

Erasmus University Rotterdam  
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Bachelor thesis



# **The effective retirement age**

## **The differences explained for six Western countries**

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**Abstract:** Many Western countries face two problems in relation to the sustainability of their pension system. Individuals live longer than at the time the pension system was set up and persons retire earlier than the standard retirement age due to incentives. This results in financial problems. Due to attractive early retirement schemes and high pension benefits, the effective retirement age nowadays is low. The effective retirement age is the age at which people actually retire. For France, Belgium, Germany, Sweden, the United States and the Netherlands the effective retirement age declined between 1960 and 1997. Compared to the other countries, Sweden and the United States have relative high effective retirement ages. In the Netherlands early retirement schemes were changed from a pay-as-you-go system to a funded prepension system in 1997. This reform had a significant positive effect on the effective retirement age.

**Keywords:** effective retirement age, pension system, social security, early retirement

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## 1. Introduction

In the Netherlands there is a large debate on the ageing problem and the retirement age. In the near future the baby boomers will retire on a large scale. Existing pension systems will get financial problems because they are not able to incorporate the increasing number of aging people. Furthermore the ageing problem is not solved after the retired baby boomers, it also exists in the long run due to the fact that people get older, thanks to a wealthier life and better medical help. There is also a demographic trend for Western countries that the birth rate decreases over time. These factors clearly indicate that the pension system in the Netherlands is not sustainable. There is, for example, a public debate about raising the retirement age from 65 to 67. Figure 1 shows one of the reasons why the pension system is not sustainable.

Figure 1



Source: CBS

In Figure 1 the Dutch old-age dependency ratio (grey pressure) is shown for the Netherlands. This is the ratio of the number of people aged 65 or over and the people aged between age 20 and 65. This figure shows one of the causes why pension systems can not hold in the future. Nowadays, almost 25 percent of all people is aged 65 or over. This means that with the current systems, each worker has to pay more, compared to the time the pension system was set up, to keep the pension benefits at the same level. This rising trend is the result of higher life expectancy and increased wealth provisions. There is another problem that is not so widely discussed. Even though the life expectancy is increasing, people leave the labor market at earlier ages over the years.

The ageing problem is a fact, not only for the Netherlands, but for the entire world. In the past decades the effective retirement age in almost all Western countries has decreased. The effective retirement age is the age at which people really retire. This is not necessarily the standard retirement age. There is also a difference of the effective retirement age between most countries. The average effective retirement age in Japan and Korea for example is about 70. In France and Belgium, on the other hand, the average retirement age is below 60. This thesis wants to study these differences.

The purpose of this research is to see if the differences in retirement age between Western countries can be explained by several factors. Ageing is a worldwide problem, but in some countries the problems are larger than in other countries. In this paper we study the pension system of each country individually to see why the effective retirement age is low for some countries.

For the sake of restriction of the research and the whole thesis the comparison between Western countries will be limited to six countries. These are the Netherlands, France, Belgium, Germany, Sweden and the United States. These countries are chosen since they have different retirement ages. It is interesting to see if there are some clear differences or similarities between neighboring countries like France, Belgium and the Netherlands. But also the differences of a totally different country, like the United States, and a country which differs in pension system and average effective retirement age (Sweden). Some countries have the same pension system but there also differences and it we want to see what the effects are of both. Countries like Japan and Mexico, where the effective retirement age is around 70, are not included. These countries have a much higher effective retirement age than the earlier mentioned six countries. We find it interesting to do research on Western countries that are known to have a relative strong economy. It is motivating to see how these economically strong countries, can still have problems with their pension systems and the low effective retirement age. This is also the reason why countries that have weak economies are not included.

For each country the average effective retirement age will be shown. The trend of this data over the years will be analyzed and explained. There are a few factors that are especially important in this analysis. Per country the pension system will be explained. Changes and reforms of the pension system will be analyzed to see if these reforms are related with the effective retirement age. It is furthermore important to take a closer look at the early retirement schemes. Among others disability insurance and unemployment insurance can

play an important role in the decision to retire. Finally, we want to study the effects of pension benefits and the loss of pension benefits if one decides not to retire at a certain age.

For the Netherlands we will also do empirical research. In 1997 the Netherlands changed their early retirement schemes. These schemes were financed on a pay-as-you-go basis before 1997 and are now financed on a funded basis. The Dutch social partners (unions and employer organizations) decided to initiate this reform because the pay-as-you-go system was too generous. We will analyze if this reform had a significant effect on the effective retirement age. Section 4 presents the data and the methodology.

This paper is organized as follows. In the Section 2 we give an overview of the related literature and we conclude this section with a short summary. In Section 3 we analyze each country individually. In Section 4 we discuss the empirical research. It is divided in subsections about data, research and methodology and final results. Section 5 compares all the countries. We clarify the factors which explain the differences of the effective retirement age. The factors of the countries are also compared with the related literature in Section 5. In Section 6 we end with the conclusions.

## *2.1 Related literature*

Before the analysis will be made to explain the differences in retirement age between countries, we will first look how the decline of retirement age can be explained in general.

Mitchell and Fields (1983) tried to find an answer to the question to why people retire at a certain moment. Empirical research is done and four conclusions can be drawn.

- 1) Income opportunities of older workers differ, depending on retirement age. If income is high it is significantly proven that the worker retires earlier. Incentives to retire differ for every age, partially because the financial situation differs. At older ages it is less expensive to retire than at very young age.
- 2) These differences in income opportunities have a significant effect on retirement patterns. This means that not only one retires earlier with more income, but it also means that if one gains more if one continues working, this means a delay of retirement. If income changes, this has stronger impact on the retirement decision than a change in pension benefits.
- 3) The preferences of a (older) worker between leisure and consumption are not the same between or within firms. In the sector of industry, for example, people retire earlier. But within firms or sectors, retirement decisions can be different too, due to the fact that individual preferences are different. A person that values leisure very much, retires earlier than someone who does not value leisure much.
- 4) The final conclusion is that the average retirement age is quite different between firms due to differences mentioned in points 1 and 3.

To come to these results, data was available from more than 8700 workers covered by ten different pension plans. Sensitivity analysis is performed to check for robustness.

Blöndal and Scarpetta (1997) show the importance of the difference between contributions of pension systems on retirement decisions. The level of pensions with a defined benefit system is determined by fixed rules. On the other hand, defined contribution systems are dependent on life-time contributions. The researchers give some indications that the level of education, the sector you work in, and the rate of self-employment can influence the average retirement age. Furthermore, you can see that if taxes are high for workers aged 55-64, for example in the Netherlands, the effective retirement age is low. In Sweden taxes are much lower, in the same age group, and the effective retirement age is higher. Including more OECD countries, a trend is visible that if taxes are high, the effective retirement age is low and vice versa.

Blöndal and Scarpetta (1999) demonstrate for OECD countries that there is often, if not always, an incentive to retire early. This is especially the case when pension benefits become first available. If one stays on the labor force, this often means that you lose a year of pension rights, without raising the benefits of your ultimate pension. On top of that, taxes that have to be paid as a worker, are disincentives to stay on the labor force at older ages. Pension benefits available before the standard retirement age also result in a disincentive to search for a job. Furthermore, Blöndal and Scarpetta (1999) notice that programs designed for, for example, disabled or unemployed persons are in some OECD countries used to finance their early retirement.

High pension accrual rates give incentives to continue working because pension benefits will be higher when one retires at a later age. Accrual rates are the gains if one continues working because pension benefits increase if retirement is postponed. Accrual rates nowadays are much lower than in the 1960s. In Germany there is a relative high accrual rate but this does not always lead to incentives to stay on the labor market, due to the fact that some pension programs, like the unemployment insurance, give continued contributions.

There are several programs to retire before the standard retirement age, like the unemployment- or the disability insurance. The conditions to use one of these programs determine the incentive to retire or to stay on labor market. An example to retire is, for example, an older-aged who becomes unemployed and has access to the unemployment insurance without the obligation to search another job. The same holds for the disability insurance; when compensation is high, people will tend to use this insurance sooner.

Empirical results show that there is a significant effect of labour market conditions and pension incentives for labor participation and retirement behavior. Blöndal and Scarpetta (1999) also find significant effects of demographic changes on retirement decisions. For example, when the baby boom generation entered the labour market, this resulted in a withdrawal for a lot of older-aged. Finally, the researchers show that, among others, France and Sweden, lowering the standard retirement age has a negative effect on the effective retirement age. These results come from a cross-country and time-series analysis. Blöndal and Scarpetta (1999) also did a micro-econometric analysis and found that socio-demographic factors play a role. For example, women often retire earlier than men. Household choices are important in the United States, where retirement decision seems to be a joint decision.

Gruber and Wise (1997) mention that the social security provisions give large incentives to stop working earlier. Gruber and Wise (1997) compare eleven countries with the same study format to give reliable evidence of the role of social security provisions on the effective retirement age. They show that participation rate of people aged between 60 and 64



decreased enormously between 1960 and 1990. According to Gruber and Wise (1997) two things are important for the age of retiring. Firstly, the age at which benefits are first available (the so called early retirement age). The pattern of benefit accrual is also important for the decision of leaving the labor market. This can be explained financially (see Blöndal and Scarpetta 1999), but also on the state of wealth. If one has the choice to retire now, say at age 62, or at age 63 he can make that choice based on his good or bad wealth. Gruber and Wise furthermore give an explanation of the effective retirement age by showing that there is a trade-off between leisure and income. Over time national income rose enormously and this led to a larger demand for leisure. Financial choices of an individual have great effects on its choice to retire or continuing work. However, rules and conditions of a social security system are very important too, especially for the decision to retire earlier.

Blanchet and Debrand (2008) have doubts about this explanation by Gruber and Wise. They say that the average retirement age cannot only be explained by the supply side, but that the role of employers is also important. The employers must be willing to accept employees that are approaching the retirement age. Older workers are often expensive and hard to retrain in comparison with younger workers. This has effect on the participation rate of elderly and thus indirectly on the effective retirement age. In times of economic recession in the 80s employers had impact on the labor force for elderly, because a lot of older workers were fired. This resulted in a decrease of the effective retirement age. Blanchet and Debrand (2008) also note that financial incentives cannot be the only reason to retire at a particular age. Other socio-economic and socio-demographic characteristics are important too (like working conditions and health conditions). Blanchet and Debrand (2008) use some models to investigate on the effects of health status and working conditions on individual base and between different countries. Their conclusions are that health and working conditions have significant effects on the decision to retire and so do financial incentives. Financial factors however, are more important to explain the differences in retirement age between countries.

Schils (2005) argues that individuals make a costs versus benefits choice when it comes to retiring. The conditions on the labor market as well as the conditions of a pension are important for this choice. Schils (2005) furthermore shows that early retirement in most European countries does not have very strict rules. For example, disability insurance is available without a thorough health inspection and unemployment insurance is often available without the demand to search for a job. A distinction is made between generous early pensions (Belgium and the Netherlands) and less generous ones (Sweden). This has a large effect on the effective retirement age of a country. Another distinction is the flexibility of the retirement age (this is the first age where benefits can be gained). The conclusion is that

a more flexible system does not work without changing the generosity of a system. Training of elderly is also important for the choice to retire or not. It can stimulate one to continue working because future perspective in that case remains higher. This means namely that employers are more willing to employ these persons.

Duval (2003) does research on old-age pension schemes for OECD countries. He says that the pension benefits are important for the retirement age, but there is also a disincentive to work due to (high) taxes that must be paid. Duval did statistical research on the effect of taxes on continued work for several countries. He finds that when taxes are high at high ages, this results in leaving the labor force. This effect especially holds for early retirement programs. Duval (2003) uses several models to study three simulating reforms. The first one, incorporating the total removal of early retirement, has large effects. The effective retirement age will rise and will strongly rise for among others Belgium and the Netherlands. This confirms that the generosity of the early retirement schemes of these countries. The second reform, move to an actuarial neutrality of old-age pension system, has even larger effects. People aged older than 65 are greatly affected by this reform. Raising the standard retirement age (the third reform) has effect too, but will have larger effects if additional measures are taken. The most important conclusion of Duval (2003) is that taxes on continued work are an important factor for the choice to retire for elderly people.

Conde-Ruiz and Galasso wrote several papers on the causes and the effects of early retirement. Conde-Ruiz and Galasso (2000) found that there are several situations where early retirement is attractive. They give reasons for early retirement when it was set up and the problems at that time. Firstly, if an individual had not worked enough years to be eligible for normal pension benefits, he still had the possibility to be awarded thanks to early retirement benefits. This was especially the case when early retirement was just set up. Secondly, early retirement is used as a kind of policy where people with an incomplete working history still had a pathway to retire. Early retirement is largely introduced in the 1960's when deindustrialization began and where older-aged workers could retire, thanks to early retirement schemes. At that time politicians thought it was a good and easy way to open job possibilities for young new-entrants in the labor market. Nowadays early retirement still exists thanks to its high incentives, as is mentioned in other literature (see above). Politically it is hard to stop the early retirement.

## *2.2 Summary related literature*

Retirement decisions in general are mainly based on financial circumstances, health and work conditions and preferences of an individual. If you look at the related literature you can see that there are often incentives for early retirement. These are usually visible at the age where benefits are first available. This is the early retirement age and for most countries a peak is visible for people leaving the labor market at that age. There are incentives to retire due to the fact that with several pension systems one loses pension benefits if one decides to continue working. On top of that, at a certain age there is a disincentive for work due to high taxes. Another incentive to retire are the easy pathways like disability and unemployment insurance. The level of standard retirement age also has influence on the effective retirement age. The rules and conditions of a pension system changed over the years and the effects are very visible in terms of easy access to early retirement but also the other way around. The level of generosity of a pension system is an explanation for the differences between countries. In the next section we will explain in more detail the different social security systems and the factors that affect the effective retirement age.

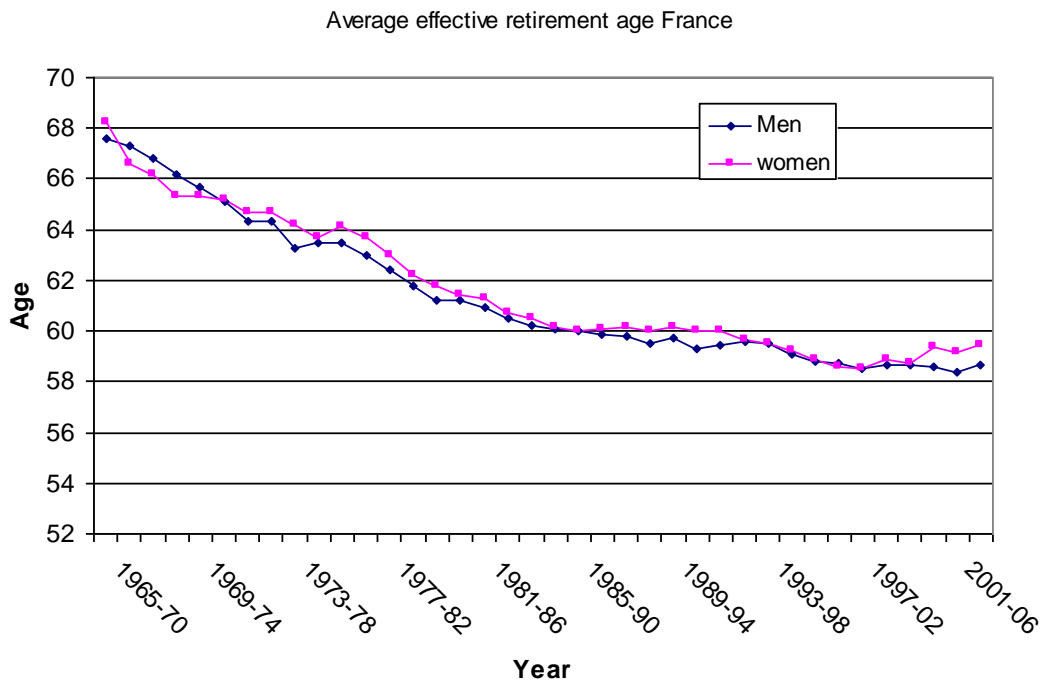
### *3.1 Introduction countries*

Life expectancy is rising and at the same time there is a trend over the past decades that people retire earlier. These trends are visible in many industrialized countries. Various papers have been written to analyze the effects of the changing social security and the retirement age. We will explain these effects per country, by summarizing social security policy and policy changes over time. For all countries, an analysis is performed for men and women separately. For the graphs for each country shown in the following chapters, data is used from OECD (2007). Each time an average is given from a 5-year period. Unfortunately data for Germany is only available from 1991. For the other countries data is available from 1965. We believe this is not the case for Germany because data before 1991 was selected separately for East and West Germany. This data is not available at the OECD website. The first countries that are analyzed are France, Belgium and Germany. These countries have relatively low effective retirement ages compared to Sweden and the United States. These two countries are analyzed next, concluding with the Netherlands. The Netherlands are analyzed last because the empirical research that follows is about the early retirement reform of the Netherlands.

### *3.2 France*

The effective retirement age in the period 2002-2007 was 58,7. For France the average retirement age has been quite low for the last twenty years. The preretirement schemes in France are an important factor for this low average retirement age. The effective retirement age before 1970 was much higher. The decrease in France can for a great part be explained by the increased generosity of the pension system (Blanchet and Pele 1997).

**Figure 2**



Source: OECD 2007

While the decrease of labor participation was enormous for men, the labor participation in France for women did not have this effect over the years. In Figure 2 you can see that average effective retirement age for men and women is more or less the same. This shows that a different trend of labor participation for men and women does not directly mean it changes the effective retirement age of both. The decline in labor force participation at older ages after the Second World War can be explained by economic growth. Western countries began to profit from the industrialization and globalization and there was an increase of welfare. This resulted in a demand for more leisure and thus earlier retirements. The French government stimulated this trend by making the pension systems more generous. Blanchet and Pele (1997) proof this generosity by showing that the ratio of average old age benefit to average wage increased enormously since 1970. These increased benefits cause obviously huge incentives to retire early, especially when comparing with years with less benefits. In 1974 pensions became mandatory in France. This strengthens the effect of a decrease of average effective retirement age.

So far it is clear that labor participation of older people is very low and we will take a look at the pension system in France and see if this is an important factor.

All pension systems in France are part of the pay-as-you-go system. For a lot of segments there are different rules and usage which makes the French system very complex. Another

difficulty in analyzing the French pension system is the fact that over the years the rules changed. This is the reason for Blanchet and Pele (1997) to concentrate on rules made at the beginning of 1990. There are two main pillars. The first pillar is the basic general regime. This social security is available for most of the (private working) population and is based on wages. The second pillar (funded) are complementary schemes, a contribution to these schemes became compulsory since 1972. It must be noted that in comparison with other countries like the Netherlands, the second pillar in France is very small.

This two-pillar system is quite simple but the difficulty lies in the fact that there are a lot of exceptions. When both pillars mentioned above were created, there were people who refused to join this system. This resulted in a lot of other and different first pillar systems than the original one.

Another important issue is the preretirement system. During the 1970s the preretirement age was 60 and in 1972 there was an insurance that if you lost your job at age 60 you would receive 60-70 percent of your last income until standard age 65. In 1983 this preretirement age became the normal retirement age. This is nowadays still the case but the number of years of contribution is 40 (it was 37,5 before 2003). This means one has to be on the labor force for at least 40 years before normal retirement begins. It is interesting to see that these changes seem to have effect on effective retirement age in France. In Figure 2 you can see a rise for women and a small rise for men since 2003.

There are no strong incentives to work after the retirement age because costs (taxes) are higher than profits. The effects of these changes in the early retirement system and the reform of lowering the standard age can also be seen in Figure 2. From 1970 until 1987 you can see an almost constant decrease of average effective retirement age for both men as well as women. From 1987 there is still a decrease but it becomes smaller and for women the effective retirement age stays more or less the same until 1993. In Figure 2 you can see that since around 1999 the average effective retirement age of women is higher than that of men. The reason is that women often have shorter careers and don't work at least 40 years. Gruber and Wise (1998) illustrate that the moment where pension benefits become available is indeed of great importance for the retirement decision. They show that at age 60 there is a peak of people leaving the labor force. In France one of the greatest incentives to retire at a certain age are the programs of unemployment benefits insurance and other special early retirement schemes. Blanchet and Pele (1997) show some possible effects of these schemes by using a base case. The results are that there can be strong incentives to retire even before 60. This is strange if you think of the fact that standard retirement age is 60. In Figure 2 however, it is confirmed that since 1985 average effective retirement age is below age 60. One reason is that if one is fired at age 56, he does not need to search actively for a

new job. Not only unemployment insurance is an important explaining factor for the fact that effective retirement age is below 60. Preretirement schemes and all kind of exceptions on 'normal' pension rules also create pathways to early retirement.

It is very clear that the standard retirement age of 60 is a very important factor for the effective retirement age of France. Pension benefits and pension system rules are very important for the French population. The favorable French pension system is well protected by the population, as was the case when they refused the new system in 1972. However even in France it is a clear that the current pension system cannot hold. The government in France announced that the standard retirement age should be raised from age 60 to age 62. This process should be completed in 2018.<sup>1</sup>

### *3.3 Belgium*

Belgium has a very low labor participation rate for people near their retirement. Gruber and Wise (1998) show that Belgium has the lowest labor force participation for age 60 and 65 compared with ten other western countries. The costs of social security will increase dramatically if the current system will not change. In Belgium early retirement schemes are first available at age 60. The criteria are that you must have worked at least 35 years (including contributions) before you are eligible for early retirement. When you look at the normal retirement age in Belgium there is one thing that attracts the attention. From all six countries analyzed in this paper, Belgium is the only country that had a difference in standard retirement age between males and females. There where standard age for males is 65, it is 60 for females until 1997. It rose to 63 around 2003 and since 2009 the standard retirement age is 65 for females too.

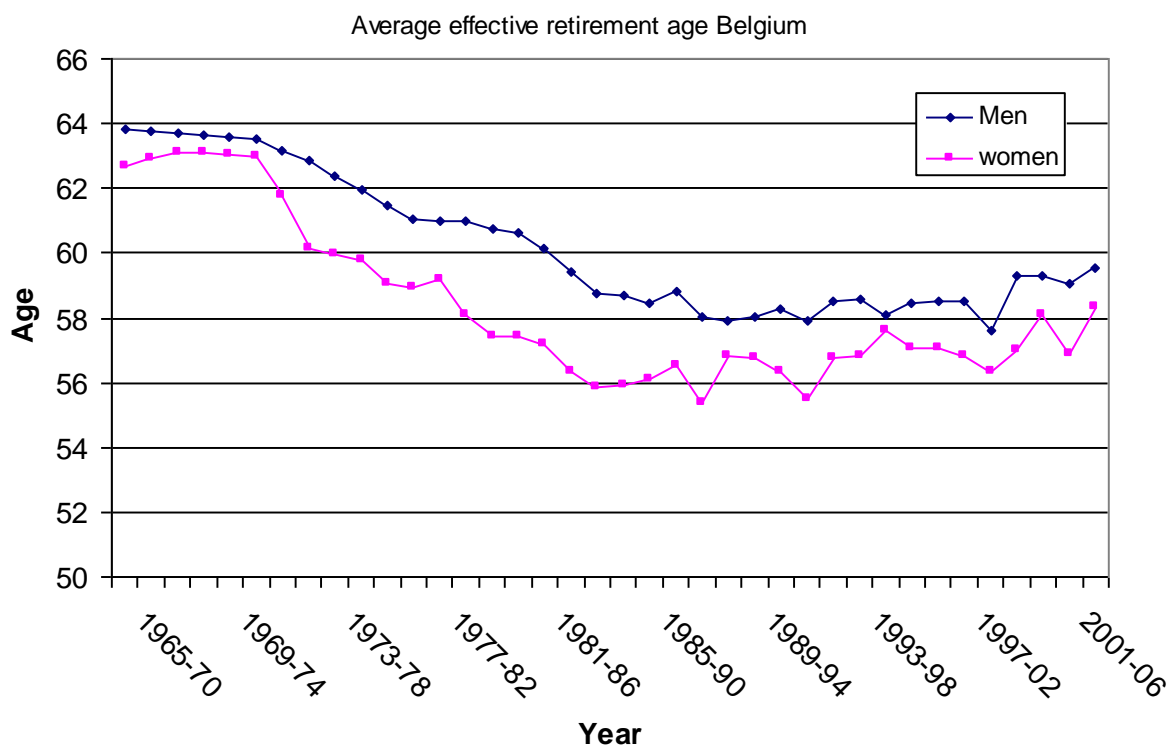
The early retirement age was different for men and women too before 1992. Women had the possibility to profit from the benefits from early retirement between age 55 and 59. Since 1992 this early retirement age is 60.

The effects of this difference are apparent in Figure 3 (see below). The average effective retirement age for females is much lower than for males. From the moment that the standard retirement age went up for females, you see that the differences become smaller. The effective retirement age in 2009 is not visible in the graph, but it is reasonable to assume that differences between men and women will be even smaller in the future.

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<sup>1</sup> <http://news.bbc.co.uk/2/hi/business/10326002.stm>

Figure 3



Source: OECD 2007

Pestieau and Stijns (1997) did research on social security and retirement decisions of Belgium. In their paper they make a distinction between four different age categories and did research on these categories. The labor force participation for older men declined since 1947 until 1978 (as you can also see in Figure 3). The female labor force participation shows a different trend. There is an increase for women between age 45 and 49. The oldest group (60-64) is declining. The general increase of labor force participation can be explained by a change of policy for women. This policy boils down to stimulating women to enter the labor market. Flexible work was promoted and retirement rules were changed (as mentioned above). You see however that this policy has no effect on the effective retirement age, as the oldest group (60-64) is still declining for women. Raising the standard retirement age for women was much more effective.

In Belgium there is a social security system for all working people since 1956. Over the years there has been an enormous increase of drawing social security, which tells us something about the generosity of the insurance (Pestieau and Stijns, 1997). The authors show that as well men as women received more and more social security until 1980. This means that pension benefits increased significantly. After 1980 the increase is smaller for men and there is even a decrease for women until 1987. But pension benefits almost doubled for both men and women nevertheless between 1960 and 1995.



There are three main pension schemes in Belgium, for the public sector, the private sector and the self employed. The way these three different groups are organized and financed etcetera differs per group. These schemes represent the first pillar and are financed to guarantee a minimum pension for everybody. Furthermore there is a second and third pillar. These private pillars are financed by employers (second pillar) and individual savings (third pillar). It must be noted that compared to the first pillar, the second and third pillar are very small in Belgium.

In 1926 Belgium had a compulsory funded pension system but since 1967 there is a pay-as-you-go system. Private-sector employees can retire between age 60 and 65 but an employee must have worked at least 30 years to be eligible for pension benefits before age 65. In comparison with France, where one has to work at least 40 years, this can be seen has an incentive to retire early, because the duration of work (30 years) is relatively short. The private sector pension is based on the salary owned during the entire career.

For public-sector employees standard retirement age is 65 but pension benefits are for the first time available at age 60. There are some conditions that determine the pension benefit for the public sector.

For the self employed early retirement age is 60 too, but there is a disincentive because pension benefits for men are reduced with 5 percent per year up to age 65 (Pestieau and Stijns 1997). In comparison to the United States, Belgium has a lot of options for several sectors for mandatory early retirement at age 60 and even before that. It is however impossible in Belgium to continue working after age 65, which means that the pension system is not very flexible. Continued working is not stimulated after age 60, because pension benefits are high and not possible after age 65. Pestieau and Stijns (1997) confirm this with a graph of people leaving the labor force and there are two explicit peaks at age 60 and age 65.

There are notable incentives to leave the labor force due to the (early) retirement systems. All kind of exceptions to leave the labor market before age 60 shift the effective retirement age down. If an industry, for example, has structural problems, retiring is possible as of age 50. Early retirement benefits are, on top of that, given as if one still has a job. These favorable agreements were stopped step by step since the end of the 80s.

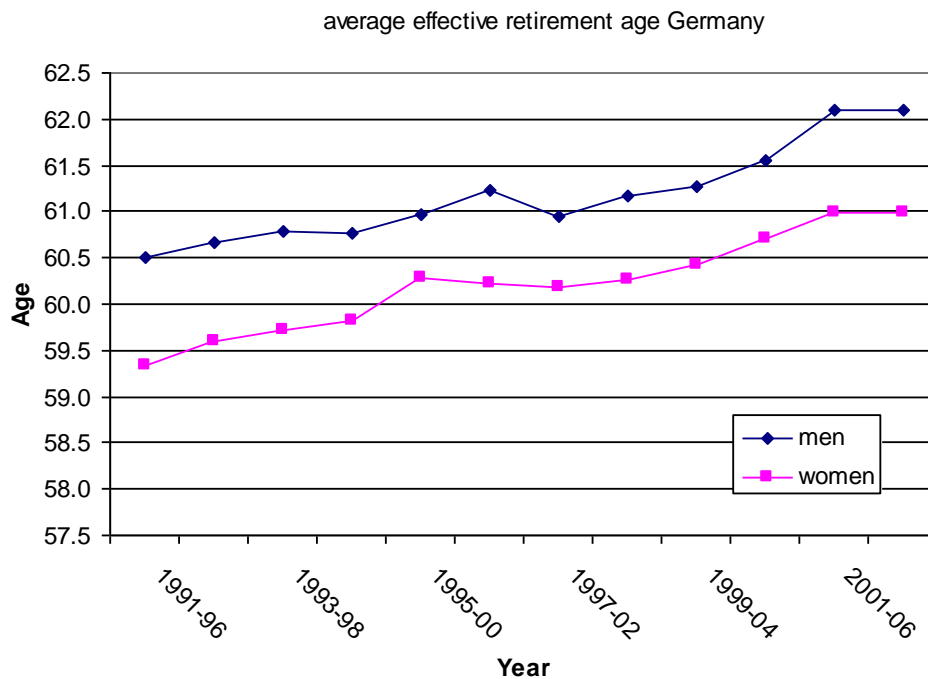
Noting the decline of effective retirement age over the years you must reckon with the fact that Belgium has had policy to force older people to retire to open up jobs for younger people entering the labor force. This is not only the case for Belgium. In the 80s, when there was a worldwide recession, a lot of countries used the pension system as a pathway for elderly to retire. Taking a further look at Figure 3 shows us that average effective retirement age has always been lower than for other countries (also in 1960). This can be partly explained by the incentives created by the Belgium (early) retirement pension system. General unemployment

is another explanation for this low rate. Unemployment is furthermore an important factor to explain the two downward spikes (especially for women) during the late 80s.

### *3.4 Germany*

Chancellor von Bismarck introduced a fully funded disability insurance in 1889. It was the first kind of social security system. The next step was a mandatory retirement insurance. Nowadays in Germany there is a pay-as-you-go system (since 1957) and this system in Germany is known as one of the most generous ones. This is the case because social security is mandatory for everybody except the self-employed (about 90 percent is covered by social security in Germany). The pay-as-you-go system is based on the average life-time income. Since almost all benefits are gained from public pension and only a small percentage of the German population uses additional private pensions, this makes it easier to analyze the effects of the social security system. In this system early retirement provisions give incentives of leaving the labor force. Before 1972 the early retirement age was 65 and nowadays it is 63. The unemployment insurance was introduced in 1972 and the pension system became much more flexible. That means that nowadays you see a peak of men retiring at age 60, while before 1972 the peak was on age 65. Early retirement is attractive in Germany because it is relative easy to access for example disability insurance. Börsch-Supan and Schnabel (1997) show that about 50 percent of people retired before age 60 use pre-retirement schemes. Unemployment insurance was attractive because it had no consequences for the public pension. The reform in 1972 results in an incentive to leave the labor force earlier and this is supported by time-series evidence (Börsch-Supan and Schnabel 1998). Between 1970 and 1980 the reform resulted in a decrease of effective retirement age from 63 to 58,5. Early retirement thus give a great incentive to leave the labor market earlier. Börsch-Supan and Schnabel (1997) give extra evidence where you see a great decline in labor participation for men aged 55-59 in the period 1970-1990. The same age-group for women shows an increase. Another feature of the German pension system is the flexible retirement available from age 63. Börsch-Supan and Schnabel (1998) use a microeconomic study to analyze if there are incentive effects for older-aged to leave the labor force. The German pension system is furthermore generous because the replacement rate is about 70 percent, which is high compared to for example the United States (53 percent). That means that benefits are 70 percent of preretirement income.

Figure 4



Source: OECD 2007

Figure 4 gives a somewhat distorted view because data is only shown from the averages of 1991-1996 to 2001-2006. Unfortunately the OECD has no data of the years before 1991. However using data and information of Börsch-Supan and Schnabel (1997), a strong decline of average effective retirement age can be seen if you look at a trend from 1960. Germany nowadays, is trying hard to raise the effective retirement age the past time as can be seen in Figure 4. Börsch-Supan and Schnabel (1997) show that since 1992 reform takes place to shift up the effective retirement age. Step by step the pension system changed and for example easy pass ways to early retirement were removed. If one retires before age 65, pension benefits will be reduced more than before 1992. Furthermore working after age 65 is stimulated by raising the pension benefits for people working after age 65. That the social system can not hold in the future is very clear and that is the reason why you see an increasing trend since reforms in 1992. Recently Germany decided to raise the standard retirement age from age 65 to 67. Effects of this reform are not yet visible, but will probably result in a rise of the effective retirement age.

Blöndal and Scarpetta (1999) used empirical results to do some micro economic research on possible pension reforms. Results are that if pension benefits are reduced, this has a small positive effect on the effective retirement age. If incentives for early retirement are taken

away, this could raise the effective retirement age with one year. Börsch-Supan and Schnabel (1998) calculated that early retirement can be accounted for 30 percent of people retiring early. They furthermore show that there is significant evidence for Germany that less healthy workers retire earlier. Finally statistically it is shown that if benefits are redistributed on a fair way, this has negative effects on retirement.

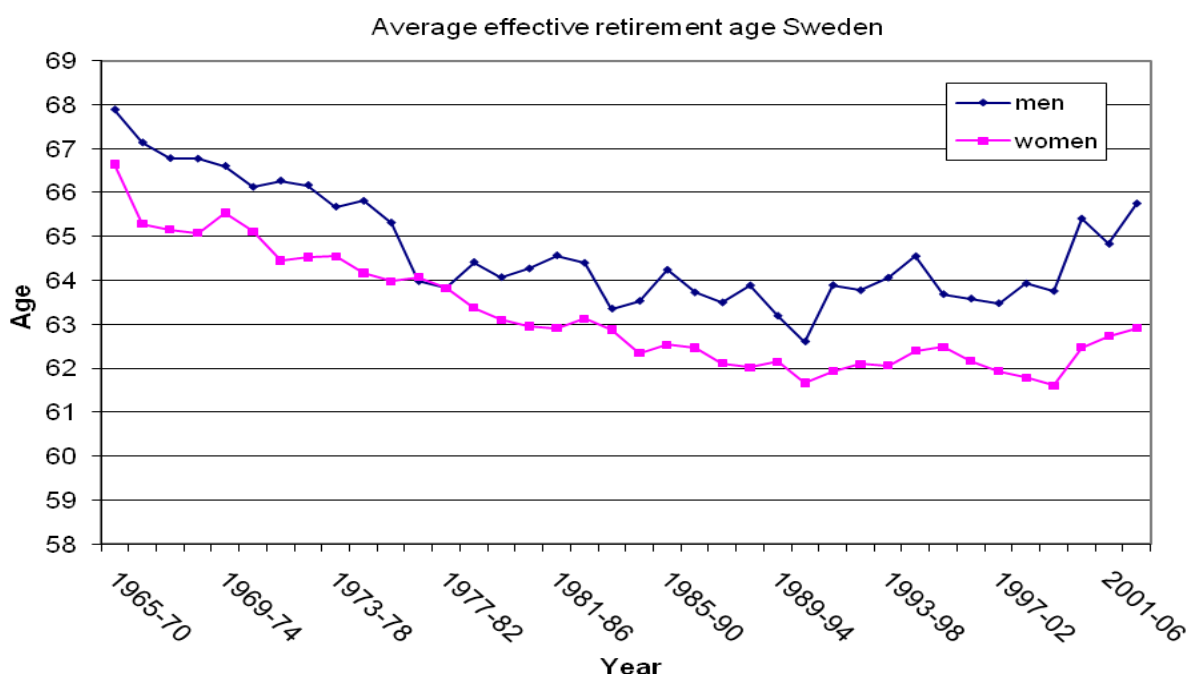
Concluded can be that the reform in 1972 had great negative effects on the effective retirement age. The reform in 1992 had less effect to increase this effective retirement age because early retirement still give great incentives to leave the labor market.

### *3.5 Sweden*

In 1913 an old-age pension was first available for all Swedish citizens. At that time it was a fully funded system. There was a means-tested basic pension and a supplementary pension, for which individuals could save money. Contributions to the basic pension were very low and therefore benefits were low as well. In 1935 the pension system changed to a pay-as-you-go system where employers financed the system. This change of system increased benefits, but did not result in an increase of government expenditures. Another reform took place at 1946, the means-tested pension changed into a basic pension.

Between 1964 and 1994 there is an enormous increase in demand of old-age pensions for men. This is partly caused by a decrease of mandatory retirement age in 1976 from 67 to 65 and other pension system reforms. But it can also be explained by demographic changes, for example the higher life expectancy. Palme and Svensson (1997) argue that the percentage of labor force participation for men decreased over time for two age-groups (60-64 and 65-74). Labor force participation for women shows an increasing trend between 1964 and 1994 for age groups between age 45 to 64. The decline for women in Figure 5 for average effective retirement age can be explained by the fact that labor participation for women is still significantly lower than for men. This is extra confirmed by the fact that labor force participation of women aged 60-64 did not increase significantly and there was even a decrease of women aged 65-74. Sweden is one of the Europe countries were the decline of labor participation over the years is rather modest. The labor participation for Swedish men aged 60-64 in 1996 was 57 percent (this percentage was 20 for among others the Netherlands and France). (Gruber and Wise 1998)

Figure 5



Source: OECD 2007

In Sweden there is a higher incentive to keep working than in most other (European) countries. Taxes on continued work are below 30 percent (in the Netherlands this rate is between 80 and 100 percent). These low taxes are an important explaining factor for the higher effective retirement age in Sweden compared to other countries.

In 1994 Swedish government agreed to implement huge reforms for social security in Sweden, these reforms are completed in 2001. Sweden changed a defined benefit system into a defined contribution system. This means that pension benefits depend on life-time contributions. The government decided to change to a defined contribution rate so that individuals make their own investment decisions.

Another element of this reform was that early retirement age increased from 60 to 61. You see in Figure 5 that for men, the average effective retirement age started to increase around 1997. For women this increase started around 1999. In 1994 there was already the emergency for reform of the pension system due to demographic changes. Raising incentives to keep working at older ages was an important issue of the reform. The increase of effective retirement age of men since 1997 was so strong that the effective retirement age around 2000 was higher than the standard retirement age. Two things can explain this. The earlier mentioned relative low taxes on continued work and if one decides to retire after age 65, the benefits of the pension are increased with a certain percentage.

The Swedish pension system nowadays has three main elements. There is the basic pension (pay-as-you-go system). Secondly there is the supplementary pension (ATP) which is a mix of pay-as-you-go and funded system (introduced in 1959) and finally the partial retirement pension. In Sweden the basic and the supplementary pension can be paid as an old age pension, a survivor's pension or a disability pension (Palme and Svensson 1997). The standard retirement age is 65. There are some disadvantages if one wants to work after that age because they can not claim unemployment insurance and on the labor force they are less protected than workers younger than age 65. On the other hand, taxes for people aged above 65 are lower. This low tax incentive is not the case for all countries in this analysis.

There are four main different pension plans for Swedish workers (two for the private sector and two for the public sector). Within these plans there are some differences in criteria and rules to build up a pension. In Sweden pension can be claimed from age 60 and as late as age 70. That pension benefits can still be claimed at age 70 is an advantage in comparison to for example Belgium where that age is 65. If pension is claimed before the standard retirement age, the amount of pension is decreased by a certain percentage (dependent on the pension plan) each month. If pension is postponed after age 65, pension benefits are increased by a certain percentage each month. Incentives for Sweden to stay on the labor force are therefore higher. Partial retirement pension and disability pension are two other ways to leave labor force earlier. Disability pension is only available for people who are completely unable to work. There are temporary or partial disability pensions for disabled people still able to work. Palme and Svensson (1997) show that the number of given disability pensions vary over time. In 1992 and 1993 the number of disability pensions was very high and in Figure 5 you see that for both men as women this had impact on the average effective retirement age. Especially for women there are five following years in which the average effective retirement age decreases.

In the early 1990s there is a strong decline of average effective retirement age visible for both men as women. This can be caused by the deep recession in Sweden and thus caused by a general redundancy of employees (Blöndal and Scarpetta 1999). Figure 5 also shows a rise for both men as women after that period, when economic growth started.

It is very important to notice that there are no peaks at age 60 or/and 61, the early retirement age, to leave the labor market. Palme and Svensson (1997) do see an increase of workers leaving the labor force but it is a gradual trend. The reason for this is that, even though, there are incentives to leave the labor force at younger age, it is detrimental to do this as soon as possible. There is a peak visible at age 65, which is the standard retirement age.

### *3.6 United States*

Social security in the United States was created in 1935. At that time the benefits of the pension were only available after age 65. In 1956 for women and in 1961 for men this minimum age was reduced to 62. The first system linked the benefits to the average of life earnings and on top of that, benefits increased per year in line with inflation. This led to financial problems, so in 1977 a new benefit structure was introduced, which is based on a wage index. Another big reform was made in 1983 when the normal age of retirement was raised from 65 to 67 (and is still in progress). This does not mean that the age at which benefits are first available has changed (62). But it does mean that if people claim their pension at age 62, the benefits are smaller than they were before (Diamond and Gruber 1997). Another part of the reform in 1983 was that new sectors were included in the social security system. More workers could therefore use the benefits and generosity of the social security and thus have incentives to leave the labor force earlier.

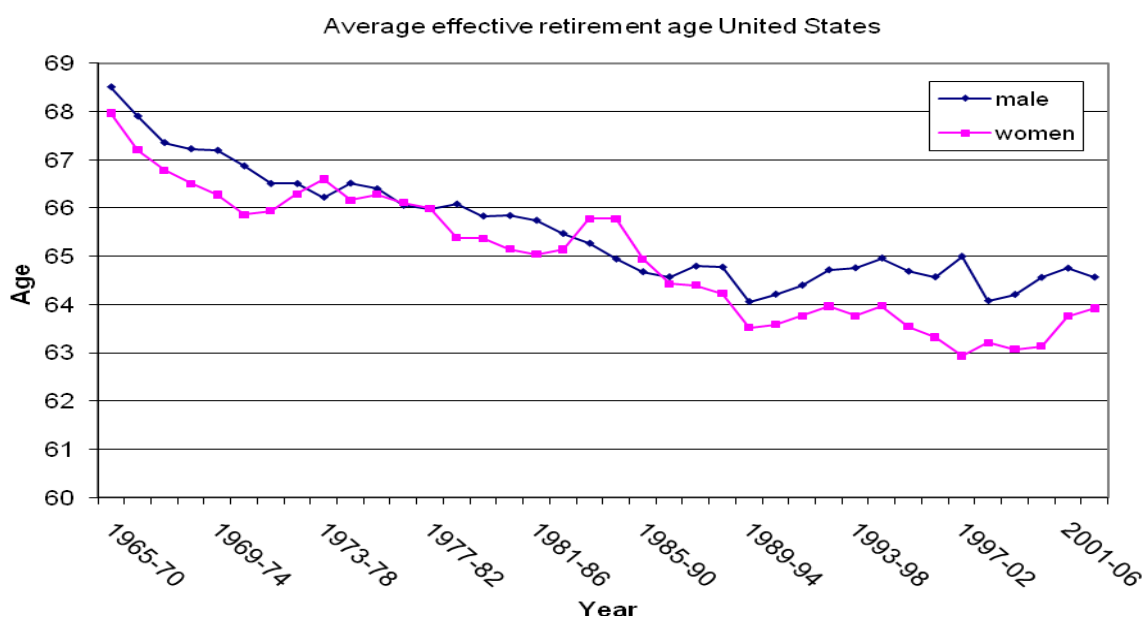
Besides the social security there is also the supplemental security income and disability insurance program. The supplemental security income is available for people (older than 65) with a low income or low social security benefits and for people who are disabled.

Private pensions are more important in the United States than for example in Germany. As of age 65 about 50 percent of all men receive income from private pensions. This percentage is much lower for women. The reason for this is that spouses in the United States receive benefits from the pensions of their husbands.

Diamond and Gruber (1997) notice two peaks of men leaving the labor force in the United States. These peaks are at the age 62 and 65, respectively the age where early retirement and normal retirement begin. These visible trends suggest that the effective retirement age is influenced by the pension system of the United States.

Figure 6 shows that average effective retirement age was above 68 for men and women around 1965 and nowadays it is around age 64 and even higher for men. In this same period Diamond and Gruber (1997) show that in that same period social security benefits increased. Coile and Gruber (2004) have done some recent empirical analysis and among others did research on the effects of raising the early and normal retirement age. Coile and Gruber (2004) note, just like Diamond and Gruber (1997) that between ages 62 and 65 most people leave the labour market. In other countries people often leave the work force earlier than the early retirement due to the fact that they stop working earlier and have easy access to unemployment insurance and disability insurance in contrast with the United States.

Figure 6



Source: OECD 2007

For the results of the analysis of Coile and Gruber (2004) there is a distinction between the 'wealth effects' and the 'accrual effects'. The accrual effects are the extra benefits of an extra year of work. The wealth effects are defined as the expected value of future pension benefits. If the wealth effect is high, people will tend to retire earlier and have more leisure. The accrual effects are an incentive to continue to work to have more consumption during the retirement. One part of the analysis consists of a policy simulation where the early retirement age and normal retirement age are raised with three years. They found that a raise of the retirement age could lead to leaving the labor force later. On the other hand if the Social Security will change to a policy where the replacement rate is 60 percent at age 65, this will lead to a rise of 2 or 3 % average annual retirement benefits. The replacement rate is the ratio of average pension income and average (wage) income. The current replacement rate is 53 %, so that means that with a replacement rate of 60 % the pension system in the United States is much more generous.

From a historical point of view the United States have a relative modest decline of labor force participation over time. The labor participation for France, Belgium and the Netherlands for men aged 60-64 declined from about 70 percent in the 1960s to around 20 percent in 1996. The United States had 'only' a decline of 82 to 53 percent (Gruber and Wise 1998). The problem for the social security is that the age group 60-64 has the largest decline for men. The trend for women is different. Even age group 60-64 shows a rise of labor force participation over time. This can be explained by the changing roles of women in society over



the years. In the period 1960-2000 the government of the United States namely had a policy to stimulate women to enter the labor market. A general explanation for the decline of labor force participation can be the increase of benefits of social security and Disability insurance. Those benefits rose more than 50 percent for men and even 100 percent for women between 1960 and 1993. Diamond and Gruber (1997) furthermore show that around 1950 about 60 percent of men aged between 65 and 69 still were active on the labor force. This percentage declined to 26% in 1990, thanks to a growth of social security. There is also a decline visible for men in Figure 6 for that same period.

That the average effective retirement age is not as low in the United States as for countries like Germany and France can be explained by the fact that there is not an as easy access to disability and unemployment insurance in the United States as in the other countries. Another factor for the relative high effective retirement age is that if pension benefits are claimed before the standard retirement age, those benefits are decreased by a certain percentage. That percentage is higher, the longer you retire before the standard retirement age. On top of that, pension benefits are increased with a certain percentage if one continues working after the standard retirement age. This means that an incentive is created to stay on the labor market.

### *3.7 The Netherlands*

Social security was introduced in the Netherlands after the Second World War in 1957. At that time the pension system was a pay-as-you-go system, based on the wages of an individual (Kapteyn and de Vos 1998). This so called AOW (this is the social security) is available for all person aged 65 and older. Benefits are at least as high as the minimum wage. Since 1980 social security benefits are fully linked to minimal wages. Most people in the Netherlands receive an occupational pension which can add up the social security. Kapteyn and de Vos (1997) show that about 80 percent of all men aged over 65 receive an additional private pension and this additional pension is almost always based on a defined benefit plan (a certain share of average earnings). Even before age 65 a significant part receives benefits from private pensions. Between age 60 and 65, 50 percent of all income comes from private pension benefits. The labor force participation rate after age 65 is very low thanks to the relative generous pension system. Besides there is a disincentive to work after age 65 due to the taxes that have to be paid, if one stays on the labor market. There are also some agreements which give incentives to leave the labor force before age 65. For example early retirement, unemployment insurance and disability insurance can be triggers to retire before age 65. These early retirement schemes are disposed at age 65 when social

security begins. Disability insurance was introduced in the Netherlands in 1967 and in 1976 this insurance was expanded and made available for self employed. The disability insurance is meant for people that are sick or disabled for longer time and these benefits do not run out after a while in contrast to the unemployment insurance. Until 1993 disability insurance was often used as an 'excuse' to retire. In other words it was an easy way to retire until the conditions were sharpened in 1993. However Lindeboom (1998) notes that this reform hardly affected persons aged over 45. An incentive to retire early can be found for unemployment insurance. If an individual loses his job after age 57,5 or later, he does not have to search a job actively to be eligible for the unemployment insurance. This means that if other conditions are satisfied unemployment insurance after age 57,5 can be seen as a preretirement possibility. Early retirement finally gives a great incentive to retire before age 65. It is organized via an occupational pension fund or by the employer. Kaptyen and de Vos (1998) note that since the 80s early retirement (the so called VUT) increased from 2 percent of the males in 1981 to 10 percent in 1987. That percentage was still rising after 1987 to 17 percent in 1995.

Pension benefits are available as of age 60. This results in a clear peak of men and women retiring at that age. In 1997 the Netherlands changed their early retirement system. Early retirement benefits were no longer based on a pay-as-you-go system, but based on a funded prepension system. We will explain the effects of this change in Section 4.

As mentioned earlier private pensions play an important part in the pension system of the Netherlands. These private pension schemes can therefore also partly explain the relative early retirement in the Netherlands. During the 80s early retirement became very common. Due to the recession, a lot of employees lost their jobs. Early retirement was used for older people to leave the labor market.

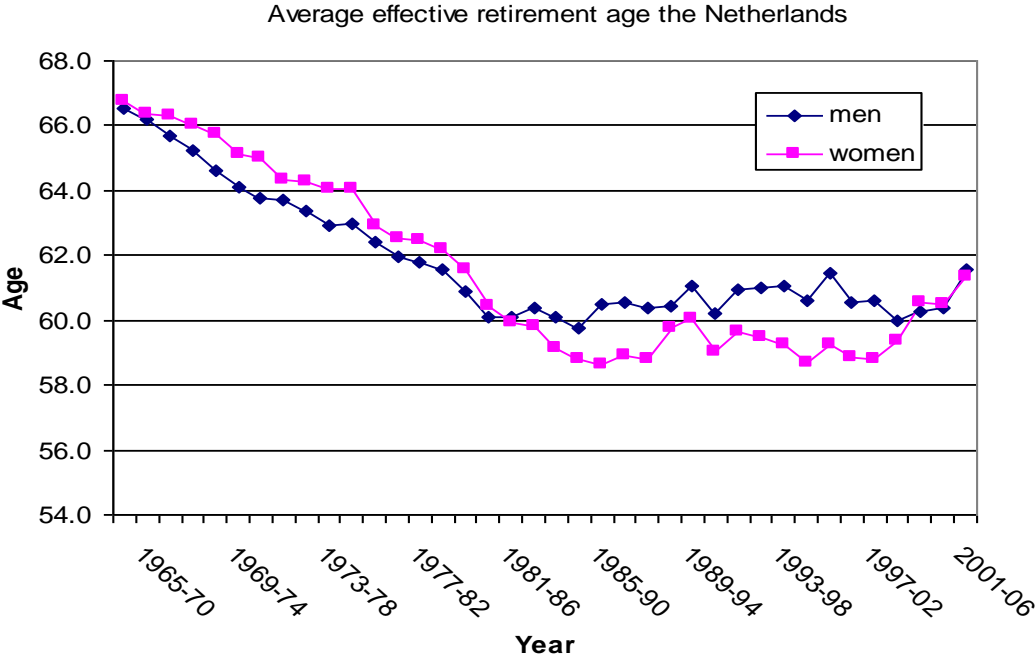
All these incentives result in a low labor force participation rate for workers aged 65 and older, but participation rate is also low for people below age 65. Between 1960 and 1995 decline was most extreme for people aged 60-64. For women labor force participation rate has always been much lower than for men but it has not declined between 1960 and 1995. For women aged between 45 and 59 there is even an increase visible.

Maarten Lindeboom (1998) furthermore shows that replacement rates and several exit routes are very important for the effective retirement age. He uses a model including these factors to come to some empirical results. Lindeboom uses data from a panel study with about 3500 households. Different factors are analyzed between 1993 and 1995 to say something about general motivations to retire and to look if early retirement schemes affect this choice.

Empirically it is proven that due to the incentives of early retirement schemes (including disability and unemployment insurance), people in the Netherlands retire as soon as

possible, that means at the age where pension benefits become first available. Changing exit routes (for example early retirement) can have effect on other pathways.

**Figure 7**



Source: OECD 2007

In Figure 7 a decline can be seen of average effective retirement age from 1965 until begin 1980 for both men as women. The decline continues for women until 1985 but stabilizes for men. As of that point average effective retirement age stays more or less at the same point, having both peaks up and down. At the begin of 2000 the effective retirement age begins to rise. At that time there is only little difference between retirement age of men and women. The biggest difference between both is in about 1995.

Blöndal and Scarpetta (1999) show that postponing the eligibility for early retirement can have large positive effects on the effective retirement age. But many people would still be able to retire early, using occupational pensions. These occupational pensions thus have a very important role. High replacement rates give another answer to the question why average effective retirement age is low.

With an empirical analysis we will now see what the effects are for the effective retirement age of changing the pay-as-you-go (VUT) system into a funded prepension system.

## *4.1 Empirical research*

After the Second World War, a time came of great economic growth. Welfare rose and these trends resulted in reforms of pension systems which made these systems much more generous. In the 90s it became clear that these generous benefits could not hold forever. Therefore you see in (almost) all OECD countries that measures are taken to reform the pension systems in a way that benefits are righteous distributed and affordable for the State. This often means that early retirement schemes are reformed. For the Netherlands this is also the case, but another reform is the change from a so-called 'vut-regeling' (this was a generous pay-as-you-go early retirement scheme) to a less generous 'prepension system' (a capital funded system). The 'vut-regeling' was among others generous because there was a constant percentage of entitlement, not depending on the age of retirement. This means that continued work is taxed, because a share of entitlement benefits are lost. The new system has also a lower percentage of entitlement (Euwals et al., 2006). In other words, with the new system, an employee pays more for leisure instead of getting leisure practically for free. The consequence is that less resources are available for leisure which leads to less incentives to retire early. However, no benefits were given at all before the permitted early retirement age. This means that under the VUT a clear peak was visible at the age where benefits were first available.

The greatest change with the reform is the way it is funded, as mentioned above, but this is not directly important for an individual, who is interested in the (loss of) benefits and change of rules. With the new prepension system full benefits are only given when an individual worked for at least 40 years (or 35 depending on the exact pension rules). A percentage of benefits is lost, if one retires earlier.

It is therefore interesting to see if the reform in 1997 has effect on the average effective retirement age. We will do empirical research on the effect of the reform of the early retirement schemes. First we will describe the data and the research methods. After that the results are shown and explained. We will also say something about the reliability and the robustness of the results.

## *4.2 Data*

It turns out to be hard to find data of the effective retirement age in the Netherlands on an annual basis. Therefore data is used from the OECD, but this data is an average of 5 years. This means that results are not as specific as it would be if annual data would be used.

For the explanatory variable, annual data is available. This data comes from the Central Bureau of Statistics in the Netherlands. For the sake of robustness, it is important to include enough variables, over a large time scale. If this is not the case, it is hard to have empirical significant results. For that reason, explanatory variables are selected only if data is available from 1965. This is also the year that average effective retirement age data is first available.

For the research it is important to include variables that determine the choice to retire or not. The average effective retirement age is the dependent endogenous variable. There are several explanatory exogenous variables to see if there is a relation with the effective retirement age. The most important one is the dummy variable which shows if the reform has a significant effect on the average effective retirement age. More information on the research and the use of this dummy variable can be read in Section 4.3.

The estimated level of influence and significance of the effect of the dependant variable shall be illustrated under here for each explanatory variable.

- Early retirement pension reform: We expect a positive and significant effect of the pension reform on the average effective retirement age. As already mentioned, this reform consists of several changes to remove earlier incentives for early retirement. If one decides to retire early, he has to pay more for the gained leisure. Also pension benefits are higher if you decide to retire later, which means an incentive to continue working.

Next it is important to include variables that determine the state of health. If a person is sick or disabled, this has large effects on his conditions to work. In general healthy people, have less incentive to retire, because the state of health allows him to continue working.

For this research, health is determined as life expectancy for men. This choice is made because we presume that if life expectancy rises for example, this results from the fact that health care improved and therefore also the general state of health. Another determinant of health is the percentage of health-related absenteeism. This is the total of days of absenteeism in percentage of the total days of work of employees.

- Life expectancy for women: Life expectancy in 1965 was much lower than it is nowadays in 2010. This means that people are now living healthier and that thanks to medical care people live longer. People nowadays are longer able to work, without having any health problems. Therefore we expect a positive significant effect of life expectancy on average effective retirement age.
- Percentage of health-related absenteeism: We expect a negative effect on the dependent variable. This means that if absenteeism has decreased over time, people are able to keep working longer and this results in a rise of effective retirement age.

Thanks to improved health care, we think that the absenteeism has decreased over time.

Other factors that are important for the retirement decision are the household situations of an individual, namely:

- Percentage married of total population: This variable is important for the effective retirement age because the decisions to retire are different for married people than for single people. Unfortunately enough data is not available for two-earner households because that affects the choice of both persons.
- Average number of children per woman: In the past decades this average declined from 3,1 to 1,7. A reason for this is that nowadays you see more two-earner households. Women are well educated and are more financial independent than 50 years ago. This has influence on the effective retirement age. That is why we expect that the average number of children per woman has a negative significant effect on the average effective retirement age. The reason for this assumption is that a lower average can indicate that both earners find it important to be financial independent and therefore are willing to work.

Income is another important factor for the retirement decision. If a person can not live to the same living standard during his retirement, this can be a reason to keep working. On the other hand, if one already has enough money for the rest of his life, this can give incentives to retire before age 65. Not only the income before retirement is important, possible income in the future is also important. It is important that the data of income is divided into different age-groups. It is not worthwhile to use data of income of age groups 30-40 for example, because at that age it has very little effect on the retirement decision. Data of income is especially important for people aged between 55 and 65 and for people aged between age 65 and older. Unfortunately the Central Bureau of Statistics has no data on the income. Further search made it clear that no data is available for income for the earlier mentioned age-groups. This must be kept in mind for the results of this empirical research.

It is furthermore important to take the social security entitlements into account. As already mentioned for each country early retirement schemes are very important factors for the decision to retire or to continue working. Two insurances are especially important, namely the disability insurance and the unemployment insurance. If a person can take the disability insurance into consideration before age 65, this has influence on the effective retirement age. Unemployment insurance is also known as a pathway to early retirement.

- Number of Disability insurances: we expect a negative significant effect. If the reform also results in stricter rules, this means that the number of disability insurance reduces. Incentives to retire early are removed. For example when disability insurance was first implemented, there was not much surveillance to see if everyone really applied. Nowadays there is more control, like an obligatory approval from a doctor.
- Number of Unemployment insurances: The same effect is expected as for the disability insurance. For unemployment insurance the same holds, that rules and conditions are stricter.

There lies a difficulty in the reliability of the results because the start of the reform was different for each economic sector.

### *4.3 Research and methodology*

The method that is used for the research is a time series analysis. For each variable (see above) data is used between 1965 and 2008. We want to test if the policy reform of 1997 has effect on the average effective retirement age. To do this we implement a dummy variable 'early retirement reform'. All years before 1998 are valued '0' and the years between 1998 and 2008 are valued '1'. By doing this we make a distinguish between both periods and see if the latter period is significantly different than the period 1965-1987. For the sake of completeness all other relevant variables are included.

To see if there are significant effects, use is made of a linear regression that has the following formula:

$$(1.) \quad Y = \alpha + \beta * X + \varepsilon$$

The regression is linear because we expect a linear relation between the average effective retirement age and among others the early retirement reform. Y is a column vector with the average effective retirement age. X is a matrix of 6 regressors and  $\beta$  is a parameter estimation vector.  $\alpha$  is a constant factor and  $\varepsilon$  is an error term. Most explanatory variables show a positive or negative linear trend over the years. The average number of children per women and the number of married couples are an example of a decreasing trend over the years. Life expectancy is a clear example, that has an increasing trend over time. For the sake of robustness we also look at auto-correlation and heteroscedasticity. With a linear regression you test if the explanatory variables have (significant) effect on the dependant

variable. For the reliability it is important to test if the explanatory variables correlate with each other or not. That is the reason why the test for auto-correlation is included. An extra test for auto-correlation is the Durbin and Watson test statistic, this test is included to.

To test for heteroscedasticity a F-test is performed. The F-test shows if there is a difference between the variances or not. The highest variance must be divided by the smallest variance. The F-statistics then follows the F-distribution using the degrees of freedom  $N(\text{large variance}) - 1$  and  $N(\text{small variance}) - 1$ . Dependent of the significance level you can see if the hypothesis with a certain F-value is rejected or not.

More information and results of the tests for auto-correlation and heteroscedasticity can be seen in Section 4.4. We will use a significance level  $\alpha$  of 5 percent. Statistical analysis's are performed in the statistical program SPSS.

#### 4.4 Results

First a linear regression is implemented using all variables mentioned in Section 4.2.

Not all explanatory variables really had influence on the dependent variable (due to for example insignificance), so we performed a so called "backward elimination". This method is used to include only the variables that have effect on the effective retirement age. This process excludes each time the least significant variable and this process is repeated until there are no insignificant variables left. All the other significant variables are shown in table 1. For each variable the coefficients, the standard error, the t-value and the significance levels are given. If the P-value is below 0,05, than the concerned variable is significant for the used significance level  $\alpha$  of 5 percent. Further below results are shown in Table 2 with corrections for auto-correlation and heteroscedasticity.

**Table 1**

	Coefficients		t	P-value
	$\beta$	Standard error		
(Constant)	4,428	19,797	0,224	0,824
Early retirement pension reform	1,511	0,355	4,259	0,000
Life expectancy for women	0,657	0,232	2,837	0,007
percentage of health-related absenteeism	0,539	0,184	2,930	0,006
Average number of children per women	3,357	0,729	4,605	0,000
Number of Disability insurances	-8,537E-6	0,000	-6,631	0,000
Number of unemployment insurances	6,197E-6	0,000	2,846	0,007

Results linear regression,

number of observations: 43

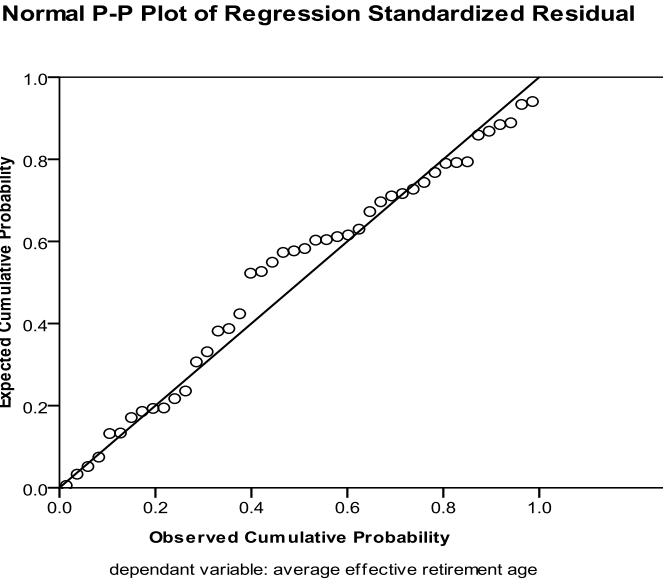


In Table 1 we can see that all variables, except the number of disability insurances, have a positive effect on the average effective retirement age. If we take a further look at the variable ‘early retirement pension reform’ we see that the coefficient  $\beta$  is positive and very significant. We can therefore assume that the reform from a VUT system to a Prepension system has significant effect on the average retirement age. In other words, it means that due to the reform, the effective retirement age has increased.

Life expectancy for Women has a positive significant effect. This means that as life expectancy rises, the effective retirement age rises too. From this we gather that better wealth nowadays gives the opportunity to keep working longer. The number of disability insurances has a negative significant effect. If there are less disability insurances over time, the effect is that effective retirement age rises. Like the life expectancy, this means that the improvements of healthcare compared to 1960 results in a delay of retirement.

It is very remarkable that three variables, namely the percentage of health-related absenteeism, the average number of children per women and the number of unemployment insurances, have a positive significant effect. For all three variables you would expect a negative effect. This positive effect for, for example the average number of children per women, means that how more children per woman how higher the effective retirement age. This is remarkable as explained in Section 4.2. We will give some explanations below, how we think these results are possible. It can be explained by autocorrelation and heteroscedasticity.

**Figure 8**



It is important that the residues have a normal distribution. In figure 8 we can see the relation between the observed and the expected residuals. These residuals are squared to see if there are any mavericks that can influence the results. As can be seen in figure 8, the residuals are more or less normally distributed, so that is not the case.

For the sake of reliability and robustness, we test for auto-correlation and heteroscedasticity. In the Appendix the complete table is shown of auto-correlation. The early retirement pension reform is significantly correlated with all other variables except the average number of children per woman. This variable is only significant correlated with the percentage of health-related absenteeism. For the rest all variables are significantly correlated with each other. A possible explanation for this, is that all time series show a same positive or negative trend. Due to the fact that these trends go to the same direction over time, auto-correlation is often significant. This is indeed not the case for variables average number of children and percentage health-related absenteeism because this latter variable does not have the same trend over time. It increases until 1979 and then decreases.

The Durbin and Watson test statistic is 0,873. The Durbin and Watson value always lies between 0 and 4. If it is smaller than 2 (which is the case) that means there is evidence of positive serial correlation.

To test for heteroscedasticity we use the F-test as mentioned earlier. We make a distinction of 2 groups. One group is before 1997 (including 1997) and the other group is after 1997. The former group is before the reform took place and the latter group is the years that there is a prepension system. The variance of the group before 1997 is 5,583 and the variance of the group after 1997 is 1,164. The F-value is 4,8 with N (31,11) so that means that it is reasonable to assume that there is significant evidence that the volatility ratio between both periods is different, even for a significance level  $\alpha$  of 1 %. In other words that means that it is reasonable to assume that there is heteroscedasticity and thus the reform of early retirement has effect on the heteroscedasticity. Heteroscedasticity shows that the hypothesis is rejected because F is high enough. In other words the period after the reform is significantly changed compared to the period before the reform.

For the reliability of the results it is necessary that some variables are corrected for auto correlation and heteroscedasticity. The results in Table 1 cannot be interpreted with enough certainty, because the explanatory variables correlate with each other. That is the reason why some coefficients do not have the positive or negative direction that you would expect. In order to correct for auto correlation we use the method of first differences. A reason for auto correlation can be that there is a certain trend in the variable. This is for example the

case for the life expectancy for women and the average number of children. Life expectancy has a rising trend over time and average number of children has a decreasing trend. The problem with these trends is that the former year is correlated with the following year. This problem occurs over the whole period. The first differences method removes this trend by way of taking the difference between each subsequent year. This method is applied to the following variables: life expectancy for women and the average number of children per women.

Furthermore it is necessary to correct for heteroscedasticity. That there is heteroscedasticity does not mean that the coefficient estimates are biased. However it can mean that variables are significant while the variables are too weak to give reliable results. To see if variables are indeed significant, heteroscedasticity is corrected by using 'weighted least squares'. This test is performed in SPSS and can be done because the variances are known.

In Table 2 the results are shown. Once again backward elimination is used to come to these final results.

**Table 2**

	Coefficients		t	P-value
	$\beta$	Standard error		
(Constant)	62,236	0,459	135,490	0,000
Early retirement pension reform	1,179	0,520	2,266	0,029
First differences: Average number of children per women	-14,543	3,250	-4,475	0,000
Number of unemployment insurances	-8,0E-006	0,000	-3,738	0,001

Results linear regression after correction for first differences and weighted least squares,  
 Number of observations: 43

The early retirement pension reform still has a significant positive effect on the effective retirement age. Furthermore there are two variables left that are significant. It is remarkable that, using the first difference method, the average number of children per women now has a negative effect. This means that a lower average number of children per women results in a higher effective retirement age. Compared to the results in Table 1, these results are more reliable. The correction for auto correlation and heteroscedasticity result in more robust results. The variables and the symbol of the variables in Table 2 are more trustworthy to interpret.

The number of unemployment insurances also has a negative significant effect. This effect can be explained by the fact that unemployment insurance is not as easy accessible as it was when pension systems were set up. Therefore a decrease of these insurances results in

an increase of effective retirement age. After the test for weighted least squares, all variables are still significant. This means that after correction for heteroscedasticity the coefficients are significant proven not to be underestimated.

While interpreting the results one must keep in mind that the number of observations is not very high. For the reliability of the research it is essential to have enough data. As already mentioned, if data is available of income of older-aged groups it is important to include this variable in the test. This is, namely, an important factor for the decision to retire.

## 5. Countries compared

In Table 3 you can see the data for each country of the average effective retirement age of the first period 1965-1970 and of the last period 2002-2007. There are several things that attract the attention.

**Table 3**

		France	Belgium	Germany	Sweden	The Netherlands	The United States
Average effective retirement age 1965-1970	Men	67,6	63,8	-	67,9	66,6	68,5
	Women	68,2	62,7	-	66,6	66,7	68
Average effective retirement age 2002-2007	Men	58,7	59,6	62,1	65,7	61,6	64,6
	Women	59,5	58,3	61	62,9	61,3	63,9

Source: OECD 2007

The first thing is that in the 60s effective retirement age was more or less the same for all countries except Belgium, where it was much lower. In that time the average age at which people retired was about 67. For Belgium this was age 63,8. If you look at the economic situation for Belgium in the 60s, you see that the social security system was already expanding and becoming more generous in the 50s. This explains the low average effective retirement age of Belgium. After the Second World War some countries started social security or other countries went through huge reforms. It was in that time that welfare rose enormously and there was a trade-off between leisure and income. This brings us to the second striking thing.

It is namely remarkable that effective retirement age declined significantly for all countries over time. For Sweden this decline was most modest, followed by the United States. For France and Belgium the effective retirement age in 2001 is even below age 60. It must be noted that for all countries, except the United States and France, the effective retirement age was even lower in the late 80s and 90s. As of begin 2000 a rise of the effective retirement age was visible for all countries. There are three main factors that can explain the general decline of effective retirement age for all countries.

1. Pension benefits rose enormously, thus there were more financial incentives to retire. This financial incentive is even higher due to the fact that taxes on work at older age, this makes it costly to continue working.
2. Early retirement (benefit) schemes were attractive and in some cases easy to access. Only Sweden and the United States had less easy pathways for early retirement.

Disability and unemployment insurances play an important role for the average effective retirement age.

3. An important factor for the decline is the change of the early retirement age and standard retirement age. A shift down or upward has large effects on the effective retirement age.

Concluded can be that there was a decline for all countries over time, but there are still some significant differences in-between the six Western countries. The higher effective retirement age of Sweden and the United States can be explained by the fact that social security is not as attractive as for the other countries. There are fewer pathways to early retirement. Besides that, pension benefits are reduced by a certain percentage if one retires before the standard retirement age. For the United States another factor for the high effective retirement age can be that early retirement is only available from age 62. The biggest difference between Belgium and the other countries is that the standard retirement age has not always been the same for men and women. This resulted in a lower effective retirement age for women. Standard retirement ages are nowadays (2010) the same and you can see that the difference of effective retirement age becomes smaller. France is the only country that has the same age for early and standard retirement age. Nevertheless countries like Belgium and the Netherlands have almost the same effective retirement age. This shows the importance of the generosity of the early retirement schemes of Belgium and the Netherlands.

Furthermore it is interesting to see how the (policy) reforms (or the lack of it) have effect on the average effective retirement age. The reform of the early retirement system in the Netherlands has significant positive effects on the effective retirement age. Pension reforms in 1992 in Germany had the same positive effects. When you look at Belgium on the other hand, early retirement incentives are not removed.

Currently most countries look at the possibility to raise the standard retirement age. Germany is already working on raising the standard retirement age to age 67. In the United States that progress is already active for years.

The main findings of the six Western countries are confirmed by the relative literature (Section 2). Mitchell and Fields (1983) indeed argue that financial incentives do have effect on the retirement decision. Furthermore Blöndal and Scarpetta (1999) and Gruber and Wise (1997) say that early retirement benefits are important too. Moreover taxes on continued work can be seen has an incentive to retire. Socio-economic characteristics and health status have changed over time and influence the effective retirement age. Like Schils (2005) argues, there is a cost versus benefits choice in relation to the retirement decision. Leisure for example became important after the Second World War which led to a consumption and leisure trade-off

## 6. Conclusion

For all countries it is a fact that thanks to economic growth after the Second World War, there was a general tradeoff between income and leisure. Early retirement schemes at that time had an important role for that tradeoff. In all graphs about the average effective retirement age, a declining trend is clearly visible over the time. Increased pension benefits, generous early retirement schemes and the age of early and standard retirement have effect on the effective retirement age. High pension benefits give incentives to retire because they are relative rewarding compared to wages with high taxes. The determined early and standard retirement age are very important because they decide on which age benefits become first available. For most countries you therefore see peaks of leaving the labour market at those ages.

The effective retirement age is higher for Sweden and the United States than for the other countries included in this paper. Flexibility is an explanation for this because one has access to pension benefits before and after standard retirement age. Moreover the benefits are reduced if one retires before standard age and are increased if one retires after standard retirement age. For France the standard retirement age and the early retirement age are both 60. This results in a peak of people leaving the labor market at age 60. Unemployment insurance and other generous (early) retirement schemes are other factors for the low effective retirement age. Unemployment insurance is an important factor for the early effective retirement age in Belgium too. Due to a lack of reforms in Belgium, problems are still visible. Germany, on the other hand, applied several reforms to raise the effective retirement age. However, there are still incentives to retire, among others due to generous early retirement schemes.

For all countries the problems of social security are obvious. Therefore, in most countries possibilities are investigated for further reforms, like raising the standard retirement age.

A problem for the Netherlands was the attractive and easy accessible early pensions. Therefore early retirement system changed from a pay-as-you-go (VUT) system to a funded prepension system. The new system was less generous and had a lower percentage of entitlement. We did empirical research on the effects of this reform for the effective retirement age. Using a time series analysis we found significant positive results of the reform. In other words this means that effective retirement age is significantly higher after the reform than before the reform. The results are checked by auto-correlation and heteroscedasticity. Research can however be improved by adding more data and more variables like for instance income.

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## 8. Appendix

**Table 4  
Correlations**

Control Variables	early retirement pension reform	life expectancy women	percentage of health-related absenteeism	average of number of children per woman	number of disability insurances	number of unemployment insurances
early retirement pension reform	1.000	.805	-.627	-.044	.817	.380
Correlation						
Significance (2-tailed)	.	.000	.000	.778	.000	.012
degrees of freedom	0	41	41	41	41	41
life expectancy women	.805	1.000	-.709	-.214	.888	.571
Correlation						
Significance (2-tailed)	.000	.	.000	.169	.000	.000
degrees of freedom	41	0	41	41	41	41
percentage of health-related absenteeism	-.627	-.709	1.000	-.388	-.712	-.799
Correlation						
Significance (2-tailed)	.000	.000	.	.010	.000	.000
degrees of freedom	41	41	0	41	41	41
average of number of children per woman	-.044	-.214	-.388	1.000	-.071	.115
Correlation						
Significance (2-tailed)	.778	.169	.010	.	.652	.463
degrees of freedom	41	41	41	0	41	41
number of disability insurances	.817	.888	-.712	-.071	1.000	.638
Correlation						
Significance (2-tailed)	.000	.000	.000	.652	.	.000
degrees of freedom	41	41	41	41	0	41
number of unemployment insurances	.380	.571	-.799	.115	.638	1.000
Correlation						
Significance (2-tailed)	.012	.000	.000	.463	.000	.
degrees of freedom	41	41	41	41	41	0