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Elizabeth de Pater

Disability and Job Retention

An Empirical German Household panel Study on the Effectiveness of Disability Quotas

MSc Thesis 2012-048

ERASMUS UNIVERSITY ROTTERDAM
Erasmus School of Economics
MSc Economics and Business, specialization Health Economics

MSc thesis

Disability and job retention: an empirical German household panel study on the effectiveness of disability quotas.

Elizabeth de Pater (320448)

Supervisor:

Dr. P. García-Gomez

Co-evaluator:

J.L.W. van Kippersluis

Abstract

This thesis is about the effectiveness of disability quota to increase low employment rates among disabled people. Disability quota systems focus on the underlying mechanisms in the labour market by creating financial incentives for employers to hire disabled workers. This thesis studies a disability quota system in Germany, specifically focussing on job loss after the onset of a health problem. The dataset used for this research consists of 19,505 observations from a German household panel (GSOEP), from the years 2001-2009. A logistic regression analysis was used to study the probabilities to become non-employed for disabled people in firms with and without a quota when experiencing a health shock, controlling for gender, type of occupation, steady partnership, income, education and on-the-job training. The results show evidence that the disability quota in Germany has a positive effect on the probability of job retention after a health shock, having a 2.36 %-points lower probability to become non employed when experiencing a health problem compared to workers employed in a firm without a disability quota. The effect was stronger for medium-sized companies (rather than large companies) and white-collar-workers (rather than blue-collar workers). Further research is necessary to provide evidence on the effectiveness of the disability quota. Good understanding of the functioning of the disability quota system will benefit the position of disabled people on the labour market. Furthermore, it would be interesting to study the impact of the levy size.

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Chapter 1: Introduction

In 2010 around 15% of the world's population was estimated to live with a form of disability (WHO, 2011). This means that more than 1 billion people are living with a health problem that limits daily life activities. In 1970, the disability prevalence was estimated at 10% of the world's population, so this number has been growing since the last century. The WHO (2011) mentions two reasons for this increase of disability prevalence across the world: firstly ageing and secondly the global increase in chronic health problems, such as diabetes, mental illness and cardiovascular disease. Since both ageing and the occurrence of chronic health problems are still increasing, it is expected that the share of disables will steadily increase in the future (OECD, 2005).

This increasing share of disabled will go hand in hand with increasing costs of social security benefits. In 2000 approximately 40% of the disabled population had a job, compared to almost 75% of the non disabled population (OECD, 2009). The high unemployment rate of disabled people goes hand in hand with lower incomes: on average the income of disabled people is 12% lower than the national average. The accumulation of two effects explains the increasing costs of social security costs. Firstly, people experiencing a health shock have an increased probability to get dismissed (e.g. García Gomez, 2011). Secondly, disability decreases the average personal income: disabled people have on average lower earnings than non-disabled people (WHO, 2008).

The difference in employment rates between disabled and non disabled people in the labour market is in many countries seen as socially unacceptable. Together with the increasing costs going along with disability there is a call for a policy to diminish the unequal employment rates between disabled and non-disabled people. Several policies have come in force to tackle the problem of high unemployment rates among disabled people, such as anti-discrimination legislation and disability quota systems. Anti-discrimination legislation is aimed to change attitudes towards disabled people and promote equal treatment of disabled and non-disabled people. Disability quota systems focus on the underlying mechanisms in the labour market by creating financial incentives to increase employment among disabled people. Several European countries have implemented quota legislation to fight the employment gap between disabled and non disabled people (e.g. Spain, France, Germany, and Austria). However, little evidence in known on the effect of the disability quota, with ambiguous results (Lalive, 2009; Lechner, 2003; Verick, 2004). García Gomez (2011) the impact of a health shock on the probability of being in employment. No significant result was found for France and Italy, the two countries that apply the highest disability quotas for disabled workers. The interesting question is whether the disability quota is the cause for this result, or that other factors play a role. In Germany, as in many European countries, a disability quota system was implemented since World War I. Since then, the regulations have been updated several times. Now, firms with more than 20 employees are obligated to hire disabled workers up to 5% of their work force. In reality this quota has never been reached: the highest percentage ever reached was in 1982 with 5.9% (by that time the quota was set at 6% instead of 5%) and the average between 1974 and 1997 was 4.2% (Lechner, 2003). Lechner (2003) studied the impact of the disability policies (including the disability quota) in Germany by examining the impact of disability on employment participation. He found a significant relationship between the onset of disability and employment participation: non-disabled had a 9.6% higher probability to be employed than disabled people. A disadvantage of this study is that Lechner looked at the overall employment rates after the onset of a disability and was not able to capture the inability to work which may come along with disability and cannot be

solved by policies. Lalive (2009) studied the disability quota rather than all disability policies. He compared the percentage of disabled workers in firms just above the threshold and firms just below the threshold in Austria. He found that firms with a disability quota employ 0.0521 more disabled workers than firms without disability quota. It is striking that many countries have implemented disability quota systems, while its effectiveness is not proven. With an increasing share of disabled people and the accompanying low employment rates, it is necessary to know the effectiveness of disability quota system for future implications. If the disability quota works, other countries may implement it as well and one can look at further improvements. On the other hand, if the disability quota works, other ways need to be found to increase employment for disables. This thesis will try to fill the gap of evidence on the effect of disability quota policies in Germany, by studying the impact of a health shock on job retention when working a firm with a disability. Data from Germany on the individual level will be used to answer the following research question:

> *Do disability quotas protect workers to job loss after the onset of a health problem in Germany?*

This thesis is structured in seven chapters. After this introduction, the second chapter will provide a theoretical framework for understanding disability and theory of quota. It also gives an overview of current empirical evidence related the research question of this thesis. The third chapter explains the institutional environment of this study, including social policy legislation in Germany. The fourth chapter an overview of the used data and methods is provided. The fifth chapter gives the results of the statistical analysis. Drawing on these results the sixth chapter contains the conclusion and gives an answer to the research question. Finally, the eighth chapter discusses the results, the limitations of this research, policy implications and suggestions for further research.

Chapter 2: Theoretical framework

This chapter provides theoretical insight into the relationship between (ill) health/disability and the labour market. It discusses empirical evidence obtained in earlier studies that are related to the subject of disability policies and in particular disability quotas. It thereby provides a framework for this thesis. The structure of this theoretical framework is as follows. The first paragraph shortly discusses what is meant by ill health in this thesis. The second paragraph provides empirical evidence on health and labour market participation. Three main mechanisms will be discussed to explain this relationship. Paragraph 3 then explains the disability quota legislation, the incentives it should create and provides evidence of previous studies on the effectiveness of the disability quota in general and for Germany in particular.

2.1. Definition ill health

The literature provides different definitions of ill health to study its impact on employment. Several approximations of ill health are used, like accidents (Dano, 2004; Lindeboom et al, 2005), formal disability (Wagner et al, 2001; Lechner and Vazquez-Alvarez, 2003; Verick, 2004), acute hospitalization (García Gomez et al, 2011) and self assessed health (Riphan, 1999; García et al, 2008; Zucchelli et al, 2012). All these definitions try to capture the factors incorporated in the definition of disability given by the WHO (2012), which also will be used for this thesis:

> *"An umbrella term, covering impairments, activity limitations, and participation restrictions. An impairment is a problem in body function or structure; an activity limitation is a difficulty encountered by an individual in executing a task or action; while a participation restriction is a problem experienced by an individual in involvement in life situations."*[1]

The WHO stresses the difficulty of defining disability:

> *"Thus disability is a complex phenomenon, reflecting an interaction between features of a person's body and features of the society in which he or she lives."*[2]

Disability is not only a medical or biological dysfunction, but also includes social aspects. Both the biological part and the restrictions in daily activities are included in this definition. Social factors also have an impact on a person's functioning. The International Classification of Functioning, Disability and Health (ICIDH) distinguishes nine broad domains of functioning which can be affected due to a disability:

- Learning and applying knowledge
- General tasks and demands
- Communication
- Mobility
- Self-care
- Domestic life
- Interpersonal interactions and relationships
- Major life areas
- Community, social and civic life, including employment *(WHO, 2001; p.12)*

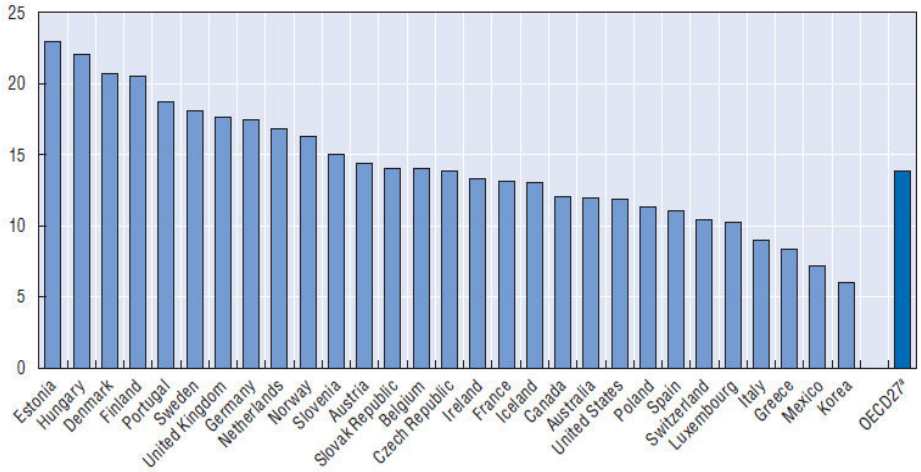
The definition according to the WHO shows that disability is a broad term, which makes it difficult to measure. The GBD (Global Burden of Disease) tried to come up with an estimation of the proportion of disabled people across the world. They measured disability as a

[1] WHO, retrieved 20 June 2012, http://www.who.int/topics/disabilities/en/.
[2] WHO, retrieved 20 June 2012, http://www.who.int/topics/disabilities/en/.

"loss of health, where health is conceptualized in terms of functioning capacity in a set of health domains such as mobility, cognition, hearing, and vision" (WHO, 2008; p.31)

The GBD report that in 2004 2.9 percent of the world's population was severely disabled, and that 12.4 percent was moderate disabled. The disability prevalence was higher at older ages and for low- and middle income countries. The estimated prevalence rates are an approximation, because of the high uncertainty in survey data. Population data is limited and other definitions are used so that comparison is difficult. That disability is not only a problem in low income countries is shown by figure 2.1. On average one in seven individuals in OECD countries self-report that they have a disability or chronic disease which hinders daily life. The figure shows that in 2000 Germany was at number 8 of the OECD countries with the highest disability prevalence.

Figure 2.1 Disability prevalence at working age in OECD countries, 2000



Source: OECD, 2005

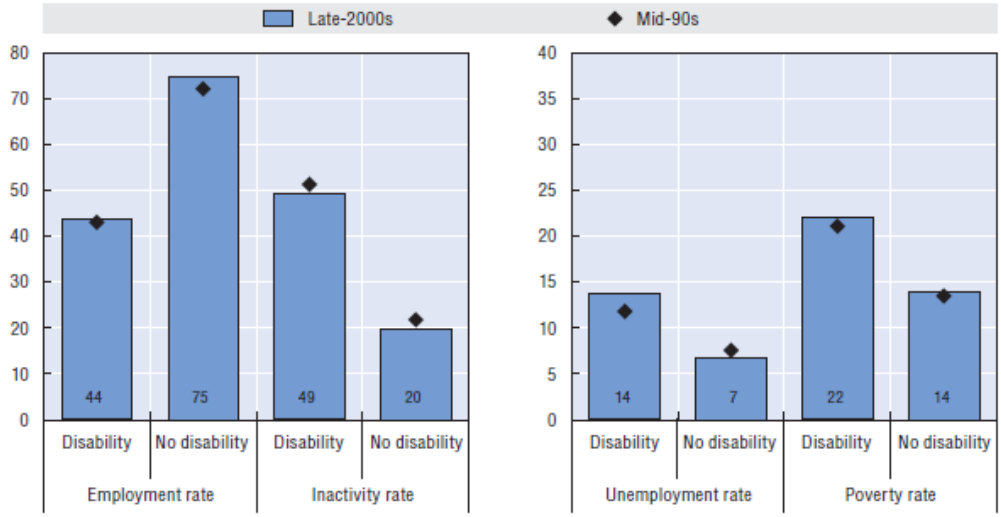
2.2.Health and labour market participation

The relationship between health and the labour market is widely discussed in the empirical literature. Disability is associated with lower employment rates compared to living in good health. At the same time, unemployment is associated with lower income, social exclusion, poverty, and higher societal costs (García Gomez et al, 2011). Furthermore, the underlying mechanisms of the lower employment rates for disabled people will be explored to explain the evidence on the employment gap. The last part of this paragraph will explain why results should be taken with caution and closes with a conclusion so far.

2.2.1.Evidence

There is increasing amount of literature available on the effects of health on employment. It is found that worse health is associated with lower employment rates. Figure 2.2 shows the employment-, inactivity-, unemployment-, and poverty rates of disabled and non disabled people in OECD countries obtained by the OECD (2007). It shows that unemployment rates for the disabled are twice as high as for the non disabled, and this gap has widened since 1990. The large gap in poverty rates is striking: 22 percent for disabled compared to 14 percent for nondisabled people. The difference in employment rates is even larger: 44% for disabled people vs. 75% for non-disabled people.

Figure 2.2 Labour market indicators for OECD countries, by disability status



Source: OECD, 2007

The literature shows that working people experiencing a health shock (sudden deterioration in health) have a lower probability to stay at work than workers not experiencing a health shock. Riphan (1999) uses self reported health to study the impact of a health shock on labour market outcomes. She determines a health shock by a drop in self assessed health of at least 5 points on a scale of 10 points and founds that people experiencing a health shock have a tripled higher probability to leave employment and move into inactivity. The probability to move into unemployment is doubled when experiencing a health shock. Dano et al (2005) used road injuries as a measure for health shocks. They found that after 6 years the employment rate among the injured people were 10 and 8 percentage points lower for men and women in Denmark. Zucchelli et al (2012) found that both ill health and health shocks increase the probability to leave fulltime employment and move into inactivity in Australia. They also found that worse health increases the probability to move from both self-employment and part-time employment into inactivity. García Gomez (2011) determine a health shock when self assessed health drops from very good or good health to fair, bad or very bad health. They find evidence that a health shock has a significant impact on the probability to get unemployed for The Netherlands, Denmark, Spain and Ireland (more than 10 percent), except for France and Italy, where the effect was not significantly different from zero.
Thus, there is less discussion that disabled people are in a worse position in society, but the underlying mechanisms to explain this are less clear, as will be described in the next paragraph.

2.2.2. Mechanisms

However, the value of labour is based on the marginal costs of the last produced unit. This is fine as long as all employees contribute the same to the marginal costs. Evidence shows that disabled people on average have a lower productivity and therefore have a lower contribution to the marginal costs. The employer only wants to hire a disabled person if he can offer lower wages, or if he is compensated by a subsidy up to the level that marginal costs are equal to that of non disabled workers. Thus, according the economic model equalization can be reached by either compensating an employee for earning losses or paying subsidies to the employer to compensate the production losses. With the former the disability of an employer in work performance is underlined, with the latter it is hard to determine the exact production loss to compensate for. Furthermore, what if the

productivity of someone is so low, that subsidies outweigh the tax benefit gained from a disabled person being employed?

Labour productivity

The first mechanism which may play a role in explaining the difference in unemployment rates between the disabled and non disabled people is labour productivity (Jones, 2006b). The economic model of disability defines disability as a different level of ability to contribute to the productive capabilities of society (Bhanushali, 2007). An impairment has economic consequences for the individual, employer, and the state: the inability to participate and the decrease in productivity results in loss of earnings for the individual, lower profits for the employer, and state payments to disability benefits etc. The value of labour is based on the marginal costs of the last produced unit. This is fine as long as all employees contribute the same to the marginal costs. However, evidence shows that disabled people on average have a lower productivity and therefore have a lower contribution to the marginal costs. In a perfect market a decrease in productivity results in a lower wage. If employers cannot relate wages to someone's productivity due to minimum wages, they are only willing to hire those employees who have the largest productivity. Disabled people will then be excluded from the labour market, unless the employer is compensated for the loss in productivity. According to Jones (2008) the productivity between the disabled and the non-disabled worker can be equalized by adaptations of the workplace. However, employers often do not want to choose for workplace adaptation when an employee gets disabled. They perceive the costs of new recruitment and training to be lower than the costs of retention, although this may not be true (OECD, 2005).

Reservation wage

Another important mechanism playing a role on both the demand- and supply side in the labour market is the so called reservation wage. If we assume that an employee receives utility from earnings, a disabled individual may choose not to work if utility declines below a certain threshold. This threshold is also called the *reservation wage.* It is the minimum wage an individual will accept for a job. It could be on the one hand that this threshold is more difficult to obtain due to lower wages. On the other hand it could be that less utility from earnings are obtained due to difficulties in functioning on the labour market. Empirical evidence shows that indeed disabled people earn a lower income than non disabled people (García et al, 2011; Lechner, 2003). This may be caused by the mechanism of productivity, as explained above. It could also be caused by decreased working hours, or by discrimination (as will be explained later). Furthermore, raising difficulties in obtaining and retaining work may result in a lower utility from work, which increases the reservation wage. Preferences move away from work to leisure (Jones, 2008). This results in a lower probability of employment for the disabled, because the employer can hire a nondisabled person at a lower wage.

Another important issue on the supply side which may explain some of the difference in employment rates between disabled and non disabled individuals is the existence of social security in many countries. A disabled individual receiving social security benefits has a certain income with a maximum of leisure, which increases the reservation wage. In this case, social security may thus partly explain the gap in employment between disabled and non disabled people. There is found a significant negative relationship between labour supply and disability benefits (Budelmyer, 2001; Autor and Duggan, 2001). Haveman et al (1990) and Bound and Waidmann (2002) found that disability insurance benefits results in lower employment. In the nineties the employment rates for both working-aged men and women stayed roughly constant, while the employment rates for

disabled people fell. Haveman et al (1990) found that the increase in disability benefits during the nineties can account for 20 percent of the decrease in labour force participation of older workers. Bound and Waidmann (2002) found that the decline in employment rates among disabled people can be explained by the move of men and women in poor health out of the labour force and into disability benefits.

Discrimination

A third mechanism which is hard to measure is discrimination against the disabled people on the demand side. Discrimination occurs when a disabled individual with the same productivity as a nondisabled individual is offered a lower wage and/or an unequal opportunity of employment (Wills et al, 1993). Wage discrimination occurs when employers offer a lower wage than the reduction in productivity does allow, which may force individuals to exit the labour market (Baldwin and Johnson, 1994). Baldwin and Johnson also found that the decrease in productivity, and the corresponding (although higher or lower) decrease in wage depends on the type of occupation and the severity of the disability. DeLeire (2001) found that in the US only a small part of the earnings gap between disabled and non disabled workers is due to discrimination: only 5 – 8 percent. This fraction did not fall between 1984 and 1993, despite of the new antidiscrimination legislation which came in force in 1990.

It is hard to find the magnitude of the mechanisms explained above on the gap between employment rates for the disabled and non disabled workers, especially due to difficulties in observing these factors directly. According the finding of Thomas DeLeire (2001) discrimination does not seem to be an important factor in explaining the difference in income between disabled and non disabled workers. Several studies are done trying to split up the effects of discrimination and other factors in explaining the higher unemployment rates of the disabled. According to Kidd et al (2002) who studied the British labour market, 50 percent of both the participation- and wage difference between disabled and non disabled individuals can be explained by differences in observed productivity related characteristics. It is unclear whether the other part is caused by discrimination or other unobserved factors. According to Jones (2006) eliminating discrimination would increase employment for the disabled by 37 percentage points for male and 33 percentage points for female in the UK, if the unobserved productivity difference is assumed to be zero. However, when controlling for unobserved productivity no evidence for employment discrimination against the disabled was found. Jones therefore suggests that disability policy should focus on increasing the productivity of the disabled rather than focusing on discrimination.

Reverse causality

Evidence on the impact of health on employment should be interpreted carefully. It is not always clear what the causal relationship is between health and labour market participation. On the one hand, it could be that ill health results in unemployment as suggested above. On the other hand, it is also possible that unemployment results in ill health. Thus, finding an association between health and unemployment does not automatically mean that ill health causes unemployment. There are different possibilities to overcome the occurrence of this reverse causal relationship when examining the causal impact of health on employment status. This can be done by for example including a variable with lagged health if panel data is available.

Conclusion

This paragraph has shown that employment probabilities are on average much smaller for the disabled workers, compared to healthy individuals. Disabled people face difficulties in finding a job, but even when having a job they have a high probability to lose it when getting disabled, compared to non-disabled people. Mechanisms that play a role in the effect of disability on employment are the decrease in productivity of the disabled, discrimination, but also security benefits play a role in this employment gap. The large gap in employment with the simultaneously higher poverty rates is seen as socially unacceptable in the OECD countries (OECD, 2007). One possibility to reduce these unequal probabilities between disabled and non disabled people is the implementation of disability insurance policy, which will be explained in the next paragraph.

2.3.Disability policy: the disability quota

There is a need to decrease inequality between disabled and non disabled people and the increasing costs of disabled people to society. One way to organize this is a disability quota system, which is the subject of this thesis. This paragraph will explain the disability quota legislation in general and explains which incentives the disability quota creates for employers. Evidence will be given on the efficacy of this kind of disability policy and an alternative policy, discrimination legislation, will be shortly discussed.

2.3.1. What is a disability quota

According to Thornton (1998), quota legislation

> "requires private and/or public sector employers, who employ a certain minimum number of workers, to ensure that a given proportion of employees consists of designated persons with disabilities". (*Thornton, 1998; p.4*)

Disability quotas are based on two assumptions: the first is that employers will not hire a large share of disabled people, unless they are obligated to do so. The second assumption is that disabled people are unable to compete with non-disabled persons, so that an obligatory mechanism is necessary (Waddington, 1996).

The quota (levy) system is a policy aimed to improve the position of the disables. It tries to create collective responsibility, by creating financial incentives for the employer to hire disabled people. In case that a disability quota is not fulfilled, an extra cost in the form of a sanction is added to the cost of hiring a non disabled instead of a disabled person. The gain for the employer when hiring a non disabled worker is then *additional productivity – sanction costs.* Ideally, the sanction costs are set at the level such that the lower productivity and eventually the costs of work place adaptation are equal to the costs of the sanction. The employer then is indifferent between hiring a disabled or non disabled person. However, in reality it is hard to set the right quota, because there is a large difference in disabilities and uncertainty about productivity losses plus wrong judgments about expected costs.

There are lots of variations possible to operationalize a disability quota system. Firstly, the threshold value when the disability quota applies for a company can vary. In Germany this is set at a company size of 20 employees, whereas in Spain this is set at 50 employees. The rationale behind a minimum threshold is that larger firms are in a better position to bear the extra costs entailed by disabled workers. Secondly, disabled people with certain characteristics (e.g. severe impairments, young ages)

may be double-counted. Thirdly, some types of occupation may be excluded from the legislation, like heavily manual occupation.

According to Greve (2009) there are three legal possibilities for disability quotas in the labour market:

- Legislative recommendations
- Legislative obligations, without effective sanctions
- Legislative obligation backed by sanctions (levy-quota system)

The authors conclude that sanctions may be necessary to let the system work. In case of a quota-levy system, employers should pay a levy if they do not meet the quota target. These financial contributions are used for purposes as training and adapting accommodation for disabled employees by employers who do employ disables. The aim of the levy-quota system is not to get revenue, but to encourage employers to employ disables (Thornton, 1998). It focuses on countering discriminating a minority in the labour market by increasing employment probabilities for them. Therefore the quota-levy system can be rather seen as an encouragement than a punishment. The first aim of the levy is an equalization mechanism: it is meant to skim off the cost advantage of those employers who do not hire disabled workers at all, or not to the required target. The second aim of the levy is to stimulate employers to employ disables by creating opportunity costs of not employing a disabled worker. Thus, financial incentives are used to diminish the employment gap between disabled and non-disabled individuals.

2.3.2. Evidence

Compared to research on the relationship between health and employment, relatively little research is done on the effectiveness of the disability quota. Lavive et al (2009) do find a significant effect of the disability quota on employment in Austria. They studied firms just above and below the threshold and found that the disability quota promotes employment for the disabled in firms just above the threshold value, compared to firms just below the threshold: firms just above the threshold employed 0.0521 more disabled workers than the firms just below the threshold. They also found that the disability quota especially stimulates employment among former employees of the firm. However, also employment probabilities among the unemployed have increased due to the disability quota. Wuellrich (2010) found a significant positive impact of the recent 30% increase of the levy on the firms' demand for disabled workers: just after the increase firms hired 0.0255 more disabled workers, which increased to 0.0669 after 18 months. Wuellrich suggests that policy makers should further increase the non-compliance tax to boost employment of disabled workers. Verick (2004) examined the impact of the disability quota policy reform in 2001 in Germany where the threshold has increased from 16 to 20 employees, the quota decreased from 6% to 5%, and the amount of the levy increased. However, he did not find a significant positive long term impact of the reform on the employment rates of the disabled.

According Delsen (1996) there is the problem of unequal treatment of the unequal's when a disability quota is in force, because employers will tend to hire the least disabled workers. Some quota schemes try to attack this problem by differentiating between types of disability. More weight is put on severity, such that a severe disabled may be double counted in determining the percentage of disabled people working in a firm. Lalive (2009) mentions another discrimination factor when a disability quota system is implemented. In case of a quota-levy-system companies have to pay the same fine in case of non-compliance, no matter which sector. This flat rate will result in stronger incentives for firms having employees at the lower wage scale, compared to firms having employees

at the higher wage scale. Disabled workers falling in lower wage scales are then favoured over the workers falling in higher wage scales. It also is likely that the disability quota will have a larger effect in promoting employment for disables in firms where productivity is less sensitive to disability related impairments (Lalive, 2009).

2.3.3. Alternative disability policies

There are alternative policies available in protecting the disabled. The most important alternative is antidiscrimination legislation. Whereas the disability quota system is focusing on the labour productivity mechanism, the antidiscrimination legislation is focusing on the discrimination aspect disabled people are facing. One of the underlying assumptions of the quota system is that disabled people are inferior to the non disabled, because they are less productive and therefore cannot compete on the labour market. This result in the negative idea that disabled workers are less productive and therefore inferior to their counterpart, which may be a reason that a disability quota may not fully work. Employers will buy themselves out their obligation to hire disabled workers if that is possible. Anti-discrimination legislation on the other hand treats the disabled person as being equal to non-disabled workers and can therefore compete on the labour market. In 1990 the American with Disabilities Act (ADA) was introduced, which stands for equal treatment for people with disabilities. One goal of the ADA is to ensure equal access for the disabled people to employment. Similar legislation was introduced in other countries, as Australia, Great Britain, Israel, and South-Africa. However, also the impact of this antidiscrimination legislation is questionable. Not much research is done on this policy either, but the evidence found does not show a positive effect (DeLeire, 2000; Acemoglu and Angrist, 2001). The UK came up with antidiscrimination legislation in 1995, the Disability Discrimination Act (DDA). However, also Jones and Jones (2008) did not find evidence that the narrowing employment gap between disabled and non disabled individuals is caused by the DDA.

2.4.Concluding remarks and relevance

Relatively a large share of the worlds' population has a kind of disability which hinders daily functioning. Evidence shows that ill health has a significant negative impact on employment. Unemployment is associated with lower income, social exclusion and poverty. The resulting inequality between disabled and non disabled people is seen as socially unacceptable. Therefore, several disability policies have come in force, of which the disability quota system is an important one. Although the disability quota is in force in several countries, little evidence is available on its effectiveness. Providing evidence on its effectiveness may result in large policy implications.

This thesis tries to fill the gap of lacking evidence on the topic of disability quotas and focuses on job retention in particular. Delsen (1996) suggested that employers would have more positive attitudes towards employees who get disabled, than towards disabled people opting for a job. He suggests that a quota scheme may improve the position of the insiders, but may not have an impact on the position of the unemployed disabled. Lalive (2009) provides evidence for this in Austria. He found that firms with a disability quota employ 0.026 more disabled people who already worked for that firm (hence, he found the total effect of the disability quota to be 0.0521). The next chapter will explain the methods and dataset used in providing evidence on the impact of the disability quota on job retention when someone experiences a health shock.

Chapter 3: Institutional Framework

At the end of 2009, around 7.1 million people in Germany were living with a severe disability, which is 8.7% of the total population (Statisches Bundesamt, 2012). 25% of the disabled were aged below 55, and 29% were older than 75. 46% were aged between 55 and 75. Thus, relatively a large number of people are disabled while at working age and is covered by the disability legislation as it is in force there.

Germany has a long history with regard to the disability quota scheme, which goes back to after World War I. The idea of a quota system was already discussed on international level at the Inter-Allied Conference in the 1920's with the aim to create a solution to create workplaces for ex-soldiers, who had become disabled during the war. As a result, Germany was one of the countries (other countries were e.g. France and Italy) who adapted a quota system which made employers obligated to employ disabled ex-soldiers, so that reintegration of these injured people was possible. Employers who did not reach that target had to pay a fine, with some exceptions. This chapter explains the design of the disability quota as in force in Germany, called the People with Severe Disabilities Act (PSDA). It furthermore explains other disability insurance policies in Germany relevant to take into account when examining the impact of the particular policy of the disability quota on employment.

3.1. The People with Severe Disabilities Act

The Severely Disabled Person Act (*Schwerbehindertengesetz*, here referred as PSDA) came into force in 1974 to encourage the integration of disabled people in the labour market. Before 2001, it obligated employers with a workforce of 16 employees or more to have a minimum of 6% disabled employees hired. Disabled persons are defined as

> *"Those who suffer from the consequences of the effects of a physical, mental or psychological condition which is not typical for the respective age, and where the consequences are not merely of a temporary nature"* (Lechner, 2003: p2)).

An independent medical institution, the *Versörgungsamt*, evaluates the degree of disability of an individual. The degree of disability can vary between 0 and 100%, where the latter is total disability. A person with a degree of disability higher than 50% is covered by the PSDA. Individuals with a degree of disability between 30% and 50% are only covered if the disability is reason for not finding or holding a job. The authority responsible for determining whether the individual is covered by the PSDA is called the *Integrationsamt* (earlier the *Hauptfürsorgestelle*). Persons with a disability between 0% and 30% are not covered by the PSDA.

In 2001 a reform of the PSDA was implemented. The threshold value was increased from 16 to 20 employees and the quota which had to be fulfilled with disabled workers was reduced from 6% to 5%, because the previous legislation has never been achieved. As mentioned in the introduction the highest percentage ever reached was in 1982 with 5.9%, but the average was 4.2% over the period between 1974 and 1997 (Lechner, 2003). It does not necessarily mean that the policy does not work. Lechner (2003) describes that in 1995 397,700 vacancies should have been fulfilled by disabled workers, according the quota requirement. However, only 155,500 unemployed people were registered as severely disabled.

Also the levy has changed by the reform in 2001. Before 2001 an employer had to pay €102 (200 DM) per month for each unfilled position. After 2001 the levy differentiates on company size. Employers with more than 59 employees have to pay €260 per unfilled position per month if less than 2% of the

quota is reached, €180 per unfilled position if the quota is filled from 2% up to 3%, and €180 per unfilled position if more than 3% but less than 5% of the quota is reached. This increasing marginal cost per unfilled position creates incentives for the employer to hire at least one or two disabled workers (Verick, 2004). Employers with between 40 and 59 employees have to pay a levy of €180 per unfilled position per month if they have no disabled workers and a levy of €105 per unfilled position per month if they have only one disabled worker. Employers with between 20 and 39 employees are required only to have one disabled worker or otherwise pay €105 per month. The revenue obtained from noncompliance is used to finance supports for integration of disabled persons.

3.2.Other disability insurance policies

There are other disability policies, although out of the scope of this thesis, which may have an impact on the relationship between disability and the labour market. These surrounding policies are important when analyzing the effect of the PSDA on the labour market, because these policies may influence this impact.

3.2.1. The Protection Against Dismissal Act

Workers are both in the public and private sector protected by the Protection Against Dismissal Act (*Kündigungsschutzgesetz*, further called PADA), with the condition that the establishment consists of at least 5 employees. Beside protection against dismissal the law also stands for an environment for the worker, which is socially and economically justifiable. The court can refuse a dismissal in case that there is no reason for dismissal or if the reason is not serious enough. Severely disabled people are provided special protection against dismissal. Before able to dismiss a severely disabled worker employers need to obtain approval from the *Integrationsamt*. In some cases it is more difficult to get approval from the *Integrationambt* (Kock, 2002):

- If the company does not comply with the disability quota if in force
- If the employee can be placed at a different reasonable workplace
- If the ground of dismissal is related to the disability

According the Eurofound (2009) the PADA does not operate as a barrier to dismissal, but works more as a mechanism to obligate employers to justify a dismissal on rational grounds. Furthermore, instead of retention it provides compensation for the employees if the justification of a dismissal is not successful. In contrary with the Eurofound, Lechner (2003) states that in 1995, 35% of dismissals of severely disabled people resulted in job retention, whereas 65% resulted in job loss. What the impact might be, it is likely that the PADA reduces incentives for firms to hire disabled workers.

3.2.2. Disability benefits

The social security system in Germany provides disabled people disability payments in the form of an annuity. These benefits can be claimed only if the individual has been working for at least 5 years. This benefit is approximately 100% of the standard old-age pension for people unable to perform any occupation, and 66% of the old-age pension for people unable to perform 50% of the tasks in his/her own or similar occupation (Schütz et al, 2001).

3.2.3. Rehabilitation and training subsidies

The employers are offered other incentives to stimulate hiring and keeping disabled workers. One is financial support for the adaptation of the workplace. This is paid by the levies of noncompliance of the PSDA. Also vocational rehabilitation and employee training can be subsidized up to 100% of the

costs. This financial support would support the PSDA, because costs of hiring a disabled person will be lowered to a large extent. However, there is little use of this financial support by employers. A reason for this may be the lack of information, and bureaucratized procedures which discourage employers to take up these benefits (Thornton and Lunt, 1997).

Chapter 4: Data and Methodology

In order to answer the main question '*Do disability quotas protect employees to job loss after the onset of a health problem?' a* quantitative research method is used to answer the research question. Transitions from employment to (non)employment are investigated by using panel data from the German Socio-Economic Panel (GSOEP). A binary logistic regression is used to examine the impact of a disability quota on job retention. For the calculations the statistical program STATA12 is used. This chapter will explain the methods, variables and data used for examining whether the disability has an effect on job retention.

4.1.Estimation method

The aim of this thesis is to examine whether the disability quota helps workers to stay at work if they get disabled. The specified research question is:

> *Do employees in Germany experiencing a health shock have a lower probability to get non employed when working in a firm affected by the disability quota compared to experiencing a health shock when working in a firm not affected by the disability quota?*

A health shock is defined as a sudden drop in self assessed health. The creation of this variable will be explained in paragraph 4.3. There are two groups of interest and each group in turn is divided into two groups:

1) A group working in a firm where a disability quota applies
    a. Experiencing a health shock
    b. Not experiencing a health shock
2) A group working in a firm where no disability quota applies
    a. Experiencing a health shock
    b. Not experiencing a health shock

Group 1a) is the group of interest, whereas group 2a) is the comparison group. The groups 1b) and 2b) are baseline groups. Including the comparison group is necessary, as people experiencing a health shock may have a higher probability to leave employment, no matter how effective the policy is. It is likely that there are workers experiencing a health shock are no longer able to participate in the labour market due to severe functional limitations. We assume that the employment gap between disabled and non disabled people do not need to be fully diminished. A disability quota can be seen as effective if there is a significant difference between working in a firm with or without disability quota when experiencing a health shock. The number of useful observations is limited, which makes matching techniques not suitable in determining a comparison group. Two other groups are created in addition to the comparison group 2b): workers who are not experiencing a health problem in both firms with and without a disability quota. These two groups are included to correct for non random factors coming along with experiencing a health problem and working in a firm with a disability quota in force.

4.1.1. Logistic regression

A binary logistic regression is used to examine the impact of a disability quota on job retention. We are interested in the probability that someone is not working at t+1. A logistic regression is a nonlinear probability model and regresses the latent variable y^* , which is assumed to be linear:

$$y_i^* = \beta_0 + \beta_i x_i + \varepsilon_i$$

The latent variable y_i^* is related to the nonlinear (S-shaped) binary dependent variable by the following equations:

$y_i = 1$ if $\quad y_i^* > 0$

$y_i = 0$ if $\quad y_i^* \leq 0$

(Long and Freese, 2006)

The logit model can also be written as:

$$\Pr(y_i = 1|x_i) = \frac{1}{1 + \exp(-\mathrm{x_i}\beta_\mathrm{i})} = \Lambda(x_i\beta_i)$$

Where Λ indicates the cumulative standard logistic probability distribution function in the binary logit model. The independent variables have a linear impact on the log odds of the event occurring, and the log odds in turn have a nonlinear relationship with the probability on the event, in this case employment status.

Because the binary logistic regression is nonlinear, the magnitudes of the coefficients of the independent variables cannot be interpreted directly. The impact on the outcome of a change in one of the independent variables depends on the levels of all the variables. To be able to interpret the magnitude of the coefficients, the marginal effect method is used. We use the mean marginal effect, so the marginal effect of the whole sample is computed and then the average is taken. The magnitude represents a one unit change of the independent variable on the outcome probability, keeping all other independent variables constant. To correct for autocorrelation in the error terms due to the panel structure of the data, the error terms are clustered at the individual level.

4.1.2. Models

To examine the impact of the disability quota when experiencing a health shock first the overall impact of a health shock is analyzed, resulting in the following regression:

Model 1:

$$y_{i,t+1}^* = \beta_1 * Shock_{i,t} + \varepsilon_{i,t}$$, if employed at t

Where:

$y_{i,t+1}^*$ is the latent variable for non employment at t+1

$Shock_{i,t}$ = experiencing a health shock at t

We look at the impact of the disability quota on job retention. Therefore, the sample is restricted to those employed at t and employment status is modelled at t+1. Examining the impact of the disability quota on employment at t+1 when experiencing a health shock at t has the advantage that it both minimizes justification bias and reverse causality. Non-employed individuals may report worse health to justify their circumstances. However, we look at the effect of change in health between t-1 and t on employment at t+1, which should minimize the justification bias of our health variable. It could also be that employment has an impact on health, instead of health having an impact on employment (Kessler et al, 1988; Lindeboom et al, 2005). However, because the effect of a health shock at t on employment status at t+1 reverse causality is minimized as well.

After that a dummy variable for working in a firm with a disability quota is included to analyze whether working in a firm with a disability quota beforehand lower/enlarge the probability to leave

employment and whether people working in a firm with a quota are more/less likely to experience a health shock.

Model 2:

$$y^*_{i,t+1} = \beta_1 * Shock_{i,t} + \beta_2 * Quota_{i,t} + \varepsilon_{i,t}, \text{ if employed at t}$$

Where:
$Quota_{i,t}$ = 1 if working in a firm at t where a disability quota applies, and 0 otherwise.

In the third model the interaction term between *Shock* and *Quota* is added.

Model 3:

$$y^*_{i,t+1} = \beta_1 * Shock_{i,t} + \beta_2 * Quota_{i,t} + \beta_3 * Interaction_{i,t} + \varepsilon_{i,t}, \text{ if employed at t}$$

Where
$Interaction_{i,t}$ = the interaction when both experiencing a health shock and working in a firm with a disability quota. β_3 captures the effect of interest: it determines the effect of transiting to non employment when working in a firm with a quota and experiencing a health shock. If the effect of a health shock on the probability to become non-employed significantly differs between employees working in a firm where a disability quota applies and employees not working in a firm with a disability quota, we may conclude that quota policies protect workers of job loss after a drop in health.

After having examined model 3 several control variables are added to control for factors which may influence significance and magnitude of the variable of our interest β_3.

Model 4:

$$y^* = \beta_1 * Shock_t + \beta_2 * Quota_t + \beta_3 * Interaction_t + \beta_4 * Age + \beta_5 * Gender + \beta_6 * Bluecollar + \beta_7 * Partner + \beta_8 * Income + \beta_9 * Education + \beta_{10} * Job\ training + \beta_{11} * year2001 + \beta_{12} * year2002 + \beta_{13} * year2003 + \beta_{14} * year\ 2004 + \beta_{15} * year2005 + \beta_{16} * year2006 + \beta_{17} * year2007 + \beta_{18} * year2008 + \beta_{19} * 2009 + \varepsilon_t$$

Where,
Age= the impact of age on the probability to become non-employed
$Gender$= 1 if being male, and 0 if being female
$Bluecollar$= 1 if person is blue-collar worker and 0 otherwise
$Partner$= 1 if steady partner, and 0 otherwise
$Income$= monthly earnings, in 1,000 euro's
$Education$= years of education
$Job\ training$= on-the-job training, in months
$yearX$= time dummies for the years 2001-2008

4.2.Data

The data used in this thesis is based on nine waves (2001-2009) of the German Socio-Economic Panel (GSOEP). The GSOEP is a representative microeconomic longitudinal study of private households and individuals living in Germany. It has started in 1984 with 6,000 individuals, and by 2007 more than 20,000 individuals were represented in the GSOEP. The panel has the aim to provide data on a large variation of topics to analyze economic, social, and living conditions in Germany. It provides data at individual, household, and family level and captures a wide range of topics like demographics, labour market, income, health and education. Original survey questions used for this study can be found in appendix B.

4.3.Variables of interest

All variables used for the analysis, their definition and original variable names in the longitudinal dataset from the GSOEP can be found in the appendix (table A.1).

4.3.1. Employment status

Employment status is a categorical variable including full-time, part-time, unemployed and out-of-labour-force. A dummy variable (*Not_Employed*) is created where 1=not employed and 0=employed. *"Not employed"* includes both unemployed and out-of-labour force (OLF), and "*employed"* includes full-time and part-time employment. All individuals not employed at t are excluded from the sample, to be able to study the effect of the disability quota on job retention at t+1, rather than employment status in general.

4.3.2. Health shock

A health shock (a sudden health deterioration in self assessed health) is chosen to measure the onset of a disability. The ideal measure of a health shock as a proxy for disability onset would include duration of the decline in health, the suddenness of the health deterioration and severity of the health event. The duration is important to know, because disability has a chronic nature and temporary health problems would not be seen as a disability. Knowing the duration allows to exclude temporary health deteriorations. The suddenness of the health deterioration is important, because it allows studying causal relationships. If health deteriorates gradually, it is more difficult to find the causal impact on employment, because other disturbing factors make it difficult to study this relationship. Furthermore, with a gradual deterioration of health the question raises whether employment affects health or health affects employment status. The severity of an ill-health event is also important, because it makes it possible to select only those shocks which are likely to hinder daily activities to some extent. Small health problems with just minor consequences are not likely to have a significant impact on employment status, whereas large health problems are likely to have an impact.

The GSOEP dataset does contain two variables with self reported health. The variable "*Current state of health"* (HEALTH) includes five possible outcomes. The respondent was asked to value his/her own health with 'very good', 'good', 'fair', 'bad' or 'very bad' health. The other variable reports health satisfaction on a scale from 0 (low) to 10 (high) (HEALTH_2). Table 4.1 shows the cross tab of the two variables, which indicates that the two variables report more or less the same health: the lower categories of *"Health satisfaction"* correspond to the worse categories of *"Current state of health"*.

Table 4.1	Crosstab of the two health variables *"Current state of health"* and *"Health satisfaction"*						
Health Satisfaction	Current state of health						
	No answer	Very bad	Bad	Fair	Good	Very good	**Total**
No answer	40	35	71	143	138	47	**474**
0	8	1,839	385	52	20	19	**2,323**
1	5	1,413	642	60	60	20	**2,2**
2	14	1,803	3,035	426	206	23	**5,507**
3	23	1,123	6,164	2,266	378	11	**9,965**
4	22	414	5,181	4,974	598	16	**11,205**
5	49	358	6,332	16,653	2,964	93	**26,449**
6	36	88	2,316	12,99	4,5	115	**20,045**
7	58	64	1,331	15,676	15,94	497	**33,566**
8	71	84	548	8,947	34,031	2,979	**46,66**
9	33	39	96	1,199	15,424	6,156	**22,947**
10	26	42	40	524	4,994	8,808	**14,434**
Total	**385**	**18,784**	**79,253**	**63,91**	**79,253**	**18,784**	**195,775**

The variable "*current state of health"* is chosen for this study, because it captures more observations when defining a health shock. A health shock is determined as a drop from 'very good' or 'good' health at t-1 to 'fair', 'bad' or 'very bad' health at t. A dummy variable (*Shock*) is created with 1= experiencing a health shock and 0= not experiencing a health shock. This measure of a health shock includes some degree of severity, because it is likely that the drop from good to bad health has an impact on daily activities. Furthermore, the shock is sudden in the sense that the health shock occurs between period t-1 and t.

4.3.3. Disability Quota

In Germany the threshold value for the disability quota is a firm size of 20 employees. Firms with less than 20 employees are not covered by the disability quota, whereas firms with more than 20 employees are covered. Before 2001 the threshold value for the quota legislation was set at 16 employees. The dataset contains a categorical variable for company size with a threshold at 20 employees, so that the years before 2001 are not appropriate for this study. The categorical variable "*Company size"* is transformed to a dummy variable (QUOTA), with value 1 if the company size is between 20 and 100 employees and value 0 if the company size is between 5 and 20. The variable QUOTA reports whether a person is working in a company with a disability quota in force or not. Companies with less than 5 employees are excluded, because the financial burden may be very high for that firm when one employee gets disabled.

Table 4.2 shows that there are 5,277 observations (between frequency) are working in a firm where a disability quota applies (size 20-100), and 5,971 observations are working in a firm where no disability quota applies (size 5-20). There are a few more observations working in a firm without a disability quota than observations working in a firm where a disability quota does apply. 4.6 % has no value for company size. Table X of the appendix shows that this distribution stays more or less the same over the years.

Table 4.2	Company size	
	Frequency	**Percentage**
No value	1,385	4,57
Under 5	3,104	10.25
5 to 10	1,458	4.82
11 to 20	1,222	4.04
91-04: 5 to 20	3,291	10.87
20 to 100	5,277	17.43
100 to 200	2,938	9.70
200 to 2000	5,356	17.69
2000 and more	5,136	16.96
Independent worker	1,111	3.67
Total	**30,278 (n=18,189)**	**100**

Ad1: the table represents the company size if working at t. Thus, 'no value' does not include the non working population.
Ad2: the observations with 'no value' are omitted from the sample

4.3.4. Control variables

Control variables added to the model are the continuous variables *income, age* and *education*, and the dummy variables *gender* and *partner. Income* is gross income of the last month, in 1,000 euro's. Observations with *age* over 60 are excluded from the sample to diminish the possibility of early retirement. The dummy variable *gender* is 1 for male and 0 for female. The dummy variable *partner* is 1 for having a steady partner and 0 for not having a steady partner. *Education* includes years of education. *Education* has missing values, but dropping the missing values would cause serious data loss. Therefore the missing values are recoded to '0' and a dummy variable *missing* is created to control for missing values with 1 for missing and 0 for non-missing values. The two variables *BLUE* and *WHITE* are included to control for type of occupation. It is expected that the disability quota is less effective when workers have physically demanding jobs. Individuals with '0' for both *BLUE* and *WHITE* are trainees and civil servants. The dummy variable *EAST* is created to see whether working in former East Germany has an impact on employment. The variable *on the job training* (in months) is also added as a control variable. On the job training is an investment by the employer, and therefore it is expected that people having had a specific training have a lower probability to get dismissed than employees not having had that investment. Time dummies are created to control for unobserved year specific influences. It captures aggregate common variation in the data, caused by for example a crisis influencing overall employment rates.

4.4.Sample

The original dataset is restricted to the years 2001-2009, because the threshold of firms affected by the disability quota has changed in 2001. The variable *company size* is a categorical variable, which cannot be used before 2001 (the threshold before 2001 was set at 16 employees, whereas the variable includes firms between 11 and 20 employees in the same category). Secondly, all observations with missing values for health satisfaction in year t or t-1 are excluded, because two values of subsequent years are required to determine a health shock between t-1 and t. Thirdly, all

observations who did not fill out that they are employed at year t are excluded, to be able to study movements from employment to non employment. Fourthly, only these observations are selected who work in a firm with 5-19 or 20-100 employers. Fifthly, individuals aged 60 and older are excluded from the sample. There are relatively a few missing values for the control variables, so the final sample includes 19,505 observations. Table 4.3 provides an overview of the sample selection and shows how many observations are excluded from the sample due to the restrictions. The original dataset from 2001 until 2009 contained 195,775 observations and 19,505 observations are left in our sample, which counts for slightly more than 10 percent of the original dataset.

Table 4.3	Sample selection	
	N	**%(N)**
Dataset 2001-2009	**195,775**	100
not employed at t	98,816	
Total	**96,959**	49.53
correct company size at t	64,948	
Total	**32,011**	16.35
missing values health shock	5,826	
Total	**26,185**	13.38
missing values employment status	5,457	
Total	**20,728**	10.59
delete age >59	970	
	19,758	
missing control variables	253	
Total	**19,505**	**10.09**

Chapter 5: Results

5.1. Descriptive statistics

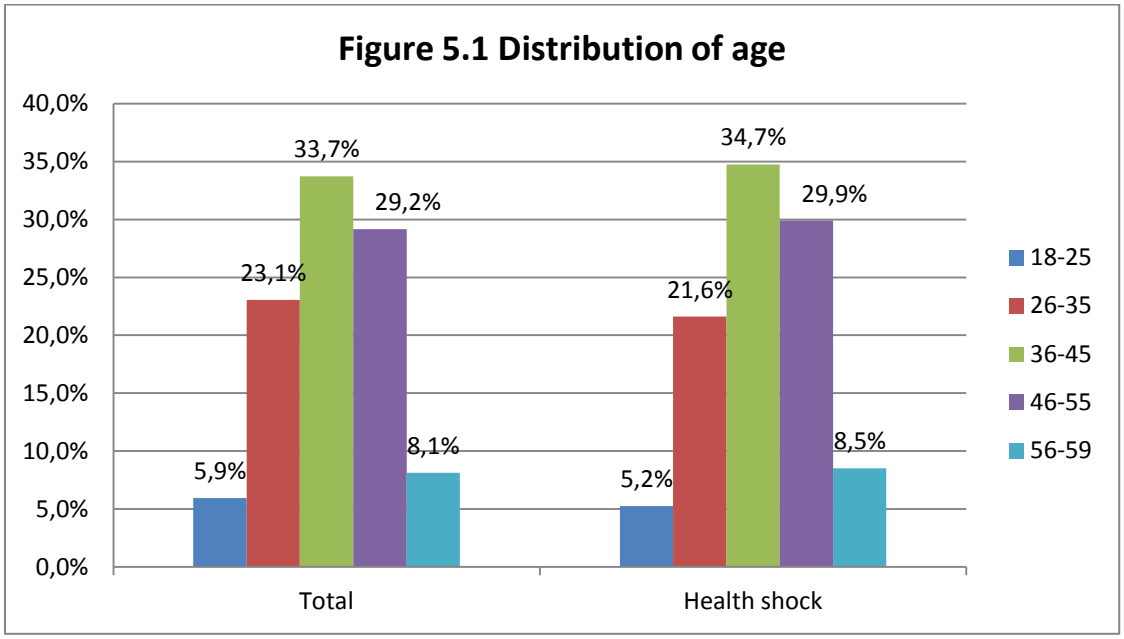
Table 5.1 provides information on the transitions from employment at t into non-employment t+1 for the full sample in column 1 (including both the people experiencing a health shock and those who do not), the sample without a health shock in column 2 and the sample selection who experienced a health shock in column 3. The rows indicate the sample selection of people working in a firm with a disability quota and people working in a firm without a disability quota. The numbers in parentheses refer to the groups created as explained in chapter 4 where group 1a is our group of interest and the other groups are comparison groups. 11% of the workers experiencing a health shock left employment the next year, which is 9.90% for the healthy sample. The second and third row split the sample up into observations working in a firm with a disability quota and observations working in a firm without a disability quota. The table shows a large difference between the two: 12.02% of the full sample working in a firm without a disability quota moved into non-employment at t+1, compared to 8.50% of the sample working in a firm with a disability quota. For the sample experiencing a health shock the difference is even larger: 14.58% gets non-employed at t+1 when working in a firm without a disability quota, compared to 8.20% of the persons working in a firm where a disability quota applies. The table suggests a positive effect of the disability quota on employment retention of those who experience a health shock. The difference in difference estimate is 3.27%[3].

Table 5.1	Distribution of transitions from employment to non employment (in percentages)		
	Full sample	**Sample with no health shock**	**Individuals who experienced a health shock at t**
Full sample	10.04	9.90	11.00
Quota	8.50	8.54 (**1b**)	8.20 (**1a**)
No Quota	12.02	11.65 (**2b**)	14.58 (**2a**)
Number of observations	**19,505**	**16,987**	**2,518**
N.B. The table describes transitions from employment to non employment from t to t+1, where only the percentages of workers transiting to non employment are represented.			

The descriptive statistics of all the variables can be found in table 5.2. The table shows the mean, standard deviation, minimum and maximum of the variables of the full sample. Furthermore, means for the subsamples 'no health shock', 'health shock', 'quota' and 'no quota' are given, to see whether there are differences between different groups. The mean of the binary variable provides the percentage of people if the binary variable is '1'. The mean of the dependent variable *NOT_EMPL* is 0.1004, which means that 10.04% of the full sample moves into non-employment from t to t+1 (as already showed in the previous table). Given the large outliers for INCOME (an income at the bottom of 0 due to missing values and a maximum of 31,000 euro's per month) these numbers may be disturbed and cannot be interpreted well based on the table. Hence, a row is added for *Income* where the missing values plus incomes higher than 10,000 euro's per month are excluded (61 observations earn an income higher than 10,000 euro's per month).

[3] The DID is estimated by group (2a – 2b) – (1a – 1b) = (14.58 – 8.20) – (11.65 – 8.54)

By first looking at the subsamples 'no health shock' and 'Health shock', it is interesting to see that the probability to experience a health shock does not seem to differ between the two groups of firms. The probability to experience a health shock is 12.90 in firms with a quota and 12.91 in firms without a quota. We find differences between the two subsamples for the variables *BLUE, WHITE* and *INCOME*. Slightly more people experiencing a health shock are blue-collar workers (40%) and slightly less people are white-collar workers (52.9%) compared to the sample of people without a health shock (38.1% and 55.1%). Striking is that the means of *AGE* do not differ very much. We would have expected that the share of people experiencing a health shock increases with age, but in this sample it does not seem that *age* has a large impact on experiencing a health shock. Figure 5.1 show the distribution of age for the full sample and the distribution of age for the subsample with individuals experiencing a health shock, both when employed at t. It indeed shows that experiencing a health shock does not seem to heavily depend on age.



Secondly, by comparing the subsamples 'quota' and 'no quota', noteworthy differences are found in the variables *NOT_EMPL, GENDER, INCOME* and *JOB_EDUC*. There are more men working in a firm with a quota than in a firm without a quota (52.6% vs. 46.4%), and people working in a firm without a disability quota earn on average 436.13.29 euro's per month less than people working in a firm where a disability quota applies (based on the corrected means). Furthermore, while persons working in a firm without a disability quota have had less education, they receive on average slightly more on-the-job training (1.1 month vs. 1.5 month) per year compared to persons working in a firm with a disability quota.

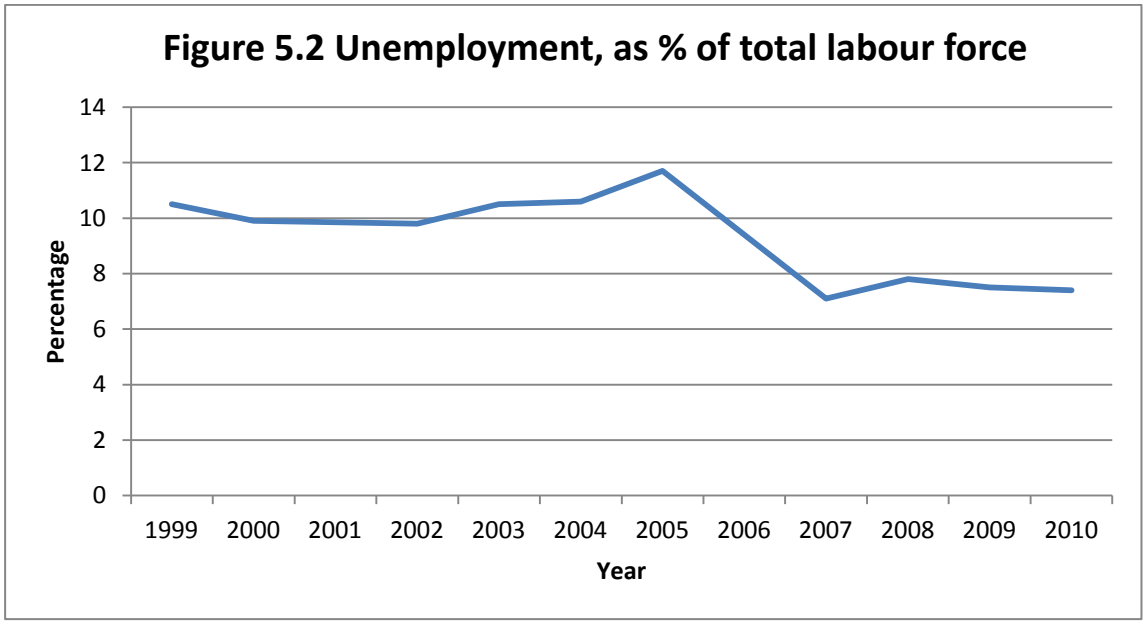
Table 5.2	Descriptive Statistics							
Variable	**Mean**					**Std.D.**	**Min.**	**Max.**
	Full sample	**No Health shock**	**Health shock**	**Quota**	**No Quota**			
Dependent Variables								
NOT_EMPL(t+1)	0.1004	.0990169	0.1100	0.0850	0.1202	0.3444	0	1
Independent variables								
SHOCK	0.1291	0	1	0.1290	0.1291	0.2355	0	1
QUOTA	0.5617	0.5617237	0.5616	1	0	0.4667	0	1
SHOCK*QUOTA	0.0725	0	0.4907	0.1291	0	0.1823	0	1
Control variables								
AGE	41.4865	41.43439	41.8384	42.3378	40.3956	10.4727	18	59
GENDER	0.4988	.4993819	0.4948	0.5261	0.4638	0.4996	0	1
BLUE	0.3837	.3812327	0.4003	0.3684	0.3905	0.4689	0	1
WHITE	0.5481	.5509507	0.5286	0.5250	0.5776	0.4777	0	1
EAST	0.1854	.1868488	0.1755	0.1808	0.1913	0.3807	0	1
PARTNER	0.2000	.1995055	0.2037	0.1855	0.2187	0.3853	0	1
INCOME	2171.66	2178207	2127.50	2344.48	1950.19	1607.14	0	31,000
INCOME (without missings)	2406.58	2412.39	2367.23	2597.70	2161.57	1563.40	36	31,000
EDUC	12.1806	12.18482	12.1521	12.4142	11.8813	3.2296	0	18
JOB_EDUC	0.1303	.1274504	0.1493	0.1129	0.1525	0.8949	0	12
N.B. For all means applies the restriction 'employed at t'								

5.2.The effect of the disability quota on non-employment

A binary logistic regression was used to test whether the disability quota has a significant impact on the probability to get non-employed after suffering a health shock. The results of the four models can be found in table 5.3.

Table 5.3	Marginal effects of determinants on the probability to become non-employed at t+1 if employed at t									
	Model 1		**Model 2**		**Model 3**		**Model 4a**		**Model 4b**	
Variable	**dy/dx**	**SE**	**dy/dx**	**SE**	**dy/dx**	**SE**	**dy/dx**	**SE**	**dy/dx**	SE
Independent										
SHOCK	0.0113921*	.0066628	0.0113041*	.0066313	0.0250157**	.0096199	0.0232152**	.0091261	0.023215**	.0091301
QUOTA			-0.0353211***	.0048092	-0.031529***	.0051021	-0.0147669**	.0048448	-0.0147678***	.0048424
SHOCK*QUOTA					-0.0263953**	.0124755	-0.023624**	.0120274	-0.0236092**	.0120272
AGE							-0.01814***	.0016862	-0.0181035***	.0016456
AGE_2							0.0002038***	.000021	0.0002037***	.0000207
GENDER							-0.0319531***	.0054151	-0.0316457***	.0054109
BLUE							0.0358143**	.0136018	0.0366721***	.0135239
WHITE							-0.0029629	.0117433	-0.0024012	.0117089
PARTNER							-0.00207	.0058998		
INCOME							-0.0357***	.0024479	-0.035922***	.0024438
EDUC							-0.0030535**	.0012709	-0.0029115**	.0012476
JOB_EDUC							0.0015579	.0019204		
EAST							0.0011917	.0060003		
year 2001	0.0233088*	.0086024	0.0234809**	.0086	0.0234329**	.0085999	0.0570038***	.0087374	0.0573826***	.0087294
year 2002	0.0110717	.0086161	0.0118752	.0086071	0.0119573	.0086073	0.0015533	.0083479	0.0016006	.0083414
year 2003	0.0139198	.0087426	0.0146949*	.0087262	0.0145984*	.0087238	0.0101234	.008444	0.0102262	.0084462
year 2004	0.0106828	.008517	0.0115779	.0085067	0.0116408	.0085071	0.0097349	.00823	0.0098926	.0082324
year 2005	-0.0065953	.0090012	-0.0056102	.0089939	-0.005452	.0089931	-0.0054354	.0086863	-0.0053867	.0086852
year 2006	-0.0173067*	.009952	-0.0171752*	.009925	-0.0172605*	.0099271	-0.0183326*	.0095263	-0.018303*	.0095229
year 2007	-0.0175037*	.0093149	-0.0169305*	.0093007	-0.0167111*	.0092985	-0.0184995**	.0089148	-0.0184472**	.0089142
*N.B. ***=significant at 1% level, ** = significant at 5% level, * = significant at 10% level*										

The first model only captures the variable *SHOCK* and time dummies. As expected experiencing a health shock has a significant positive effect on the probability to be non-employed in the next year. Experiencing a health shock increases the probability to be non-employed with 1.14 %-points. As the descriptive statistics have shown (table 5.2), the non-employment rate at t+1 for the full sample is 10.04%. Thus, experiencing a health shock increases the probability to become non-employed with 11.35%[4]. The reference year of the time dummies is 2008. As figure 5.1 shows, in that year the overall unemployment rate increased to almost 8%. The years 2001, 2006 and 2007 are significant, while the other years are not significant at the 10%-level. However, they are jointly significant and are therefore not excluded from the model. Interesting is that for the years 2001-2004 the impact on non-employment is positive, whereas the impact for the years 2005-2007 turned out to be negative. This can be explained by the unemployment rates over the years as illustrated in figure 5.2. From 2005 to 2007 unemployment rates dropped dramatically from almost 12% of the total labour force to around 7% in 2007 (the reason for this may lay in the growth of GDP during these years).



Source: CIA World Factbook 2012

The impact of QUOTA (model 2) is negative and also significant: working in a firm with a disability quota decreases the probability to be non-employed with 3.5 %-points. The impact of *QUOTA* is even larger than for *SHOCK*, which is not surprising in view of table 5.1 of the descriptive statistics. This table already suggested that persons working in a larger firm (>20 employees) have a lower probability to get non-employed, compared to persons working in a smaller firm (<20 employees). The magnitude of *SHOCK* does only show a minor change, which indicates that 'experiencing a health shock' does not depend on company size (working in a firm with quota or working in firm without quota).

The impact of a disability quota when experiencing a health shock is shown by the variable *SHOCK*QUOTA* (model 3) and is significant at the 5%-level. Working in a firm with a disability quota when experiencing a health shock decreases the probability to get non-employed with 2.64 %-points, compared to people working in a firm without a disability quota.

[4] (1.14/10.04)*100

This result indicates a significant impact of the effectiveness of the disability quota: with an overall employment-leaving rate of 10.04%, a decrease of 2.64 %-point to 7.4% is relative large. Table 5.4 shows the predicted probabilities for the different groups. The disability quota decreases the probability to become non-employed by 3.08 %-points[5] when experiencing a health shock, compared to people experiencing a health shock while working in a firm without a disability quota.

Table 5.4	Predicted probabilities to become non-employed at t+1 (in percentages), model 3	
	Healthy sample	**Individuals who experienced a health shock at t**
Quota	8.14 (**1b**)	7.88 (**1a**)
No Quota	11.15 (**2b**)	13.97 (**2a**)
N.B. The table describes the predicted probabilities to become non-employed for the different groups as explained in chapter 3. The results are obtained for the reference year (2008).		

Model 4 adds several control variables. The variables *PARTNER, JOB_EDUC, WHITE* and *EAST* are not significant. *PARTNER, JOB_EDUC* and *EAST* are also not jointly significant, so they are excluded from the model, leaving model 4b. The interaction term *SHOCK*QUOTA* is still significant, and its magnitude slightly decreases to 2.36 %-points. Shown by table 5.5, the disability quota decreases the probability to become non-employed by 4.29 %-points[6] when experiencing a health shock, compared to people experiencing a health shock while working in a firm without a disability quota.

Table 5.5	Predicted probabilities to become non-employed at t+1 (in percentages), model 4	
	Healthy sample	**Individuals who experienced a health shock at t**
Quota	8.24 (**1b**)	7.78 (**1a**)
No Quota	10.93 (**2b**)	14.76 (**2a**)
N.B. The table describes the predicted probabilities to become non-employed for the different groups as explained in chapter 3. The results are obtained for the reference year (2008).		

The effect of AGE on non-employment cannot be interpreted directly, because the quadratic effect also has to be taken into account. The marginal effect of *AGE* turned out to be -0.04 %-points. Thus, an increase of one year in age decreases the probability to be non-employed at t+1 with 0.04 %-points. The effect was higher for a 50 year old person (-0.14 %-points) than for a 30 year old person (-0.05 %-points). Unfortunately no variable for job experience was available in our dataset, because that could explain the lower probability to get non-employed when being older.

Men have a lower probability to leave employment, compared to female and given the other variables. It could be that women tend to leave employment more often voluntary, for example to look after the children. Another reason may be that women are in different types of jobs which can explain the higher probability to get non-employed. However, there could also be a discrimination aspect that women are more easily dismissed. *INCOME* is significant and positive. An increase in monthly earnings of 1,000 euro's decreases the probability to get non-employed with 3.59 %-points.

[5] (7.88 - 13.97) – (8.14 - 11.15)
[6] (7.78 - 14.76) – (8.24 - 10.93)

The impact of *EDUC* is relatively small: one more year of education decreases the probability to get non-employed with 0.29 %-points.

5.3.Differences across socio-economic groups

The paragraph above shows a significant impact of the disability quota on the probability to become non-employed. Interesting to know is whether different socio-economic groups all benefit from the disability quota and to what extent. We have split up our sample in type of occupation, older- and younger workers, and type of education. The results can be found in the tables A.2, A.3, and A.4 of the appendix. The tables A.5, A.6 and A.7 of the appendix represent the non employment rates across the sub-samples.

Type of occupation

To start with the type of occupation, experiencing a health shock has a positive impact on non-employment for both groups, although the magnitude is higher for blue-collar workers than for white-collar workers. Blue-collar workers have a 3.26 %-point higher probability to be non-employed at t+1 when experiencing a health shock, which is only 1.70 %-points for white-collar workers. The impact is significant for blue-collar workers, but not for white-collar workers. The higher probability to be non-employed at t+1 for blue-collar workers compared to white-collar workers is as expected. Since blue-collar workers have more physically demanding jobs than white-collar workers, it is likely that the onset of a health problem is more limiting for blue-collar workers. They may not be able to switch easily to less demanding physical occupation within the firm they work for. Compared to the blue-collar workers, it is likely that the onset of a health problem is less limiting for white-collar workers, because they have less physically demanding jobs. The effect of a health shock is not significant for white-collar workers. There are 1,331 white-collar workers who experience a health shock, so it is not likely that the non-significance is caused by a limited number of observations.

The impact of the disability quota on non-employment differs largely between the two groups. For the white-collar workers, working in a firm with a disability quota decreases the probability to become non-employed with 3.00 %-points (model 4) when experiencing a health shock compared to working a firm without a disability quota. Hence, this probability is higher than for the full sample, suggesting that white-collar workers are benefiting more from the disability quota policy. For blue-collar workers the impact is also positive: compared to working in a firm without a disability quota, working in a firm with a disability quota increases the probability to become non-employed at t+1 with 1.52 %-points when experiencing a health shock. Although this effect is not significant, it seems to stress the expectation that white-collar workers benefit more from the disability quota than blue-collar workers. Table A.8 and A.9 of the appendix show the predicted probabilities of the different subgroups for both blue- and white-collar workers. The impact of the disability quota is -2.2 %-points for blue-collar workers and -3.69 %-points for white-collar workers, which is similar to the results shown by the interaction term. Interesting is that blue-collar workers have a much lower probability become non-employed when working in a large firm (>20 employees) instead of working in a small firm (<20 employees) compared to white-collar workers (table A.5 of the appendix already suggests this).

Older/younger workers

The sample is divided into two age groups: 'younger workers' which includes workers younger than 41 and 'older workers' which includes workers 41 years and older. For the younger age group,

experiencing a health shock increases the probability to get non-employed at t+1 with 2.90 %-points. For the older age group, this is 1.70 %-points, although this is not found to be significant. In relative terms the difference between the two groups is much smaller: 23.2 % for younger workers and 21.3 % for older workers. The impact of the disability quota when experiencing a health shock on non-employment is -2.85 %-points for younger workers and -1.89 %-points for older workers. Thus, it seems that the disability quota benefits the younger workers more than the older workers. However, both effects are not found to be significant. Table A.10 and A.11 of the appendix show the predicted probabilities for the different subgroups for older and younger workers. The impact of the disability quota is -3.34 %-points for younger workers and -2.55 %-points for older workers, which is similar to the results shown above.

Gender

Male have a lower probability to become non-employed in our full sample as shown in table A.4 of the appendix. When experiencing a health shock, the probability to leave employment increases with 2.79 %-points for women, while this is 1.85 %-points for men. Because the overall non-employment rates for male and female differ (7.84% vs. 12.23%), the absolute terms do not give a good indication. In relative terms, the impact of a health shock is 23.6% for men and 22.81% for women.

The impact of the disability quota when experiencing a health shock on non-employment is -2.22 %-points for male and -2.50 %-points for female. Thus, the disability quota seems to benefit female over male. However, again this effect is small and not found to be significant. Table A.12 and A.13 of the appendix show the predicted probabilities of the different subgroups for male and female. The impact of the disability quota is -3.85 %-points for female and -2.34 %-points for male, which is similar to the results shown by the interaction term.

5.4.Sensitivity analysis

The second paragraph has shown a significant negative impact of the disability quota on the probability to get non-employed. However, this effect may depend on the variable for company size. *QUOTA* was measured as (1) if company size was between 20 and 100 employees and (0) if company size was between 5 and 20 employees. To test whether the results rely on the choice of values chosen for the variable *QUOTA*, the variable *QUOTA* was expanded to a variable with (1) if company size was between 20 and 200 employees and (0) if company size was between 5 and 20 employees. First the results from model 5a were obtained (table 5.6) where *QUOTA* includes firms between 20 and 200 employees. When experiencing a health shock, working in a firm where a disability quota applies decreases the probability to become non-employed at t+1 with 1.23 %-points. This is a smaller effect compared with the results obtained earlier. The small impact may explain the finding that the impact is not found to be significant. This outcome raises the suggestion that the impact of the disability quota may depend on the size of the company. It could be that the disability quota works better in medium firms, compared to larger firms, or vice versa. Therefore another model is run where firm size is split up in medium firms and large firms. *QUOTA2* represents the medium firms (with between 20 and 100 employees) and *QUOTA3* represents the large firms (with between 100 and 200 employees). The results show that people working in large firms have a lower probability to become non-employed than people working in medium firms (3.10 %-points vs. 1.33 %-points). Striking are the effects obtained from the interaction terms. The effect of the disability quota on non-employment is negative when working in a medium firm and experiencing a health shock: it decreases the probability to become non-employed with 2.07 %-points. However, the opposite is

true if working in a large firm: the disability quota then has a positive impact on non-employment when experiencing a health shock. Working in a large firm increases the probability to become non-employed with 0.74 %-points when experiencing a health shock, compared to people working in a small firm. Based on the results, it seems that the disability quota works better in a medium firm than in a large firm. However, large firms may have other characteristics than medium and small firms, so that this outcome should be taken with caution.

The logistic regression does not correct for unobserved heterogeneity. To test whether this is sensitive to our results, we estimate a fixed effects model to control for unobserved heterogeneity. Table A.14 in the appendix shows the results. The impact of the disability quota is also negative for the fixed effects model: experiencing a health shock when working in a firm with a disability quota decreases the probability to become non-employed with 1.15 %-points, compared to working in a firm without a disability quota. This effect is smaller compared to the logit model. However, the results are not significant for the fixed effects model.

Table 5.6	Marginal effects of determinants on employment status at t+1 when *QUOTA* has changed			
	Model 5a		**Model 5b**	
Variable	**dy/dx**	**SE**	**dy/dx**	**SE**
Independent variables				
SHOCK	0.0185625**	.0076169	0.018553**	.0076059
QUOTA	-0.0200854***	.003875		
QUOTA2			-0.0133445***	.0038936
QUOTA3			-0.0309527***	.0043234
SHOCK*QUOTA	-0.0122855	.0090771		
SHOCK*QUOTA2			-0.0206823**	.0100311
SHOCK*QUOTA3			0.0074154	.0127188
AGE	-0.015809***	.001256	-0.0157865***	.0012575
AGE_2	0.0001782***	.0000158	0.0001781***	.0000158
GENDER	-0.0285503***	.0040352	-0.0284116***	.0040442
BLUE	0.0421229***	.0107637	0.0421989***	.010778
WHITE	0.0055179	.0090093	0.0061888	.0090156
INCOME	-0.0286469***	.0018047	-0.0285082***	.0018071
EDUC	-0.0012757	.0009364	-0.0013476	.0009375
year 2001	0.0445874***	.0066322	0.0443893**	.0066269
year 2002	0.0128771**	.0063603	0.0129281	.0063615
year 2003	0.0107067*	.0064758	0.0106537	.0064754
year 2004	.0201052***	.0062952	0.0200013***	.0062972
year 2005	.0033249	.0067364	0.0033554	.0067332
year 2006	-.0156842**	.007189	-0.0155172**	.0071898
year 2007	-.0028799	.0068032	-0.0026169	.0068013

*N.B. ***=significant at 1% level, ** = significant at 5% level, * = significant at 10% level*
*Ad1 SHOCK*QUOTA2 represents the effect of a disability quota in firms with 20-100*

Chapter 6: Conclusion

This thesis questions the impact of a disability quota in promoting job retention for workers when a health problem has started. The results from a logistic regression analysis show evidence that the disability quota in Germany has a positive effect on the probability of job retention after a health shock. Workers employed in a firm where a disability quota applies have a 2.36 %-points higher probability to keep their job when experiencing a health problem compared to workers employed in a firm without a disability quota. This effect is significant at a 5%-level. Seen the overall non-employment rate at t+1 is 10.04% if employed at t, the decrease of 2.36 %-points to 7.68% is relative large. The results obtained by predicted probabilities are even larger: the disability quota decreases the probability to become non-employed at t+1 by 4.29 %-points when experiencing a health shock.
The results suggest that company size plays an important role on the effectiveness of a disability quota. This effect is significant for companies with a medium size, but for larger companies the results were not significant.
When dividing the sample in subgroups, the disability quota benefits white-collar workers more than blue-collar workers. Health problems are likely to go hand in hand with physical limitations which are more bounding for physical demanding jobs. The subgroups based on age provide no evidence that the disability quota benefits specific age groups. Female on average have a higher probability to become non-employed, but no evidence is found that the disability quota strengthens or weakens this effect.

These results contradict with earlier findings on the impact of the disability quota. Lechner and Vasquez-Alvarez (2003) studied the impact of disability on labour market outcomes in Germany and found that disability policies were not effective in removing the barriers for disabled people to enter the labour market. A reason why these findings possibly contradict is that Lechner and Vasquez assumed that disability policies are only effective when labour market outcomes did not differ between disabled and non-disabled people in absolute terms. This is questionable because it is likely that there is a percentage of disabled people that is too severely disabled to work or is not able to work for other reasons e.g. mental diseases. This study overcomes this by including a comparison group of people working in a firm without disability quota. Adding a comparison group enables studying differences in both absolute and relative terms.
The results are consistent with the finding of Lalive et al (2009), who did a similar comparison for Austria at the firm level (while this study is on level of the individual). They compared the employment of disabled workers in companies applying to the disability quota requirements to companies without a quota in Austria and found that firms with a quota are more likely to employ disabled workers. These results are especially relevant for this study while it also studied the effect on job retention in a different environment, since the context in Austria is different to Germany.
The results confirm that financial incentives are a way to influent the behavior of firms towards disabled people. As the theoretical framework of this thesis already explored, a levy increases the opportunity costs for employers of not employing disabled people.
The limitations of this study and recommendations for further research are described in the next chapter.

Chapter 7: Limitations and areas for further research

This thesis about the effect of disability quota in Germany used a quantitative research method, which has inevitably methodological restrictions.

First of all, the data from the household panel was self reported. People's perception of health and disease may differ. Furthermore, company size was also reported by the individual itself, which may result in wrong answers. It could be that an individual reports that he/she is working in a firm with 5-20 employees, while in reality that firm consists of 21 employees and thus is covered by the disability quota. Furthermore, information was on individual level, so information about firms was not included. Compliance rates at company level are not known. It could be that a firm already fulfills a quota when an employee becomes disabled. If that firm than dismisses the disabled worker it can be concluded wrongly that the disability quota does not work.

Secondly, the questionnaire for the included household was performed once per year. Information about the history of health- and employment status between measurements was not gathered. If an individual had a health shock just after measurement at t=0, but recovered to a large extend and reported a moderate health status at t=1, this health shock is not included in this research. Furthermore, if an individual is dismissed after a health shock, but finds another job before t+1, this individual is wrongly observed as a person who kept his/her job. However, it is not likely that this will happen on a large scale and disturb the results.

Thirdly, the variable in the GSOEP data for company size is a categorical variable, with relatively large categories. A firm with 30 employees may have different characteristics to a company with 99 employees, while in the data they are both in the company-size category '20-100 employees'.

Fourthly, the number of observations after selection is also a limitation in this study. Although the sample is relatively large, just a small group is experiencing a health shock, and this group is again split up in working in a firm with quota and without quota. This has resulted in a relatively small group of interest and large control group, which may disturb the magnitude and significance of the results.

Fifthly, the onset of disability was measured by a health shock. It is not necessarily the case that a health shock is the onset of a disability. It may be that a health shock is temporarily, such that the impact on employment is likely to be negligible. On the other hand, self-assessed health and ability to perform in daily activities (which suggests a disability) are found to be related to each other. Linn et al (1980) compared self-assessed health and physician-rated impairment in relation to the self-assessed disability of the respondent. They found that self-assessed health was strongly related to the ability to perform in daily activities. Self-assessed health may report disability even better than an objective measure of disability. The same authors also found only a minor relationship between self-assessed disability and the physician-rated impairment. A reason mentioned by the authors to explain this is that the physician-rated impairment was only based on a medical record and not on functional limitations which can differ across persons with the same medical conditions. However, although self-assessed health may be better related to disability than physician-rated impairment, for this type of study the physician-rated impairment is important. People not functioning well in daily activities but not having a degree of disability, are not covered by the disability quota. However,

people do not just report worse health without reason, so it is likely that worse self reported health goes along with limited daily activities.

This study filled the gap of evidence on the effectiveness of the disability quota in Germany. However, a large field is left for further research. Interesting to study is what the optimal size of a levy is to make a disability quota effective. In 2001 the levy in Germany had increased to a maximum of €260 per month (see for exact sizes for different compliance rates and firm sizes chapter 3). However, it may not be high enough to prevent non-compliance by employers. On the other hand, just increasing the levy may not result in an optimal situation for society. It can be that firms are just not able to employ disabled workers, because of really low productivity rates.
Furthermore, it is interesting to do a similar study on firm level for Germany to be able to control for firm characteristics and include compliance rates. This study has focused on employment in the year after a health shock. Further research could be done on other years than only the year after a health shock. A duration model could be used to study the effect of the disability quota during the years after a health shock.

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Appendix A – tables

Table A.1	Definition of Variables
Variable	**Description**
Dependent Variables	
NOT_EMPLOYED	1 if individual is non-employed, 0 otherwise
Independent variables	
SHOCK	1 if experienced a health shock at t, 0 otherwise
SHOCK_NEXT	1 if experienced a health shock at t+1, 0 otherwise
QUOTA	1 if disability quota is applied in the company where individual works at t-1, 0 otherwise
QUOTA2	1 if working in medium sized firm (20-100 employees), 0 otherwise
QUOTA3	1 if working in large size firm (100-200 employees), 0 otherwise
SHOCK*QUOTA	Interaction term
SHOCK*QUOTA2	interaction term
SHOCK*QUOTA3	Interaction term
Control variables	
AGE	Age of the individual
AGE_2	Age squared
GENDER	1 if male, 0 otherwise
BLUE	1 if blue collar worker, 0 otherwise
WHITE	1 if white collar worker, 0 otherwise
PARTNER	1 if steady partner, 0 otherwise
INCOME	Income of respondent
EDUC	Years of education
JOB_EDUC	retraining in company, in months
EAST	1 if someone is working in former East-Germany, 0 otherwise

Table A.2	Marginal effects of determinants on employment status at t+1 for type of occupation							
	Blue-collar				**White-collar**			
	Model 3		**Model 4**		**Model 3**		**Model 4**	
Variable	**dy/dx**	**SE**	**dy/dx**	**SE**	**dy/dx**	**SE**	**dy/dx**	**SE**
Independent variables								
SHOCK	0.0309159*	.0309159	0.0326204**	.016446	0.0188291	.0119172	0.0169525	.0114746
QUOTA	-0.0395681***	-.0395681	-0.0334417***	.0088782	-0.0192507***	.0061668	-0.0016259	.0059458
SHOCK*QUOTA	-0.0135191	-.0135191	-0.0151899	.021018	-0.0336761**	.0163079	-0.0299751**	.0159598
AGE			-0.0167167***	.0029865			-0.0191612***	.0021101
AGE_2			0.0001957***	.0000374			0.000214***	.0000266
GENDER			-0.0365947***	.0101115			-0.023325***	.0064144
BLUE	-	-	-	-	-	-	-	
WHITE	-	-	-	-	-	-	-	
INCOME			-0.0550267***	.0044732			-0.0263656***	.0030159
EDUC			-0.0099369**	.0033031			-0.0000346	.0012553
dSVYYEAR1	0.019235	.019235	0.0814692***	.0152978	0.0216703*	.0112249	0.0234809**	
dSVYYEAR2	0.0097019	.0097019	0.0003872	.0144346	0.0076567	.0112655	0.0118752	.0114383
dSVYYEAR3	0.0127767	.0127767	0.0079043	.0147099	0.0145196	.0112491	0.0146949*	.0110513
dSVYYEAR4	0.0080625	.0080625	0.0076606	.0145784	0.0123832	.0109003	0.0115779	.0110775
dSVYYEAR5	-0.0304969*	-.0304969	-0.0295351*	.0159599	0.0071706	.0112759	-0.0056102	.0106712
dSVYYEAR6	-0.0488186***	-.0488186	-0.0460441**	.0175272	0.0031472	.0120899	-0.0171752*	.0110191
dSVYYEAR7	-0.0343933**	-.0343933	-0.0362592**	.0159431	-0.0051821	.0117157	-0.0169305*	.01172
No. of observations	**7,484**				**10,690**			
*N.B. ***=significant at 1% level, ** = significant at 5% level, * = significant at 10% level*								

Table A.3	Marginal effects of determinants on employment status at t+1 for younger- and older workers							
	Younger workers				**Older workers**			
	Model 3		**Model 4**		**Model 3**		**Model 4**	
Variable	**dy/dx**	**SE**	**dy/dx**	**SE**	**dy/dx**	**SE**	**dy/dx**	**SE**
Independent variables								
SHOCK	0.0290731*	.0153114	0.0289919**	.0147365	0.0204233*	.0120644	0.0170226	.0113875
QUOTA	-0.0257651***	.0080643	-0.0113596	.0077316	-0.030255***	.0063853	-0.0173047***	.0061176
SHOCK*QUOTA	-0.0277511	.0207345	-0.028522	.0200697	-0.0216612	.0150815	-0.0188807	.0148259
AGE			-0.005538	.0072942			-0.0298193***	.0110828
AGE_2			-0.00000732	.0001182			0.0003278***	.0001123
GENDER			-0.0701497***	.0088589			-0.0024754	.0066678
BLUE			-0.008671	.003912			0.1110116***	.0330353
WHITE			-0.0521394***	.018211			0.0642504***	.0262483
INCOME			-0.0391224***	.0175094			-0.0315371***	.0029753
EDUC			-0.0037675*	.0020107			-0.0021671	.0015664
Time dummies								
dSVYYEAR1	0.0043949***	.0143877	0.0509792***	.0145072	0.0311055***	.0104196	0.0601554	.010627
dSVYYEAR2	-0.0001473	.0143637	-0.0058469	.0138984	0.0139049	.0104504	0.0072188	.0102809
dSVYYEAR3	0.0040227*	.0147359	-0.0004843	.0142302	0.0174973*	.0104536	0.0186964	.010148
dSVYYEAR4	0.0030209*	.0144251	0.0014042	.0139259	0.0130753	.0100409	0.0176024	.0097231
dSVYYEAR5	-0.0107046	.0149238	-0.0095956	.0144663	-0.0053305	.0109022	-0.001855	.0105869
dSVYYEAR6	-0.0212825	.016599	-0.021481	.0159582	-0.0163738	.0118859	-0.0151668	.0114425
dSVYYEAR7	-0.0221544	.0156259	-0.0244619	.014998	-0.012503	.0110591	-0.0149852	.0107734
no. of observations	**8,825**				**10,680**			

*N.B. ***=significant at 1% level, ** = significant at 5% level, * = significant at 10% level*

Ad1 Younger workers are workers aged 18 up to 45 years old, older workers are workers aged 46 up to 59 years old

Table A.4	Marginal effects of determinants on employment status at t+1 for gender							
	Male				**Female**			
Variable	**Model 3**		**Model 4**		**Model 3**		**Model 4**	
	dy/dx	**SE**	**dy/dx**	**SE**	**dy/dx**	**SE**	**dy/dx**	**SE**
Independent variables								
SHOCK	.0186774	.0125791	0.0184595	.0122055	.0310315**	.0144789	.0279492**	.0137106
QUOTA	-.0252999***	.0065157	-0.0102703*	.0062128	-.0320617***	.0077722	-.0208279**	.0074463
SHOCK*QUOTA	-.0220003	.0160161	-0.0222231	.0156039	-.032375*	.0190577	-.025008	.0183776
AGE			-0.0157093***	.0021365			-.0200667***	.0025265
AGE_2			0.0001936***	.0000264			.0002072***	.0000322
BLUE			0.0172392	.0167029			.0656851**	.0224287
WHITE			0.0039519	.017427			-.0019855	.016425
INCOME			-0.0279618***	.0027048			-.0451097***	.0043187
EDUC			-0.0066967***	.0017167			-.0006796	.0017981
Time dummies								
dSVYYEAR1	.0287344***	.010963	0.067328***	.0114692	.0214136***	.0132765	.0456039***	.0132582
dSVYYEAR2	.0347275***	.0107953	0.0298165**	.010549	-.0135057**	.01355	-.0323114**	.0131203
dSVYYEAR3	.0103907	.0116202	0.01084	.0113392	.0177469	.0130399	.0070098	.0126276
dSVYYEAR4	.014815	.011298	0.0194813*	.0110842	.0082417	.0127095	.0012428	.0122561
dSVYYEAR5	.0105671	.0115927	0.0142016	.0112826	-.0213602*	.0137048	-.0240385*	.0132603
dSVYYEAR6	-.0282208**	.0140208	-0.0266673	.0134957	-.0109813	.0144452	-.0141476	.0138523
dSVYYEAR7	-.0190636	.0126376	-0.0199923	.0121822	-.0161011	.0137521	-.0182192	.013138
No. of observations	**9,729**				**9,776**			

*N.B. ***=significant at 1% level, ** = significant at 5% level, * = significant at 10% level*

Ad1 Younger workers are workers aged 18 up to 45 years old, older workers are workers aged 46 up to 59 years old

Table A.5	Distribution of transitions from employment to non employment (in percentages)					
	Blue-collar			**White-collar**		
	Full sample	**no health shock**	**Health Shock**	**Full sample**	**no health shock**	**health shock**
Full sample	12,81	12.52	14.68	8.60	8.56	8.87
Quota	10.97	10.81	12.01	7.51	7.68	6.33
No Quota	15.10	14.65	18.00	9.86	9.59	11.77
Number of observations	**7,484**		**1,008**	**10,690**		**1,331**
N.B. The table describes transitions from employment to non employment from t to t+1, where only the percentages of workers transiting to non employment are represented.						

Table A.6	Distribution of transitions from employment to non employment (in percentages)					
	Younger workers			**Older workers**		
	Full sample	**No health Shock**	**Health Shock**	**Full sample**	**No Health shock**	**health shock**
Full sample	12.52	12.32	13.94	8.00	7.90	8.65
Quota	11.12	11.12	11.01	6.64	6.68	6.40
No Quota	14.03	13.61	16.81	10.02	9.70	12.24
Number of observations	**8,825**	**7,706**	**1,119**	**10,680**	**9,281**	**1,399**
N.B. The table describes transitions from employment to non employment from t to t+1, where only the percentages of workers transiting to non employment are represented.						

Table A.7	Distribution of transitions from employment to non employment (in percentages)					
	Male			**Female**		
	Full sample	**No health shock**	**Health Shock**	**Full sample**	**No health shock**	**health shock**
Full sample	7.84	7.74	8.51	12.23	12.05	13.44
Quota	6.70	6.75	6.34	10.50	10.55	10.16
No Quota	9.51	9.20	11.52	14.20	13.75	17.32
Number of observations	**9,729**	**8,483**	**1,246**	**9,776**	**8,504**	**1,272**
N.B. The table describes transitions from employment to non employment from t to t+1, where only the percentages of workers transiting to non employment are represented.						

Table A.8	Predicted probabilities to become non-employed at t+1 (in percentages), blue-collar workers	
	Healthy sample	**Individuals who experienced a health shock at t**
Quota	11.09 (**1b**)	12.54 (**1a**)
No Quota	15.09 (**2b**)	18.74 (**2a**)
DID		-2.2
N.B. The table describes the predicted probabilities to become non employed for the different groups as explained in chapter 3. The results are obtained for the reference year (2008).		

Table A.9	Predicted probabilities to become non-employed at t+1 (in percentages), white-collar workers	
	Healthy sample	**Individuals who experienced a health shock at t**
Quota	7.06 (**1b**)	6.38 (**1a**)
No Quota	8.43 (**2b**)	11.44 (**2a**)
DID		-3.69
N.B. The table describes the predicted probabilities to become non employed for the different groups as explained in chapter 3. The results are obtained for the reference year (2008).		

Table A.10	Predicted probabilities to become non-employed at t+1 (in percentages), younger workers	
	Healthy sample	**Individuals who experienced a health shock at t**
Quota	11.45 (**1b**)	11.39 (**1a**)
No Quota	14.06 (**2b**)	17.34 (**2a**)
DID		-3.34
N.B. The table describes the predicted probabilities to become non employed for the different groups as explained in chapter 3. The results are obtained for the reference year (2008).		

Table A.11	Predicted probabilities to become non-employed at t+1 (in percentages), older workers	
	Healthy sample	**Individuals who experienced a health shock at t**
Quota	6.14 (**1b**)	5.92 (**1a**)
No Quota	8.93 (**2b**)	11.26 (**2a**)
DID		-2.55
N.B. The table describes the predicted probabilities to become non employed for the different groups as explained in chapter 3. The results are obtained for the reference year (2008).		

Table A.12	Predicted probabilities to become non-employed at t+1 (in percentages), female	
	Healthy sample	**Individuals who experienced a health shock at t**
Quota	10.64 (**1b**)	10.33 (**1a**)
No Quota	13.84 (**2b**)	17.38 (**2a**)
		-3,85
N.B. The table describes the predicted probabilities to become non employed for the different groups as explained in chapter 3. The results are obtained for the reference year (2008).		

Table A.13	Predicted probabilities to become non-employed at t+1 (in percentages), male	
	Healthy sample	**Individuals who experienced a health shock at t**
Quota	5.84 (**1b**)	5.48 (**1a**)
No Quota	8.05 (**2b**)	10.03 (**2a**)
		-2.34
N.B. The table describes the predicted probabilities to become non employed for the different groups as explained in chapter 3. The results are obtained for the reference year (2008).		

Table A.14	Effects of determinants on employment status at t+1, fixed effects	
	Model 6	
Varialbe	**Coef.**	**SE**
Independent variables		
SHOCK	-0.0060843	.008652
QUOTA	-0.0056468	.0079343
SHOCK*QUOTA	-0.0115227	.0115166
AGE	-0.0025942	.0215806
AGE_2	0.0000587	.0000556
GENDER	-	-
BLUE	0.0164729	.0309398
WHITE	0.0173491	.0295544
INCOME	0.004406	.002587
EDUC	-0.0657717***	.012766
Time dummies		
year 2002	0.046499**	.0223706
year 2003	0.0669443	.0425792
year 2004	0.0705962	.0631417
year 2005	0.0771782	.0839593
year 2006	0.0697546	.1048641
year 2007	0.0499109	.1257057
year 2008	0.0803602	.1465901
No. of groups	5,904	
*N.B. ***=significant at 1% level, ** = significant at 5% level, * = significant at 10% level* *Ad1 Younger workers are workers aged 18 up to 45 years old, older workers are workers aged 46 up to 59 years old*		

Appendix B – original survey questions

Each wave contains the same question with respect to self assessed health. The question is asked as follows:

How would you describe your current health?

- *Very good*
- *Good*
- *Satisfactory*
- *Poor*
- *Bad*

The question concerning company size has changed over time. From 2001-2004 the question was as follows:

Approximately how many people does the company employ as a whole?

- *Less than 5 people*
- *From 5 up to, but less than 20 people*
- *From 20 up to, but less than 100 people*
- *From 100 up to, but less than 200 people*
- *From 200 up to, but less than 2,000 people*
- *2,000 or more people*
- *Not applicable, because I am self-employed without further employees*

From 2005 onwards the possible answers slightly changed:

Approximately how many people does the company employ as a whole?

- *Less than 5 people*
- *From 5 up to 10 people*
- *From 11 up to, but less than 20 people*
- *From 20 up to, but less than 100 people*
- *From 100 up to, but less than 200 people*
- *From 200 up to, but less than 2,000 people*
- *2,000 or more people*
- *Not applicable, because I am self-employed without further employees*

The question concerning employment status was as follows:

Are you currently engaged in paid employment? Which of the following applies best to your status? Pensioners with a job contract are considered employed.

- *Full-time employed*
- *Part-time employed*
- *In occupational/professional education or retraining*
- *Marginally ("geringfügig") or irregularly employed*
- *Approaching retirement part-time employment with zero working hours*
- *Doing your compulsory military service*
- *Doing community service as substitute for compulsory military service ("Zivildienst")/ Voluntary social year*
- *Not employed*