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Vulnerable to (un)employment during the Great Recession

Empirical study to inflow in unemployment benefits or benefits income support in the Netherlands during the aftermath of the Great Recession (2009-2013)

Master Thesis

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Abstract

This thesis investigates the vulnerability to unemployment of employees in the Netherlands during the Great Recession which started in 2008. The effects on the labour market of an economic recession and the subsequent demand shock are mainly through the labour demand side of the labour market. The theoretical framework is shows that the labour demand depends on the marginal benefits and the marginal costs of labour. The marginal benefits of labour are determined by the marginal product of labour and the marginal costs of labour are determined by the wages and labour adjustment costs. The costs of other production factors could also affect the demand of labour, especially in the long run. From the theory is expected that younger employees, employees with flexible contracts, unskilled and low skilled employees and employees working in occupations sensitive to demand shocks, are most likely to become unemployed during an economic recession. The likelihood to inflow in unemployment benefits or benefit income support is empirically estimated by a logistic model using data of employees in the Netherlands between 2008 and 2013. Besides demographic characteristics are socio-economic, regional and sectoral data used to estimate the vulnerability to unemployment. The results demonstrates that prime age men with foreign origin and low income level are vulnerable to inflow in unemployment benefits or benefits income support. Employees living in the more rural areas of the Netherlands or living in high urbanized areas are more likely to become unemployed. Workers employed in temporary jobs or occupations sensitive to demand shocks are also more likely to lose their job.

Keywords: Unemployment, Unemployment Benefits, Benefits Income Support, Great Recession, Logistic Model

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Content

1 Introduction

"To be employed means for people more than earning income. Indeed, a job also provides a social network, self-confidence and a higher achievement." This sentence was written by the current Dutch vice prime minister Asscher in a letter to the Dutch parliament (Asscher, Kamerbrief aanpak werkloosheid, 2015). The importance of employment implies that unemployment is a personal tragedy, and the consequences thereof are multiple. The Dutch prime minister Rutte declared that "the economic recovery really begins to be broadened", however "too many Dutch are still without work. The unemployment level must be reduced" (Rutte, 2015). And the Eurogroup president Dijsselbloem joined this view in a speech during the Cobbenhagen Summit. "The economy is now starting to recover, but only slowly. Throughout the entire Eurozone, many people are still unemployed and are finding it hard to make ends meet." (Dijsselbloem, 2015). The need to be employed stands very clear, but the unemployment increased during the aftermath of the global financial and economic crisis and the subsequent economic decline.

The world became in a financial and economic crisis triggered by the bankruptcy of banks in the United Kingdom and United States since the autumn in 2007 and the crisis intensified by the collapse of the US financial services firm, Lehman Brothers in 2008. The crisis infected the global economy and the global demand collapsed and resulted in a period of general decline of economic activity spread across the economy, lasting more than a few months, in economics called a 'recession'[1]. This recession led to a reassessment of wealth and income prospects and prompted households to raise saving rates and postpone spending (International Monetary Fund, 2009). As a result, trade volumes collapsed, which in turn affected the labour market by employment reduction, and increased unemployment rates. In the remainder of this thesis is this global financial and economic crisis called the Great Recession, following the existing literature.

According to the National Bureau of Economic Research (National Bureau of Economic Research, 2010), the economy in the US shrank for 18 months in the period between December 2007 and June 2009, resulting in increasing unemployment rates with a peak in October 2009 of 10%. In the Euro area, the recession started from the first quarter of 2008 and lasted 15 months until the second quarter of 2009 (Centre for Economic Policy Research, 2010). However, since

[1] In economic literature a recession is commonly defined as: 'a decline in real GDP for two or more consecutive quarters'

the third quarter of 2011, the Euro area has been in recession again and the 'double dip' was created. The labour market consequences of these recessions followed with a short time lag, although there were remarkable differences within European countries. The unemployment rate in the Euro area increased from the lowest rate in a decade to reach 10% in November 2009 (Arpaia & Curci, 2010). In contrast with the unemployment rates in the US, the unemployment rates were increasing again since 2011 (European Commission, 2013). The unemployment rate in the OECD area as a whole increased from the lowest level since the early 1980's (5,7%) in the first quarter of 2008 to a post-war peak of 8,7% in the fourth quarter of 2009 (OECD, 2011).

The labour market in Germany was remarkably stable during the period of recession. The German GDP fell 6,6% from its peak in the first quarter in 2008, larger than the decline of the US GDP (4,1%). The unemployment rate in the US increased from 4,5% to 10% between the first quarter of 2007 until the end of 2009, while the German unemployment rate declined in the same period. The reasons behind this German labour market pattern, are specific for the German labour market. Employment rose less than expected in the preceding expansion, which shows a lack of confidence that this boom would last. Also the wage moderation policy, may explain the missing employment decline during the recession. Besides these reasons, one important policy reason could explain the stable unemployment pattern in Germany. This are the working time accounts, which permit employers to use overtime for free as long as working time is cut by an equal amount within a defined window of time. Employers could have kept these workers employed at low hours until these accounts were drawn down to zero (Burda & Hunt, 2011).

The Dutch economy went into recession for more than one year since the second quarter of 2008 and, after a short period of recovery, again in the third quarter of 2011 until the end of 2013, except for the second quarter of 2012 (see figure 1). In the midst of 2008, the unemployed labour force and the number of people using social insurance programs were at historical low levels (see figure 2 and figure 3). However, since the last quarter of 2008, the number of people earning unemployment insurance benefits generally increased until now. Experiences of previous recessions suggests that unemployment will continue to rise, even after the recovery begins, and it will take a long time to reabsorb the upsurge of unemployment (OECD, 2009).

Figure 1: GDP at market prices (Netherlands); Source: Statistics Netherlands

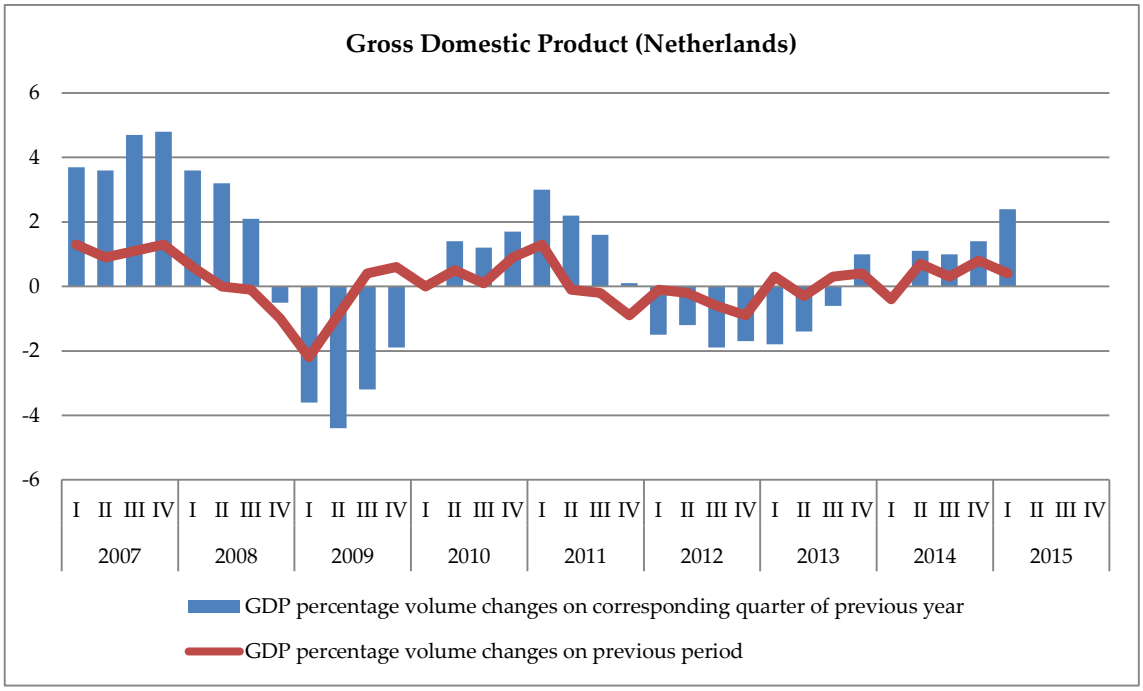
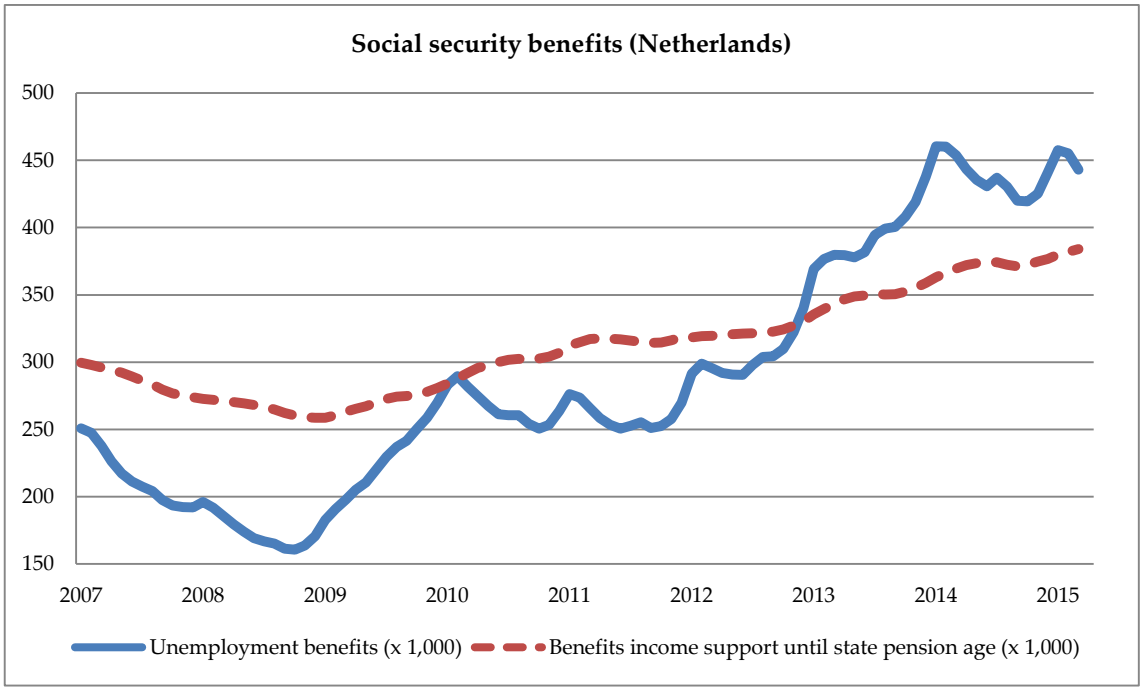


Figure 2: Unemployed labour force (Netherlands); Source: Statistics Netherlands

Figure 3: Social security benefit (Netherlands); Source: Statistics Netherlands



The labour market effects of the Great Recession vary across and within countries, depending on the structure of the economy, institutions in place and policy responses (Verick, 2009). The impact of the Great Recession also differs among demographic and socioeconomic groups at the labour market. Unemployment levels differ for example by gender, age and education levels and also the country of origin seems to be an important factor in varying unemployment levels. Additionally, the impact of the Great Recession at the labour market differs between sectors and regions. Insight in the composition of unemployed people is important to address labour market policy measures in an effective way.

The high level of unemployment emphasizes the need to continue to do everything to speed up the economic recovery and to lower the unemployment (Asscher, 2015). The aim of the Dutch ministry of social affairs and employment is to give people a fair chance to work and economic independence as much as possible (Asscher, 2015). The government pays attention to prevent the inflow into the unemployment insurance benefits by policy measures which stimulates employment and reduces unemployment. Demographic and socioeconomic groups, sectors and regions in the Netherlands are not equally affected by the consequences of the Great Recession. "Rising youth unemployment is one of the most acute problems in Europe", according to minister of social affairs and employment Asscher in 2013 (Asscher, 2013). At the other side are the elderly more often long-term unemployed (Asscher, 2015). Labour market policies should be targeted to the most vulnerable groups, to be effective. Attention must be

paid to people who are vulnerable to become unemployed and therefore become economically dependent. This vulnerability could also differ between regions, as showed in a visual application of Statistics Netherlands (Statistics Netherlands, 2012).

The aim of this master thesis is to identify the victims in terms of dependency of unemployment insurance during the recessions between 2009 and 2013 as a result of the Great Recession in the Netherlands. People are characterized by their demographic and, socioeconomic characteristics, the sector in which they operate and their residence. The research question is as follows:

Which demographic, and socioeconomic groups, in which sectors and in which regions were most vulnerable to inflow in the unemployment benefits (WW) in the Netherlands during the aftermath of the Great Recession (2009-2013)?

The answer to this question is essential for making effective policy measures to reduces inflows in unemployment and unemployment benefits. New policy measures can be taken an targeted to the most vulnerable groups in society. We investigate this question by a logistic regression model on the employees which flowed into unemployment benefits (WW) or in some cases the benefit income support (WWB) in the case of losing a job.

The remainder of this thesis is structured as follows. In the next section we describe the theoretical factors which determine unemployment during economic recessions. The data and methodology we have used are described and explained the third section. In section 4 are the results of the analysis presented and in section 5 we end with a discussion and we derive the conclusions.

2 Theory

2.1 Economic recession at the labour market

The labour market is the place where supply of labour meets demand of labour. Labour is demanded by firms and the government, and is supplied by individual workers. Consumers need income to buy goods and services, and they will earn this required income by supplying labour. Firms demand input factors as labour and capital, to maximize profits by producing and selling final goods and services (output) to the consumers. Therefore labour demand is derived from the demand for final goods and services (Hamermesh, 1993). At the intersection of the labour demand and labour supply curve a labour market equilibrium exists. At equilibrium, firms do not hire additional workers for higher wages and employees do not accept jobs for lower wages and the labour market is cleared.

The aim of this thesis is to explain the consequences of the economic recession at the labour market, and more specific to recognize who the vulnerable people are to become unemployed. Job losses during the Great Recession were mainly driven by the decline in aggregate demand (Mian & Sufi, 2012). This shows that the main effects of a recession on the labour market are through the labour demand side of the labour market. The decline in aggregate demand pushes firms to adjust the production of goods and services downwards and thereof also the demand for production factors. The demand for production factor capital is relative rigid in the short run, because adjustment of the size of plants or equipment is difficult and relatively costly. It is more easy to adjust the demand for labour, in the short run. Hence, the level of layoffs and unemployment rates tend to increase as a consequence of the decline in aggregate demand. In short, during an economic recession the labour market is largely affected by the decline in labour demand.

Also the labour force participation could be affected by the economic business cycle. On the one hand, when family income falls as a consequence of an economic recession and declining labour demand, secondary workers out of the labour force, are motivated to search for jobs and get jobs to make up the family loss. This effect is called the added worker effect (Borjas, 2010). On the other hand, unemployed workers would have difficulties in searching new jobs during a recession, and they give up. These workers will wait out the recession and drop out of the labour force, called the discouraged worker effect (Borjas, 2010). Both effects are the result of changes in the labour market and are indirect effects of an economic recession. We

focus on the direct effect of an economic recession at the labour market, which is mainly through the labour demand side.

2.2 Determinants of unemployment

As we have seen, labour demand is derived from the demand for final goods and services and depends on the profit maximization objective of firms. To achieve profit maximization, firms produce goods and services to satisfy the aggregate demand. Firms demand production factors capital and labour to produce these goods. The profits of the firm depend on the benefits of the sold output and the costs of the demanded input factors. To maximize the profits, the marginal benefits and the marginal costs have to be equalized. This shows us that the demand for production factors depend on the earning capacity of the firm, which in turn depends on the aggregate demand. The demand for production factors thus depends on the relative benefits and costs of that factor, because this will affect the total marginal costs and hence, the demand for labour depends on the marginal benefits and costs of labour. The benefits of labour are determined by the marginal productivity of labour – or marginal product of labour – which could in turn be affected by human capital investments (Becker, 1962). The costs of labour consists of the wage and adjustment costs of labour. Beyond the benefits and costs of labour is the demand for labour also affected by the costs of other production factors, especially in the long run (Cahuc & Zylberberg, 2004). We discuss the way in which the marginal product of labour, the costs of labour and the costs of other production factors affect the demand of labour and especially how these will affect labour demand during the aftermath of an economic recession.

2.2.1 Elasticity of demand

Before discussing the determinants of the demand for labour, we discuss the reason why the demand for labour will differ between various firms and occupations. This is related to the sensitivity of demand for the goods and services provided by the firm and reflected in the elasticity of demand for the produced goods and services. The demand for production factors depends in turn on the elasticity of demand for these goods and services. This implies that a decline in demand for goods and services will cause a decline in demand for the production factors to produce these goods and services also. When aggregate demand falls, the labour demand will decline in firms and occupations with a high elasticity of demand for their produced goods and services.

The hereafter discussed determinants for diminishing demand are strongly related to the elasticity of demand, because the strength of this elasticity will affect the extent to which

these mechanisms are effectively brought into force. Empirical literature shows that the demand for goods and services in the construction and manufacturing sectors declined significantly during the recent economic recession. Hence, workers employed in those sectors are most vulnerable to lose their job, as is showed in the literature (Verick, 2009) (Groot, Möhlmann, Garretsen, & Groot, 2011).

2.2.2 Marginal product of labour

The marginal product of labour ($\Delta Y/\Delta L$) is a measure of the productivity of labour and is defined by the relative change in output (Y) associated with a change in the quantity of labour (L), holding other inputs constant (Cahuc & Zylberberg, 2004). It shows the change in output when an additional unit of labour is employed. The real wage (W/P) reflects the change of variable labour costs (W) as an additional unit of labour is employed. It would represent the variable labour costs associated with the revenues of the production of goods and services, expressed in the price (P) of this output . The relationship between the marginal product of labour and the real wage is important to understand decisions on the quantity of the labour force by firms. When the marginal product of labour is higher than the real wage, the added value of the output produced by an additional unit of labour is higher than the additional variable labour costs of hiring one additional unit of labour. Expanding the quantity of labour is profitable for the firm. At the other hand, when the real wage is greater than the marginal product of labour, the costs of an additional unit of labour is higher than the added value of an extra unit output. When the marginal product of labour equals the real wage rate, the profit maximization objective of firms is satisfied.

The aggregate demand and the prices of goods and services decline during an economic recession. Firms lower the production of goods and services as a result of the decline in aggregate demand and falling prices of their output. This will have consequences for either the marginal product of labour and the real wage. Because of the downwards adjusted production of output (decline in Y), the marginal product of labour ($\Delta Y/\Delta L$) declines by a constant quantity of labour. In turn, the falling output prices (P) push the real wage upwards by a rigid wage level and the relative costs of labour increase. As long as the marginal product of labour of an individual worker exceeds the real wage of this worker, the worker will be profitable for the firm. When the real wage exceeds the marginal product of labour of a worker, the firm tends to lay off the worker. As a consequence of the decline in marginal product of labour and increase in real wage, the profit maximization objective of firms does not hold anymore and the firm tends to adjust the workforce downwards to restore the profit maximization objective.

2.2.3 Human capital investments

So far, we have assumed labour as homogeneous production factor, however it has turned out that this is not realistic. The labour force is heterogeneous and workers will differ in either their marginal productivity and their (real) wage rate. These differences could be explained by differences in abilities and skills of workers, the human capital of workers. Intuitively, differences in workers' human capital investments does matter in firms' decisions in adjustments of their workforce and will be an important determinant of the vulnerability to become unemployed as a consequence of a negative demand shock.

As all sorts of investments, human capital investments enclose expenditures and receipts in different time periods (Borjas, 2010). Training or education are investments which generates additional future income to both employers and employees. It will increase the future marginal product of workers and workers with higher education levels are linked to better labour market performances and higher wage earnings (Cahuc & Zylberberg, 2004). We make a distinction between general and job-specific training, following the analysis of Becker (1962). This distinction is theoretical to the extent that all training has a certain degree of specificity. General training is useful in many firms additionally to the firm which provides the training, while job-specific training only enhances the marginal product of workers in a particular type of job. General training is used by the worker who adds to his or her productivity in different types of jobs and therefore brings employers to compete for his or her services. Firms would therefore provide general training only if they did not have to pay any of the costs (Becker, 1962). Meanwhile, specific training add to the productivity of a worker in a specific job or firm. Investments in firm-specific human capital makes the employment relationship more productive. The difference in general and specific training implies that general training is valuable for all firms and workers, while specific training is valuable in the firm that provides this training. Therefore, firms have an incentive to provide and pay (partly) for specific training and tend not to pay for general training. Specific trained employees would have a higher wage, however not equal to their marginal product of labour. The employee has the incentive to stay at the job, because a higher wage as a result of the specific training and the employer has no incentive to lay off these employees because their marginal product is increased due to the specific training and would be greater than the wage. Employees with more specific human capital have less incentive to quit than employees with general or no human capital, because their wage will be lower in other jobs and other firms. At the other hand will employers have less incentive to lay off workers with specific human capital, because their marginal product is higher than their costs.

When the aggregate demand declines, the marginal product of labour would immediate decline and firms tend to equalize the marginal benefits and costs by reducing the demand for production factors labour and capital. Because the marginal product of labour is greater than the wage for specific trained employees, they are not laid off immediately. Firms tend to lay off workers with general human capital or unskilled workers first, because they have less space between their marginal product of labour and wage. Also when the marginal product of labour is temporary below the wage, is there an incentive not to lay off employees with specific human capital because future replacement of these investments will be more costly. The larger the investment in firm specific human capital, the larger is the incentive not to lay off these workers (Becker, 1962). Also empirical literature shows that firms will change the employment of high-skilled workers less rapidly (Hamermesh, 1993). Younger workers will have less experience at the firm, with respect to its older colleagues and generally have less investments in firm-specific human capital. This could be the reason that the younger workers are more vulnerable to become unemployed during an economic downturn with respect to their older colleagues (Gielen & Van Ours, 2006).

2.2.4 Labour adjustment costs

We have seen that labour demand depends on the relationship between the marginal product of labour and the real wage. Human capital investments adds a time horizon to the concepts of marginal product of labour and the real wage, which could be reflected in the present value of each worker. In decisions to adjust the workforce, employers should not only consider the variable labour costs related to the production of goods and services. Changes in the size of the workforce generate always adjustment costs, and plays therefore an important role in employers' decisions of hiring and firing. Labour adjustment costs are defined as the costs that arise from the variation in the number of hours worked and the replacement of old employees for new employees (Cahuc & Zylberberg, 2004). We can think of costs related to recruiting new employees (hiring costs) and costs related to employment protection measures (firing costs). However, also efficiency losses from reorganisations, costs related to incidental overtime work, and costs for supervision and training new employees enclose labour adjustment costs. In this section we discuss the way in which labour adjustment costs affect the demand of labour. All explicit and implicit costs related to recruitment and hiring new employees are mentioned by hiring costs and all cost related to firing or separation are mentioned by firing costs.

The demand for labour is affected by the height of hiring costs, because hiring costs discourage employers to attract new workers. Firms would like to hire new workers when the

marginal product of labour of the initial workforce is greater than the costs of labour (i.e. wage) plus the hiring costs. When the marginal product of labour exceeds the real wage, the additional profits by the new hired worker exceeds the hiring costs. Firms would be reserved to hire new workers as the marginal product of labour decline during an economic recession, because of both the existence of hiring costs and firing costs. Additionally, it is costly for firms to hire new workers and therefore firms wait to separate from a part of their workforce, because future replacements of the workers entails hiring costs.

When the marginal product of the initial labour force declines, employers tends to reduce their workforce. However, to terminate labour contracts of workers entail firing costs. As a result to the existence of firing costs, firms will separate from their workers if the marginal productivity of the initial workforce are less than the costs of labour minus the firing costs. Firing costs create a barrier to employers to separate from workers. The higher the firing costs are, the lower is the tendency to separate from workers. Despite of the marginal product of labour declines during an economic recession, firms wait for adjustments in their workforce, because of the existence of firing costs. Firing costs affects either job destruction and job creation. At the one hand, firing costs support labour hoarding, which reduces job destruction. Labour hoarding is a less than proportionate decrease in worker-hours in response to a decline in aggregate demand (Hamermesh, 1993). This implies a decline in the marginal product of labour, because of a superfluous part of the workforce is not laid off as a result of a negative aggregate demand shock. At the other hand, firing costs reduce job creation, because higher firing costs have the effect of degrading the profit outlook of every new hired employee (Cahuc & Zylberberg, 2004).

Empirical studies shows that in contrast to the United States the firing costs in continental Europe are relative higher, because of the legal measures to enhance job security ((OECD, 1999). This is one of the reasons why a less than proportionate decrease in worker-hours in response to the negative demand shock existed in some European countries. Labour hoarding was one of the reasons of the remarkable stable low unemployment level in Germany in the aftermath of the economic recession (Burda & Hunt, 2011) (Dietz, Stops, & Walwei, 2010). The phenomenon labour hoarding has been rationalized as employers' optimal response to the presence of costs of adjusting the labour demand (Hamermesh, 1993).

It follows from this analysis that the existence of adjustment costs lead to stabilization of labour demand, also in response of a negative aggregate demand shock as a consequence of an economic recession. As the adjustment costs increases with age, tenure, and wage (Bell &

Blanchflower, 2011) (Gielen & Van Ours, 2006), we expect the younger workers, workers with flexible contracts, low-skilled workers, and – more ambiguous –older workers to be vulnerable for being laid off as a consequence of a negative aggregate demand shock.

2.2.5 Costs of other production factors

So far we have focussed mainly on one production factor, namely labour. The demand for labour depends not only on factors determining costs and benefits of labour, but also on the possible substitutes and complements for the production factor labour. Labour demand is thus also affected by changes in the costs of other production factors, for example the production factor capital. Generally in economic literature is assumed that the production process use mainly two production factors, labour and capital. As we have seen above, capital is assumed to be rigid in the short run and labour demand is therefore affected by the costs of capital in the long run. The dependence of labour demand on the cost of capital is ambiguous and depends on the required production factors in the production process.

The costs of capital affects the labour demand in two ways. Labour and capital could be substitutes, which means that labour and capital could replace each other in the production process. When the costs of capital increase, the firm tends to substitute capital for labour and the labour demand increase. When labour and capital are complements, both production factors are required in the production process and if one production factor increase, the other have to increase also. An increase in capital cost will then result in a decrease in the demand for capital and a decrease in the labour demand.

Empirical evidence shows that there is price complementarity between skilled labour and physical capital and there is price substitution between capital and unskilled labour (Hamermesh, 1993). This implies, that if the price of capital decrease, the demand for capital will increase, the labour demand for skilled labour increase, and the labour demand for unskilled labour decrease also.

2.3 Who are affected?

The labour demand will be affected by the marginal product of labour, the real wage, human capital investments, labour adjustment costs, costs of other production factors and the elasticity of demand. The vulnerability of workers, which were most affected by the economic recession and subsequent demand shock is determined by various factors. We can conclude that there are different groups relatively more vulnerable to become unemployed during the economic downturn.

- The young people, because they will have relatively less investments and experience in the level of firm-specific human capital and therefore also a relatively low marginal product of labour. Additional, the adjustment costs for younger people are relatively low, because these increase with age, tenure and wage (Bell & Blanchflower, 2011) (Gielen & Van Ours, 2006). We expect that youth are most affected, which is proved by various empirical studies (Verick, 2009) (Arpaia & Curci, 2010).

- Workers with flexible contracts, because the adjustment costs of these workers are relatively low. The people with weaker contracts, less qualified and less experienced workers are the most vulnerable employees in Europe (Arpaia & Curci, 2010).

- Unskilled workers, because the price substitution between capital and unskilled labour. Additional, firms tends to layoff unskilled workers first, because their marginal product of labour is relatively low. The more educated are less likely to experience unemployment, and this effects increase during economic recession (Bell & Blanchflower, 2011).

- The workers employed in sectors which are sensitive for aggregate demand are also more vulnerable to become unemployed. Workers in the construction and manufacturing sectors are more vulnerable, where male employment is relatively high.

3 Data

The purpose of this thesis is to research the vulnerability to become unemployed in the Netherlands in the aftermath of the Great Recession. We use administrative data of both the number of unemployment benefits based on the Unemployment Insurance Act (Werkloosheidwet; WW) and the benefits income support (Wet Werk en Bijstand; WWB) to identify the people who lose their job and became financially dependent of income support. Information about wages, social security benefits and contracts of all employees in the Netherlands are collected by the Employee Insurance Agency (UWV) in the Operational Data Store (Polisadministratie). The administrative data are merged in the system of social statistical datasets (SSB) by the Dutch national statistical bureau Statistics Netherlands (CBS). These data files in the SSB are merged with other data files including demographic characteristics, jobs, income, education, region and other socioeconomic characteristics.

Official unemployment statistics in the Netherlands are based on the Dutch labour force survey (LFS), a rotating panel data research in the Netherlands. The participation at the labour market, unemployment level and other related labour market statistics are estimated by the data generated by this survey. We prefer administrative data within the SSB above survey data to the labour force survey, because of the quality, objectivity and comparability of administrative data. Additionally, an advantage of the data in the SSB is the possibility to merge different data sources by the personal identification number and the possibility to analyse for detailed personal background characteristics because of the use of data on the integral population (no sample).

In general is the quality of survey data declining because of decreased response in surveys (Stoop, 2005) and the increased selectivity of response (Bakker, 2009). Due to improvements in the information technology is the quality of administrative data improved, however the primary objective is of administrative nature. By the use of the data for statistical research, this administrative nature of the data should be considered in interpreting the results and drawing the conclusions. Second, survey data are subject to the relative subjective self-response, which affect the comparability of the data. The relative objectiveness of administrative data will be beneficial for the comparability of these data. Third, administrative data files could be merged by personal identification numbers to create large data files and extend the possibilities for social research and longitudinal research will be much more feasible. Finally, the large population size of register data opens the possibilities to analyse various small

subpopulation groups. While analysis based on survey data require standard errors in the analysis estimates because it is based on a sample, register data increases the accuracy of data analysis and enables to analyse small subpopulations because these data are based on the integral population (Bakker, 2009). Therefore we could distinguish population groups on detailed background characteristics in our analysis.

3.1 Dependent variable

In our analysis, we use data the data from the SSB of the employees in the Netherlands which are registered in the municipal population register (GBA[2]). These data includes demographic background characteristics, socioeconomic characteristics as well as job information, regional data and social security benefits in the years 2008-2013. The objective of the analysis is to identify the likelihood of employees to become unemployed during the aftermath of the Great Recession. The inflows in unemployment benefits based on the Unemployment Insurance Act (WW) are used to identify the employees which became unemployed. Employees need to satisfy the requirements of the Unemployment Insurance Act to be eligible for receiving unemployment benefits. The most important and relevant requirements are the following (Rijksoverheid, 2015) (Stimulansz, 2014):

1. The applicant have to be insured for unemployment, which is the case when the applicant was employee before unemployment
2. The applicant lost at least five job hours (or at least a half of the average job hours worked)
3. The applicant is immediately available for paid work
4. The applicant has worked 26 weeks of the last 36 weeks before becoming unemployed
5. The applicant should not be culpably unemployed

These requirements implies that some employees which become unemployed were not entitled to receive unemployment benefits. For example new labour market entrants, which worked less than 26 weeks before unemployment are not entitled to the unemployment benefits (WW). The Dutch Statistical Bureau confirms that youth until age 25 flowed less into the unemployment benefits (WW) relative to older workers after being laid off (Centraal Bureau voor de Statistiek, 2015). Additional, youth flow more often into the benefits income support (WWB) than their older counterparts. The employees which flowed into the WW could be selective, because the youth could be underreported in the data. We attempt to reduce this

[2] In Dutch: 'Gemeentelijke Basis Administratie'

selectivity by adding employees which flowed into the benefits income support (WWB). Because of the different nature of the WWB relative to the WW, we add two conditions before include them into the data as flowed into unemployment. First, the employee was in a job for at least one month within the year before receiving benefit income support (WWB) and second the employee hasn't received unemployment benefits in the period since 2008. These conditions are important because of the different nature of the benefits income support, which provides a minimum guaranteed income to individuals without family income and without own capital. Both requirements prevent for inflow of individuals which became not unemployed as a result of job loss. The first because it excludes individuals which did not paid work before inflow and the second excludes individuals which received unemployment benefits before receiving benefits income support. The latter were already identified as employees flowed into unemployed.

The population in the analysis is defined by the employees which were in a job in December of the year before the analysis. For example, we analyse the inflows in the unemployment benefits (WW) or the benefits income support (WWB) in 2009 of the employees which were in a job in December 2008.

Other possible vulnerable individuals are also ignored in our data, as the self-employed, seasonal workers and graduates which do not always satisfy the conditions of the unemployment benefits. However they could also be victims of the Great Recession with respect to unemployment. Therefore the definition of unemployment does not entire fit the unemployed in our data. We have to consider these drawbacks in the interpretation of the results and drawing the conclusions.

The data we use contain characteristics related to individuals instead of jobs. The occupational sectors are linked to the main job of every employee. This implies that when an employee loses a job, this employee is not necessarily unemployed, because other jobs could have remained. In the analysis are all employees which lose one job entitled as inflow in unemployment and coupled with the occupational sector of their main job. This implies that employees with part time jobs are included in our analysis, both if they keep their job as well as lose one job. If the latter is the case, the employee is entitled as inflow in unemployment. This is an important issue to consider in the interpretation of the results and drawing the conclusions.

3.2 Independent variables

In the SSB data source are demographic, socioeconomic and regional data merged which enables to identify the explanatory factors of inflow in unemployment benefits (WW) or benefit income support (WWB). In our analysis we use gender, age, and origin which are based on the registrations in the municipality population register. The age variable is categorized in five relevant age groups and calculated from the year of birth. The origin is distinguished in Dutch-born workers[3], Moroccans, Turkey's, Surinamers, Antilleans and Arubans, other non-Western countries and other Western countries. This variable is derived from the nationality of the individual and the nationality of the parents of this individual. Additionally, we include the socioeconomic variable personal yearly income in our analysis as an indicative predictor for the level of education, in accordance with the theory (Cahuc & Zylberberg, 2004). The highest level of education is not available for the whole population because of a large amount of missing records and the selectivity of them. Furthermore we have added the standard industrial classification (SIC) of the main job of every employee. We should keep in mind that the main job is the job of which the employee is most dependent and is not necessarily the job to which the employee is laid off. Regional data are used to identify the county in which the employees live.

The reference date of the independent variables is taken in December of the year before we analysed the inflows. The demographic background characteristics are independent from reference date, and the age is taken in the year of analysis. The yearly personal income refers to the income in the year before analysis, because the income in the year of analysis could be affected by inflow. The standard industrial classification (SIC) of the main job is also taken in December of the year before analysis, however for the employees which flowed into the WW or WWB we have taken the SIC in the month before inflow.

3.3 Summary statistics

The data of inflows into unemployment benefits (WW) or the benefit income support (WWB) of employees is summarized in table 1. Table 1 shows declining inflows into WW or WWB between 2009 and 2011, and a large increase in the period between 2011 and 2013. The increase of the total amount of employees between 2009 and 2011 and the decrease of the total amount of employees between 2011 and 2013 confirms the pattern of the employee-inflows into a WW or WWB benefit.

[3] There is no exact equivalent for the Dutch word 'allochtoon' in the English language

Table 1: Summary Statistics

(N = x 1,000)	2009		2011		2013	
	N	**%**	**N**	**%**	**N**	**%**
Employees	7.261		7.270		7.155	
Inflow into WW + WWB	324	4,5	290	4,0	414	5,8
Mean age		40,0		40,5		41,1
Mean age inflow into WWB + WWB		38,3		38,7		39,0
Inflow into WW + WWB to origin	**N**	**%**	**N**	**%**	**N**	**%**
Netherlands	226	3,8	202	3,4	301	5,2
Morocco	9	8,8	8	7,9	10	9,6
Turkey	12	9,3	10	8,0	13	10,4
Suriname	13	8,1	12	7,3	14	9,2
Former Netherlands Antilles and Aruba	6	10,1	5	9,2	6	10,6
Other non-Western countries	20	9,8	18	8,2	20	9,1
Other Western countries	38	5,9	32	5,1	43	7,0
Mean income		32.749		33.847		35.357
Mean income inflow into WW + WWB		28.351		28.467		29.189
Inflow into WW + WWB to county	**N**	**%**	**N**	**%**	**N**	**%**
Groningen	13	5,4	12	5,0	15	6,3
Friesland	14	5,5	14	5,2	17	6,6
Drenthe	11	5,4	9	4,6	12	6,3
Overijssel	23	4,7	20	4,0	30	6,3
Flevoland	9	5,3	8	4,7	11	6,7
Gelderland	35	4,0	31	3,6	48	5,7
Utrecht	21	3,7	20	3,6	29	5,2
Noord-Holland	49	4,3	46	3,9	65	5,6
Zuid-Holland	61	4,0	60	3,9	83	5,5
Zeeland	6	3,7	5	3,1	7	4,8
Noord-Brabant	51	4,7	43	3,9	63	5,9
Limburg	25	5,5	20	4,3	28	6,2
Inflow into WW + WWB to SIC[4]	**N**	**%**	**N**	**%**	**N**	**%**
Agriculture, forestry and fishing	2	2,9	2	2,9	3	3,9
Mining and quarrying	0	1,7	0	1,4	0	1,3
Manufacturing	38	4,8	21	2,9	32	4,5
Energy supply	0	1,3	0	2,1	1	2,7
Water supply and waste management	1	2,6	1	2,3	1	3,5
Construction	18	4,7	15	4,4	28	9,0
Wholesale and retail trade	52	4,2	43	3,5	70	5,7
Transportation and storage	15	4,2	11	3,2	18	5,1
Accomodation and food service activities	11	4,1	11	3,9	17	5,8
Information and communication	13	5,5	10	4,5	13	6,0
Financial institutitions	10	3,9	9	3,5	12	4,7
Renting and trading of real estate	4	4,9	3	3,9	3	5,2
Specialised business services	26	5,1	20	4,3	26	5,7
Renting and other business support services	87	13,0	81	12,0	94	15,3
Public administration and services	3	0,7	6	1,3	5	1,0
Education	10	2,0	13	2,7	18	3,7
Human health and social work activities	22	2,0	31	2,5	54	4,4
Culture, sports and recreation	5	5,0	5	5,1	8	7,4
Other service activities	6	4,1	6	4,6	9	7,0
Households	0	2,7	1	2,7	1	3,6
Extraterritorial organisations	0	3,7	0	3,6	0	3,0

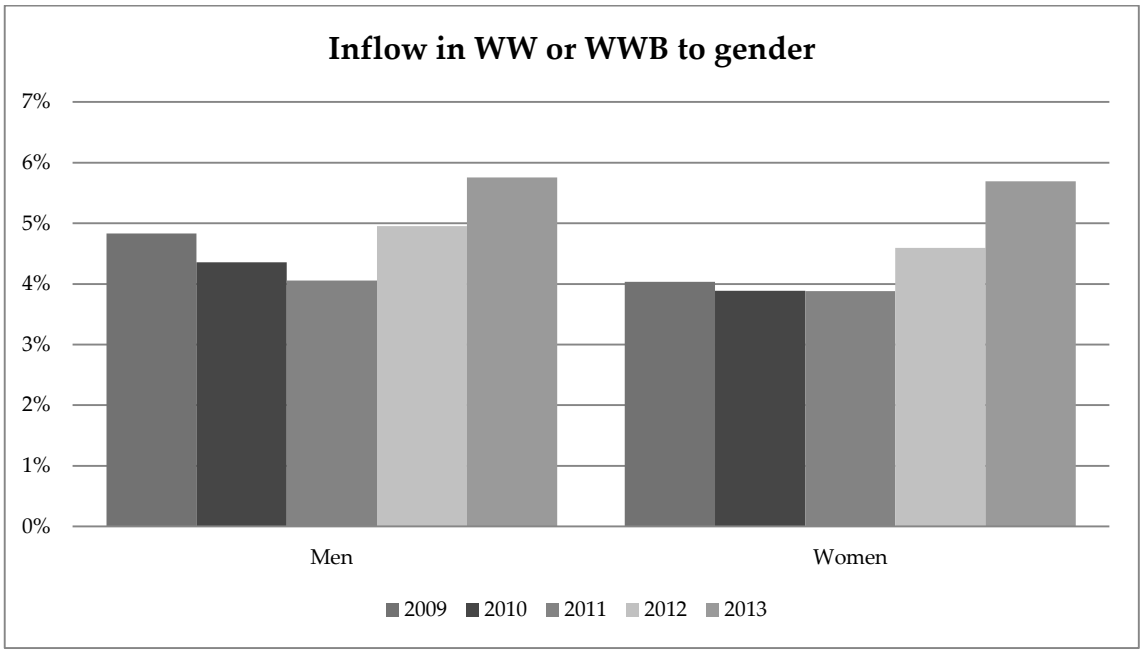
[4] Standard Industrial Classification (of the main job)

The inflows in a WW or WWB benefit were relatively higher for men, especially in the early years of the Great Recession (2009-20011). In the subsequent period were gender differences almost disappeared, as is showed in table 2 and figure 4. This means that the inflows in WW or WWB increased more for women in the period between 2011 and 2013 relative to their male counterparts.

Table 2: Inflow to gender

(N = x 1,000)	2009		2011		2013	
Inflow into WW + WWB to gender	**N**	**%**	**N**	**%**	**N**	**%**
Men	189	4,8	156	4,1	216	5,8
Women	135	4,0	132	3,9	192	5,7

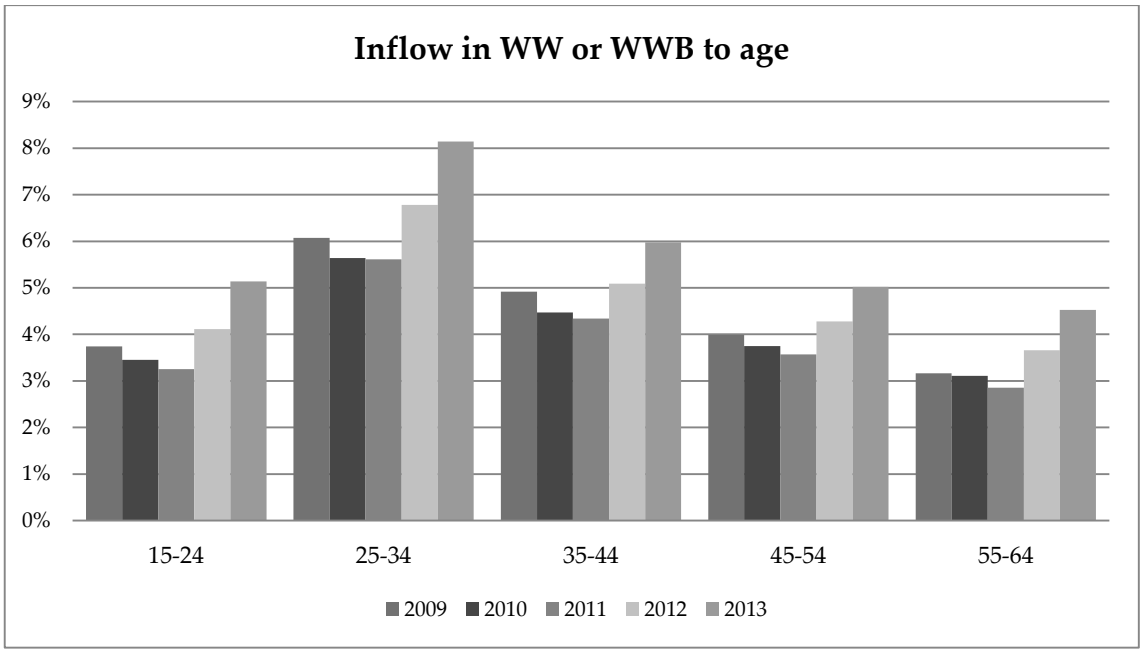
Figure 4: Unemployment inflow to gender



Generally, employees which flowed into WW or WWB are 1,7 (2009) to 2,1 (2013) years younger related to the total population of employees. As showed in table 1 is this age difference increasing in the whole period of the analysis. However, this could partly be explained by the increasing age of both the whole employee population (included in the analysis) and the employees flowed into WW or WWB. Excluding the youngest age group (aged 15-24 years), are the inflows in WW or WWB decreasing by age (see figure 5). The relatively low amount of inflows of employees in the youngest age group could be explained by the labour market flexibility in the youngest age group (Centraal Bureau voor de Statistiek, 2015). Youth have more temporary contracts and are more in part-time jobs, which implies that they are less motivated to apply for an unemployment benefit (WW) or are unable to apply for an

unemployment benefit (WW) due to the legislative provisions in the Unemployment Insurance Act. The share of older employees in WW or WWB inflow is a bit increasing, especially in the latest period of the analysis (2011-2013). This could be explained by the sequence in the layoffs during the period of the Great Recession, where firms tend to layoff first the cheapest employees (the youth and flexible contracts) and thereafter layoff the employees with low marginal product of labour (see determinants of unemployment). The marginal product of labour will decrease when employees get older, especially when they are aged above fifty, which implies that elderly employees are increasing vulnerable to lose their job.

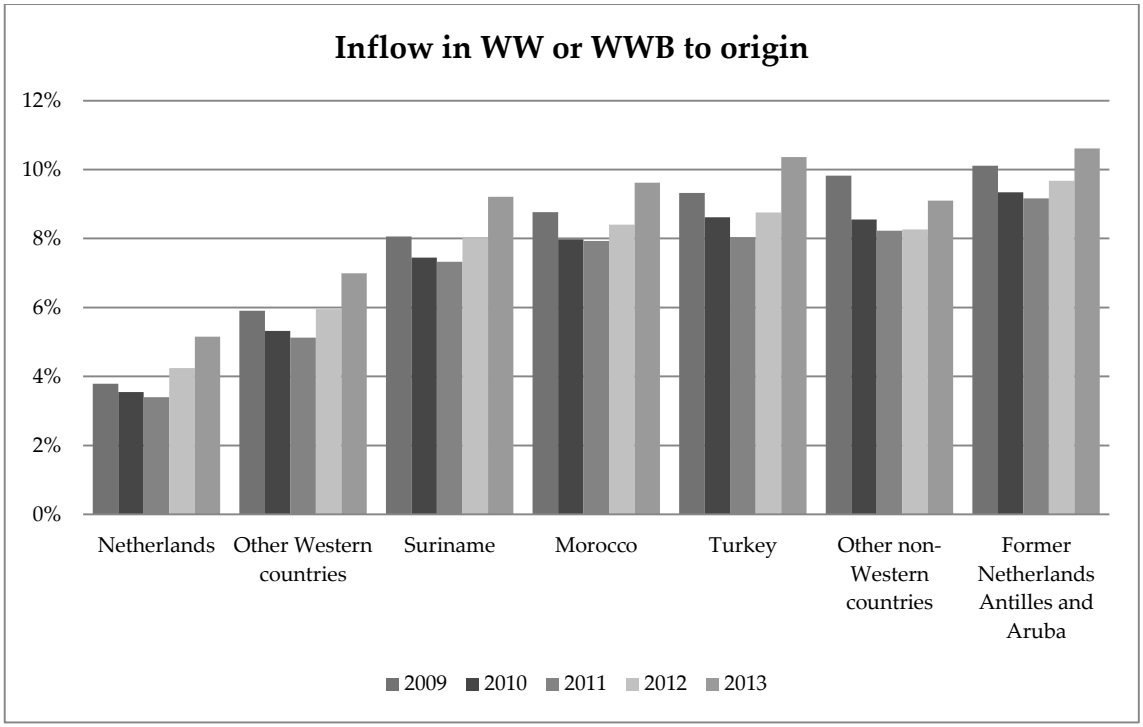
Figure 5: Unemployment inflow to age



The largest group of employees are Dutch-born and in absolute numbers they were by far the largest group which flowed into WW or WWB benefits. However, the relative inflows into WW or WWB of Dutch-born employees were substantially less compared to the non-native employees as is showed in table 1 and figure 6. Of all non-native employees are the employees coming from other western countries best of, because their relative low inflow rate is more than two percentage points less than the subsequent group. Employees coming from non-western countries (the former Netherlands Antilles and Aruba, other non-Western countries, Turkey, Morocco or Suriname) were hit hardest during the aftermath of the Great Recession, considering the high ratios of inflows in the WW or WWB. The percentage increase of inflows of employees coming from the other western-countries (0.9 percentage points) or the former Netherlands Antilles and Aruba (1.4 percentage points) is small relative to, for example, Turkey (2.4 percentage points). The reasons for the differences between Dutch-born, western

and non-western employees could be explained due to lower education levels of the non-native Dutch, more flexible contracts, other socioeconomic characteristics of the non-native Dutch, and the social opinion whereof the non-native Dutch being more discriminated at the labour market (Bouma, Coenen, & Kerckhaert, 2011).

Figure 6: Unemployment inflow to origin



The difference in the mean of the personal yearly income of the employees included in our analysis and the employees which loosed a job and flowed into the WW or WWB is substantial (see table 1). The difference in income level is still increasing in the period between 2009 (4.398) and 2013 (6.168). The categorized income groups (figure 7) show us that the inflows in WW or WWB diminish by the income level, leaving the lowest income group aside. Employees earning a lower yearly income are relatively more often flowed into the WW or WWB. The remarkable low inflow into WW or WWB of the lowest income group could be explained by employees in part-time employment relationships and therefore earning a lower total income, who are less vulnerable to flow into a WW or WWB benefit.

Figure 7: Unemployment inflow to income level

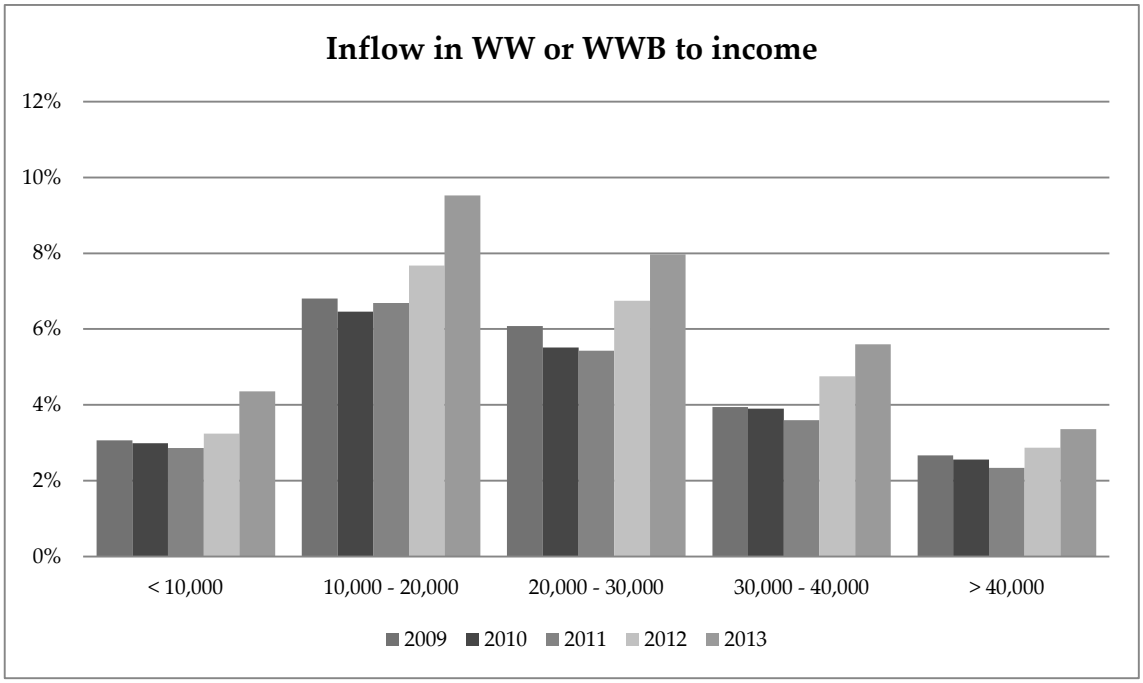
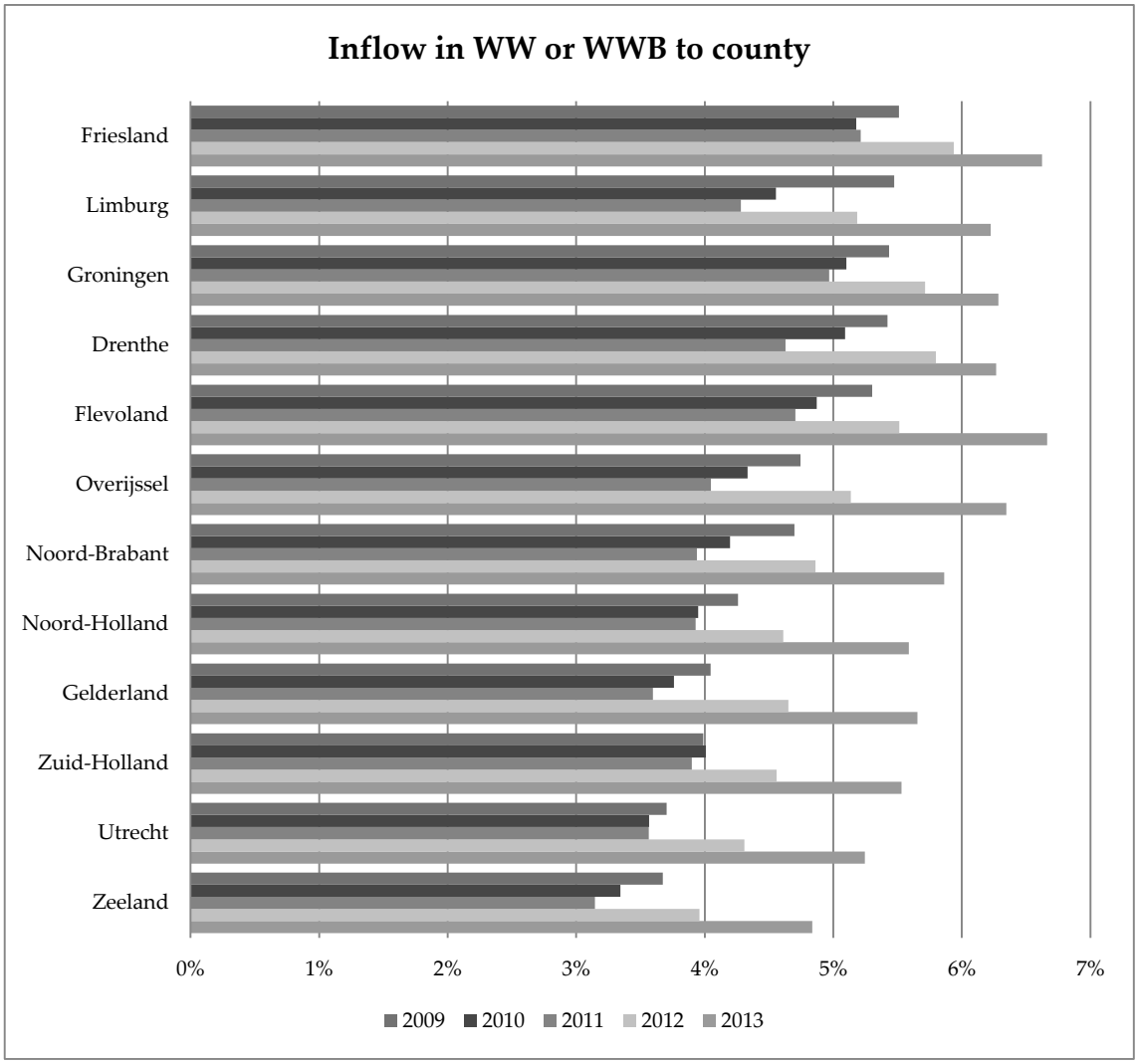


Figure 9 shows that employees living in the more rural areas of the Netherlands have lost their job more often. The inflows in WW or WWB were clearly the lowest for employees living in the south west county Zeeland. Nevertheless, in table 1 are the absolute numbers of inflows showed, indicating very high inflows in unemployment benefits or benefit income supports in Zuid- (61k-83k) and Noord-Holland (49k-65k). The high inflows in WW or WWB is declared by the differences of the number of inhabitants, which differs very much between counties.

Figure 8: Counties in the Netherlands

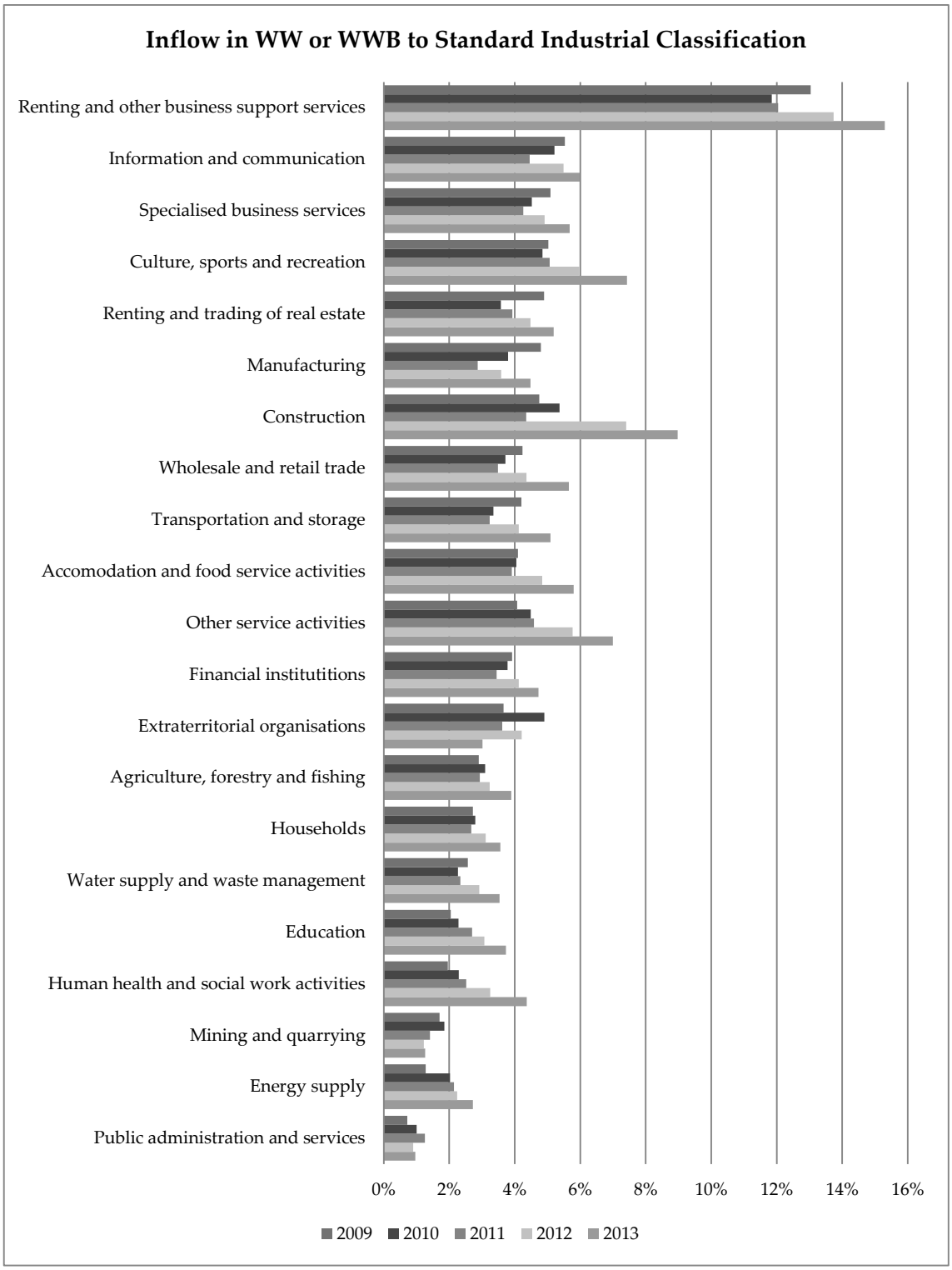
Figure 9: Unemployment inflow to county



The inflow in WW or WWB of employees which are employed in the sector renting and leasing of tangible goods and other business support services is remarkably high, both in absolute terms (see table 1) as the proportional inflow (see table 1 and figure 10). This sector includes employment placement, provision of temporary employment and pay rolling, security and investigation and facility management. The high proportion of inflows is caused by the high inflows in the temporary employment sector and could be explained by the high flexibility among employees employed in this sector. The information and communication sector, specialized services sector and culture, sports and recreation sector show also high inflow rates, where the latter sector shows also a large increase in inflows in the period 2011-2013. The large inflows in these sectors could be explained by the supportive nature of the employment activities in these sectors. We could imagine that firms would cut in expenses on secondary activities first, before affect the core business. Figure 10 shows large increases of inflows in WW or WWB in the construction sector, culture, sports and recreation sector, other service activities,

and human health and social work activities. These sectors will be sensitive to the economic business cycle and the human health and social work activities sector will possibly be affected by substantial changes in the fees from health insurance.

Figure 10: Unemployment inflow to standard industrial classification



The lowest WW or WWB inflows are shown in the so-called primary sector (agriculture, forestry and fishing; mining and quarrying; water supply; energy supply) and the public sector (public administration; education; human health). These are almost insensitive to aggregate demand and seems to be very stable in the employment level.

In short, the summary statistics show that men, prime-agers, (non-Western) non-native Dutch employees and low income earners experienced a relative high vulnerable for inflow in unemployment benefits (WW) or benefit income support (WWB) during the aftermath of the Great Recession. Employees working in the renting and other business support services sector, construction sector, information and communication sector or culture, sports and recreation sector shown a higher vulnerability of inflow in WW or WWB. However, these statistics describe the separate likelihood to the inflows. In the following analysis we will consider the determinants for inflows in a WW of WWB benefit in interdependency.

3.4 Identification strategy

To consider the interdependence of the factors which determine the vulnerability of employees to inflow in unemployment benefits (WW) or benefit income support (WWB), is a regression analysis required. A regression enables us to identify the extent to which demographic and socioeconomic determine the likelihood of an employee to lose a job and become dependent on social security benefits. It is obvious that we use a logistic regression model, because we use a dichotomous dependent variable (whether or not flowed into the WW or WWB).

The basic logistic model is as follows (Verbeek, 2010):

$$\ln \frac{p\{Y_i = 1|x_i\}}{p\{Y_i = 0|x_i\}} = a + x_i\beta$$

where $\ln \frac{p\{Y_i = 1|x_i\}}{p\{Y_i = 0|x_i\}}$ is the odds ratio, which is the relationship between the probability that a worker became unemployed ($p\{Y_i = 1|x_i\}$) and a worker does not become unemployed ($p\{Y_i = 0|x_i\}$). Because of insight in the magnitude of the likelihood for inflow in WW or WWB we will present the odds, which demonstrates the probability of the determinants ($x_i\beta$) explaining the likelihood of inflows in the WW or WWB.

The determinants of WW or WWB inflow are analysed using two models, a basic model (I) including demographic background characteristics and income, and an extended model (II) where the residing county, standard industrial classification (SIC) of the main job of every employee, and the interaction of gender with the SIC are added. The first model gives insight

whether personal characteristics may affect the likelihood to lose a job, while the second model shows additionally the extent to which regional and occupational factors affect the vulnerability of employees to inflow in the WW or WWB. The differences in the results of both models is valuable to identify whether the added variables improves the explaining power of the model. We analyse the first year after the onset of the Great Recession (2009), the middle year when the WW or WWB inflow was the lowest (2011), and the latest year 2013, which is the year of the highest inflow.

4 Results

In this section we test the likelihood of the factors determining the vulnerability of employees to become dependent of unemployment benefits (WW) or benefit income support (WW). The results of the logistic regression models are displayed in the tables in this section for the years 2009, 2011 and 2013. The odds values show the likelihood ratio for employees in the category relative to the reference category. When the odds are below (above) one, the employees in this category are less (more) vulnerable for inflow relative to the reference category.

In table 3 are the results of the regression models presented of 2009, the first year after the onset of the Great Recession in the Netherlands. The first model estimates the effect of gender, age, origin and the yearly personal income on the likelihood of inflow in WW or WWB. In this model is clearly shown that given the age, origin and income, men are more vulnerable to inflow relative to their female counterparts. The remarkably low likelihood for the employees aged between 15 and 24, was also showed in the summary statistics (figure 5). The low likelihood of these youth employees will be explained by the higher labour flexibility among the youth and the reduced accrued entitlements for inflow in the unemployment benefits (WW). Regarding the employees from age 25, we can conclude that the likelihood for inflow in WW or WWB is decreasing with age in the first year of the Great Recession. The employees between age 25 and 44 are most vulnerable to lose a job and becoming dependent of a WW or WWB benefit. With respect to the origin of employees, a sharp contrast is shown between Dutch born employees and the non-native Dutch employees. Given gender, age and income are Dutch born employees clearly less vulnerable for WW or WWB inflow, relative to the employees of foreign origin. However, we could also distinguish employees which originate from western countries and non-western countries, where the likelihood to WW or WWB inflow of the non-western employees is substantially higher (odds of 2.0-2.4 versus 1.5). The vulnerability of employees to WW or WWB inflow is decreasing with the height of their personal yearly income, disregarding the employees with yearly income up to 10.000 euro. The latter are less likely to inflow in a WW or WWB benefit relative to the employees with income levels between 10.000 and 30.000 euro. In the lowest income group are probably a large number of employees with part time contracts, which seems to be less vulnerable for inflow in WW or WWB. The decreasing vulnerability for inflow in WW or WWB implies that the likelihood to lose a job is decreasing with income level, because the income level is an indication of the income level.

Table 3: Logistic Regression Results 2009

Logistic Regression Results (2009)

	Model I			Model II		
	odds		s.e.	odds		s.e.
Constant (B)	-3,464	**	(,007)	-3,993	**	(,010)
Gender (reference category: men)						
Women	0,595	**	(,004)	0,844	**	(,009)
Age (reference category: 15-24)						
25-34	1,702	**	(,007)	1,601	**	(,007)
35-44	1,609	**	(,007)	1,570	**	(,007)
45-54	1,374	**	(,007)	1,443	**	(,008)
55-64	1,118	**	(,009)	1,207	**	(,009)
Origin (reference category: Netherlands)						
Morocco	1,946	**	(,011)	1,684	**	(,012)
Turkey	2,099	**	(,010)	1,772	**	(,010)
Suriname	2,024	**	(,010)	1,916	**	(,010)
Former Netherlands Antilles and Aruba	2,415	**	(,014)	2,164	**	(,015)
Other non-Western countries	2,200	**	(,008)	1,922	**	(,008)
Other Western countries	1,546	**	(,006)	1,420	**	(,006)
Income (reference category: < 10,000)						
10,000 - 20,000	2,074	**	(,007)	2,285	**	(,007)
20,000 - 30,000	1,578	**	(,008)	1,957	**	(,008)
30,000 - 40,000	0,922	**	(,008)	1,279	**	(,009)
> 40,000	0,617	**	(,009)	0,886	**	(,009)
County (reference category: Zuid-Holland)						
Groningen				1,468	**	(,010)
Friesland				1,545	**	(,010)
Drenthe				1,584	**	(,011)
Overijssel				1,292	**	(,008)
Flevoland				1,306	**	(,012)
Gelderland				1,155	**	(,007)
Utrecht				1,009		(,008)
Noord-Holland				1,057	**	(,006)
Zeeland				1,053	**	(,014)
Noord-Brabant				1,293	**	(,006)
Limburg				1,535	**	(,008)
Standard Industrial Classification (reference category: Wholesale and retail trade)						
Agriculture, forestry and fishing				0,559	**	(,029)
Mining and quarrying				0,412	**	(,106)
Manufacturing				1,013		(,009)
Energy supply				0,280	**	(,082)
Water supply and waste management				0,605	**	(,039)
Construction				1,160	**	(,010)
Transportation and storage				0,988		(,012)
Accomodation and food service activities				0,859	**	(,015)
Information and communication				1,308	**	(,013)
Financial institutitions				1,063	**	(,016)
Renting and trading of real estate				1,141	**	(,027)
Specialised business services				1,249	**	(,011)
Renting and other business support services				3,174	**	(,008)
Public administration and services				0,160	**	(,025)
Education				0,572	**	(,017)
Human health and social work activities				0,632	**	(,016)
Culture, sports and recreation				1,190	**	(,022)
Other service activities				1,006		(,024)
Households				0,865		(,103)
Extraterritorial organisations				0,351	*	(,507)

Notes: N=7,261,474 Nagelkerke R square=.047 (I) .097 (II) * p<.05 - ** p<.01

In the second model are the residence county of employees and the standard industrial classification of their main job. The general pattern of the results in the first model will remain in the second model, however the magnitudes of the result will change a bit. The explaining power of the second model is improved substantially, showed in the increased value of the R square. When the residing county and the industrial occupation of the main job are added in the model, are the gender differences a bit diminished in terms of the likelihood for inflow in the unemployment benefits (WW) or benefits income support (WWB). The substantial difference of the odds between the models (0.595 versus 0.844) are partly explained by differences in the interaction of gender by the industrial occupation, and additionally by the added variable of the residing county. From this result, we could conclude that gender differences are not the main determinant of the vulnerability for inflow in WW or WWB. The odds for the age categories show reduced differences between age categories, however the pattern of the first model keeps existing, which means that the likelihood of inflow will be decreasing by age, disregarded the youngest age group (15-24 years). The results on the origin of the employees show that the differences between Dutch-born and non-native Dutch employees exist. However looking into detail to the difference groups show that the Turkeys and Moroccan employees' likelihood for inflow is diminished substantially given the added variables in the second model. The employees coming from the former Netherlands Antilles and Aruba, other non-western countries and Suriname are unabated high. The pattern of the odds of income remains the same as in the first model, however they increased almost proportionally. This means that the likelihood for inflow in the WW or WWB of the employees in the lowest income category is less when the county, industrial occupation and interaction of gender by industrial occupation is added.

The odds to the different counties show a general difference between the counties in the economic core region in the Netherlands, called the Randstad (including Noord-Holland, Zuid-Holland and Utrecht), and the more rural peripheral counties (see figure 8). Employees living in the Randstad region and Zeeland were clearly less vulnerable for inflow in the unemployment benefits (WW) or benefits income support (WWB) in the first year after the onset of the Great Recession. However, the likelihood ratio of employees living in Utrecht isn't significant different from the other counties, and Zeeland, the smallest given the population, is a bit extraordinary because of the relative large amount of inactive persons at the labour market due to the aging population. Employees living in the northern counties Drenthe, Friesland and Groningen, and the most south situated county Limburg however, are much more likely to inflow in WW or WWB benefits. The high likelihood of inflows in Drenthe could not be

declared by other factors, because of this county scored highest in odds and was ranked fourth in the summary statistics.

Because of the added interaction effects of gender by the standard industrial classification, represent the odds of SIC in table 3 the odds directly related to male employees and represent the odds in table 4 the differences of likelihood for inflow in WW or WWB of female employees. As already remarked in the summary statistics is the inflow into WW or WWB of employees with a main job in the renting and other business support sector very high, because of the flexibility in this sector. Employees working in the information and communication sector, specialized business services and culture, sports and recreation sector are relative the most vulnerable for inflow in the WW or WWB. Otherwise, employees working sectors related to the primary sector and the public sector are less likely for WW or WWB inflow.

Table 4: Interaction results gender by standard industrial classification 2009

Logistic Regression Results (2009) - Interaction gender by standard industrial classification

	Model II		
	odds		s.e.
Standard Industrial Classification (reference category: Wholesale and retail trade)			
Agriculture, forestry and fishing	1,636	**	(,043)
Mining and quarrying	1,632	**	(,207)
Manufacturing	0,922	**	(,015)
Energy supply	1,545	**	(,128)
Water supply and waste management	0,868		(,083)
Construction	0,894	*	(,026)
Transportation and storage	0,872		(,021)
Accomodation and food service activities	0,938	**	(,022)
Information and communication	1,154	**	(,021)
Financial institutitions	0,811		(,022)
Renting and trading of real estate	1,033	**	(,036)
Specialised business services	0,947	**	(,016)
Renting and other business support services	0,638	**	(,012)
Public administration and services	1,123	**	(,035)
Education	0,657	**	(,023)
Human health and social work activities	0,477	**	(,019)
Culture, sports and recreation	0,861		(,030)
Other service activities	0,756	**	(,030)
Households	0,593	**	(,116)
Extraterritorial organisations	2,298		(,588)

Notes: * p<.05 - ** p<.01

In table 4 are the odds showed of the standard industrial classification, which present the differences between male and female employees. Odds below (above) one means that female employees are less likely to inflow in WW or WWB relative to male employees. The interaction effects show that women are significant more vulnerable to unemployment when

they are working in sectors related to the primary sector, as the agriculture, forestry and fishing sector, the mining and quarrying sector, and the energy supply sector relative to men. Also in the public administration and services and information and communication sectors are women more likely inflow in WW or WWB. This could be explained by the fact that these sectors are possibly more male oriented. This explanation is supported by the fact that in women oriented sectors as the human health and social work activities and the households the likelihood for inflows in WW or WWB for female employees is much less relative to men.

In table 5 are the results presented of the logistic regression analysis in the year with the lowest inflow into unemployment benefits (WW) or benefits income support (WWB). Both models compared to the models in 2009 show that the gender differences in likelihood to inflow in WW or WWB is substantially reduced. The odds value of 0.974 indicate that the gender differences were almost disappeared in 2011. The odds related to the age categories are increased a little relative to 2009, while the general pattern exists the same. The likelihood to inflow into WW or WWB for the youngest age group is diminished a little, which is shown in the increase of all other age categories. This means that the vulnerability of the youth diminished a little relative to the other age groups. The general pattern in the different origin backgrounds of employees reduced a little in 2011 relative to 2009, which implies that the likelihood to inflow in WW or WWB for employees in the reference category, the Dutch born has increased a little vis-à-vis the other categories (except for the Moroccan employees). The likelihood for WW or WWB inflow of the employees with origin from other non-western countries showed the most relevant decrease in both regression models. The difference between Dutch born and non-native Dutch employees keeps existing in 2011. Comparing the odds for the income categories shows in both regression models only little changes in 2011 relative to the first year after the onset of the Great Recession (2009). This implies that the factor income didn't change during the years in the aftermath of the Great Recession, and hence this factor is a stable explaining determinant for the inflow in WW or WWB. The odds of the counties in 2011 reduced all relative to the results of 2009, which implies an increasing vulnerability for employees living in Zuid-Holland to inflow in the WW or WWB vis-à-vis the other counties. The likelihood to inflow in WW or WWB of employees living in the counties Utrecht en Noord-Holland differs not significantly from the likelihood to inflow in WW or WWB for employees in the reference county Zuid-Holland. The odds of the counties Drenthe and Limburg decreased substantially relative to 2009. Generally, the likelihood to inflow in WW or WWB was converging among all counties, which implies that the determining power of region is reduced.

Table 5: Logistic Regression Results 2011

Logistic Regression Results (2011)

	Model I			Model II		
	odds		s.e.	odds		s.e.
Constant (B)	-3,625	**	(,007)	-4,134	**	(,010)
Gender (reference category: men)						
Women	0,681	**	(,004)	0,974	*	(,010)
Age (reference category 15-24)						
25-34	1,833	**	(,008)	1,690	**	(,008)
35-44	1,662	**	(,008)	1,605	**	(,008)
45-54	1,435	**	(,008)	1,466	**	(,008)
55-64	1,188	**	(,009)	1,258	**	(,009)
Origin (reference category: Netherlands)						
Morocco	1,987	**	(,012)	1,720	**	(,012)
Turkey	2,009	**	(,011)	1,720	**	(,011)
Suriname	2,046	**	(,010)	1,874	**	(,010)
Former Netherlands Antilles and Aruba	2,424	**	(,015)	2,136	**	(,015)
Other non-Western countries	2,032	**	(,008)	1,770	**	(,009)
Other Western countries	1,491	**	(,006)	1,363	**	(,006)
Income (reference category: < 10,000)						
10,000 - 20,000	2,094	**	(,008)	2,246	**	(,008)
20,000 - 30,000	1,506	**	(,008)	1,804	**	(,008)
30,000 - 40,000	0,919	**	(,009)	1,230	**	(,009)
> 40,000	0,602	**	(,009)	0,850	**	(,009)
County (reference category: Zuid-Holland)						
Groningen				1,376	**	(,011)
Friesland				1,493	**	(,010)
Drenthe				1,377	**	(,012)
Overijssel				1,135	**	(,009)
Flevoland				1,203	**	(,012)
Gelderland				1,042	**	(,007)
Utrecht				0,991		(,009)
Noord-Holland				0,999		(,006)
Zeeland				0,917	**	(,015)
Noord-Brabant				1,107	**	(,007)
Limburg				1,206	**	(,009)
Standard Industrial Classification (reference category: Wholesale and retail trade)						
Agriculture, forestry and fishing				0,767	**	(,029)
Mining and quarrying				0,410	**	(,121)
Manufacturing				0,772	**	(,011)
Energy supply				0,645	**	(,061)
Water supply and waste management				0,699	**	(,042)
Construction				1,454	**	(,011)
Transportation and storage				0,982		(,013)
Accomodation and food service activities				1,051	**	(,016)
Information and communication				1,287	**	(,015)
Financial institutitions				1,195	**	(,017)
Renting and trading of real estate				1,243	**	(,030)
Specialised business services				1,309	**	(,012)
Renting and other business support services				3,608	**	(,009)
Public administration and services				0,368	**	(,020)
Education				0,903	**	(,017)
Human health and social work activities				1,089	**	(,014)
Culture, sports and recreation				1,608	**	(,022)
Other service activities				1,483	**	(,023)
Households				0,951		(,094)
Extraterritorial organisations				0,669		(,322)

Notes: N=7,270,099 Nagelkerke R square=.045 (I) .084 (II) * p<.05 - ** p<.01

With respect to the industrial occupation in which male employees were employed (in their main job), these changed remarkably among different categories. The likelihood to flow into WW or WWB is highest (relative to the wholesale and retail trade) for male employees working in the renting and other business support services sector, culture, sports and recreation sector, other service activities sector, construction sector, and specialized business services sector. These sectors seems to be sensible for the economic business cycle and the development of aggregate demand. Especially the odds of the construction sector increased substantially in 2011 relative to 2009. Furthermore, table 5 showed remarkable increases in the likelihood to inflow into WW or WWB in of male employees in the sectors education and human health and social work activities. These developments could be explained by the policy measures taken by the Dutch government to reduce the public debt and insurance companies which would reduce their costs. However, the likelihood to inflow in WW or WWB remains the lowest for employees working in the public sector itself (0.368).

Table 6: Interaction Results gender by standard industrial classification 2011

Logistic Regression Results (2011) - Interaction gender by standard industrial classification

	Model II		
	odds		s.e.
Standard Industrial Classification (reference category: Wholesale and retail trade)			
Agriculture, forestry and fishing	1,449	**	(,044)
Mining and quarrying	2,046	**	(,213)
Manufacturing	1,119	**	(,018)
Energy supply	1,512	**	(,097)
Water supply and waste management	1,240	**	(,078)
Construction	0,829	**	(,028)
Transportation and storage	0,992		(,024)
Accomodation and food service activities	0,958		(,022)
Information and communication	1,376	**	(,024)
Financial institutitions	0,891	**	(,024)
Renting and trading of real estate	0,970		(,041)
Specialised business services	1,049	**	(,018)
Renting and other business support services	0,675	**	(,013)
Public administration and services	1,188	**	(,027)
Education	0,808	**	(,021)
Human health and social work activities	0,484	**	(,017)
Culture, sports and recreation	0,807	**	(,030)
Other service activities	0,766	**	(,029)
Households	0,694	**	(,106)
Extraterritorial organisations	1,433		(,408)

Notes: * p<.05 - ** p<.01

The gender differences between the different industrial occupations remains generally the same into 2011, as shown in table 6. In the energy supply sector, mining and quarrying sector and the information and communication sector increased the likelihood for female employees to inflow in WW or WWB substantially.

Table 7 shows the results of the logistic regression analysis for the last available year 2013. We have already discussed the general pattern between the categories, which did not change substantially (except for the changes to the standard industrial classification). We would discuss now the main changes relative to the earlier years in the aftermath of the Great Recession, considering that the inflows in unemployment benefits (WW) or benefits income support (WWB) was of the highest level in 2013 (see table 1).

The differences to gender were not substantially changed in 2013 relative to 2011, where they were almost disappeared in 2011. The employees in age categories 35-44 and 45-54 show the most reduce in odds, implying a decreasing vulnerability to inflow into WW or WWB relative to the earlier years. The likelihood to inflow in WW or WWB reduced also a little in the other age categories, however they remained almost at the same level. Generally, the age differences decreased in the whole period 2009-2013. The Dutch born employees became relative more likely to inflow into WW or WWB in the period 2009-2013. All odds of the other origin categories decreased substantially, which implies that the differences in likelihood to flow into WW or WWB between Dutch born employees and non-native Dutch employees is reduced remarkably.

The estimates of personal yearly income of employees which flowed into the WW or WWB is almost remained the same, and this points out that this determinant is independent of the Great Recession. The odds of the regional variable are converging to each other, which means that the region in which employees live, have decreasing relevance for explaining the likelihood to inflow in the WW or WWB. However, the difference between the Randstad area (including Zeeland) and the more rural areas of the Netherlands remains, even though this difference is reduced. The estimate results for the industrial occupation of the main job of the employees show interesting developments. Especially employees working in the construction sector were increasingly vulnerable to inflow in the WW or WWB in the period 2009-2013. However, in 2009 were employees working in the information and communication sector very likely to inflow in the WW or WWB, in 2013 is this likelihood reduced. The odds of the sectors suggests that the likelihood to become dependent of a WW or WWB benefit is increasing for employees working in the reference category wholesale and retail trade.

Table 7: Logistic Regression Results 2013

Logistic Regression Results (2013)

	Model I			Model II		
	odds		s.e.	odds		s.e.
Constant (B)	-3,107	**	(,006)	-3,457	**	(,008)
Gender (reference category: men)						
Women	0,705	**	(,004)	0,940	**	(,008)
Age (reference category 15-24)						
25-34	1,667	**	(,006)	1,560	**	(,006)
35-44	1,430	**	(,007)	1,377	**	(,007)
45-54	1,245	**	(,007)	1,252	**	(,007)
55-64	1,150	**	(,007)	1,214	**	(,007)
Origin (reference category: Netherlands)						
Morocco	1,617	**	(,011)	1,489	**	(,011)
Turkey	1,745	**	(,010)	1,578	**	(,010)
Suriname	1,714	**	(,009)	1,662	**	(,010)
Former Netherlands Antilles and Aruba	1,871	**	(,014)	1,767	**	(,014)
Other non-Western countries	1,489	**	(,008)	1,390	**	(,008)
Other Western countries	1,351	**	(,005)	1,279	**	(,006)
Income (reference category: < 10,000)						
10,000 - 20,000	2,080	**	(,007)	2,166	**	(,007)
20,000 - 30,000	1,575	**	(,007)	1,802	**	(,007)
30,000 - 40,000	1,018	*	(,007)	1,259	**	(,008)
> 40,000	0,606	**	(,008)	0,804	**	(,008)
County (reference category: Zuid-Holland)						
Groningen				1,181	**	(,010)
Friesland				1,270	**	(,009)
Drenthe				1,244	**	(,010)
Overijssel				1,201	**	(,007)
Flevoland				1,203	**	(,011)
Gelderland				1,107	**	(,006)
Utrecht				1,008		(,007)
Noord-Holland				1,007		(,006)
Zeeland				0,934	**	(,013)
Noord-Brabant				1,111	**	(,006)
Limburg				1,189	**	(,007)
Standard Industrial Classification (reference category: Wholesale and retail trade)						
Agriculture, forestry and fishing				0,594	**	(,025)
Mining and quarrying				0,242	**	(,120)
Manufacturing				0,794	**	(,009)
Energy supply				0,442	**	(,054)
Water supply and waste management				0,700	**	(,033)
Construction				1,935	**	(,009)
Transportation and storage				0,965	**	(,011)
Accomodation and food service activities				0,930	**	(,013)
Information and communication				1,092	**	(,013)
Financial institutitions				1,062	**	(,015)
Renting and trading of real estate				1,024		(,027)
Specialised business services				1,089	**	(,011)
Renting and other business support services				2,782	**	(,007)
Public administration and services				0,176	**	(,022)
Education				0,795	**	(,014)
Human health and social work activities				0,850	**	(,012)
Culture, sports and recreation				1,351	**	(,019)
Other service activities				1,432	**	(,020)
Households				0,686	**	(,075)
Extraterritorial organisations				0,594	*	(,264)

Notes: N=7,155,427 Nagelkerke R square=.044 (I) .079 (II) * p<.05 - ** p<.01

The gender differences to the various sectors did not change substantially in 2013 relative to the earlier years (see table 8). The female employees became increasingly vulnerable for inflow in WW or WWB in the sectors energy supply and human health and social work activities. However, in the latter sector the odds remain below one, which means that their male counterpart remained more vulnerable.

Table 8: Interaction Results gender by standard industrial classification 2013

Logistic Regression Results (2013) - Interaction gender by standard industrial classification

	Model II		
	odds		s.e.
Standard Industrial Classification (reference category: Wholesale and retail trade)			
Agriculture, forestry and fishing	1,360	**	(,040)
Mining and quarrying	1,756	**	(,221)
Manufacturing	0,936		(,015)
Energy supply	2,085	**	(,077)
Water supply and waste management	0,981		(,068)
Construction	0,738	**	(,022)
Transportation and storage	0,974		(,019)
Accomodation and food service activities	0,977	*	(,018)
Information and communication	1,340	**	(,020)
Financial institutitions	0,864	**	(,021)
Renting and trading of real estate	1,007		(,037)
Specialised business services	1,037	**	(,015)
Renting and other business support services	0,709	**	(,011)
Public administration and services	1,162	**	(,031)
Education	0,730	**	(,018)
Human health and social work activities	0,714	**	(,014)
Culture, sports and recreation	0,905		(,025)
Other service activities	0,729	**	(,025)
Households	0,812		(,085)
Extraterritorial organisations	0,610		(,395)

Notes: * p<.05 - ** p<.01

5 Discussion

Before interpreting the results, we have to discuss some limitations and drawbacks of the administrative data we used in the analysis. First, employees which started to receive unemployment benefits according to the Unemployment Insurance Act (WW) and the employees which started to receive benefits income support (WWB)[5] are used to identify employees which became unemployed. Other unemployed which were no employees before they became unemployed are not included in the analysis. These are for example unemployed graduates and self-employed, while they could be hit by the Great Recession also and stay unemployed for a longer time. Because of this limitation to our data, it seems to be that youth unemployment is underreported in our data, because they were not entitle to receive unemployment benefits (WW) or benefits income support (WWB). We would recommend for further research into youth unemployment to abstract targeted policy measures for youth which are graduated and couldn't immediate find a job.

Second, the administrative data we have used contains characteristics related to individuals and their main job, while the unemployment benefits are directly related to jobs (and not to individuals). The analysis is therefore based on the main job of every employee which has important implications for interpreting the results. First, the income data are not directly related to the job which the employee did loose, but the total yearly personal income of the employee. Second, the employee could have loosed a job, while remain in other job(s). In the analysis we have argued that every job loose is a reflection of being vulnerable to become unemployed. Strictly speaking, we analysed the vulnerability of losing a job and becoming dependent Third, when the inflow in unemployment benefits is not related to the main job of an employee, the industrial classification related to that employee is not necessarily related to the loosed job.

Third, regional data were included in the analysis which are based on the residence of employees. Because of labour mobility could workers be employed in other regions than they live. The results on regions should be interpreted as the living place of employees and statements on the regional differences of the labour market should be done with caution. For example, inhabitants of Flevoland are to a large extend employed in the region of the Dutch capital city Amsterdam in the county Noord-Holland. These drawbacks of the data should be

[5] Employees receiving benefits income support are included in our analysis when they both were at least one month in a job in the year before start receiving benefits income support and they hasn't received unemployment benefits since 2008, see also the data section

kept in mind when the results are interpreted. The underreported youth unemployment should be subject to further research.

Fourth, our analysis focus on vulnerability of employees based on the inflow into unemployment. There could be other factors which could be defined determining vulnerability to unemployment during the aftermath of the Great Recession. In our analysis, we didn't consider the duration of unemployment and the loss of working hours. Additionally, the part time unemployment benefits[6], which were introduced in April 2009 in the Netherlands as a response to the Great Recession were also excluded from our analysis.

Fifth, the data on inflows into unemployment benefits (WW) and benefits income support (WWB) unable to investigate the vulnerability for the people which are already unemployed. A recent study by the Dutch bureau for economic policy analysis stated that unemployed youth are not very long unemployed relative to the elderly unemployed (CPB Netherlands Bureau for Economic Policy Analysis, 2015). In our research we have ignored the duration of unemployment, which is also a factor of labour market vulnerability. Furthermore, the outflow of unemployment is also ignored. The outflow to less paid jobs, discouraged people which flow out of the labour force and the unemployed which returned to school. We recommend these topics for further research.

[6] In Dutch: Deeltijd WW

6 Conclusion

This study focussed on the labour market effects of the Great Recession, and more specific on the vulnerability to unemployment of employees in the Netherlands. The theoretical framework makes clear that when the economy is hit by an economic recession and the subsequent aggregate demand shock, unemployment will increase. Important factors which determines the increase in unemployment are the sudden fall in the productivity and the related marginal product of labour, the degree of investments in human capital, the height of labour adjustment costs and costs of other production factors. Additional, the likelihood to become unemployed differ between industrial occupations where workers are employed, because the elasticity of demand will also vary between sectors. A sudden decline in aggregate demand will therefore have different implications in different occupational groups.

Based on the theoretical framework, we expect that young employees will be more likely to become unemployed, because young are generally less experienced and relatively less firm-specific human capital and will have a lower marginal product of labour related to older employees. Additionally, the adjustment costs increase with age, tenure and wage (Bell & Blanchflower, 2011) which implies that the adjustment costs are relative low for the youth. The marginal product of labour is also low for the less skilled workers, and therefore they will be more vulnerable to unemployment when the productivity suddenly falls as a result of an economic recession. The theory point out that labour adjustment costs are an important determinant of the vulnerability to become unemployed when a recession hit the economy, because employers tend to adjust their workforce in a cost effective way. Employees which are employed in temporary employment or other flexible contracts should be more vulnerable to become unemployed, according to the theory. Finally, the theory predict that workers employed in industrial sectors where the elasticity of demand is relative high (low), will be more (less) vulnerable to become unemployed.

Generally, the results confirm the theoretical predictions to a high extent. The employee which is most likely to inflow in the unemployment benefits is male, aged between 25 and 35, of non-Dutch origin with a low income level.

Male employees were more likely to lose their job in the first year after the Great Recession started, relative to their female counterpart. Though the difference in the likelihood to become unemployed between men and women is considerably reduced and almost disappeared in 2013. Age is a more important factor determining the likelihood to become

unemployed. The analysed models showed that the employees in age category between 15 and 25 were least vulnerable to lose their job. However, this is excluding the graduates and other young job seekers. The highest likelihood to become unemployed during the aftermath of the Great Recession is demonstrated by the prime age employees (aged between 25 and 35), and to a lesser extent the employees age between 35 and 45. As is expected from the theory, the likelihood to become unemployed is decreasing by age. The oldest age group of employees will be less likely to lose their job relative to their younger colleagues. In 2013 is showed that the likelihood to inflow in unemployment is increased for the youth and prime agers relative to the other age groups. The analysis demonstrated very clear that the origin is an important determinant to the likelihood of becoming unemployed. Employees with a foreign background are more vulnerable to unemployment relative to their colleagues with original background from the Netherlands. Mainly in the beginning of the Great Recession were the differences in the likelihoods large between the Netherlands origin and foreign origin. These reduced substantially and remained until 2013 to a lesser extent. Within the foreign origins we can conclude that the employees which originated from western countries have a substantially lower likelihood to become unemployed relative to the employees coming from non-western countries.

The likelihood to become unemployed differ largely between income categories. Except for the personal yearly income below 10.000 euros, is the likelihood to become unemployed decreasing with income. The highest income group have the lowest likelihood The year of analysis does not matter and the likelihood ratios does not change substantial between 2009 and 2013. From the summary statistics and the model without interactions, we can conclude that the likelihood to inflow in unemployment is the highest in the rural areas of the Netherlands and the lowest in the west core area of the Netherlands, in Dutch called the Randstad area. The southwest county Zeeland is an exception and will have an rural nature but the likelihood to become unemployed seems to be low.

From the results has been found that workers employed within temporary jobs were more vulnerable to become unemployed during the aftermath of the Great Recession. This is according to the theory, because the labour adjustment costs of temporary employed workers are low. Employees working in the sectors which are more sensible for demand shocks were generally more likely to lose their job, like the manufacturing, construction, information and communication, renting and trading of real estate, and culture, sports and recreation activities sectors. A remarkably difference between the first year after the start of the Great Recession and

the last year of analysis in 2013 is the manufacturing sector, which likelihood for inflow in unemployment is substantially declined. And at the other hand is the likelihood in the construction sector substantially increased. We can conclude that the reference category wholesale and retail trade has a moderate likelihood jointly with transportation, other service activities and financial sector. Employees working in sectors which largely depend on public funding and the sectors related to necessities of life are less likely to become unemployed. These include public administration, education and health care services and sectors related to agriculture, mineral resources and energy supply. Concerning gender differences, we conclude that women are more likely to become unemployed in the sectors related to agriculture, mineral resources and energy supply. Men are more vulnerable to become unemployed if they are employed in the human health services, household activities and the renting and other business support services, including the (temporary) employment agencies. Generally, these gender differences became smaller in 2013 unless the mining and quarrying, energy supply and the information and communication sector. However, the reasons of the gender differences could be caused by differences in the proportion of the men or women are employed in each sector.

Summarizing, the most vulnerable employees to become unemployed during the Great Recession in the Netherlands were the prime age men, with foreign origin and living in the rural counties. Additional, they were mainly employed in temporary jobs or jobs related to the sectors which were more sensitive for the decline in aggregate demand as a result of the Great Recession. Thereof were employees employed in the construction sector in the latter years in the aftermath of the recession and the information and communication sector more likely to lose their job.

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