (0.70%). Noticeable is that the gap has been widening faster after 1994 and even more so after 2007. After the financial crisis of 2007, the labour share has declined with an annual average of 0.32%. The transport, trade & hospitality sector shows an increase of the productivity-wage gap, especially in the period 1994-2007. The productivity-wage gap for the communication & information industry shows a remarkable spike around the beginning of the 21st century. Which is possibly related to the dotcom bubble. In conclusion, the productivity-wage gap has developed very differently between sectors. Also, the three drives, labour share, social contributions and labour terms of trade have had a different impact per sector.*
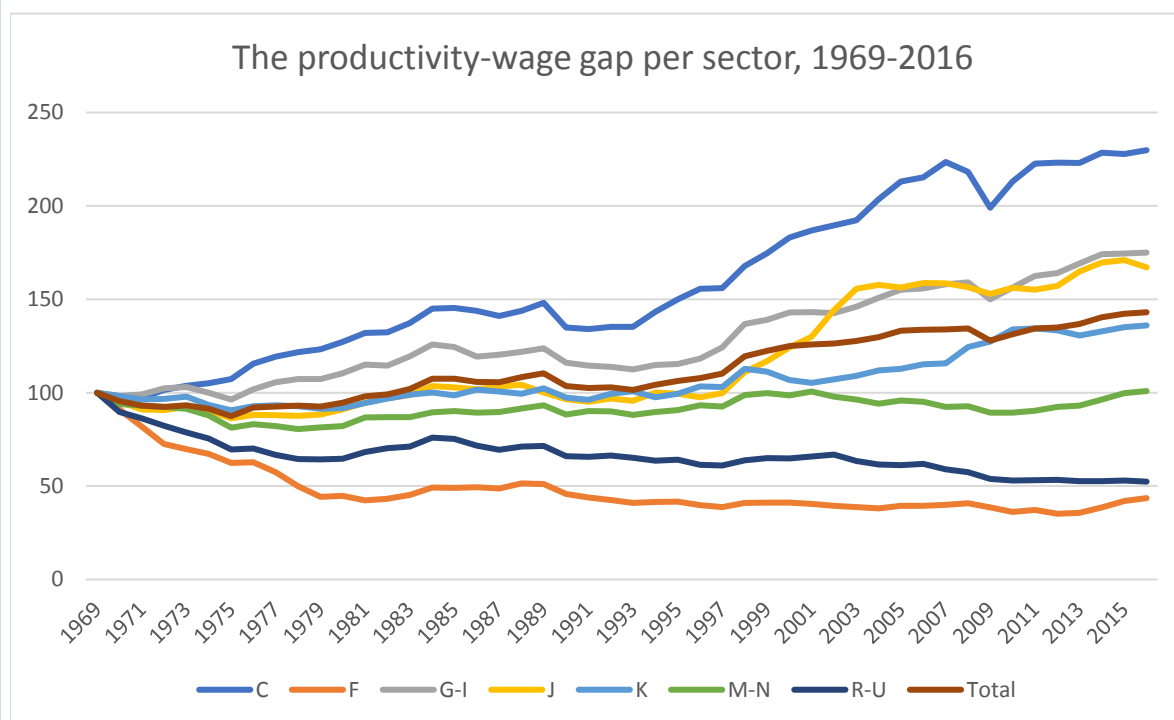

Figure 12. The development of the productivity-wage gap per sector, 1969-2016. Presents the sectors that are included in the analysis to the productivity-wage gap. Excluded are non-market, primary/commodity and real estate sectors. Own illustration, Data source: CBS

5.1 Sectoral overview Dutch economy

The highest level of decomposition of the Dutch economy gives 13 sectors[7]. This study excludes the sectors Agriculture, forestry & fishery, Mining & quarrying, Energy & electricity, Water & waste management, Real estate and Government and healthcare. The industries that are included are Manufacturing, , Construction, Trade, transport & hospitality, Information & communication, Financial services, Business services and Culture, recreation and other services. This paragraph discusses how the Dutch economy has developed over the time period 1970-2016. The excluded sectors, which are non-market or primary sectors, account for around one third of Dutch GDP.

5.1.1 National GDP

The sectoral composition of the Dutch GDP has changed greatly over the period 1970-2016. The share of some industries has declined drastically while that of others has grown. Figure 11 shows the sectoral decomposition of Dutch GDP in nominal values. Most significant is the decline of the manufacturing sector from 36% share in 1970 to 18% in 2016. Meanwhile, the share of service related sectors has grown.
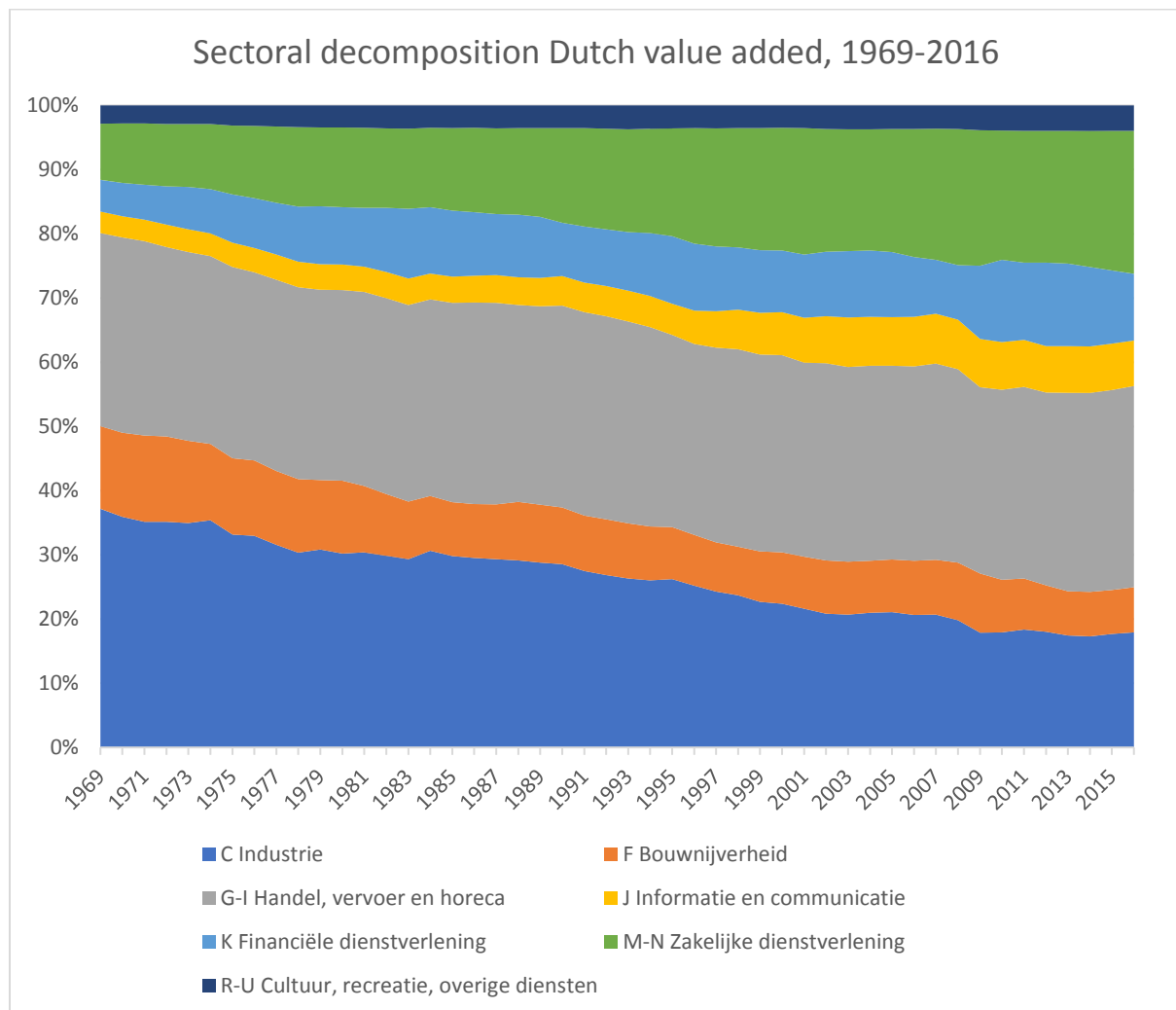
Figure 13. Sectoral decomposition of Dutch value added, 1969-2016. Presents the sectors that are included in the analysis to the productivity-wage gap. Excluded are non-market, primary/commodity and real estate sectors. Own illustration, data source: CBS.

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[7] SBI 2008 classification used by CBS, conform to NACE 2.

5.1.2 Productivity-wage gap per sector

The productivity-wage gap at sector level is calculated with the same method as at the national level. National statistics are replaced by sectoral statistics. So instead of aggregate GDP, sector GDP is used. The same goes for labour input, labour compensation and GDP inflation. The constant term over all sectors is the CPI inflation. All consumers are confronted with the same consumer price inflation while firms can experience different value added inflation rates. This means that the labour terms of trade can vary greatly between sectors. The manufacturing sector experienced a slow growth of value added prices resulting in a decline of the labour terms of trade. In contrast, the construction sector is confronted with a high growth rate of value added inflation, resulting in an increase of the labour terms of trade. Labour terms of trade at sector level is a great indicator of how value added is distributed between capital and labour. When consumer prices rise faster than value added prices, the purchasing power of employees can only remain constant by increasing the labour share. The value of money from the employee devaluates faster. However, it is possible that productivity growth can not support the employees compensation for CPI inflation because this reduces the compensation of capital to such an extent that it limits economic growth. This happened in the late 70s.

Table 2 gives an overview of changes in the productivity-wage gap per sector over time. There are only two sectors that show a decline of the productivity-wage gap over the period 1970-2016, these are Construction and Culture & Recreation. Culture & Recreation is of course a special case because it receives a lot of government subsidies. Moreover, productivity growth in this sector is difficult and maybe not desirable to accomplish. The sectors with the greatest impact on the total economy are Manufacturing and Trade, Transport and Hospitality. For this period they take on respectively 30% and 29% of nominal value added. Table 2 indicates that the productivity-wage gap has increased at a slower pace in service related sectors. Figure 11 visualizes how the productivity-wage gap has developed per sector. We can conclude that the period 1994-2007 has been the most dramatic in terms of productivity-wage divergence for most sectors.

The weighted annual average growth rate of the productivity-wage gap over the period 1970-2016 is 0.8% per year. The period 1994-2007 shows the fastest annual average growth of the productivity-wage gap (2.02%).

Table 2. Average annual growth rate of the productivity-wage gap per sector, 1969-2016. Data source: CBS. On average, the productivity-wage gap expands with an annual rate of 0.8% over the period 1970-2016, however, there are great sectoral differences. During the period 1994-2007, productivity and wage diverged fastest, with an average annual rate of 2%.

	1970-1982	1983-1993	1994-2007	2007-2016	1970-2016
C Manufacturing	2.21	0.26	3.67	0.40	1.84
F Construction	-6.12	-0.36	-0.15	1.11	-1.61
G-I Transport, Trade & Hospitality	1.09	-0.12	2.49	1.17	1.24
J Information & Communication	-0.19	-0.10	3.75	0.61	1.16
K Financial Services	-0.22	0.38	1.04	1.85	0.70
M-N Business Services	-1.02	0.15	0.38	1.00	0.06
R-U Culture and Recreation	-2.58	-0.63	-0.66	-1.29	-1.31
Total	-0.04	0.26	2.02	0.76	0.80

5.2 Manufacturing

The share of the manufacturing sector in national GDP has declined significantly from 36% in 1970 to 18% in 2016. Also the number of hours worked decreased steadily. This is mainly a result of increased subcontracting of service related activities that support the core activities of producers in the manufacturing industry. Activities such as catering, security, cleaning and administration are subcontracted to specialized firms in the business services sector (M-N). While these activities remained the same, their value added shifted to business service sector and as a result, value added of the manufacturing sector decreased (Notten F. H., 2011). Secondly, production shifted to low wage countries which reduced the number of hours worked in the Dutch manufacturing sector (Notten, Hoekstra, & Smits). In the 80s and 90s, the Netherlands was an important supplier to the German car manufacturing industry. However, in the past decades, these activities moved to eastern-Europe and China. A third explanation for the declining hours worked in the manufacturing sector is the fast labour productivity growth which has outpaced all other sectors. Productivity growth will reduce the number of jobs when demand for products is not increasing. Low productivity growth in the fourth period is possibly related to the economic downturn caused by the financial and eurozone crisis. A shortfall of aggregate demand has possibly reduced output and in combination with labour hording this has resulted in limited productivity growth. This assumption is supported by the increase of the labour share in the fourth period.

The labour terms of trade have declined faster than in any other sector that is included in this analysis. Only the agriculture, which is omitted from this study, shows a stronger decline of the labour terms of trade. This implies that the manufacturing sector has experienced slow growth of value added prices relative to consumer prices. Slow wage growth and low GDP inflation are both possibly related to globalization and the rise of global value chains. Outsourcing and offshoring to low wage countries has possibly had a negative correlation with the wage bill (CBS, 2017). Domestic wage claims are reduced out of fear for offshoring while wage growth abroad is possibly limited by weak employment protection legislation. Globalization allows multinational to integrate vertically along the value chain, thereby reducing production costs.

Labour in the manufacturing sector did profit from increasing labour productivity as the average wage growth is higher than the national average. However, this wage increase occurred in the period 1970-1993. After implementation of "Een nieuwe Koers", wage setting decentralized, leaving more room for industry specific contract specifications. Table 3 indicates that the divergence between productivity and wages intensified after 1993. In the period 1994-2007, wage growth stagnated while productivity growth accelerated.

Table 3. Decomposition of the productivity-wage gap for the manufacturing sector. Real average annual growth rates per time period. Data source: CBS.

	1970-1982	1983-1993	1994-2007	2008-2016	1970-2016
real average wage	2.34	3.09	0.34	0.42	1.55
gross labour productivity	4.54	3.36	4.01	0.82	3.39
productivity-wage gap	2.20	0.27	3.67	0.40	1.84
labour share	0.37	-0.19	-1.49	0.91	-0.21
terms of trade	-2.36	-1.05	-1.77	-1.15	-1.65
social contributions	0.20	-0.97	0.40	0.17	-0.02

Figure 14. Growth rates of productivity and wages in the manufacturing sector, 1969-2016. Own illustration, data source: CBS
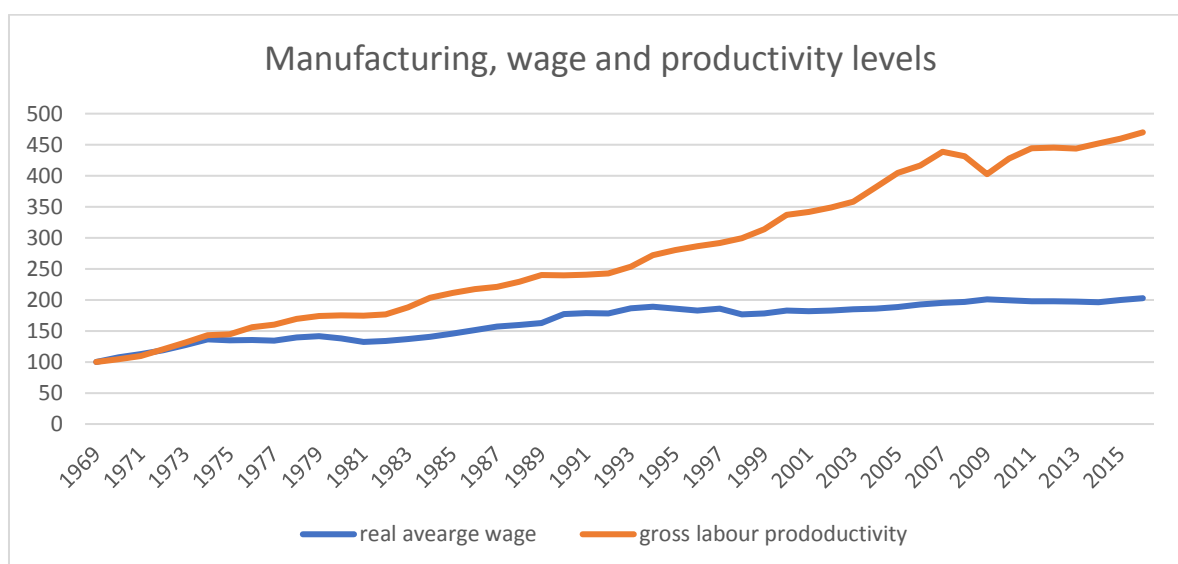

Figure 15. Levels of productivity and wages in the manufacturing sector, 1969-2016. Own illustration, data source: CBS

5.3 Construction

The construction sector is the only sector in the Dutch economy in which value added, employment and labour productivity have declined since 1969. Especially the limited growth of labour productivity is striking. Three possible explanations for this are: (1) building sights are scattered across the country which makes it difficult to move heavy machinery and therefore automate the building process, (2) building is custom work, every building sight is different which makes automation or industrialization difficult, (3) the demand in the construction sector is very volatile, which makes big investments very risky (CBS, 2017). For these reasons, construction companies tend to trust on manual labour which is more flexible (Polder, 2017).

Important are developments in the first time period. Terms of trade grew fast, indicating that value added inflation was very high. This most likely a result of increasing unit labour costs. Simultaneously, the labour share increased fast, suggesting high pressure on the labour market which pushed up wages. As a result, the productivity-wage gap declined with an annual average of over 6%. In the second period, wages and productivity grew more proportionately. After the Wassenaar Akkoord, social contributions declined fast, just as in most other sectors. Value added inflation was also high during the third period while wage growth remained limited. Consequently it can be argued that during this period value added inflation was mainly driven by increasing profit mark-ups.

In contrast to the three successive periods, the productivity-wage gap grew in the fourth period. The main driver was the worsening labour terms of trade. The global financial recession had suppressed value added prices in the construction sector while consumer price inflation was stable around the 2%. Meanwhile, the labour share shows a small increase, mainly because the construction sector is very cyclical and the most firms anticipate on economic recovery by keeping on their employees (labour hording).

Table 4. Decomposition of the productivity-wage gap for the construction sector. Real average annual growth rates per time period. Data source: CBS

	1970-1982	1983-1993	1994-2007	2008-2016	1970-2016
real average wage	3.92	1.71	0.31	0.06	1.59
gross labour productivity	-2.20	1.34	0.16	1.17	-0.02
productivity-wage gap	-6.12	-0.37	-0.15	1.11	-1.61
labour share	2.60	-0.41	-1.67	0.15	0.16
terms of trade	3.55	-0.09	1.73	-1.37	1.22
social contributions	0.03	-0.86	-0.08	-0.10	-0.24

Figure 16. Growth rates of productivity and wage in the construction sector, 1969-2016. Own illustration, data source: CBS
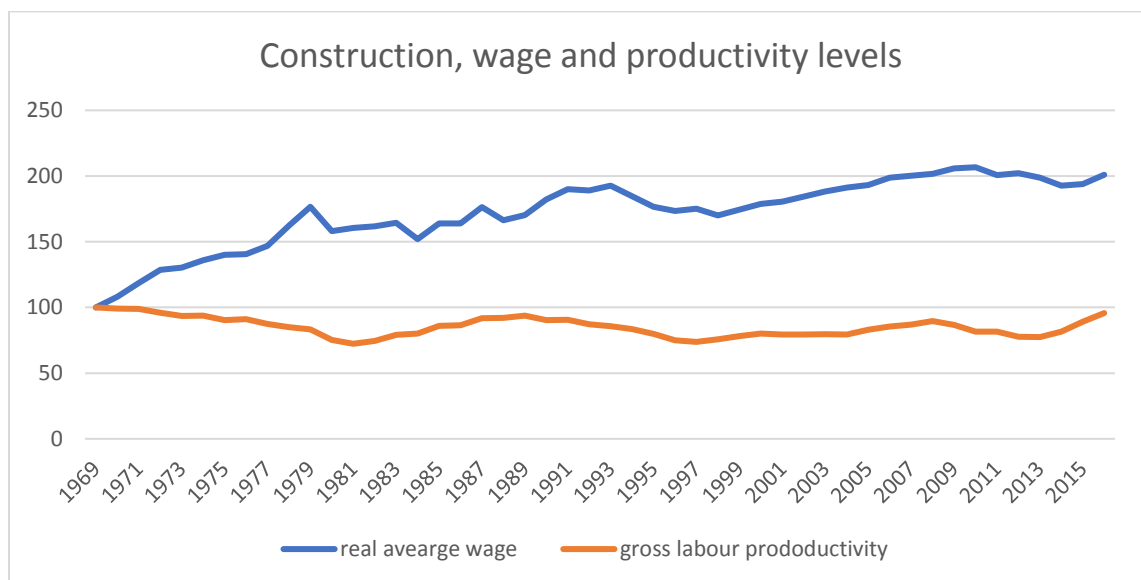

Figure 17. Levels of productivity and wage in the construction sector, 1969-2016. Own illustration, data source: CBS

5.4 Trade, Transport & Hospitality

The sector has always been a big element of the Dutch national GDP and its share has remained constant throughout the period 1972-2016. In 2016 it covered 21 percent of Dutch GDP. This sector is very diverse and consists of three main branches, wholesale, retail, transport & storage and hospitality.

The wholesale branch consists of companies that provide products to retail stores, industrial companies and wholesale companies abroad. The Dutch wholesale branch dubbled its value added during the period 1995-2016. This growth facilitated by growing international trade and the role of the Netherlands as a trading hub in Europe. Also the unification of Europe realized increasing activity in the wholesale branch (CBS, 2017). The growth of this branch is driven by increasing labour productivity as employment grew at a much lower pace. The retail branch grew with an yearly average of 1.9%. However, there were some major shifts within the branch. From the 90s onwards, international chain stores have expanded their activities at the cost of local stores. Their scale gives them a significant efficiency advantage. Moreover, physical stores in general experience increasing competition from online stores that are not bound to opening hours and offer a wide assortment of products. Online shopping and increasing scale are the two main drivers of increasing labour productivity in the retail branch (CBS, 2017). Transport & storage is an important sector for the Dutch economy. In 2016, this branch realized 4.7% of Dutch value added. The central position in Western-Europe makes the Netherlands an interesting location for distribution centers. Important are the port of Rotterdam and the airport Schiphol. Good connection with the European hinterland makes this branch very competitive internationally. The hospitality branch grew with an annual average of just 0.4%. This growth is mainly realized by growing employment of 1.2% per year. Consequently, labour productivity declined in the hospitality branch.

Since 1994, the productivity-wage gap has grown rapidly in the trade, transport & hospitality sector. Wage growth has stagnated while productivity continued its growth path from before 1994. The labour share declined with an annual average of 0.42%. while labour terms of trade declined with 0.83% on average.

Table 5. Decomposition of the productivity-wage gap for the trade, transport and hospitality sector. Real average annual growth rates per time period. Data source: CBS

	1970-1982	1983-1993	1994-2007	2008-2016	1970-2016
real average wage	2.69	1.73	0.29	-0.04	1.23
gross labour productivity	3.79	1.61	2.78	1.13	2.47
productivity-wage gap	1.09	-0.12	2.49	1.17	1.24
labour share	0.66	-0.54	-1.30	-0.50	-0.42
terms of trade	-1.48	-0.28	-0.89	-0.47	-0.83
social contributions	0.28	-0.95	0.31	0.21	-0.01

Figure 18. Growth rates of productivity and wage in the trade, transport and hospitality sector, 1969-2016. Own illustration, data source: CBS
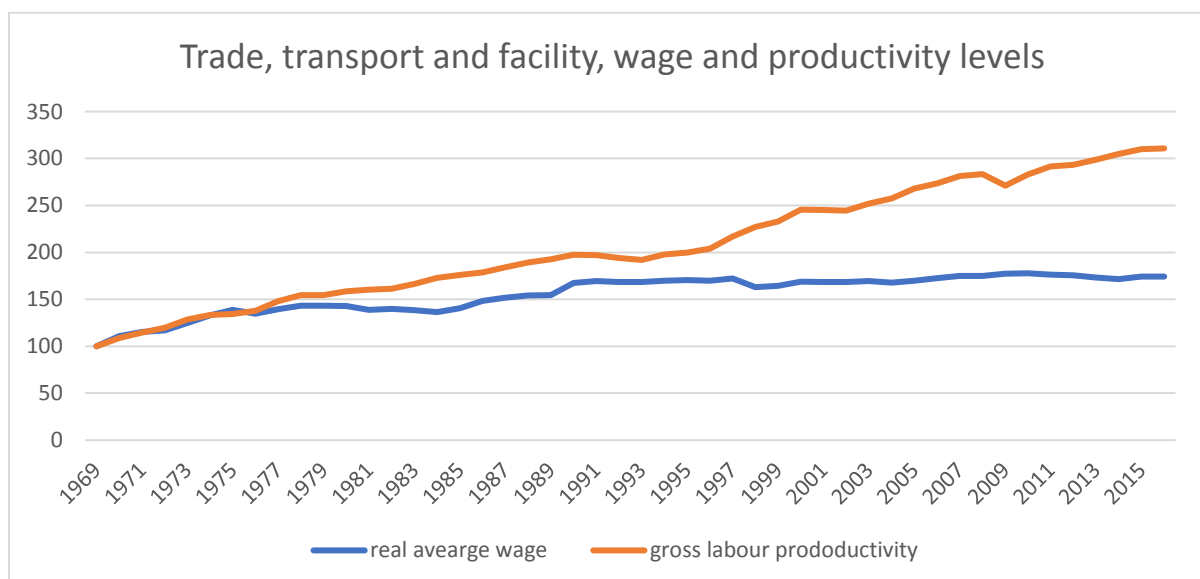

Figure 19. Levels of productivity and wage in the trade, transport and hospitality sector, 1969-2016. Own illustration, data source: CBS

5.5 Information & Communication

The information & communication sector was in the period 1969-2016 the fastest growing sector in the Dutch economy with an average of 4.7% per year. In 2016, the sector makes up almost 5% of Dutch value added while providing employment to 277 thousand persons (CBS, 2017). The sector consists of the branches telecommunication, ICT-services and digital publishing. Telecommunication and ICT-services grew fast during the 90s mainly due to fast technological developments and the liberalization of the Dutch market for telecommunication. This growth path was disrupted by the dotcom bubble (2001) and the financial crisis (2007). In the period 1995-2016, the ICT-services branch grew with 8% per year on average while employment grew with 5.6%. This growth was mainly based on outsourcing of ICT tasks by goods producing sectors to specialized firms.

Meanwhile, growth in the telecommunication branch remains limited. The market is saturated which limits the potential for growth. In addition, traditional means of communication experience increasing competition from free communication methods via social media. Consequently, the pressure in prices is great. Remarkable is the tremendous labour productivity growth in the telecommunication branch since 1995 which averages at 6.7% per year.

Up to 1997, wages and productivity in the information & communication sector grew at an even pace. This is also the case for the period after 2003. What stands out is the period 1997-2003. Productivity growth accelerated tremendously while wage growth remained limited. Throughout the period 1969-2016, the labour share remain fairly constant. The labour terms of trade declined fast, indicating that value added inflation was relatively low compared to consumer price inflation. This was mainly the result of technological progress, especially in the 90s.

Table 6. Decomposition of the productivity-wage gap in the information and communication sector. Real average annual growth rates per time period. Data source: CBS

	1970-1982	1983-1993	1994-2007	2008-2016	1970-2016
real average wage	2.08	2.23	0.48	-0.24	1.20
gross labour productivity	1.85	2.19	4.23	0.37	2.36
productivity-wage gap	-0.23	-0.05	3.75	0.61	1.16
labour share	0.60	-1.09	-1.14	1.73	-0.10
terms of trade	-0.25	-0.02	-2.22	-2.37	-1.19
social contributions	0.12	-1.16	0.39	-0.03	-0.13
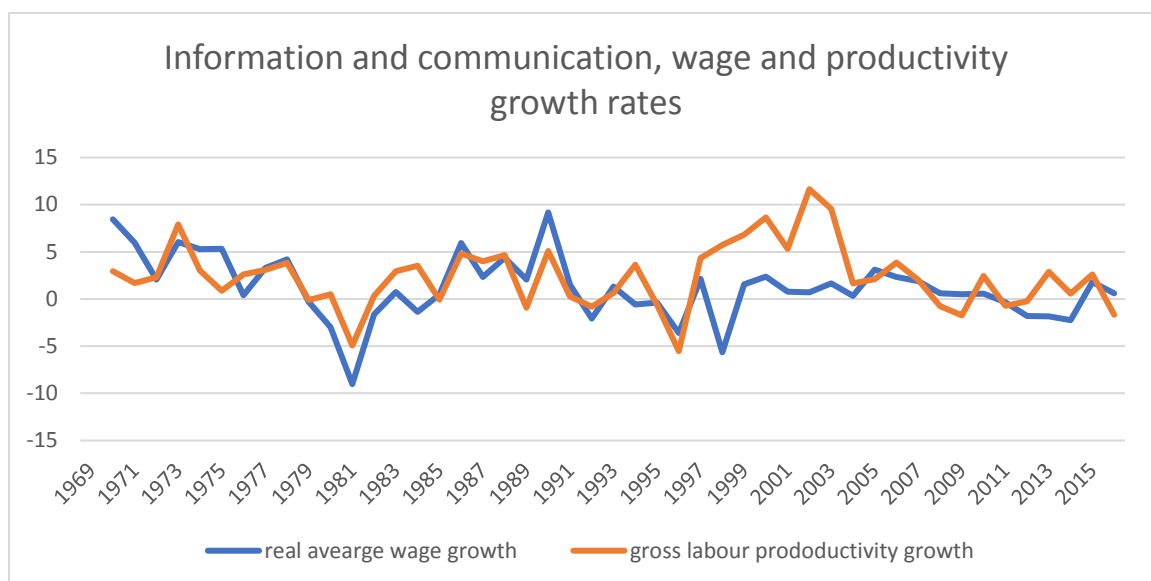
Figure 20. Growth rates of productivity and wage in the information and communication sector, 1969-2016. Own illustration, data source: CBS
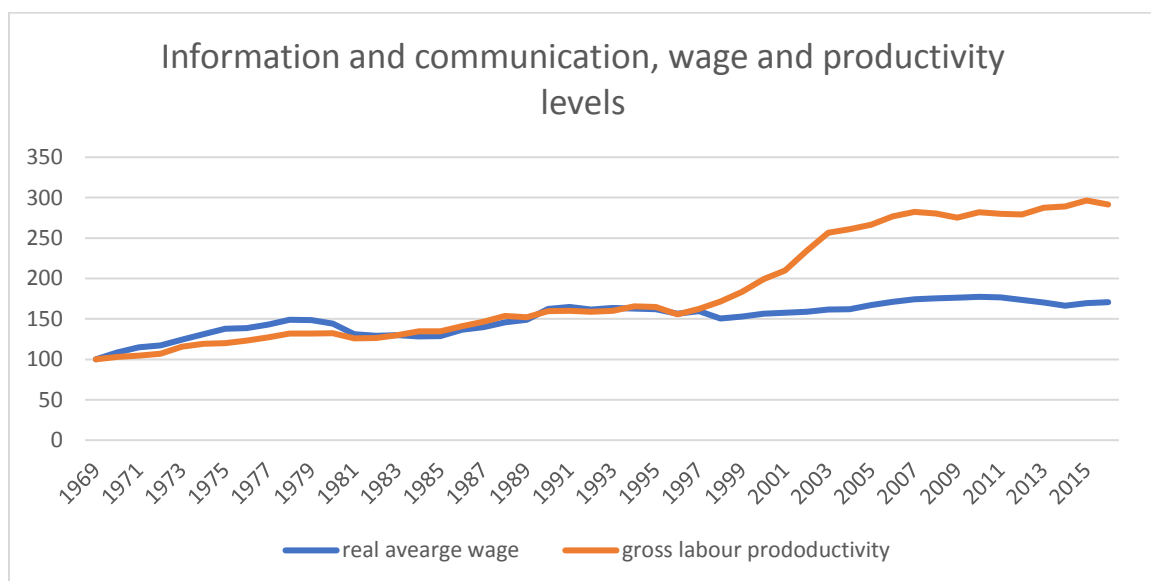

Figure 21. Levels of productivity and wage in the information and communication sector, 1969-2017. Own illustration, data source: CBS

5.6 Financial services

The Dutch economy has a relative large financial sector which makes up 7% op national value added in 2016. This is above the EU-average of 5% (CBS, 2017). The number of jobs this sector provides is only 2.6% of the total amount of jobs in the Netherlands. This makes the financial sector very productive. The fast growth of the financial sector during the period 1969-2016 is mostly due to automation and technological progress. Computers and internet banking have contributed greatly to the productivity gains in the sector.

After 1994, labour productivity accelerated. With the unification of Europe followed deregulation of capital markets. Moreover, technological progress and globalization enabled financial firms to operate all around the globe. The size of international financial flows increased greatly during the past decades as firms seek profit abroad (Pozsar, 2011). These two factors enabled the growth of the financial sector. As a result, the financial sector became a business of its own. Instead of providing a service to sectors such as manufacturing and transport.

Up to the financial crisis in 2007, wages and productivity in the financial sector grew in tandem with the exception of the year 1998 in which wage growth dropped dramatically (-6.22%). After the crisis, wage growth stagnated completely while productivity

Table 7. Decomposition of the productivity-wage gap in the financial service sector. Real average annual growth rates per time period. Data source: CBS

|	1970-1982	1983-1993	1994-2007	2008-2016	1970-2016
real average wage	4.37	1.43	1.87	-0.32	2.04
gross labour productivity	4.16	1.81	2.92	1.54	2.74
productivity-wage gap	-0.22	0.38	1.04	1.85	0.70
labour share	0.19	0.35	0.90	-4.27	-0.41
terms of trade	0.28	-1.15	-1.54	3.04	-0.07
social contributions	0.26	-0.42	0.40	0.62	0.21

Figure 22. Growth rates of productivity and wage in the financial service sector, 1969-2016. Own illustration, data source: CBS
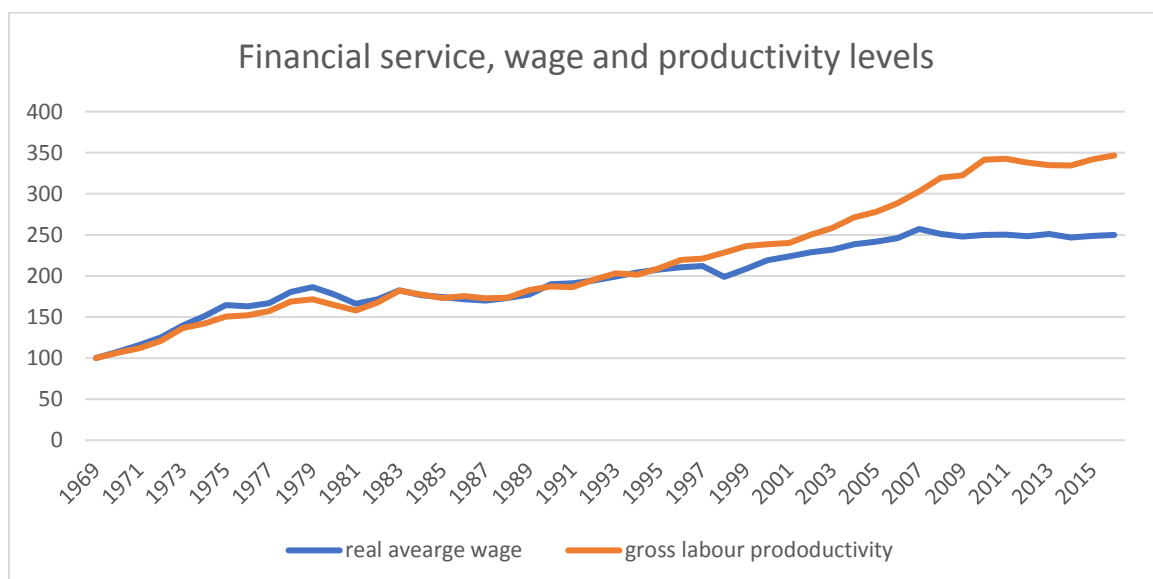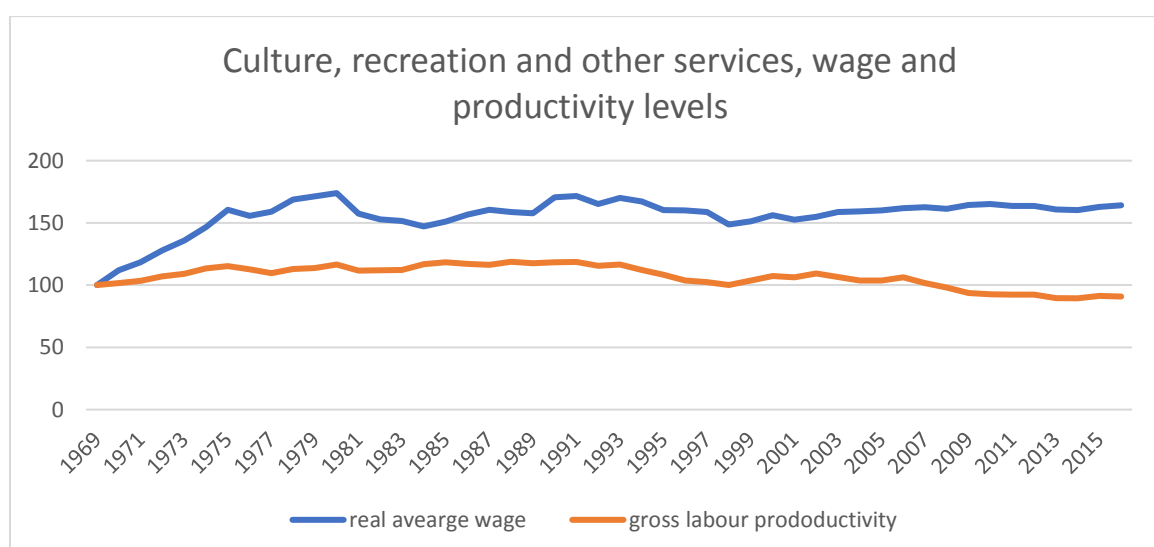

Figure 23. Levels of productivity and wage in the financial service sector, 1969-2016. Own illustration, data source: CBS

5.7 Business services

In the past decades, the business services sector has developed into one of the biggest sectors in the Dutch economy. It's share of national GDP has increased from 6% in 1969 to 15% in 2016. Also employment in the sector has increased rapidly. Currently, it employs 20% of the Dutch employed workforce. The developments in the business service sector is remarkable as it is the only sector in which the productivity-gap has remained constant over the period 1972-2016. Since 1978, both wage growth and productivity growth have stagnated. Employees have been compensated fairly for the consumer price inflation which grew at a lower rate than value added inflation, resulting in an increase of the labour terms of trade. Consequently, the labour share declined.

This sector consists of two branches: the specialized business services and administrative & supportive services. The specialized branch consists of services in the field of legal, architecture, promotion, research, etc.. The administrative & supportive branch consists of services in the field of retail and lease, travel, security, cleaning, etc.. The specialized branch is primarily focused on transferring expertise and knowledge. Services in the administrative & supportive branch are more generic resulting in more competition and pressure on prices relative to the specialized branch.

The sector's fast growth of value added in mainly realized by increasing use of labour. Growth of labour productivity was very low relative to other sectors. This mainly the result of limited competition in the sector (CPB, 2012). In addition, the relative small size of firms in the specialized services branch limits the possibilities for labour productivity growth through economies of scale. Lagging labour productivity growth in the business services sector is a trend that is also observable in other European countries (Kox, Van Leeuwen, & Van der Wiel).

Table 8. Decomposition of the productivity-wage gap in the business service sector. Real average annual growth rates per time period. Data source: CBS

	1970-1982	1983-1993	1994-2007	2008-2016	1970-2016
real average wage	2.75	0.13	-0.09	-0.61	0.65
gross labour productivity	1.73	0.27	0.29	0.39	0.70
productivity-wage gap	-1.02	0.15	0.38	1.00	0.06
labour share	1.04	-1.50	-0.61	-0.45	-0.33
terms of trade	0.20	0.62	0.73	-0.61	0.30
social contributions	0.22	-0.73	0.49	-0.06	0.02

Figure 24. Growth rates of productivity and wage in the business service sector, 1969-2016. Own illustration, data source: CBS

Figure 25. levels of productivity and wage in the business service sector Own illustration, data source: CBS

5.8 Culture, Recreation & Other services

Table 9. Decomposition of the productivity-wage gap in the Culture, recreation and other services sector. Real average annual growth rates per time period. Data source: CBS

	1970-1982	1983-1993	1994-2007	2008-2016	1970-2016
real average wage	3.48	1.03	-0.28	0.10	1.14
gross labour productivity	0.90	0.39	-0.94	-1.21	-0.17
productivity-wage gap	-2.58	-0.63	-0.66	-1.31	-1.31
labour share	1.48	-1.49	-0.02	-0.01	0.05
terms of trade	1.15	1.52	0.73	1.22	1.13
social contributions	0.06	-0.60	0.05	-0.10	-0.13
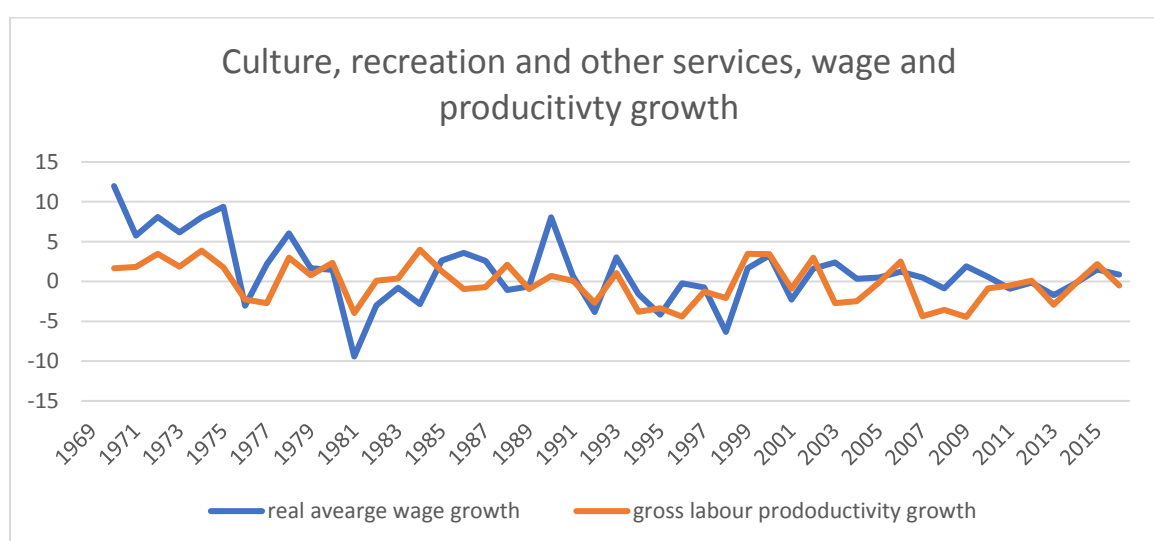
Figure 26. Growth rates of productivity and wage in the culture, recreation and other services sector, 1969-2016. Own illustration, data source: CBS

Figure 27. Levels of productivity and wage in the culture, recreation and other services sector, 1969-2016. Own illustration, data source: CBS

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5.9 Sectoral differences in wage and productivity growth

The previous paragraphs indicate how the productivity-wage gap has developed over time within the different sectors. Furthermore, it can be concluded that the divergence between productivity and wage differs greatly between sectors but in general the gap has increased. This paragraph puts the comparison between sectors in a different perspective. Table 10 presents the annual average growth rates for the seven sectors over the period 1970-2016. This indicates that real average wage growth has been fairly similar between sectors, it ranges from 0.65 to 2.04. As it turns out, the sectoral differences in the growth of the productivity-wage gap are mainly a result of highly fluctuating growth rates for gross labour productivity which ranges from -0.17 to 3.39. These differences arise from several factors. For example, the Manufacturing sector (C) is vulnerable to automation. The production of goods is fairly routine based and a production plant can be built anywhere. This offers possibilities for productivity growth while labour costs can be reduced by the possibility of moving to low wage locations. The Construction sector (F) has limited option for productivity increases as every building site is geographically bounded and poses new challenges. Meanwhile, the pool of available labour is limited by the location of the building site. The sector Trade & Transport (G-I) is characterized by great economies to scale and fairly routine based processes which enables opportunities for productivity growth. The sectors business services (M-N) and Recreation & Culture (R-U) are characterized by low growth of labour productivity while wages grow fairly in line with the sectoral average.

One could argue that the Dutch sectors can be divided in two groups, the innovative/high productive (Manufacturing, Trade & Transport, Information & Communication, Financial services) and the low productive (Construction, Business services, Culture & Recreation). This would be characterized as a dual economy. From this perspective one could argue that in the innovative group, productivity growth is enabled by automation, innovation, etc. However, as the data shows, this does not materialize in proportionate wage growth. Wage growth is possibly suppressed by earlier mentioned factors such as offshoring, negative policy competition, competition on unit labour costs, shortfall of demand, etc. In the low productive group, wage growth is limited because of slow productivity growth. Meanwhile, low productivity growth could be a result of limited opportunities for innovation/automation. Also, labour supply is expected to increase when productivity growth in the innovative sector is not matched by growth of aggregate demand and hence an expansion of production. In general it seems that there is no uniform correlation between labour productivity growth and wage growth. Wage growth is fairly similar between sectors while productivity growth fluctuates. The following chapter analyses to what extend labour productivity growth is associated with wage growth.

Tabel 10. Decomposition of the productivity-wage gap per sector. Average annual growth rates for the period 1970-2016. Sectors Manufacturing (C), Construction (F), Trade Transport & Hospitality (G-I), Information & Communication (J), Business services (M-N), Culture & Recreation (R-U). Data source: CBS

	C	F	G-I	J	K	M-N	R-U
real average wage	1.55	1.59	1.23	1.20	2.04	0.65	1.14
gross labour productivity	3.39	-0.02	2.47	2.36	2.74	0.70	-0.17
productivity-wage gap	1.84	-1.61	1.24	1.16	0.70	0.06	-1.31
labour share	-0.21	0.16	-0.42	-0.10	-0.41	-0.33	0.05
terms of trade	-1.65	1.22	-0.83	-1.19	-0.07	0.30	1.13
social contributions	-0.02	-0.24	-0.01	-0.13	0.21	0.02	-0.13

6. The association of wage, productivity and employment

SUMMARY *The interaction between productivity growth and wage growth is the foundation of the productivity-wage gap. Under the orthodox view of the relation between productivity and compensation, an increase in labour productivity translates into an increase of average wage. The labour share remains constant when labour is paid its marginal product and thus, increased labour productivity is fully reflected in higher wages. This analysis presents a distributed lag regression model with real average wage growth as dependent variable and real gross labour productivity as dependent variable. The unemployment rate is likely to reflect broader cyclical economic fluctuations and is included in the regression model as control variable. The change in productivity may actually take some time to be reflected in change in compensation resulting from the process of wage negotiations. For this reason, using same-year values may actually hide some of these dynamics. The same goes for the rate of unemployment. Therefore, lagged values of productivity growth and unemployment rate are included. A time dummy variable for the years 1994-2002 is included to capture the transition to the EMU. Minimum wage is included as independent variable. The association between productivity growth and wage growth differs between sectors and ranges between 0.319 and 0.674. The association between minimum wage growth and wage growth differs between sectors and ranges between 0.459 and 0.827. Also without the labour terms of trade component, the association between productivity growth and wage growth is les then one-for-one. Structural break at 1993 in the association between productivity growth and wage growth.*

6.1 Theory

6.1.1 Link between productivity and wage growth

Standard microeconomic theory, as presented by standard economic textbooks, suggests a clear relationship between productivity and wages, in which wages correspond to the marginal productivity of labour, following from profit-maximizing behavior of firms (Boardman, Greenberg, Vinning, & Weimer, 2014; Dietz, Heijman, & Marks, 2015). Worth emphasizing is the fundamental assumption of a firm being a profit-maximizing entity. This excludes many government and healthcare organization in the Netherlands. This theory brings forth two plausible conclusions about the relationship between labour productivity and wages in the short-run, (1) if labour productivity increases, while wages remain constant, labour demand will increase because an expansion of production will increase profits, and (2) given a fixed labour supply, the increased labor demand would result in higher pay, until a new profit-maximizing equilibrium is reached at which wages equal labour productivity (Meager & Speckesser, 2011). From a macroeconomic perspective, the labour market clears where the downward-sloping labour demand curve from the business sector intersects the aggregate labour supply curve from households (van Biesebroeck, 2015). Of course, tightness of the labour will determine to what extend and in what time frame wages will respond to increased productivity. In the situation of a high unemployment rate, wages will increase when the level of unemployment has dropped to such an extent that firms have to compete for workers. Another prerequisite is the profitability of increasing production. In the case of stagnating consumption, firms could choose to maintain their increased profit margin instead of expanding production.

An important guideline in Dutch bargaining practice is the so-called 'loonruimte'. It indicates how much wages are allowed to grow, considering economic growth and inflation. The LIR is constant when actual labour compensation growth is consistent with the 'loonruimte'.

$$loonruimte = \hat{p} + \left(\hat{Y} - \hat{L}\right)$$

In the short-term, labour compensation growth is likely to differ from the 'loonruimte'. This is because the LIR is very susceptible to cyclical fluctuations. An economic downturn will suppress GDP growth more than labour compensation due to a phenomenon named "labour hording". As a result, the LIR will increase when the economic activity decreases. In contrast, economic growth is not likely to translate into wage growth immediately, which results in a decline of the LIR. Labour hoarding is the phenomenon where producers in a downturn cycle do not immediately reduce their workforce in line with falling demand because they anticipate needing these workers in the future and because the adjustment costs (dismissal and recruitment) are substantial. In addition, employment protection legislation could pose legal obstacles that prevent employees from being fired during an economic downturn. Under perfect market conditions, it is expected that the growth of wages is equal to the 'loonruimte'. This implies wages are corrected for both inflation and labour productivity growth. Wage equals the marginal product of labour, as firms continue to hire employees up to the point where the value of one additional worker equals the wage rate. From a macroeconomic perspective, the market clearing wage rate is where the labour demand curve (downward-sloping) intersects the labour supply curve (upward-sloping). Many models assume a perfectly inelastic labour supply which would imply that an increase of productivity and the resulting increase in labour demand are fully reflected in higher wages. In reality, a positive marginal disutility of work implies that more workers enter the labour market as wages rise. The upward-sloping labour supply results in an increase of labour supply as wages rise, which limits wage growth. In such a situation, certain workers receive rents as their wage is higher than their disutility of work. In summary, perfect markets result in equality of wage and productivity growth through the hiring practices of profit maximizing firms. In the case of a positive productivity shock, the labour demand curve shift up which results in higher wages.

6.1.2 Capital-labour substitution

In the medium- and long-run, firms can also adjust their capital stock. As a result, changes in the price of labour (wages) and the price of capital (interest rates) can lead to substitution of production factors. The ease of substitution between labour and capital depends on the elasticity of substitution. This elasticity could differ between sectors. In theory, the demand for production factors (labour and capital) adjust to its supply as mismatches lead to changes in the relative factor price which will induce substitution. In this way, the direction of technological progress is partly influenced by the relative factor price. An increase of the cost of labour induces firms to substitute labour for capital, resulting in labour productivity growth. Cheap labour on the other hand, induces firms to attract more labour, hence labour productivity growth stagnates. In theory this is a balanced process as an increase or decrease of demand for labour will affect the relative factor price of labour. For this reason, the labour share is assumed to be fairly stable over time. In the short-term, the business cycle can result in fluctuations in the labour share (Krueger, 1999). The share of labour compensation in national GDP increases when economic activity declines. This is the result of "labour hording" and rigid labour contracts. Labour hording arises when firms keep workers on their payroll, despite declining economic activity, because they anticipate on economic recovery and the thereby increasing labour demand. Employment protection regulations make it difficult to fire employees which affects the flexibility of the wage bill. The adjustment of both capital and labour would result in an allocation of factors of production corresponding to their marginal products under perfect competition. Once again, increases in wages would follow from increases in labour productivity. Since the neoclassical model assumes an exogenously-given price level on goods markets under perfect competition, both the scale and the substitution effects of an increase in wages on labour demand are unambiguously negative (Meager & Speckesser, 2011).

6.1.3 Reverse causality in productivity-wage relation

Some wage models argue for a 'reverse causality' between productivity growth and wage growth. Wages are not being set according to productivity, but wages are set at a particular level in order to result in a specific level of productivity in a context in which labour market institutions (e.g. unemployment benefits) reduce the "penalty associated with being fired" (Shapiro & Stiglitz, 1984). The bi-directional relationship between wages and productivity depends on the particular nature of the wage setting process in different countries (Millea, 2002). It can be interpreted in the light of efficiency wages, i.e. explaining productivity as resulting from particular wage levels (Fuess & Millea, 2006). Moreover, increasing wage levels are argued to induce labour productivity growth as the increased factor price of labour results in the substitution towards capital (Storm, 2017; Chennells & van Reenen, 1997). Standard microeconomic models assume that technological change is exogenous in the short- and medium-run. More recently, however, endogenous growth theory rejects this assumption, on the basis that changes in factor use resulting from factor price changes impact on technological progress (Romer, 1990). Unlike Solow-type growth models (Solow, 1956), these models do not predict that growth in productivity results in a steady state after some time, or that productivity growth requires external changes in technological progress. The assumption holds that firms' choices of innovation investments depend on both (real) interest rates and (real) future wages (Hellwig & Irmen, 2011). The set-up of the model is inter-temporal and assumes rational expectations (i.e. anticipations of wage increases materialize as actual wage increases). Under the usual profit-maximizing framework, firms anticipating a high level of future wages have incentives to invest in productivity enhancing innovations or be driven from the market. This is in line with the reverse causal relation between productivity and wage . Therefore, a high growth rate of wages leads to investments in productivity-enhancing capital. As in standard theory, wages and productivity will be aligned in the

long run, because firms with productivity increases below the level of wage increases will eventually be unable to pay their wage bills and go out of business.

Based on the substitution between capital and labour as a result of changing factor prices, it could be argued that labour productivity growth is not exogenous as it depends on the cost of labour. In addition, it has been found that productivity growth is positively affected by the growth of aggregate demand, called the Kaldor-Verdoorn effect. Another factor of influence is the level of labour market regulations. This leads to a function for labour productivity growth ($\hat{\lambda}$) including economic growth ($\hat{Y}$), real wage growth ($\hat{w}$) and labour market regulation (Z).

$$\hat{\lambda} = \beta_0 + \beta_1 \hat{Y} + \beta_2 \hat{w} + \beta_3 Z$$

The Kaldor-Verdoorn effect (β_1) represents the increasing level of productivity growth as the economy expands at a faster pace. β_2 represents the incentive for firms to substitute capital for labour when the price of labour increases. The effect of labour market regulations is captured by (β_3). High labour market regulations (Z) lead to labour saving innovations because firms perceive to less flexible, this is an example of technology forcing regulation. Z is a qualitative and multi-dimensional variable which contains concepts such as employment protection legislation, minimum wage, unemployment benefit and degree of unionization.

Depreciation as a share of value added fluctuates in response to changes in the composition of capital and changes in the capital-output ratio (Karabarbounis & Neiman, 2014). In general there are two important factor that influence the share of depreciation. First, the price of investment goods. Technological progress reduces the cost of investments goods and in response the share of depreciation declines proportionately. Labour-capital substitution increases the capital intensity. It is plausible that as the capital stock grows, the increment of output produced declines slowly, but there can be no question that depreciation increases proportionally. Secondly, the real interest rate. A decline in the real interest rate causes the capital-output ratio to rise, which increases depreciation as a share of gross value added. Reduction in the real interest rates causes the net labour share to increase despite a decrease in the gross labour share (Karabarbounis & Neiman, 2014).

6.1.4 Deviation from equality between productivity and wage growth

Monopsony on the side of the employer could be a reason for wage growth staying behind labour productivity growth. When a firm can dictate wages, it does not have to select a wage on its own demand curve but instead it can pick a point on the workers supply schedual that maximizes the firms profit (van Biesebroeck, 2015). This will only be feasible if workers cannot easily substitute away to competing employers, for example in the case of geographically localized labor markets or in highly segmented labor markets by occupation (van Biesebroeck, 2015). As discussed earlier, the unification of Europe has, to some extent, created these circumstances. Capital is fully mobile within the EU, while labour is not, despite the encouragement of labour mobility by EU law (Galanis, 2013).

Asymmetric information could also lead to a deviation from equality of wage and productivity. Productivity could be unobservable making it more difficult to value and reward it. Also, job search is costly and time that can be spent without a job is limited for most workers. Under these circumstances it will not even be optimal for a worker to keep looking for a job that pays the full marginal productivity (van Biesebroeck, 2015). This illustrates the importance of unemployment benefits.

6.2 Results

6.2.1 Model

The association between productivity growth and wage growth is the foundation of the productivity-wage gap. Under the orthodox view on the relation between productivity and compensation, an increase in labour productivity translates into an increase of average wage. The simplest regression model assesses the sole interaction between gross real labour productivity growth[8] to real average wage growth[9]. However, cyclical factors could affect the estimation of the association between productivity growth and wage growth. These effects are minimized by controlling for changes in the unemployment rate. The change in productivity may actually take some time to be reflected in change in compensation resulting from the process of wage negotiations. For this reason, using same-year values may actually hide some of these dynamics. The same goes for the rate of unemployment. Therefore, following Stansbury and Summers (2017), this analysis presents a distributed lag model that captures the impact of lagged values of productivity growth and unemployment on wage growth. It also includes a time dummy for the period 1994-2002 during which there was a significant shock in the productivity-wage association as the Dutch economy transitioned to a shared European currency. See paragraph 6.2.7 for detailed information. Ofcourse, some developments, such as negative policy competition on labour costs, remain to exist after 2002. The first transitional shock is captured in the regression model by including a dummy variable for the period 1994-2002. Finally, minimum wage growth is added to the distributed lag model. The extent to which productivity growth flows through into wage growth is for a big part determined by the institutional context. The foundation for wage claims is based on the bargaining power of workers. Institutions shape the bargaining process and could possibly empower workers in their effort to appropriate a larger wage share. The inclusion of minimum wage results in the following distributed lag model (4). Chapter 6.3 discusses in more detail the different models that have been tested. In addition is presents different robustness checks.

$$(4) \; \Delta \log wage_t = \; \alpha + \sum_0^2 \beta_0 \, \Delta \log labour \; productivity_{t-i} + \sum_0^2 \beta_1 \, unemployment_{t-i} + \\ \beta_2 dummy \; years \; 1994 - 2002 + \beta_3 \, \Delta \log minimum \; wage + \; \varepsilon_t$$

6.2.2 country level models

Figure 28 displays the regression results for the four regression models presented in the previous paragraph. All models have the growth of average real wage as the dependent variable and the data spans from 1972 to 2016. The standard errors, presented in parentheses under the estimated coefficients, are heteroskedastic and autocorrelation consistent. Most interesting is whether a significant association exists between productivity growth and wage growth and whether this association is positive or negative. All coefficient estimates are strongly significantly different from zero. Model 4 provides the best fit with an adjusted R-squared of 0.510. In this model the sum of productivity growth coefficients equals 0.811. Model 4 shows there has been a positive and significant association between labour productivity growth and wage growth. The results suggest a strong correlation but it is likely to have been less than one-for-one. When comparing model 3 to model 4, we can conclude that the introduction of minimum wage growth as independent variable absorbs some of the positive association first attributed to productivity. The sum of productivity growth coefficients drops from 1.089 to 0.811. This suggest some multicollinearity between the two independent variables. However, the variance inflation factors remain under the 3 for both variables[10].

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[8] National GDP over total hours worked, deflated by GDP deflator.

[9] Total labour compensation over total hours worked, deflated by CPI deflator. Assumption that self-employed earn the same compensation as employed.

[10] Variance Inflation Factors for model 4, see appendix. VIF for minimum wage (2.4), light multicollinearity

| | Dependent variable: | | | |
| | log change avearage real wage 1972-2016 | | | |
	(1)	(2)	(3)	(4)
log change gross labour productivity	0.526***	0.544***	0.611***	0.441***
	(0.167)	(0.133)	(0.098)	(0.074)
log change gross labour productivity 1 year lag		0.487***	0.478***	0.370***
		(0.130)	(0.113)	(0.110)
unemployment rate		1.105***	0.933***	0.939***
		(0.325)	(0.187)	(0.265)
unemployment rate 1 year lag		-2.271***	-2.243***	-1.755***
		(0.441)	(0.254)	(0.340)
unemployment rate 2 year lag		1.176***	1.333***	1.145***
		(0.378)	(0.225)	(0.144)
Dummy variable years 1994-2002			-2.264***	-1.787***
			(0.469)	(0.463)
log change minimum wage				0.468***
				(0.113)
Constant	-0.007	-1.096	-0.856	-2.673***
	(0.469)	(1.021)	(0.806)	(0.883)
Observations	45	45	45	45
R^2	0.165	0.394	0.495	0.588
Adjusted R^2	0.145	0.316	0.415	0.510
Residual Std. Error	2.369 (df = 43)	2.119 (df = 39)	1.959 (df = 38)	1.793 (df = 37)
F Statistic	8.479*** (df = 1; 43)	5.067*** (df = 5; 39)	6.210*** (df = 6; 38)	7.547*** (df = 7; 37)

Note: *p<0.1; **p<0.05; ***p<0.01

Figure 28. Newey-West standard errors (HAC in parentheses). Wage calculated as total labour compensation over total hours worked with self-employed assumed to receive the same compensation as employees (CPI deflated). Gross labour productivity calculated as total value added over total hours worked including depreciation (GDP deflated). Unemployment rate for labour force 15-64 year. Dummy is categorical variable with 1 for the years 1994-2002 capturing effects related to the transition to the EMU. Real minimum wage growth. All data obtained from Dutch national accounts published by CBS.

The years 1994 to 2002 are negatively associated with the growth of wages, as expected. These years mark the transition period towards the European Monetary Union. In this period, fiscal and monetary autonomy of the Dutch government were surrendered to Brussels. Also, the system of fixed exchange rates, which was leading up to the introduction of the Euro, put more emphasis on labour costs as the main factor for competition between Eurozone countries as monetary policies and currency devaluation were no longer available. The Netherlands experienced a conflict between hard currency policies and their effects on the labour market. The year dummy variable represents these structural changes which resulted in a significant shock to the relation between productivity growth and wage growth. The coefficient for the year dummy is strongly negative and highly significant. The strong negative association is in line with the growing productivity-wage gap during this period, illustrated in figure 33. In the period 1994-2002, the labour compensation share declined with five percent point. The regression results confirm that the association between productivity and wage was significantly different during the period 1994-2002 when compared to the other years. Even though the unemployment rate variables are included as control variables, their coefficients point out an interesting issue.

The cumulative coefficient for the unemployment rate is positive which indicates that higher rates of unemployment are associated with higher rates of wage growth. This goes against the well-established notion that pressure on the labour market, and thus low unemployment rates, result in higher wage

growth. The positive association between the cumulative unemployment rate coefficients and wage growth is remarkable. However, it does fall within the bandwidth of the standard errors for the unemployment rate variables. See paragraph 6.3.9 for a further discussion on the unemployment variables.

6.2.3 Sector level results

The use of economy wide averaged data hides some of the heterogeneity across sectors. Figure 29 presents the sectors specific results for model 4. Figure 30 presents boxplots for the sector specific coefficients. From this plot we can conclude that the two productivity coefficients do not vary much across sectors. The mean of productivity coefficients is 0.454, which is comparable to the coefficient on economy wide averaged data (see figure 28, 0.441). Remarkable is the coefficient for the lagged productivity growth rate. The mean across sectors dropped to 0.031, compared to 0.370 on the averaged data (see figure 28). This positive association seems to have been absorbed by the coefficient for minimum wage growth that increased from 0.468 on averaged data, to a mean of 0.616 across sectors. The coefficient for minimum wage growth shows little variation across sectors (see figure 30).

The negative association between wage growth and the period 1994-2002 holds for all sectors except the financial sector (K). Faster wage growth in the financial sector could very well be associated with the deregulation of capital markets that occurred during this period. These findings seem to support the claim that the formation of the EMU induced further financialization and faster growth of compensation relative to the other sector (Arnone, Laurens, Segalotto, & Sommer, 2007; Galanis, 2013).

Figure 29 indicates how the association between productivity growth and wage growth varies greatly between sectors. The sectors manufacturing (C), construction (F), transport trade & hospitality (G-I) and information & communication (J) are characterized by a relatively low association between productivity growth and wage growth. It is not a coincidence that in these sectors the productivity-wage gap grew the fastest.

Comparison between the coefficients of productivity growth and minimum wage growth is interesting for policy question related to wage growth. In CPB's recent publication on wage growth, van Tilburg & Suyker (2018) argued that policy makes should focus on stimulating productivity growth which would result in wage growth. This is in line with the conclusion of Standsbury & Summers (2017). In contrast, Bivens & Mishel (2015) argue that productivity growth alone will fail to translate in significant wage growth. Instead, institutional changes are required to support a faster and broader shared wage growth. The coefficietns for productivity growth prove that the association with wage growth is less than one for one, which will result in the divergence of productivity and wage. The high associaiton between minimum wage growth and labour productivity indicates that policy makers can have a significant impact on the growth of real average wages.

log change average real wage, 1972-2016

	C	F	G-I	J	K	M-N	R-U
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
log change gross labour productivity	0.370**	0.319*	0.320***	0.379***	0.543***	0.674***	0.571***
	(0.136)	(0.181)	(0.107)	(0.095)	(0.087)	(0.176)	(0.061)
log change gross labour productivity 1 year lag	0.228***	-0.209	-0.043	-0.078	0.263**	0.105	-0.050**
	(0.076)	(0.171)	(0.113)	(0.052)	(0.109)	(0.137)	(0.022)
unemployment rate	1.173***	0.696	0.378	-0.601	1.076**	0.473	0.174
	(0.356)	(0.526)	(0.270)	(0.406)	(0.416)	(0.412)	(0.270)
unemployment rate 1 year lag	-2.084***	-2.592***	-0.903*	0.938	-1.220	-0.942	-0.602**
	(0.697)	(0.638)	(0.505)	(0.629)	(0.969)	(0.749)	(0.289)
unemployment rate 2 year lag	1.559***	1.943***	0.980**	0.112	0.499	0.541	0.641***
	(0.421)	(0.351)	(0.373)	(0.348)	(0.594)	(0.334)	(0.056)
dummy variable years 1994-2002	-2.535***	-2.686**	-1.590	-2.484**	0.781	-1.192**	-1.830***
	(0.377)	(1.011)	(1.064)	(1.042)	(1.163)	(0.562)	(0.193)
log change real minimum wage	0.459***	0.562***	0.602***	0.730***	0.572***	0.561***	0.827***
	(0.144)	(0.196)	(0.146)	(0.137)	(0.150)	(0.177)	(0.031)
Constant	-4.758***	1.423	-2.635***	-2.590**	-3.160**	-0.540	-0.406
	(1.149)	(1.765)	(0.923)	(1.079)	(1.170)	(1.261)	(0.387)
Observations	45	45	45	45	45	45	45
R^2	0.535	0.396	0.388	0.551	0.638	0.607	0.583
Adjusted R^2	0.447	0.282	0.272	0.466	0.569	0.533	0.504
Residual Std. Error (df = 37)	1.996	3.531	2.194	2.297	2.532	2.266	2.647
F Statistic (df = 7; 37)	6.090***	3.467***	3.353***	6.492***	9.312***	8.169***	7.382***

Note: *p<0.1; **p<0.05; ***p<0.01

Figure 29. Newey-West standard errors (HAC in parentheses). Wage calculated as total labour compensation over total hours worked with self-employed assumed to receive the same compensation as employees (CPI deflated). Gross labour productivity calculated as total value added over total hours worked, including depreciation (GDP deflated). Unemployment rate for labour force 15-64 year. Dummy is categorical variable with 1 for the years 1994-2002 capturing effects related to the transition to the EMU. Real minimum wage growth. All data obtained from Dutch national accounts published by CBS.
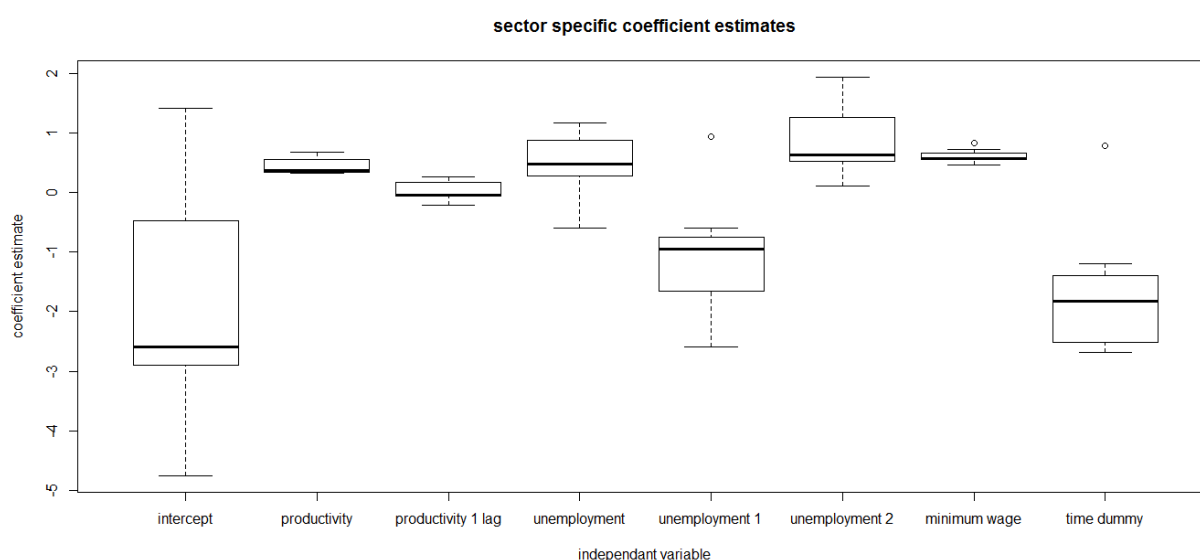
Figure 30. Boxplots for sector specific coefficient estimates for distributed lag model 4. Independent variable real average wage growth. The coefficients for productivity and minimum wage differ very little across sectors.

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6.2.5 Breakpoints

So far, the analysis has indicated that the relation between productivity and wage has changed drastically since 1993. This is partly captured by the dummy variable for the years 1994-2002. As a robustness check, the model is tested on two subintervals, one series from 1972 to 1993 and the other from 1994 to 2016. The results are presented in figure 31. A Chow test[11] indicates a structural break at 1993 as the true coefficients in the two linear regressions differ significantly. Separate regression on the subintervals delivers a better model than the combined regression. The results for the period 1972-2016 are mainly driven by the data from the period 1972-1993. From 1994 onwards, the model gives no significant results since the adjusted r-squared indicates that the model has no explanatory value at all. For the period 1972-1993, productivity growth is positively associated with real average wage growth. Also, minimum wage growth is positively associated with an increase of real average wage. The Chow test confirms the presence of a structural break in 1993 which was assumed beforehand. However, it is possible that there are breakpoints that result in a smaller residual sum of squares (RSS). The function "breakpoints" of the package strucchange in R finds breakspoints based on piecewise linear models. It uses dynamic programming to find breakpoints that minimize residual sum of squares (RSS) of a linear model with m + 1 segments. The Bayesian Information criterion (BIC) is used to find an optimal model as compromise between RSS and number of parameters. The breakpoints test[12] indicates a structural break in the year 1984, 1994 and 2004. These years correspond closely, though not exactly, to the demarcation chosen in chapter 3 which were the years 1983, 1993 and 2007.

log change average real wage, 1972-2016

	Dependent variable:		
	1972-2016	1972-1993	1994-2016
	(1)	(2)	(3)
log change gross productivity	0.441***	0.415***	0.340***
	(0.074)	(0.103)	(0.057)
log change gross productivity 1 year lag	0.370***	0.493***	0.056
	(0.110)	(0.112)	(0.104)
unemployment rate	0.939***	0.666*	0.719***
	(0.265)	(0.355)	(0.234)
unemployment rate 1 year lag	-1.755***	-1.610**	-1.626***
	(0.340)	(0.620)	(0.374)
unemployment rate 2 year lag	1.145***	1.267***	0.901***
	(0.144)	(0.417)	(0.124)
Dummy variable years 1994-2002	-1.787***		-0.950**
	(0.463)		(0.374)
log change real minimum wage	0.468***	0.486**	0.057
	(0.113)	(0.179)	(0.278)
Constant	-2.673***	-2.726	-0.056
	(0.883)	(1.984)	(0.774)
Observations	45	22	23
R^2	0.588	0.682	0.272
Adjusted R^2	0.510	0.555	-0.068
Residual Std. Error	1.793 (df = 37)	2.005 (df = 15)	1.686 (df = 15)
F Statistic	7.547*** (df = 7; 37)	5.369*** (df = 6; 15)	0.800 (df = 7; 15)
Note:			*p<0.1; **p<0.05; ***p<0.01

Figure 31. Newey-West standard errors (HAC in parentheses). Distributed lag model with log change real average wage as dependent variable. Two subintervals. Own calculations. Data source: CBS.

[11] Chow test. 95% confidence. F-critical value 1.97, Chow statistic 2.03
[12] Breakpoints test, indicates 1984, 1994, 2004 as breakpoints based on minimizing RRS.

6.3 Statistical tests

6.3.1 linear regression productivity-wage

The association between productivity growth and wage growth is the foundation of the productivity-wage gap. Under the orthodox view of the relation between productivity and compensation, an increase in labour productivity translates into an increase of average wage. The labour share remains constant when labour is paid its marginal product and thus, increased labour productivity is fully reflected in higher wages. Some economist argue that the positive association between productivity and wage is broken, resulting in a decline of the labour share. Under this view, labour productivity growth is no longer translating into average wage growth. Equation 1 illustrates the simplest regression model that assesses the sole interaction between gross real labour productivity growth[13] to real average wage growth[14]. The basic model (equation 1) uses change in logged values of compensation and productivity. The levels of productivity and wage are non-stationary unit root processes while their first differences are not[15]. High correlation between both factors results in a β_0 close to 1.

$$(1)\ \Delta \log wage_t = \alpha + \beta_0\, \Delta \log productivity_t + \varepsilon_t$$

Before continuing with the regression analysis there are certain criteria that each linear regression model should meet in order to obtain the best linear unbiased estimator of the coefficients given by the ordinary least squares estimator.
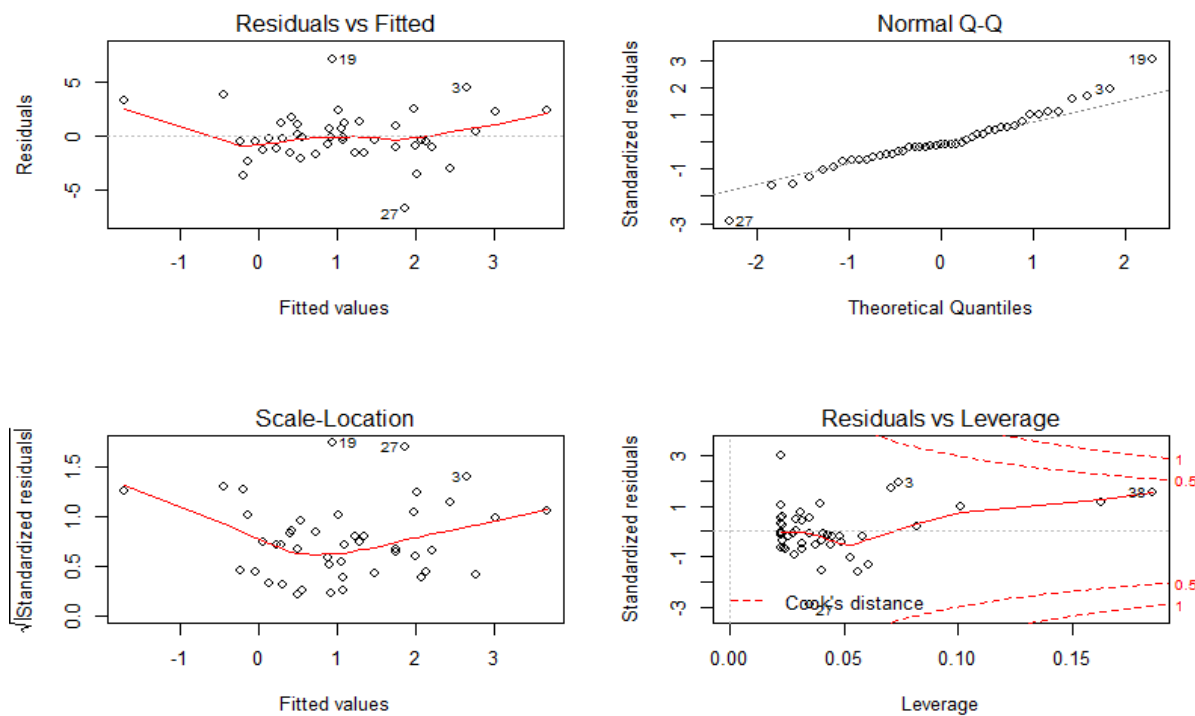
Figure 32. Diagnostic plots linear regression model (1). Real average wage growth as dependent variable and real gross labour productivity growth as independent variable. Own calculations. Data source: CBS

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[13] National GDP over total hours worked, deflated by GDP deflator.

[14] Total labour compensation over total hours worked, deflated by CPI deflator. Assumption that self-employed earn the same compensation as employed.

[15] Augmented Dickey-Fuller test, wage growth p-value = 0.09, productivity growth p-value = 0.06. In both cases H0 is not rejected because p-value > 0.05. However, both growth rates are assumed to be stationary in other research as well. See appendix for test results

Figure 32 presents the diagnostic plots for the simplest regression model (1). The residuals vs fitted plot indicates a linear pattern. However, the residuals seem to be higher at the more extreme values for productivity growth. This could be a result of the small sample size. The normal Q-Q plot shows a slightly heavy-tailed distribution. The scale-location plot shows that the residuals are spread unequally along the range of predictors which indicates heteroscedasticity. The residuals vs leverage plot indicates that the regression results are not very sensitive for outliers as none of the observations exceeds a Cook's distance of 0.5. The outliers will be discussed in more detail in the following paragraphs.

6.2.2 Distributed lag regression

Cyclical factors could affect the estimation of the association between productivity growth and wage growth. These effects are minimized by controlling for changes in the unemployment rate. The unemployment rate is likely to affect the wage setting process as it impacts the bargaining position of both employers and employees. An increase in unemployment is likely to undermine the bargaining position of employees which allows employers to offer a smaller wage increase then when unemployment is low. Stainsbury and Summers (2017) use the percent point change of the unemployment rate instead of the unemployment rate as a level. This approach could result in misleading figures because a percent point increase of the unemployment rate from 3% to 4% has a very different effect then an increase from 7% to 8%. The change in the unemployment rate fails to capture the pressure on the labour market, which is much higher in the first example than in the latter. In addition, the unemployment rate is likely to reflect broader cyclical economic fluctuations. An increase in unemployment could be interpreted as a signal for an economic downturn. Firms are likely to hold off with wage increases.

The change in productivity may actually take some time to be reflected in change in compensation resulting from the process of wage negotiations. For this reason, using same-year values may actually hide some of these dynamics. The same goes for the rate of unemployment. Therefore, following Stansbury and Summers (2017), this analysis presents a distributed lag model that captures the impact of lagged values of productivity growth and unemployment on wage growth. In this case we are interested in the cumulative effect of a change in productivity on compensation over a number of years. Therefore the parameter of interest is the sum of the β_0 estimated coefficients. In contrast to a moving average model, this method allows for an independent estimation of coefficients for productivity growth and a lagged version.

$$(2)\ \Delta \log wage_t = \alpha + \sum_0^2 \beta_0\ \Delta \log labour\ productivity_{t-i} + \sum_0^2 \beta_1\ unemployment_{t-i} + \varepsilon_t$$

The validity of ordinary least squares for estimating the regression coefficients is based on the Gauss Markov assumptions. The Breusch-Pagan test[16] rejects the assumption of homoscedasticity, implying that the variance of the error term is not constant but varies along the range of regressors. In addition, the Durbin-Watson test[17] indicates the presence of autocorrelation, correlation among the error terms. Therefore, this analysis uses Heteroskedasticity-and autocorrelation-consistent (HAC) estimators. The fourth least squares assumption is non-collinearity. The variance-inflation factors for model 2 indicates significant correlation between the unemployment variables[18]. Nevertheless, this does not pose an issue since these are control variables. The productivity variables, the ones we are interested in, show no correlation with other independent variables.

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[16] Breusch-Pagan test, see appendix
[17] Durbin-Watson test, see appendix
[18] VIF, see appendix for test results

6.2.3 Time dummy variables

Chapter 3 presents how the development of the productivity-wage gap developed over time. This chapter points out that the gap increased fastest during the period 1994-2007. The regression analysis could benefit from including a time dummy that represents the sudden shock in the productivity-wage relation. Figure 33 illustrates the productivity-wage gap during this turbulent period. Influential policy agreements are identified and used to demarcate four periods. This paragraph provides an argumentation for the choice of time variable, based on figure 33.

The treaty of Maastricht (1992) set new rules for fiscal and monetary policies for governments with the aim to smoothen the transition to an European Monetary Union through the convergence of European economies. Fiscal policies were limited by the Stability and Growth Pact. Meanwhile, the coordination of monetary policy was institutionalized by the establishment of the European Monetary Institution (EMI). Strict fiscal budget rules and monetary policy had to ensure a convergence of inflation rates. In addition, exchange rates between participating countries were stabilized so to smoothen the transition to a shared currency. Short thereafter, the Netherlands implemented a new round of wage moderation policies "Een Nieuwe Koers". The Netherlands had lost is fiscal and monetary instruments. The only way for maintaining competitiveness is by controlling unit labour costs as a means of real exchange rate devaluation (Galanis, 2013). The Dutch government had an interest in competitive corporatism as a way of attracting business investment and thus by exporting their unemployment problem to their euro-peers. The strong link between macroeconomic competitiveness and social protection led to increased flexibility and deregulation on the labour market. Figure 33 illustrates how the productivity-wage gap grew rapidly after the introduction of "Een Nieuwe Koers" (phase II).

After the establishment of the EMU (1999) a common currency was introduced on the financial markets. Capital became fully mobile within the EU, while labour remained significantly immobile in practice in spite of a positive stance of EU law in favour of worker mobility under the free movement of persons provisions of the Treaty. This resulted in a significant power increase of the corporate sector vis-á-vis labour stakeholders due to the ability of the former to exploit arbitrage opportunities generated by differences between regulatory regimes on the basis of their impact on labour costs (Galanis, 2013). In response, countries engaged in negative policy competition with the aim to attract or retain foreign investment (Delsen & Poutsma, 2005).

In summary, the period 1994-2002 led to a significant shock in the productivity-wage association as the Dutch economy transitioned to a shared European currency. Ofcourse, some developments, such as negative policy competition on labour costs, remain to exist after 2002. However, the first transitional shock is captured in the regression model by including a dummy variable for the period 1994-2002. The inclusion of this variable can be justified when it increases the adjusted r-squared (variance explained by the independent variables). This results in the following regression model.

$$(3) \; \Delta \log wage_t = \; \alpha + \sum_0^2 \beta_0 \; \Delta \log labour \; productivity_{t-i} + \sum_0^2 \beta_1 \; unemployment_{t-i} + \\ \beta_2 dummy \; years \; 1994 - 2002 + \; \varepsilon_t$$

The inclusion of this time dummy effects the outcome of the Breusch-Pagan test and the Durbin-Watson test. In both cases the null hypothesis can not be rejected for model 3 indicating homoscedasticity[19] and absence of autocorrelation[20].

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[19] Breusch-Pagan test, p-value = 0.33, see appendix
[20] Durbin-Watson test, p-value = 0.12, see appendix
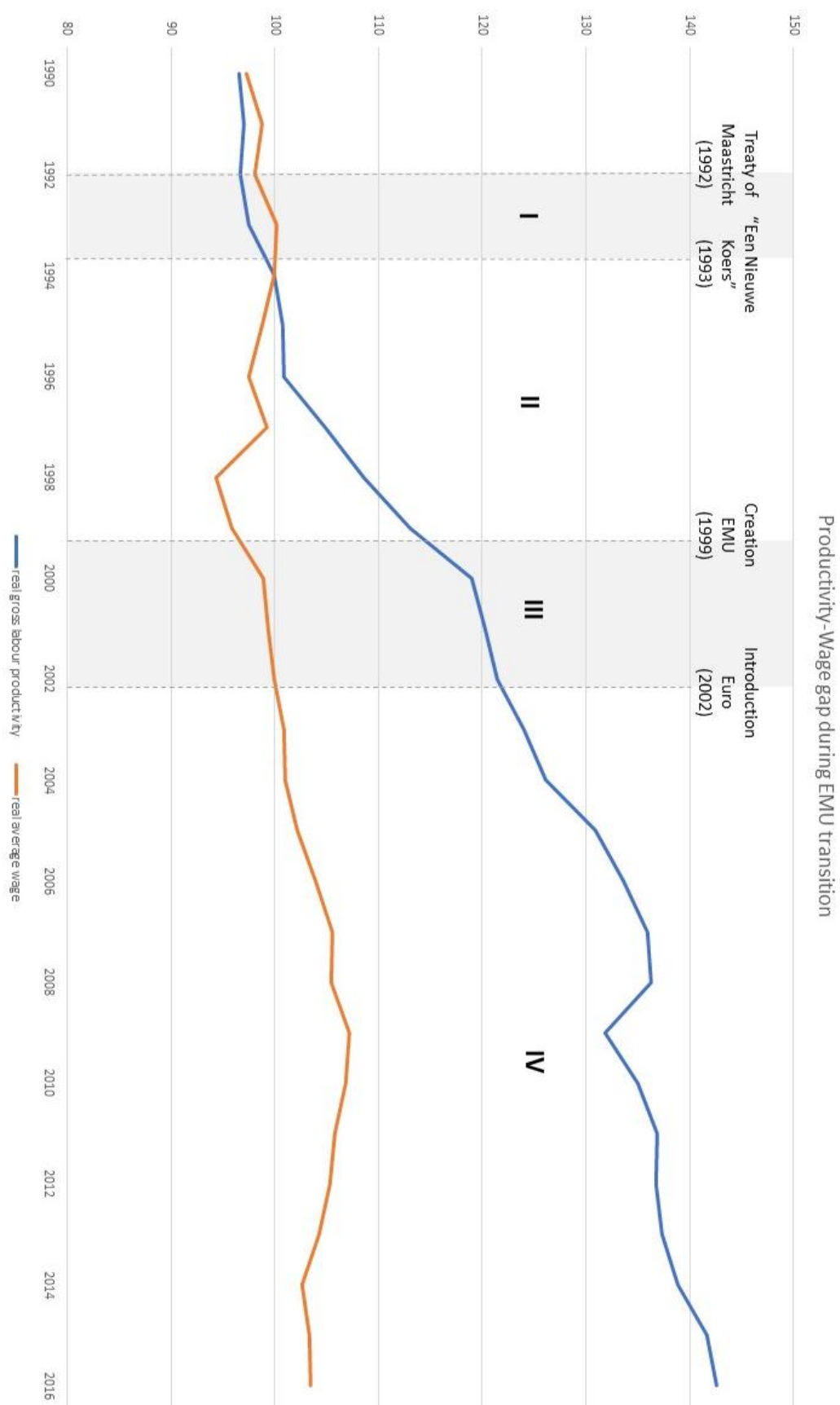
Figure 33. Detailed visualization of the productivity-wage gap over the period 1990-2016. Productivity (blue) and wage (orange). This figure illustrates the rapid growth of the productivity-wage gap during the years in which the EMU was established. Influential developments are identified demarcating four phases. Own illustration. Data source: CBS.

6.2.4 Minimum wage

The extent to which productivity growth flows through into wage growth is for a big part determined by the institutional context. The foundation for wage claims is based on the bargaining power of workers. Institutions shape the bargaining process and could possibly empower workers in their effort to appropriate a larger wage share. For example, by increasing the legal minimum wage, the government can secure a broad based growth of wages throughout the economy. This way, the government can intervene by implementing legal measures when the market fails to adjust wages to the minimum level at required for workers to have a decent level of income. Intuitively we can assume that the level of minimum wage is of great importance for the actual growth of wages, especially in sectors that employ low-skilled workers and in which competition between workers is high. A point of attention is the possible multicollinearity between minimum wage and labour productivity. A high correlation between the two terms is highly plausible based on the assumption that a rise of minimum wage increases the factor price of labour, resulting in substitution towards capital and thereby an increase of labour productivity[21]. The inclusion of minimum wage results in the following distributed lag model (4).

$$(4)\ \Delta \log wage_t = \alpha + \sum_0^2 \beta_0 \Delta\log labour\ productivity_{t-i} + \sum_0^2 \beta_1\ unemployment_{t-i} + \beta_2 dummy\ years\ 1994 - 2002 + \beta_3\ \Delta\log minimum\ wage + \varepsilon_t$$

Adding minimum wage as independent variable results in the rejection of the Breusch-Pagan test[22]. The H0 for the Durbin-Watson test is accepted indicating no autocorrelation[23]. The residuals vs leverage plot in figure 34 shows that the influence exerted by specific outliers is reduced which indicates that the included explanatory variables help to explain the variance.
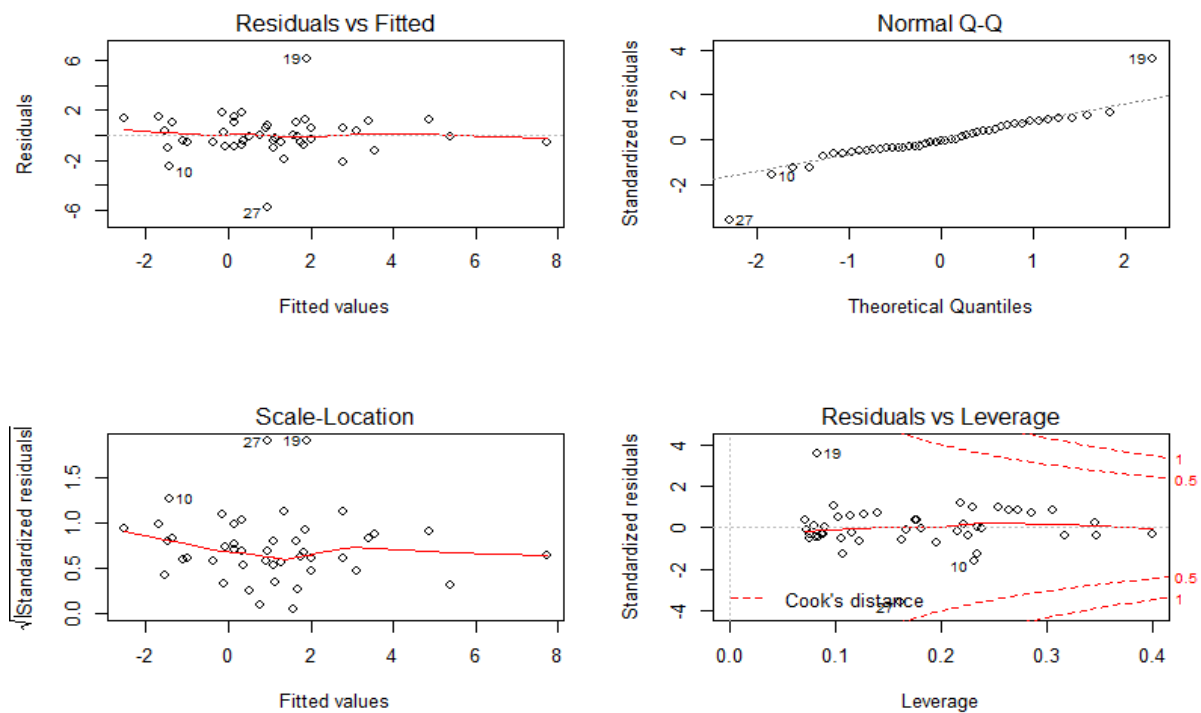
Figure 34. Diagnostic plots distributed lag model (4). Real average wage growth as dependent variable. Own calculations.

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[21] See appendix for Variance Inflation Vectors for model 4
[22] Breusch-Pagan test, p-value = 0.015, see appendix
[23] Durbin-Watson test, p-value = 0.238, see appendix

6.2.5 Outliers

The Residuals vs Leverage plot in figure 35 indicates that there are two significant outliers. Cooks distance is used to compute the influence exerted by these outliers on the predicted outcome which indicates how much the outlying observations impact the fitted values (see figure 36). Observations 19 and 27 are marked as influential. These correspond to the years 1990 and 1998. In 1990, wage growth exceeded productivity growth by 6.24 percent point while in 1998, productivity growth exceeded wage growth by 8.47 percent point. The rapid growth of wages in 1990 (8.06%) was mainly caused by transition in the Dutch social security system. In the same year, social contributions by employers were reduced (-6.37%). With this transition, the Dutch government tried to curtail the rising costs of the social security system (van Gestel, de Beer, & van der Meer, 2009). In 1998, social contributions by employers grew with 5.37% as a result of a change in the WAO law (Ministerie van Sociale Zaken en Werkgelegenheid, 1998). The transition allowed employers to buy-off future social contributions which led to the increase of social contributions by employers. This led to a decline of wage as part of total labour compensation (wage and social contributions).
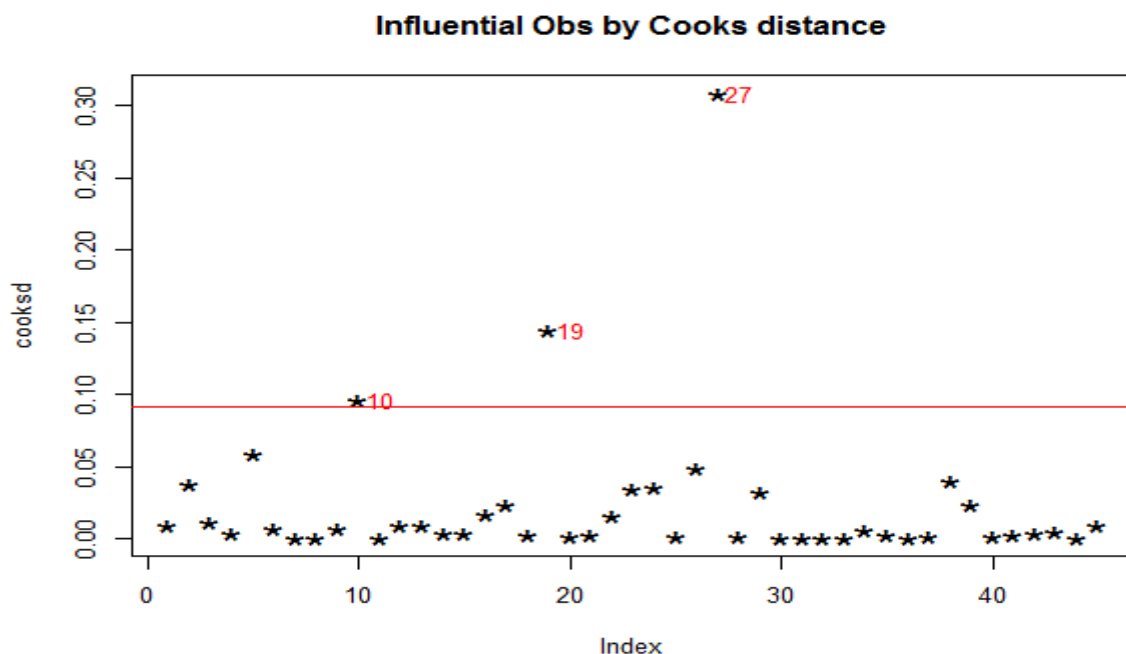
Figure 35. Influential observations by Cooks distance (model 4). Observations with Cooks distance greater than 4 times the mean are marked as influential. Bonferroni p-values for testing each observation in turn to be a mean-shift outliner also indicate observation 19 and 27. Own calculations. Data source: CBS

6.2.6 Data

As discussed earlier the data excludes non-market sectors, agriculture and highly speculative sectors such as real estate. The data covers only 67% of Dutch GDP, but the productivity data is likely to be better measured then that of the total economy. The data is gross not net, so coefficient estimates may be biased if changes in the rate of depreciation are related to changes in both productivity and wage growth. Figure 36 illustrates how the actual values for real average wage growth correspond to the fitted values from model 4. The model provides an good estimation for the dependent variable (real average wage growth) with exception for the years 1990 and 1998. These outliers are discussed in the previous paragraph.
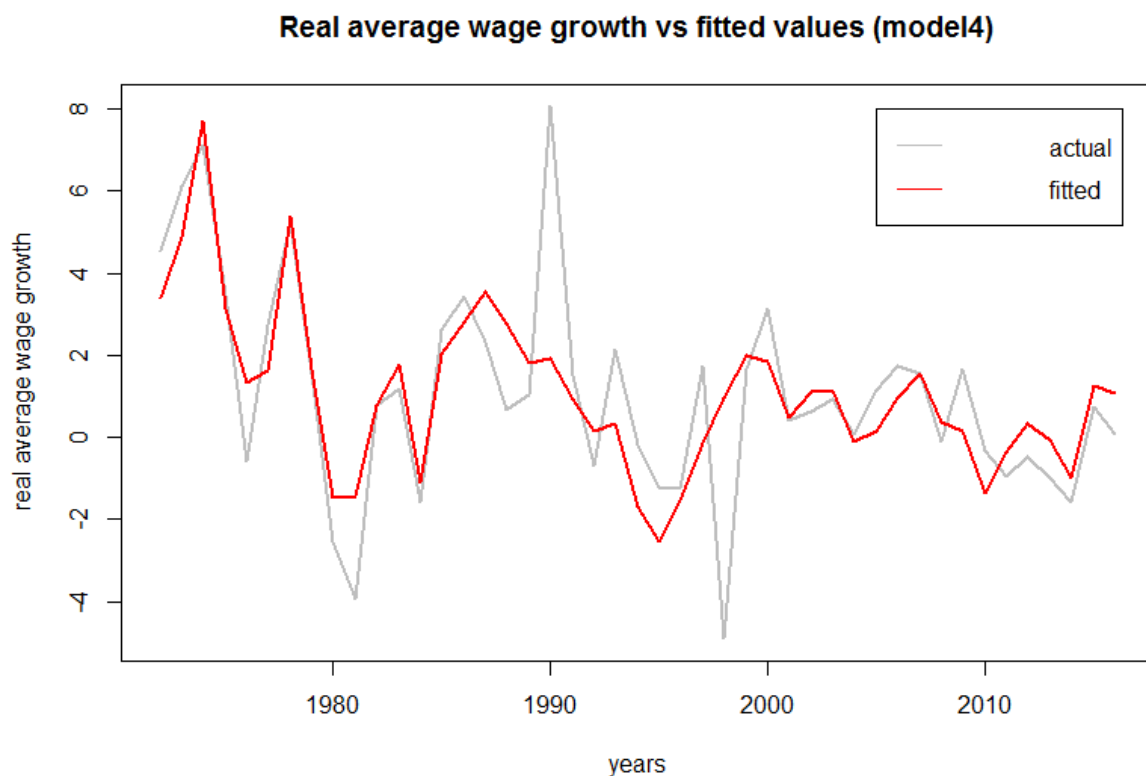
Figure 36. Illustration of the values for the dependent variable real average wage growth and the fitted values from model 4. Own calculations. Data source: CBS.

6.2.7 Fixed effects and poolability

The previous paragraphs describe how Ordinary Least Squares regression analysis is used to fit four different models to a data set of 45 observations. These observations include variables (wage growth, productivity growth, unemployment rate, ect) for the aggregate Dutch economy minus the earlier discussed sectors. The aggregate data can be decomposed into sectors which allows to study the association between productivity growth and wage growth on a sector level. The first option is to run the earlier discussed models on sector specific data (45 observations). This results in 7 individual regression models with sector specific coefficient estimates. This provides insight in to why the productivity-wage gap has developed differently per sector. This method requires a new interpretation for some of the independent variables. The unemployment rate is economy wide and not sector specific. This means that the rate of unemployment does not capture the tension on the labour market, but rather the cyclical movement of the economy.

Another method would be the use of panel data analysis which utilizes the strongly balanced dataset of 315 (45x7) observations. More observations could benefit the analysis. However, heterogeneity across sectors could bias the predictor variables. A fixed or random effects model can be used to control for these time-invariant sector specific characteristics resulting in two error terms, an idiosyncratic error and a sector error component. The sector component may be independent from the regressors or correlated. If correlated, the fixed effects model is most suitable. This method gives the same result as a single OLS regression (on the 315 observations) with binary sector dummies, also referred to as least square dummy variable model (LSDV). In this way, the effect of independent variables is mediated by the differences across sectors. The difference is that in the fixed effects model, the dummy coefficients from the LSDV model are absorbed by sector-specific intercepts. The coefficients of the independent variables remain the same. A random effects model assumes, opposite to the fixed effects model, that the variation across sectors is uncorrelated with the independent variables. Thus, differences across sectors have influence on the dependent variable wage. Also, the random effects model could include time invariant variables while in a fixed effects model these are absorbed by the intercept. A Hausman test indicates that the random effects model is preferred over the fixed effects model[24]. When the sectors specific error terms are missing altogether, a standard OLS regression on pooled data is preferred. The Breusch-Pagan Lagrange multiplier test[25] is not rejected which indicates that a simple OLS regression on pooled data is preferred to a random effects model. There is no evidence of significant differences across sectors.

Because there is no heterogeneity across error terms, a pooled model is preferred to a fixed or random effects model. However, a pooled model assumes that the same coefficients apply to each sector. A variable coefficient model relaxes the assumption of a single coefficient for independent variables across sectors and time. Fixed coefficients models allow the coefficient to vary along the sector dimension while random coefficient models assume that coefficients vary randomly around a common average for each specific sector. A fixed variable coefficient model gives the same results as 7 sector specific regression. A F-test could test the hypothesis of same coefficients by comparing the pooled model to the variable coefficient model (7 sector specific regressions). The H0 is rejected[26], indicating instability across coefficients implying that the variable coefficient model is most applicable. This means that pooled OLS regression results in inaccurate estimates. Therefore, 7 sector specific regressions will provid the best estimation.

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[24] Hausman test, tests whether the unique sector errors are correlated with the regressor or not, H0 is they are not. p-value=0.987.
[25] Lagrange multiplier test, H0 = variance across sectors is zero, p-value=0.600.
[26] F-test, H0 = same coefficients across sectors. P-value = 0.0399. variable coefficient model is preferred.

6.2.8 Endogeneity

The literature points out a reverse causality between productivity and wage, leading to the failure of exogeneity which is an important assumption for OLS regression. The claim for reverse causality is substantiated by the theory that employers substitute labour for capital when wages increase. In the case of model 2, the explanatory variable labour productivity growth is jointly determined with the dependent variable wage growth, resulting in a bias in regression estimates. This endogeneity problem, resulting from reverse causality, could be countered by introducing an instrumental variable for productivity growth. In a two stage least squares (2SLS) regression, the instrumental variable is used to estimate productivity growth after which this estimate is used as an proxy for productivity growth. The most important requirement for a good instrumental variable is high correlation with the independent variable and no correlation with the dependent variable. Such variable is difficult to find in the case of productivity and wage.

A Granger test is used to identify Granger causality in the bivariate series of productivity and wage growth. Grangers causality indicates if a particular variable precedes another and not causality in the sense of cause and effect. However, the test is widely used to identify an empirical argument for the presence of reverse causality. The test reflects the extent to which the lag process in productivity explains the current value of wage, and the other way around. The test compares an unrestricted model in which y is explained by the lags of y and x and a restricted model in which y is only explained by the lags of y.

For the Granger test, the appropriate number of lags for wage growth and productivity growth are identified by use of a VAR model[27]. From the Granger test follows that wage growth does not Granger-cause productivity growth while productivity growth does Granger-cause wage growth[28]. The null hypothesis of no Granger-causality from wage to productivity is not rejected. As a result, the claim for bidirectional causality can not be substantiated by the Granger test.

6.3.8 Without labour terms of trade component

Chapter 3 and 4 indicated that the labour terms of trade is a significant component in the increasing productivity-wage gap. However, it could be argued that the use of two different deflators makes the analysis vulnerable to statistical mismeasurements of inflation rates. Especially because the GDP deflator differs between sectors. As a robustness check, both wage[29] and productivity are corrected for value added inflation. Exclusion of the labour terms of trade component affects the association between productivity growth and wage growth positively while it reduces the association between minimum wage growth and wage growth. This results from the fact that a rise in minimum wage is a policy decision based on the cost of living. Hence, the deflation of wages by use of the CPI deflator will result in a higher correlation with minimum wage. When deflating both wages and productivity with the value added deflator, the two growth rates are becoming more alignment, resulting in a higher correlation. For most sectors, the use of GDP deflation has a limited effect on the correlation between productivity and wage and it remains less than one for one in all cases except the financial sector (K).

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[27] Estimation of VAR model for productivity growth and wage growth, see appendix.
[28] Granger test, see appendix.
[29] Wage and productivity are both deflated with sector specific value added inflation rates.

log change average real wage, 1972-2016

	Dependent variable:						
	C	F	G-I	J	K	M-N	R-U
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
log change gross labour productivity	0.319**	0.632***	0.439**	0.458***	1.162***	0.697***	0.790***
	(0.131)	(0.194)	(0.181)	(0.156)	(0.164)	(0.153)	(0.196)
log change gross labour productivity 1 year lag	0.284**	-0.282*	0.059	-0.079	0.268	0.014	0.140*
	(0.125)	(0.159)	(0.142)	(0.072)	(0.346)	(0.125)	(0.081)
unemployment rate	2.091***	0.990*	0.421	-1.274***	-2.199	0.876**	0.305
	(0.552)	(0.575)	(0.339)	(0.393)	(1.887)	(0.391)	(0.631)
unemployment rate 1 year lag	-3.204***	-1.624**	-0.761	1.239*	1.787	-1.150*	-0.915
	(1.071)	(0.773)	(0.707)	(0.664)	(3.727)	(0.674)	(0.748)
unemployment rate 2 year lag	1.548**	1.015**	0.405	-0.086	0.641	0.238	0.441
	(0.608)	(0.404)	(0.541)	(0.322)	(1.906)	(0.402)	(0.389)
dummy variable years 1994-2002	-1.096	-2.899***	-1.139	-0.842	-3.188*	-0.830	-1.053
	(0.670)	(0.634)	(1.841)	(0.788)	(1.705)	(0.716)	(1.439)
log change real minimum wage	0.517**	0.251*	0.263*	0.208	-0.147	0.355	0.204
	(0.248)	(0.141)	(0.148)	(0.218)	(0.372)	(0.242)	(0.159)
Constant	-1.988	-1.865	0.325	2.408	-2.512	-0.111	1.254
	(2.186)	(1.567)	(1.162)	(1.553)	(2.519)	(1.357)	(1.724)
Observations	45	45	45	45	45	45	45
R^2	0.402	0.478	0.210	0.430	0.325	0.527	0.500
Adjusted R^2	0.289	0.379	0.061	0.322	0.197	0.437	0.406
Residual Std. Error (df = 37)	2.833	3.206	2.739	2.654	7.037	2.260	2.826
F Statistic (df = 7; 37)	3.552***	4.840***	1.407	3.985***	2.542**	5.886***	5.291***

Note: *p<0.1; **p<0.05; ***p<0.01

Figure 37. Distributed lag model (4) per sector without the labour terms of trade component. Both wage and productivity are deflated for GDP inflation. Newey-West standard errors (HAC in parentheses). Own calculations. Data source: CBS.

6.3.9 With change unemployment rate

Regression model 4 uses the national unemployment rate as control variable with the argument that it captures the pressure on the labour market but also represents broader cyclical economic fluctuations. Stainsbury and Summers (2017) use the percent point change of the unemployment rate instead of the unemployment rate as a level. This approach could result in misleading figures because a percent point increase of the unemployment rate from 3% to 4% has a very different effect then an increase from 7% to 8%. This paragraph presents, as a robustness check, the results when using percent point change instead of the level of unemployment.

On the aggregate data, percent point change of the unemployment rate variables are less significant than the level of the unemployment rate. The model using percent point change in the unemployment rate is less significant on the aggregate data as the adjusted r-squared drops from 0.51 to 0.44. The same is true for the sector specific data. It is interesting to notice that the cumulative coefficient for percent change of the unemployment rate is negative while that of the unemployment rate (see paragraph 6.2.2) was positive. Adding an interaction term provides no additional value (See appendix).

The effect on the cumulative labour productivity coefficient is minimal. It drops from 0.81 to 0.77 which indicates that the findings regarding the association between productivity and wage are indifferent to different specifications for unemployment variables.

log change average real wage, 1972-2016

	Dependent variable:							
	All	C	F	G-I	J	K	M-N	R-U
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
log change gross labour productivity	0.428***	0.307**	0.368*	0.219**	0.371***	0.531***	0.700***	0.613***
	(0.099)	(0.139)	(0.199)	(0.090)	(0.125)	(0.112)	(0.169)	(0.095)
log change gross labour productivity 1 year lag	0.349**	0.186**	-0.230	-0.060	-0.113	0.207	0.106	-0.085
	(0.133)	(0.076)	(0.184)	(0.154)	(0.069)	(0.131)	(0.131)	(0.067)
change unemployment rate	0.292	0.040	0.504	-0.326	-1.179***	0.565	0.317	0.096
	(0.235)	(0.267)	(0.520)	(0.278)	(0.417)	(0.450)	(0.447)	(0.588)
change unemployment rate 1 year lag	-0.777**	-0.790*	-2.314***	-0.608	0.328	-0.097	-0.545	-1.069***
	(0.290)	(0.407)	(0.539)	(0.423)	(0.295)	(0.810)	(0.480)	(0.325)
change unemployment rate 2 year lag	0.131	0.163	1.059*	0.344	-0.211	0.143	0.069	0.584*
	(0.169)	(0.278)	(0.528)	(0.213)	(0.213)	(0.384)	(0.341)	(0.335)
dummy variable years 1994-2002	-1.896**	-2.650***	-2.409***	-1.536	-2.694***	0.755	-1.279**	-1.813**
	(0.817)	(0.710)	(0.875)	(1.112)	(0.874)	(1.252)	(0.618)	(0.818)
log change real minimum wage	0.308***	0.157	0.569***	0.394***	0.490***	0.431**	0.510***	0.698***
	(0.096)	(0.143)	(0.176)	(0.134)	(0.128)	(0.184)	(0.154)	(0.118)
Constant	-0.235	0.212	1.620***	0.829	0.786	-0.486	-0.010	1.105***
	(0.344)	(0.472)	(0.533)	(0.506)	(0.652)	(0.487)	(0.342)	(0.215)
Observations	45	45	45	45	45	45	45	45
R^2	0.532	0.371	0.409	0.310	0.505	0.617	0.610	0.598
Adjusted R^2	0.444	0.252	0.297	0.179	0.411	0.545	0.537	0.522
Residual Std. Error (df = 37)	1.911	2.322	3.493	2.330	2.412	2.604	2.257	2.599
F Statistic (df = 7; 37)	6.012***	3.123**	3.656***	2.371**	5.392***	8.516***	8.277***	7.854***

Note: *p<0.1; **p<0.05; ***p<0.01

Figure 38. Distributed lag model. Newey-West standard errors (HAC in parentheses). Dependent variable is real average wage growth. Change in unemployment rate as independent variable instead of the level of unemployment.

7. Conclusion and policy discussion

7.1 Conclusion and findings for policy making

Dutch policy makers are faced with 'great challenges', one of which originates from the stagnation of wage growth. This thesis presents a detailed overview of how labour productivity and wages have diverged over time and between business sectors, thereby providing insights for policy makers that aim to tackle this challenge. This chapter presents the conclusions and policy discussions that can be derived from this study.

The stagnation of wages is both a social-political challenge and an economic challenge. The social-political challenge relates to the shifting distribution of income between capital and labour. Social cohesion is deteriorating as capital accumulates around the top income earners. The Dutch labour share is declining and workers are unable to appropriate a proportionate share of income, relative to their increasing productivity. Instead, gains in productivity come to the benefit of capital owners. This results in growing income inequality between workers and capital owners. This is a global phenomenon. Top income earners, who generally generate most of their income through return on capital, experience on average a much faster increase of income then average and low income earners. Secondly, wage stagnation results in an economic challenge that is not as much addressed as the social-political challenge. Wage stagnation has put pressure on consumption by households, which poses a challenge to the goal of sustainable economic growth. Especially when we consider that the propensity to save tends to increase as the level of income is higher. Therefore, a redistribution of income towards the top income earners results in a higher average propensity to save. This, in combination with slow economic growth, can enhance economic stagnation, resulting in a vicious circle. Moreover, wage stagnation has also led to an increase of debt financed consumption which leads to growing fragility in the financial system. The financial crisis of 2007 is a good example of how debt financed consumption can have dramatic results.

The divergence of productivity and wage growth is not in line with standard economic theory which predicts that productivity growth results in proportionate wage growth. Microeconomic theory, as presented by standard economic textbooks, suggests an equilibrium relationship between productivity and wages, in which wages correspond to the marginal productivity of labour, following from profit-maximizing behavior of firms. From a macroeconomic perspective, the market clearing wage rate is where the labour demand curve (downward-sloping) intersects the labour supply curve (upward-sloping). Many models assume a perfectly inelastic labour supply which would imply that an increase of productivity and the resulting increase in labour demand are fully reflected in higher wages. In theory this is a balanced process as an increase or decrease of demand for labour will affect the relative factor price of labour. For this reason, the labour share is assumed to be fairly stable over time. The data, however, indicates that the association between productivity growth and wage growth has been less than one for one, indicating that capital compensation has grown disproportionate to labour compensation, resulting in divergence of productivity and wage.

The literature discusses automation, globalization, changing institutions, financialization and the European unification as developments that could have given rise to the divergence of productivity and wage. Automation is argued to accelerate the substitution of machines for labour which in addition puts pressure on the bargaining position of labour. Globalisation has a similar effect as it allows multinational to offshore labour intensive processes to countries with weak employment protection legislation and low wages. This limits the possibility for wage claims by employees. Public policies and institution can protect workers, but in most countries, also in the Netherlands, collective wage bargaining has become more decentralized and institution such as employment protection and minimum wage have eroded. As a result, the bargaining position of workers has declined relative to

that of capital. Financialization is argued to drive a wedge between productivity growth and wage growth as it induces a shareholder value orientation which results in the extraction of profits from the economy to the benefit of capital. Finally, the literature points out that the monetary unification of Europe has had great macroeconomic consequences that have possibly suppressed the growth of wages. It is argued to have increased competition on unit labour costs as a means of real exchange rate devaluation. Countries engaged in negative policy competition with the aim to attract or retain foreign investment. The strong link between macroeconomic competitiveness and social protection led to increased flexibility and deregulation on the labour market. Also, increased capital mobility in combination with rather immobile labour supply resulted in a significant power increase of the corporate sector vis-á-vis labour stakeholders due to the ability of the former to exploit arbitrage opportunities generated by differences between regulatory regimes on the basis of their impact on labour costs. The theoretical explanations for the current wage stagnation are numerous, however, it is not possible to identify significant causal relations. For this reason, this thesis does not try to identify a causation between the above mentioned factors and the stagnation of wages, but rather presents an analysis of the productivity-wage gap.

Since 1993, Dutch wages have stagnated while productivity growth has slowed down. Over the last four and a half decades in the Netherlands, real average wage growth has been slow compared to real hourly gross labour productivity growth. Real average wage per hour rose by 85% between 1969 and 2016, or at an annual growth rate of 1.35% per year. During the same period, real hourly labour productivity rose by 170% or 2.15% per year. As a result, productivity and wage diverged with an annual average growth rate of 0.80%. The rate with which real average hourly wage and real hourly labour productivity diverge has changed over time. From 1970 to 1993, wage and productivity grew in tandem. However, from 1994 onwards, wage growth stagnated while labour productivity grew, though at a lower rate as before 1994. During the period 1969-1993, real average wage grew at an annual average rate of 2.50% and real hourly labour productivity at a rate of 2.60%. However, during the period 1994-2016, real average wage grew with 0.15% per year while real hourly labour productivity grew with 1.69%. As such, a period of slower productivity growth since 1993 has coincided with a period of even slower real wage growth. This could be interpreted as a deterioration of the link between productivity and wage, implying that productivity growth no longer systematically translates into growth of real average wage.

One could interpret these findings reversely, arguing that wage stagnation has led to a slowdown of labour productivity growth. This interpretation draws on a possible causal relation from wage growth to productivity growth. From this line of reasoning, firms are not motivated to innovate and substitute away from labour in the case of slow wage growth since labour is relatively cheap. Moreover, when assuming that capital income is earned disproportionately by high income earners and labour income by lower income earners, it can be argued that a stagnation of labour compensation reduces the growth of aggregate demand as the propensity to save for high income earners is greater than that for low income earners. A shortfall of aggregate demand will then reduce productivity growth through the Kaldor-Verdoorn effect. From this perspective, one could argue that wage growth is required in order to spur the growth of labour productivity.

The productivity-wage gap expanded greatly in 1994-2002, which overlaps with the monetary unification of Europe. Any conclusions on what has evoked the stagnation of wages is surrounded with some degree of speculation. However, it is safe to conclude that the stagnation of wages overlaps perfectly with the monetary unification of Europe. There are some theoretical arguments that substantiate the claim that the EMU has put pressure on wage growth: 1) A single currency and limited fiscal and monetary freedom has made labour costs the most effective method for international competition, 2) competition on unit labour costs has reduced value added inflation relative to CPI

inflation resulting in a terms of trade loss for workers, 3) increased competition in capital markets could possibly have induced a shareholder value perspective by firms which has tilted the distribution of value added in favor of capital, 4) capital mobility versus immobile labour has resulted in a significant power increase of the corporate sector vis-á-vis labour stakeholders due to the ability of the former to exploit arbitrage opportunities generated by differences between regulatory regimes on the basis of their impact on labour costs.

Deterioration of the labour terms of trade is the main component of the productivity-wage gap, especially in sectors that compete on unit labour costs in international markets. The difference between consumer price inflation (CPI) and value added inflation is known as the labour terms of trade. Hourly wage is corrected for CPI inflation because this is the most accurate measurement for the increasing cost of living. Meanwhile, productivity growth is corrected for value added inflation, a measure of output price inflation. Value added inflation can be decomposed further, into the growth of profit mark-up and the growth of unit labour costs (see paragraph 3.5). As a result, lower wage growth will increase the productivity-wage gap in two ways. First, and most obvious, the labour share will decline as the share of labour compensation in total value added declines. Secondly, low wage growth results in a low growth of unit labour costs which results in a relative slow growth of value added inflation compared to CPI inflation. Hence, the labour terms of trade decreases. During the period 1969-2016, the annual growth rate of consumer price inflation outpaced the growth rate of weighted average value added inflation with 0.68 percent point. The labour terms of trade differs between sectors because value added inflation depends on sector specific output. For example, in the Manufacturing sector (C), the average annual growth of the labour terms of trade during the period 1972-2016 was -1.65%. This indicates that value added inflation was relatively low compared to CPI inflation. In contrast, the labour terms of trade grew with an annual average of 1.22% in the Construction sector (F), indicating that value added inflation was relatively high compared to CPI inflation. In general, the labour terms of trade declines faster in sectors that experience international competition. Suppressing unit labour costs will increase competitiveness and reduce value added inflation. The sectors Manufacturing (C), Trade Transport & Hospitality and Information & Communication display a rapid decline of the labour terms of trade. In contrast, the sectors Construction (F), Culture & Recreation (R-U) and Business services (M-N) display an increase of unit labour cost and therefore an increase of the labour terms of trade. These developments stress the importance for policy makers to few CPI inflation in relation to value added inflation.

The aggregate labour share has declined with an annual average of 0.68% since 1994. The labour share is a second component of the productivity-wage gap. From 1969 to 1993, the labour share increased with an annual average of 0.29%. While in the period 1994-2016, the labour share declined with at an annual average rate of 0.68%. Over the period 1972-2016, the labour share declined fastest in the sectors Manufacturing (C) and Trade, Transport & Hospitality (G-I), while growing in the sectors Construction (F) and Culture & Recreation (R-U). Again, exposure to international competition seems to suppress wage growth.

The association between productivity growth and wage growth differs between sectors, and varies between 0.32 and 0.67. This analysis does not support any claims on a causal relation between the two growth rates, but the association does indicate how the two growth rates are correlated in the time series. The regression model is extended with the independent variable minimum wage growth. The business cycle and the transition to the EMU are controlled for by the unemployment rate and a time dummy for the years 1994-2002.

The association between minimum wage growth and wage growth differs between sectors, and varies between 0.459 and 0.827. The higher correlation of wage growth with minimum wage growth, compared to productivity growth, raises questions about what is the most effective way to raise wages. Van Tilbur & Suyker (2018) advocated for stimulating productivity growth. However, the findings of

this thesis are more in line with the findings of Bivens & Mishel (2015) which argues that minimum wage growth is an important policy tool to secure broad based sharing of productivity gains.

Also without the labour terms of trade component, the association between productivity growth and wage growth is less then one-for-one. As a robustness check, both wage and productivity are corrected for value added inflation. Exclusion of the labour terms of trade component affects the association between productivity growth and wage growth positively while it reduces the association between minimum wage growth and wage growth. This results from the fact that a rise in minimum wage is a policy decision based on the cost of living. Hence, the deflation of wages by use of the CPI deflator will result in a higher correlation with minimum wage. When deflating both wages and productivity with the value added deflator, the two growth rates are becoming more aligned, resulting in a higher correlation.

There is a structural break in the year 1993 in the association between productivity growth and wage growth. For regression model 4, the sum of productivity growth coefficient drops from 0.91 for the years 1972-1993, to 0.40 for 1994-2016. In addition, the model is not significant on the second time period. This indicates a significant shift in the association between productivity growth and wage growth.

Productivity growth is not sufficient in raising wages. The relatively low association indicates that increasing productivity growth is not sufficient in raising wages.

A sectoral perspective is needed when arguing for wage increase. The productivity-wage gap gives an indication to what extent labour productivity growth has materialized in the growth of wages. Productivity growth enables the growth of wages. It increases value added per labour input and thereby allows the compensation of both labour and capital to increase. The widening of the productivity-wage gap indicates that productivity growth has not materialized in labour compensation growth. Wage stagnation is present in most sectors but wage increase can only be supported if productivity increases as well. Therefore, a call for broad based wage growth over all sectors would be unrealistic. For example, the Business services (M-N) sector has experienced a relatively slow growth of both wage and productivity. Therefore, further wage growth will reduce profitability. The same goes for the Construction sector (F) where wage growth has outpaced productivity growth and as a result the labour share has increased. The sectors Manufacturing (C) and Trade Transport & Hospitality (G-I) show a fast increase of the productivity-wage gap, hence, wage growth can easily be supported by growing productivity. The underlying sectoral differences can be categorized in two groups. Firstly, the higher productive sectors that display above average productivity growth (manufacturing, trade & transport, information & communication and financial services). In these sectors, room for wage increase has not been utilized fully, resulting in a productivity-wage gap. Secondly, the lower productivity sectors that display a stagnation or decline of productivity growth (business services, culture & recreation and construction). These sectors offer little room for wage increase. Stagnation of both wage and productivity has resulted in a stable productivity-wage gap.

Minimum wage growth is effective in stimulating broad-based wage growth, but it affects profitability differently across sectors. The deteriorated association between productivity growth and wage growth on an aggregate level stress the importance of social institutions that secure a proportionate growth of wages in relation to increasing productivity of workers. The rapid growth of the productivity-wage gap in recent years indicates that in the current situation, labour is not able to appropriate a proportionate share in value added gains. The political and economic context has changed markedly since 1993. The bargaining position of workers has deteriorated as a result of globalisation, and monetary unification. Meanwhile, the independence of the Dutch government, regarding fiscal and monetary policies, has been surrendered to a European level. Within this new

context, the Dutch government needs new ways to stimulate a proportionate sharing of value added gains between capital and labour. Minimum wage growth is strongly associated with wage growth and could therefore be an effective method. However, it ignores sectoral differences. The low productive sectors cannot support a wage increase, equal to that of the more productive sectors, because it will put pressure on profitability. One could argue that such pressure induces capital-labour substitution resulting in labour productivity growth. However, this cannot be assumed to be true for all process.

Decentralization of wage bargaining could result in a divergence of wage growth. In recent years, the wage bargaining process has become more decentralized, which offers more possibilities for sector specific wage claims. Further decentralization could enable workers in more productive sectors to receive a larger share in sector specific gains in value added, resulting in a decline of the productivity-wage gap. However, decentralization is also likely to weaken the bargaining position of labour in general. The aim of collective labour agreements is equality and the strengthening of the bargaining position of the individual worker. A weakening of the legal agreements that support workers will put more emphasis on the individual's capacity to bargain for wage growth. In addition, decentralization of the wage bargaining process will likely result in greater disparities in income, especially between high productive and low productive sectors. Without a centralized wage policy, like minimum wage, wages are likely to diverge between sectors.

7.2 Inferences for economic policy

As mentioned, this thesis provides an analysis of the Dutch productivity-wage gap and does not try to identify causal relations between macroeconomic developments and the stagnation of wages. However, it is possible to discuss policy implications based on our findings, although this has a somewhat speculative character.

Schooling and retraining as an alternative to competition on unit labour costs? This analysis indicates that the monetary unification of Europe is positively associated with the growth of the productivity-wage gap. An important element is the relative immobility of labour compared to capital which allows the former to exploit arbitrage opportunities generated by differences between regulatory regimes on the basis of their impact on labour costs. Firms compete on unit labour costs as a means of real exchange rate devaluation. From this perspective, the growing productivity-wage gap, especially in internationally orientated sectors (manufacturing, trade & transport), requires a European approach. Employment protection legislation at a European level could significantly reduce the negative policy competition between countries and the competition on unit labour costs by companies. A harmonization of legal frameworks will reduce arbitrage opportunities for firms. The Netherlands could also take a unilateral approach to the above described challenge through competition on labour quality instead of cost. Investment in education and personal development of workers is a more positive approach to international competition compared to unit labour costs. In recent years, education and training of employees has become more pronounced already. However, it is important to consider the additional pressure on workers this approach results in. Constant improving, re-schooling and learning could be experienced as very stressful. Also, such an approach is expected to increase competition between workers which makes it unlikely that everyone is able to participate in this dynamic labour market since it is strongly biased to the flexible, adaptable and fast learning workers. Therefore, such an approach requires substantial participation by the government in order to secure schooling opportunities for all workers.

Are growing sectoral differences a prelude to a dual economy? Disparities in labour productivity growth across sectors are argued to result in pressure on profitability or affordability in low productive

sectors (Baumol, 1967). According to Baumol's theory, low productive sectors have to compete with the more productive sectors on the labour market. As a result, profitability/affordability is under pressure as these sectors have to match the wage rate offered in the high productive sectors. The high productive sectors are able to offer higher wages as a result of increasing value added per unit of labour input. Under this theory, productivity and wage are expected to grow in tandem in the high productive sector. Consequently, wages in the low productive sectors are pushed upwards by the wage growth in the high productive sector, resulting in a negative growth of the productivity-wage gap. The analysis in this thesis points out that a sectoral division in high productive and low productive is appropriate for the Netherlands. However, the productivity-wage gap has not grown negatively in the low productive sector, as suggested by Baumol's theory, but instead, the productivity-wage gap has grown positively in the high productive-sector. So instead of wages growing disproportionately fast compared to productivity in the low productive sectors, wages grow disproportionately slow compared to productivity in the high productive sectors. Growing disparities in productivity and income between two groups of economic sectors is expletory for a dual economy.

Is a decline of the labour share a threat to economic growth? In recent years, the Dutch labour share has declined rapidly, five percentage points in the past seven years. Economists have argued that this could possibly result in a decline in aggregate demand and consequently a stagnation of economic growth. This results from the fact that the propensity to save is higher for capital income then it is for labour income. Therefore, a decline of the labour share, in combination with slow economic growth, could result in a shortfall of aggregate demand. This line of reasoning underlines that wage growth is crucial for long-term economic growth through an increase of consumption.

From a macroeconomic perspective, especially considering the Dutch trading surplus, wages can increase without harming international competitiveness. As discussed earlier, some economists argue that wage costs (unit labour costs) determines to a great extent the economic competitiveness of a country. Especially since the European Unification, countries have tried to suppress wage costs resulting in wage moderation policies such as "Een Nieuwe Koers". The growing divergence between productivity and wage indicates that these measures have been successful since wages have not grown proportionate to productivity. The importance for wage moderation in the Netherlands for the sake of international competition, can be tempered when taking into account the Dutch trading surplus. A long term deficit could indicate weak international competitiveness, but this is definitely not the case for the Netherlands. Instead, the long run trading surplus indicates that Dutch wages have room to increase. Imports are likely to increase when Dutch wages grow, which brings imports closer to a balance with exports.

From a European perspective, it could be argued that increased wage growth in the Netherlands is beneficial for the stability in the Eurozone. The Eurozone crisis has shown that trading imbalances within the Eurozone can have disastrous consequences. Following the introduction of the Euro, interest rates dropped significantly in southern European countries towards German standards, resulting in an influx of capital. For these countries, capital became relatively cheap compared to pre Euro standards. This gave rise to large trade imbalances. Capital moved from countries that were running a trading surplus (Germany, the Netherlands), to the southern European countries (Spain, Greece, Portugal) who began to run a trading deficit. There is some discussion on the cause of these trade imbalances. Some argue it is caused by high unit labour costs in southern European countries, while others argue that it is the result of the single currency and the ECB's monetary policy which would be biased towards Germany. In response, economists have argued that southern European countries should suppress unit labour costs to German levels in order to bring balance between European countries. However, wage increase in the Netherlands (and Germany) will have the same

effects since it will also balance unit labour cost across European countries. In any case, it is important to consider what the effects will be on a global economic level.

7.3 Reflections on research methodology

The conclusions that are derived in this study are partly a result of the applied methodology. The following paragraphs present a reflection on the strengths and weaknesses of our selected methodology and possible improvements for future work.

A substantial body of earlier research has addressed the divergence between productivity and wage. In Europe, most of these studies have focussed on OECD data or EU data. In this study however, we have chosen to limit the empirical study to the Dutch economy which allows for a more in dept country specific study that provides more in sights for national policy makers. This study is the first to present a sectoral decomposition of the Dutch productivity-wage gap. By combining detailed empirical findings on the Dutch economy with a literature study on global macroeconomic developments we present a complete overview of the developments in the Netherlands regarding the growth of wage and labour productivity.

The data used in this study is derived from the official Dutch national accounts published by the Dutch Central Bureau of Statistics. The dataset is consistent which is very useful for the study of structural developments. Recently, CBS has published a harmonized dataset on Dutch national account statistics for the period 1969-2016. This is categorized in 13 sectors, of which 8 are included in this study. The dataset provides coherent time series for the most important macroeconomic indicators such as value added, hours worked, labour compensation. Through simple calculations, these indicators are used to construct the main indicators of this study, namely wage growth and labour productivity growth. As a result, the calculations and empirical findings of this study are very transparent and easily replicable. Moreover, it provides a robust and coherent analysis of Dutch macroeconomic developments over a long time span which is perfect for the study of structural developments regarding wage and productivity.

The consistency of this dataset comes with some limitations. Firstly, the level of sector aggregation. For example, the sector G-I (Trade, transport & hospitality) is very diverse and a more detailed study indicates that productivity and wage develop differently in the hospitality branch as in the transport branch. However, the dataset does not support any further disaggregation. Secondly, the dataset does not include data on depreciation. Many economists have argued that depreciation is a crucial element when studying the divergence between productivity and wage. However, making assumptions on the rate of depreciation is difficult, especially when considering differences between sectors. Therefore, we have chosen to not include depreciation. Depreciation is included in value added but is not compensation for either labour or capital. In this study, the labour share calculated from the national account statistics. The remaining share of value added is attributed to capital which also includes depreciation. Therefore, in this study, the capital share is over estimated. Future work could improve this study by including sector specific depreciation rates. Thirdly, the inclusion of a median wage rate could provide more information on the development of wage inequality by comparing the growth of median and average wage growth. This is very common in studies on the productivity-wage gap. However, available data from CBS on median wage is inconsistent with the inflation rates presented in the national accounts. In addition, sectoral median wage rates are not present at all.

The decomposition method presents the development of the productivity-wage gap in a tangible way by identifying how developments in the labour share, the labour terms of trade and social contributions together make up the divergence between productivity and wage. The decomposition method follows earlier studies that have been done on the divergence of productivity and wage at a

European level (Schwellnus, Kappeler, & Pionnier, 2017; Sharpe & Uguccioni, 2017). This decomposition provides an important insight in how different deflation rates (labour terms of trade) have a great impact on the productivity-wage gap.

The sectoral perspective taken in this study, identifies differences in the productivity-wage association between sectors, which offers valuable academic insights. While most studies on structural developments in the relation between productivity and wage take a macroeconomic perspective, this study takes a sectoral perspective. This identifies the heterogeneity between sectors within the Dutch economy which remains unobservable for studies on the productivity-wage relation at an aggregate level. This sectoral perspective indicates that there are significant differences in the productivity-wage association between high productive and low productive sectors.

This thesis offers a comprehensive study on structural developments regarding the productivity-wage gap and has established a foundation for future work on more recent developments. This study focuses on long term structural developments in the relation between productivity and wage. This, together with a literature review, results in a comprehensive story on past developments which is a great strength of the method chosen in this study. This study has established a foundation for future work on the productivity-wage gap that could focus on more recent developments. This will be interesting for two main reasons. First, this study on the long term developments is severely restrained by the data availability from the past. Over time, data gathering has improved greatly, offering new possibilities for researchers. By focusing on more recent developments, researchers could utilize the growing availability of microdata. This allows research to take into account regional differences, but also the differences between high performing firms, often labelled "frontiers" and low performing firms. Secondly, a focus on more recent developments could be beneficial for short term policy making. This study provides a comprehensive overview of structural developments, which is beneficial for long term policy making. Alternatively, a follow-up study of more recent developments would aid policy makers in addressing practical short term issues.

Literature

Acemoglu, D., & Restrepo, P. (2016). The Race Between Machine and Man: Implications of Technology for Growth, Factor Shares and Employment. *NBER Working Paper No. 22252*.

Arnone, M., Laurens, B., Segalotto, J., & Sommer, M. (2007). *Central Bank Autonomy: Lessons from Global Trends.* IMF Working Paper No. 07/08.

Autor, D., & Salomons, A. (2018). Is automation labor share-displacing? Productivity growth, employment, and the labor share. *Brookings Paper on Economic Activity*, 1-87.

Autor, D., Dorn, D., & Hanson, G. (2015). Untangling Trade and Technology, Evidence from Local Labour Markets. *Economic Journal*, 125,621-646.

Autor, D., Dorn, D., & Hanson, G. (2016). The China Shock, Learning from Labour-Market Adjustment to Large Changes in Trade. *Annual Review of Economics*, 8, 205-240.

Baker, D. (2017). *The Productivity to Paycheck Gap: What the Data Show.* Washington DC: Center for Economic and Policy Research.

Baumol, W. (1967). Macroeconics of Unbalanced Growth: The Anatomy of the Urban Crisis. *American Economic Review*, 57, 185-196.

Betrand, M., & Morse, A. (2013). Trickle-down Consumption. *NBER working paper No. 18883*.

Bivens, J., & Mishel, L. (2015). *Understanding the Historic Divergence between Productivity and a Typical Worker's Pay, Why It Matters and Why It's Real.* Washington DC: Economic Policy Institute.

Bivens, J., Gould, E., Mishel, L., & Shierholz, H. (2014). Raising America's Pay, Why It's our Central Economic Policy Challange. *Economic Policy Instituut, Briefing Paper #378*.

Boardman, Greenberg, Vinning, & Weimer. (2014). *Cost-Benefit Analysis Concepts and Practice.* Essex: Pearson Education Limited.

Bridgeman, B. (2018). Is Labor's Loss Capital's Gain? Gross versus Net Labor Shares. *Macroeconomic Dynamics*, 22(8), 2070-2087.

Brynjolfsson, E., & McAfee, A. (2014). *The second machine age: Work, progress, and prosperity in a time of brilliant technologies.* WW Norton & Company.

CBS. (2017). *Economische groei en verdienstelijking, 1969-2016.* CBS.

Chennells, L., & van Reenen, J. (1997). Technical Change and Earnings in British Establishments. *Economica*, 64, 587-604.

Cho, T., Hwang, S., & Schreyer, P. (2017). *Has the Labour Share Declined? It Depends.* Paris: OECD Statistics Working Papers No. 2017/01.

CPB. (2012). Nederlandsche zakelijke dienstverleners onvoldoende geprikkeld.

De Serres, A., & Schwellnus, C. (2018). *A General Equilibrium (LM and PM reforms) Perspective to Inequality, in C. Astarita and G. D'Adamo (eds.), Inequality and Structural Reforms: Methodological Concerns and Lessons from Policy. .* Brussels: Workshop Proceedings, European Economy Discussion Papers N0. 71, European Commission .

Delsen, L., & Poutsma, E. (2005). Labour Market Institutions and Economic Performance in the Netherlands. *International Economic Journal*, 19(2), 169-196.

den Bakker, G. (2008). *De Nederlandse economie 2008.* Centraal Bureau voor de Statistiek.

Dietz, F., Heijman, W., & Marks, P. (2015). *Toegepaste Microeconomie.* Coutinho: Bussum.

Dumenil, G., & Levy, D. (2004). *Capital resurgent: Roots of the neoliberal revolution.* Cambridge MA: Harvard University Press.

Eggelte, J., Jansen, J., Schotten, G., & Dicou, D. (2014). *Overwegingen bij de loonontwikkeling.* DNB Occasional Studies Vol.12, No.1.

Eggelte, J., Jansen, J., Schotten, G., & Dicou, D. (2014). *Wage Development Considered.* DNB Occasional Studies, Vol.12/No.1.

Euwals, R., & Meijerink, G. (2018). *Inclusieve Globalisering.* CPB Policy Brief, 2018/08.

Fadda, S., & Tridico, P. (2013). *Financial Crisis, Labour markets and institutions.* London: Routledge.

Fleck, S., Glaser, J., & Sprague, S. (2011). The compensation-productivity gap: a visual essay. *Monthly Labor Review*, 134(1), 57-69.

Frey, C. B., & Osborne, M. A. (2013). The Future of Employment: How Susceptible are Jobs to Computerization. *University of Oxford*.

Fuess, S., & Millea, M. (2006). Pay and Productivity in 'Corporatist' Germany. *Journal of Labor Research*, 27(3), 397-409.

Galanis, M. (2013). The impact of EMU on corporate governance: Bargaining in Austerity. *Oxford Journal of Legal Studies*, 33(3), 475-501.

Goslinga, S., & Klandermans, B. (1996). Flexibilisering en individualisering van de arbeidsvoorwaarden. *Tijdschrift voor Arbeidsvraagstukken*, 12(2).

Groot, S., Akçomak, S., & de Groot, H. L. (2013). *The impact of trade offshoring and multinationals on job loss and job finding.* SBP Discussion Paper, 252.

Hall, P. A., & Franzese, R. (1998). Mixed Signals, central bank independence, coordinated wage bargaining and European Monetary Union. *International Organization*, 52, 505-535.

Harteveld, L. (2012). Loonvorming in tijden van crisis. *Tijdschrift voor Arbeidsvraagstukken*, (28)2.

Harvey. (2006). *A brief history of neoliberalism.* New York: Oxford University Press.

Hassel, A. (2003). The politics of social pacts. *British Journal of Industrial Relations*, 41(4), 707-726.

Hellwig, M., & Irmen, A. (2011). *Wage Growth, Productivity Growth, and the Evolution of Employment.* CEPR Discussion Paper 2927.

Heyma, A., & ter Weel, B. (2017). *Loonontwikkeling en de rol van de overheid.* Amsterdam: SEO Economisch Onderzoek.

IMF. (2017). Why is labor receiving a smaller share of global income? Theory and empirical evidence. *IMF Working Paper WP/17/169*.

IMF. (2017). *World Economic Outlook, April 2017: Gaining Momentum?* IMF.

Kaldor, N. (1957). A Model of Economic Growth. *The Economic Journal*, 67(268), 591-624.

Karabarbounis, L., & Neiman, B. (2014). *Capital depreciation and labor shares around the world: measurement and implications.* Cambridge: NBER working paper series.

Kittel, B. (2000). Trade union bargaining horizons in comparative perspective, the effects of encompassing organization, unemployment and the monetary regime of wage-pushfulness. *European Journal of Industrial Relations*, 6, 181-202.

Köhler, K., Guschanski, A., & Stockhammer, E. (2015). *How does financialisation affect functional income distribution? A theoretical clarification and empirical assessment. .* Kingston University Economics Discussion Papers 2015-5.

Kohler, W., Guschanski, A., & Stockhammer, E. (2018). The impact of fianncialization on the wage share: a theoretical clarification and empirical test. *Post-Keynsian economics society, Working Paper 1902*.

Kox, H., Van Leeuwen, G., & Van der Wiel, G. (sd). *Small firms captive in a box like lobster. Causes of poor productivity performance in European business services.* CPB discussion paper 158.

Krueger, A. (1999). Measuring labor's share. *American Economic Review*, 89(2), 45-51.

Kumhof, M., & Ranciere, R. (2010). Inequality, leverage and crisis. *IMF working paper*.

Lapavistas, C. (2013). *Profiting Without Producing. How Finance Exploits Us All.* London: Verso.

Lukkezen, J. (2019, mei 2). *Vier punten bij de CPB-analyse over de ontrafeling van de vertraagde loonontwikkeling.* Opgehaald van ESB: https://esb.nu/blog/20046996/vier-punten-bij-de-cpb-analyse-over-de-ontrafeling-van-de-vertraagde-loonontwikkeling

Meager, N., & Speckesser, S. (2011). *Wages, productivity and employment: a review of theory and international data.* Brighton: Institute for Employment Studies.

Millea, M. (2002). Disentangling the Wage-Productivity Relationship: Evidence from Select OECD Member Countries. *International Advances in Economic Research*, 8, 314-23.

Ministerie van Sociale Zaken en Werkgelegenheid. (1998). Besluit van 3 juli 1998, houdende wijziging van het Besluit premiedifferentiatie WAO. *Staatsblad van het Koninkrijk der Nederlanden*.

Notten, F. H. (2011). Aandeel dienstverlening neemt niet verder toe. *De Nederlandse economie (CBS)*.

Notten, F., Hoekstra, R., & Smits, J. (sd). De rol van de Nederlandse industrie in internationale productieketens. *De Nederlandse economie (CBS)*.

OECD. (2017). *Understanding the Socio-Economic divide in Europe.* OECD.

OECD. (2018). *Economic Outlook, Volume 2018 Issue 2.* OECD.

Pasimeni, P. (2018). *The Relation between Productivity and Compensation in Europe.* Luxembourg: Puplication Office of the European Union.

Peters, J. (2008). Labour market deregulation and the decline of labour power in North America and Western Europe. *Policy and Society*, 27(1), 83-98.

Piketty, T., & Saez, E. (2013). Top incomes and the great recession: recent evolutions and policy implications. *IMF Economic Review*, 61(3).

Polder, M. (2017). Digitalisering en arbeid: ICT, werkgelegenheid en beloning in Nederland vanaf 2011. *De Nederlandse economie (CBS)*.

Pozsar, Z. (2011). *Institutional Cash Pools and the Triffin Dilemma of the U.S. Banking System.* IMF Working Paper n. 190.

Romer, P. (1990). Endogenous Technological Change. *Journal of Policital Economy*, 90, 71-102.

Salverda, W., & Checchi, D. (2015). Labour-Market Institutions and the Dispersion of Wage Earnings. *Handbook of Income Distributions 2*, 1535-1727.

Schwellnus, C. e. (2018). *Labour Share Developments Over the Past Two Decades: The Role of Technological Progress, Globalisation and "Winner-Takes-Most Dynamics.* Paris: OECD Economics Working Papers, No. 1503.

Schwellnus, C., Kappeler, A., & Pionnier, P. A. (2017). The Decoupling of Median Wages from Productivity in OECD countries. *International Productivity Monitor*, vol. 32.

Shapiro, C., & Stiglitz, J. (1984). Equilibrium Unemployment as a Worker Discipline Device. *American Economic Review*, 74(3), 433-444.

Sharpe, A., & Uguccioni, J. (2017). Decomposing the Productivity-Wage Nexus in Selected OECD Countries, 1986-2013. *International Productivity Monitor*, vol. 32.

Solow, R. (1956). A Contribution to the Theory of Economic Growth. *Quaterly Journal of Economics*, 70, 65-94.

Standsbury, A. M., & Summers, L. H. (2017). Productivity and Pay: is the link broken? *Nationat Bureau of Economic Research*, No. w24165.

Stichting van de Arbeid. (1993). *Een nieuw Koers: agenda voor het cao-overleg 1994 in het perspectief van de middellange termijn.* Publikatienr. 9.93.

Stockhammer, E. (2017). Determinants of the wage share: A panel analysis of advanced and developing countries. *Britisch Journal of Industrial Relations*, 55(1), 3-33.

Storm, S. (2017). The New Normal: Demand, Secular Stagnation and the Vanishing Middle-Class. *Institute of New Economic Thinking Working Paper Series*.

Taskforce Sociale Innovatie. (2005). *Sociale Innovatie, de Andere Dimensie.* Den Haag.

Tooze, A. (2018). *Crashed: how a decade of fianncial crises changed the world.* UK: Penguin Random House.

van Biesebroeck, J. (2015). *How tight is the link between wages and productivity? A survey of the literature.* Geneva: International Labour Organization.

van den Berge, W., & ter Weel, B. (2015). *Baanpolarisatie in Nederland.* CPB Policy Brief, 2015/13.

van Gestel, N., de Beer, P., & van der Meer, M. (2009). *Het hervormingsmoeras van de verzorgingsstaat.* Amsterdam: Amsterdam University Press.

van Tilburg, I., & Suyker, W. (2018). *De loongroei, een internationale macro-analyse.* CPB Achtergronddocument.

Vergeer, R., & Kleinknecht, A. (2014). Do labour market reorms reduce labour productivity growth? A panel data anaylisis of 20 OECD countries (1960-2004). *International Labour Review*, 153(3).

APPENDIX

Augmented Dickey-Fuller test

Test for unit-root process on wage growth and productivity growth at aggregate level.

```
Augmented Dickey-Fuller Test

data:  wagex
Dickey-Fuller = -3.2049, Lag order = 3, p-value =
0.0984
alternative hypothesis: stationary
```

```
Augmented Dickey-Fuller Test

data:  prox
Dickey-Fuller = -3.4033, Lag order = 3, p-value =
0.06831
alternative hypothesis: stationary
```

Breusch-Pagan test

Test for hetroskecadicity on different distributed lag regression models, NULL: Homoskecadicity

Model 2

```
Breusch-Pagan test

data:  olsreg
BP = 11.337, df = 5, p-value = 0.0451
```

Model 3

```
Breusch-Pagan test

data:  olsreg
BP = 6.9479, df = 6, p-value = 0.3257
```

Model 4

```
Breusch-Pagan test

data:  mod4
BP = 17.379, df = 7, p-value = 0.01511
```

Durbin-Watson test

Test for autocorrelation on different distributed lag regression models, NULL: no autocorrelation

Model 2

```
Durbin-Watson test

data:  olsreg
DW = 1.529, p-value = 0.02629
alternative hypothesis: true autocorrelation is greater than 0
```

Model 3

```
Durbin-Watson test

data:  olsreg
DW = 1.8015, p-value = 0.1213
alternative hypothesis: true autocorrelation is greater than 0
```

Model 4

```
Durbin-Watson test

data:  mod4
DW = 1.9653, p-value = 0.2382
alternative hypothesis: true autocorrelation is greater than 0
```

Variance Inflation Factors

Calculation of variance-inflation factors for identification of collinearity

Model 2

```
Prox       prox_lag1    unemployment    unemployment_lag1  unemployment_lag2
1.273830   1.352356     14.325567       41.899943          14.580153
```

Model 3

```
Prox           prox_lag1       unemployment      unemployment_lag1
1.300006       1.352915        14.558342         41.906779
unemployment_lag2      year1994_2002
14.814633              1.152338
```

Model 4

```
prox          prox_lag1       unemployment        unemployment_lag1

1.483540      1.426476        14.558667           44.162534
unemployment_lag2      year1994_2002      minwage
15.180071              1.208148           2.411288
```

Estimation VAR model

Estimation of a VAR model for productivity growth and wage growth at an aggregate level. Is to be used in a Granger causality test

```
VAR Estimation Results:
=======================

Estimated coefficients for equation wagex:
==========================================
Call:
wagex = wagex.l1 + prox.l1 + wagex.l2 + prox.l2 + const

  wagex.l1     prox.l1   wagex.l2    prox.l2       const
 0.1238658   0.3551475 -0.1787669  0.3458513 -0.5052279


Estimated coefficients for equation prox:
=========================================
Call:
prox = wagex.l1 + prox.l1 + wagex.l2 + prox.l2 + const

     wagex.l1      prox.l1     wagex.l2      prox.l2
 0.008654816  0.292777204 -0.200288101  0.006874843
        const
 1.510065583
```

Causality Analysis

Granger causality test on wage growth and productivity growth at an aggregate level by use of a VAR model with robust covariance-matrix estimator for heteroskedasticity

```
Granger causality H0: wagex do not Granger-cause
       prox

data:  VAR object wage_var
F-Test = 0.87104, df1 = 2, df2 = 76, p-value =
0.4227




Granger causality H0: prox do not Granger-cause
       wagex

data:  VAR object wage_var
F-Test = 6.437, df1 = 2, df2 = 76, p-value =
0.002615
```

Hausman Test

```
data:  wage ~ productivity + productivity_lag1 + unemployment + unemploymen
t_lag1 +  ...
chisq = 2.5362, df = 7, p-value = 0.9243
alternative hypothesis: one model is inconsistent
```

Lagrange Multiplier Test

```
- (Breusch-Pagan) for
        balanced panels

data:  wage ~ productivity + productivity_lag1 + unemployment + unemploymen
t_lag1 +  ...
chisq = 0.12206, df = 1, p-value = 0.7268
alternative hypothesis: significant effects
```

```
F statistic

data:  model
F = 1.4383, df1 = 48, df2 = 259, p-value = 0.03999
alternative hypothesis: unstability
```

Chow test

Chow test model 4

Structural break test at pre-defined date (1993) for distributed lag regression model 4.

```
> mod1 <- lm(wagex[1:45] ~ prox[1:45] + prox_lag1[1:45] + unemployment[1:45] +
unemployment_lag1[1:45] + unemployment_lag2[1:45] + year1994_2002[1:45] + minwage[1:45],
data = Data_organized)
```

```
> mod2 <- lm(wagex[1:22] ~ prox[1:22] + prox_lag1[1:22] + unemployment[1:22] +
unemployment_lag1[1:22] + unemployment_lag2[1:22] + year1994_2002[1:22] + minwage[1:22],
data = Data_organized)
```

```
> mod3 <- lm(wagex[23:45] ~ prox[23:45] + prox_lag1[23:45] + unemployment[23:45] +
unemployment_lag1[23:45] + unemployment_lag2[23:45] + year1994_2002[23:45] +
minwage[23:45], data = Data_organized)
```

```
> rss <- sum(residuals(mod1)^2)
```

```
> rss1 <- sum(residuals(mod2)^2)
```

```
> rss2 <- sum(residuals(mod3)^2)
```

```
> k = 2
```

```
> fcrit = qf(.9, df1=mod2$df, df2=mod3$df)
```

```
> fcrit
```

```
[1] 1.972216
```

```
> chowst = ((rss-(rss1+rss2))/k)/((rss1+rss2)/(mod2$df+mod3$df-(2*k)))
```

```
> chowst
```

```
[1] 2.025768
```

Chow test wage growth ~ productivity growth

Structural break test at pre-defined date (1993) for regression model 1.

```
> mod1 <- lm(wagex[1:45] ~ prox[1:45], data = Data_organized)

> mod2 <- lm(wagex[1:22] ~ prox[1:22], data = Data_organized)

> mod2 <- lm(wagex[23:45] ~ prox[23:45], data = Data_organized)

>

> rss <- sum(residuals(mod1)^2)

> rss1 <- sum(residuals(mod2)^2)

> rss2 <- sum(residuals(mod3)^2)

>

> k = 2

>

> fcrit = qf(.9, df1=mod2$df, df2=mod3$df)

> fcrit

[1] 1.917191

>

> chowst = ((rss-(rss1+rss2))/k)/((rss1+rss2)/(mod2$df+mod3$df-(2*k)))

> chowst

[1] 22.83944
```

Breakpoints test

Breakpoint test on distributed lag regression model 4.

```
        Optimal (m+1)-segment partition:

Call:
breakpoints.formula(formula = wagex ~ prox + prox_lag1 + unemployment +
    unemployment_lag1 + unemployment_lag2 + year1994_2002 + minwage,
    h = 0.2, data = Data_organized)

Breakpoints at observation number:

m = 1   13
m = 2   18 27
m = 3   13 23 33

Corresponding to breakdates:

m = 1   0.288888888888889
m = 2   0.4                 0.6
m = 3   0.288888888888889 0.511111111111111 0.733333333333333

Fit:

m    0       1       2       3
RSS 119.07   82.98   23.13   12.16
BIC 205.75 223.76 200.53 205.88
```

Inclusion of interaction term unemployment rate and change in unemployment rate

log change average real wage, 1972-2016

	Dependent variable:			
	1			
	(1)	(2)	(3)	(4)
log change gross productivity	0.268**	0.306***	0.264**	0.296**
	(0.105)	(0.087)	(0.116)	(0.118)
log change gross productivity 1 year lag	0.339**	0.312**	0.320**	0.317**
	(0.137)	(0.120)	(0.126)	(0.131)
unemployment rate	0.209*		0.216*	0.242
	(0.106)		(0.121)	(0.147)
change unemployment rate		-0.051	-0.104	0.911
		(0.286)	(0.290)	(0.965)
Dummy variable years 1994-2002	-1.397***	-1.609***	-1.461***	-1.249**
	(0.390)	(0.478)	(0.448)	(0.579)
log change real minimum wage	0.526***	0.397***	0.537***	0.522***
	(0.128)	(0.083)	(0.149)	(0.156)
interaction unemployment rate				-0.121
				(0.094)
Constant	-1.589*	-0.049	-1.573**	-1.838*
	(0.792)	(0.576)	(0.765)	(1.005)
Observations	45	45	45	45
R^2	0.503	0.486	0.505	0.515
Adjusted R^2	0.440	0.420	0.426	0.423
Residual Std. Error	1.918 (df = 39)	1.951 (df = 39)	1.941 (df = 38)	1.946 (df = 37)
F Statistic	7.905*** (df = 5; 39)	7.378*** (df = 5; 39)	6.450*** (df = 6; 38)	5.615*** (df = 7; 37)

Note: $^*p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$

Figure 39. Newey-West standard errors (HAC in parentheses). Distributed lag model. Dependent variable is real average wage growth. Inclusion of unemployment rate, change in unemployment rate and an interaction term for unemployment rate and change unemployment rate. Theoretical foundation for inclusion of interaction term is: A change in the unemployment rate will have a different effect on wage growth as the level of unemployment is different. However, this graph indicates that this is not the case. The interaction terms is insignificant while the inclusion of both level and change on unemployment seems to been redundant as a combination of the two does not provide any additional explanation of the variance.

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GROWTH WAS RESTORED. THE FOLLOWING PERIOD FROM 1994 TO 2007 IS CHARACTERIZED BY STAGNANT WAGES, A DECLINE OF THE LABOUR SHARE AND A RAPID GROWTH OF THE PRODUCTIVITY-WAGE GAP WITH AN ANNUAL AVERAGE OF 2%. THE LABOUR SHARE DECLINED FROM 0.65 TO IN 1994 TO 0.56 IN 2007. AT THE SAME TIME, THE RATE OF UNEMPLOYMENT DROPPED FROM 9,7% IN 1994 TO 4.0% IN 2001, THE LOWEST IT HAD BEEN SINCE 1974. THE TRADE-OFF BETWEEN WAGE AND EMPLOYMENT WAS TILTING IN FAVOR OF THE UNEMPLOYED. STRICT MONETARY POLICY WAS SUCCESSFUL IN DISCOURAGING WAGE CLAIMS. MEANWHILE, RISING CONSUMER PRICES RESULTED IN A DECLINING LABOUR TERMS OF TRADE. FINANCIALIZATION AND THE SHIFT TO SHAREHOLDER CAPITALISM EMPOWERED SHAREHOLDERS AND RENTIERS TO EXTRACT A BIGGER SHARE OF CORPORATE PROFITS IN THE FORM OF INTEREST AND DIVIDEND PAYMENTS WHICH REDUCED THE LABOUR SHARE AND HAS PUT PRESSURE ON WAGES.

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