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CHANGING SAVINGS PATTERNS IN SWEDEN

Effects on private savings from the Swedish pension reform in the 1990s

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Abstract:
Many countries struggle to sustain their pension systems in the face of demographic shifts and increasing life-expectancies. Without reforms that deal with systemic funding issues, many pensions systems around the world might prove unsustainable in the years to come. Sweden successfully managed to reform its pension system in the 1990s. It did so by going from an unfunded Defined Benefit system to a partially funded Defined Contribution system. This thesis studies the effect on private savings from the reform, and a first-difference multivariate regression is used to identify this effect. The thesis also examines whether the size of the change, if any, in private savings is in accordance with the predictions of prevailing theory. Later, it is shown that there has been an increase in private savings as a result of the pension reform. However, it is argued that this increase is not large enough to offset the decrease in expected future payments. The most compelling explanation for the shortfall is found to be the possibility of working longer as a substitute to private savings. That leads to a prediction that people will choose to work longer to compensate for the insufficient increase in the private savings rate.

Keywords: pension reform, Life-Cycle Hypothesis, Precautionary Savings

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Table of Contents

Part 1 - Introduction 1

An Overview of the Swedish Pension System 3

The Pension Reform's Impact on Expected Future Income 5

Part 2 - Theoretical Framework 7

Past Work on Pension Reform and Their Effect on Savings 7

Life Cycle Hypothesis 8

Precautionary Savings 9

Hypothesis 11

Part 3 - Method - Testing the Theory 12

Theoretical Justification and Data Collection of the Regression Variables 12

The private savings rate 12

Income level and income growth 13

Dependency ratio 14

Liquidity constraints 15

The real interest rate 16

The government fiscal balance 17

Tax reform 17

Financial crises 18

Pension reform 18

Part 4 - Empirical Results 19

Variables 19

Omitted Variable Bias and the Inclusion of Variables 20

Regression Results 21

Part 5 - Evaluation of the Results 25

5.1 Evaluation from the Perspective of Established Theories 25

Life Cycle Hypothesis 25

Precautionary Savings Theory 25

Combined consideration 26

5.2 Insufficiency of Savings 26

5.3 Explaining the Shortfall of Savings 28

5.3.1 Habit Formation, Myopia or Intellectual Constraints? 28

Habit formation 28
Myopia 29
Intellectual constraints 30
5.3.2 Substitutes to Private Savings 31
Occupational pensions 31
Substitution of savings by working longer 32
Conclusion 34
Summary 36
Bibliography 37
Appendix 41

Tables and Graphs

Table 1 - Impact of Pension Reform 2
Table 2 - Variable information 20
Table 3 - Private Savings Rate 22
Table 4 - Private Savings Rate 23
Table 5 - Private Savings Rate 24
Table 6 - Replacement Rates (annuity as percentage of last earnings) 28
Table 7 - Replacement Rates (annuity as percentage of last earnings) 32
Figure 1 – Private Savings Rate 21

Part 1 - Introduction

Many countries struggle today to create sustainable pension systems due to the growing pressure from aging populations. Most reforms are based on transiting from an unfunded system, to a partially or fully funded system. An important motivation underlying many of these reforms is the notion that the accumulation of private pension assets would affect the savings rate. Many unfunded systems are critically underfunded, with insignificant assets compared to future liabilities. Thus, the need for reform is widely recognized, even though the reform of pension systems includes a very profound systemic change. A systemic change on that scale usually affects large parts of the economic system, such as public finances, capital markets, labor markets, saving and growth (Schmidt-Hebbel, 1998). This thesis will focus solely on the effect of the Swedish pension reform on the private savings rate, and will thus not focus on other aspects of pension reform. Many other studies have focused on different pension reforms' effect on the savings rate, since the savings rate also affects long-term financial trends in society, such as economic growth and investment. Sweden provides an interesting case study, since it has successfully adopted a hybrid system with partly funded and partly unfunded parts. The new Swedish system also manages to take changing demographics and faltering growth into account, in order to create a sustainable system. Little research has been made on the effects of these hybrid pension systems, partly because few countries have done similar reforms, and partly because the effects of the reform are only now becoming apparent.

The research questions addressed by this thesis are:

i) Did the Swedish pension reform in the 1990s give rise to an increase in the private savings rate?

ii) If there has been an increase, has this increase been sufficient to make up for lost expected future income?

Private savings are important not only as a way to finance reasonable pensions at retirement, but also as a main source of gross national savings in many countries. National savings in turn play a critical role in funding investments and inducing economic growth. Given the importance of the private savings rate, the pension reform and its impact on private savings rate becomes an important field to investigate. The topic of this thesis will thus give

valuable insight into a topic relevant to Sweden and other countries facing similar situations.

The new Swedish pension system has been phased in over time, with yearly cohorts born from 1938 up to 1953 receiving pensions partially from the old system and partially from the new system. It becomes important to estimate to what extent it is possible to accurately study the effects of the new system on the individuals' private savings patterns. After all, elderly workers might skew the results, as they do not need to adapt to changes in pension income in the same way that younger workers do.

Table 1.
Impact of pension reform*

Year[a]	Working-age cohort (21-63)	Aggregate Pension Reform Impact[b]
1999	1936-1978	80.07%
2000	1937-1979	81.97%
2001	1938-1980	83.89%
2002	1939-1981	85.46%
2003	1940-1982	86.98%
2004	1941-1983	88.38%
2005	1942-1984	89.73%
2006	1943-1985	91.14%
2007	1944-1986	92.56%
2008	1945-1987	93.95%
2009	1946-1988	95.23%
2010	1947-1989	96.35%
2011	1948-1990	97.32%
2012	1949-1991	98.14%

Note.

*) Data for each yearly working-age group comes from Statistics Sweden. The working-age groups have been calculated by adding together the total number of people aged 21-63 in a specific year. Individuals are assumed to start fully working at 21, and retire at the *average* retirement age of 63. For example, the working-age cohort in 1999 is the sum of live births from 1936-1978, in 2000 it is the sum of live births from 1937-1979, and so on. It is assumed that everyone born in those years is still alive, which allows a slight overestimation of the number of elderly in each working-age cohort, due to early deaths which are not accounted for.

a) For each year the size of the cohort of working-age people, aged 21-63, has been calculated. The reform was initiated during 1998.

b) Shows the extent to which the working-age population in that year will have its pensions from the new system.

Table 1 outlines the aggregate pension reform impact for the working-age cohort in a particular year. It measures the extent to which the working-age group will have its pension payments from the new pension system. To illustrate; in 2012 there were approximately 4 637 000 people in the age-span 21-63. The working-age cohort in that year will be 98.14% affected by the new pension system. That is to say, 98.14% of pension payments for that working-age cohort will be through the new pension system.

Since the individuals in the data are of working-age, they are able to react to changes in the generosity of the pension system by increasing or decreasing their private savings. As the aggregate pension reform impact is very high even from the beginning, it should be possible to ignore potential "phasing-in"-effects of the new pension system, where unaffected elderly workers skew results. After all, the working-age cohorts during the period 1999-2012 are going to receive the vast majority of their pension payments through the new system. This means that it should be possible to investigate whether the private savings rate has changed, without having to worry about elderly workers biasing the results.

This thesis will first provide a historical background for the Swedish pension reform. Second, it will provide a theoretical framework, which will lay the groundwork for how the reform will be interpreted. The framework will also provide the tools for formulating the thesis hypothesis. Third, an econometric model will be constructed, which will be empirically tested in order to observe the actual outcome on private savings of the pension reform. Fourth, the empirical results will be evaluated and interpreted through the perspective of the established theoretical framework.

An Overview of the Swedish Pension System

In 1994, several parties of the Swedish Parliament, which together represented over 90% of voters, voted to reform the Swedish pension system from the bottom-up. Four years later, the Parliament voted again for a specific package that would put the reform into law.

The previous ATP-system was a Notional Defined Benefit (NDB) system. It entailed that a worker would receive a pension equivalent to 60% of the average wage of his 15 last years in employment, in addition to the old, minimal, flat-rate old-age pension (*folkpension)*. The NDB system did not take into account life expectancy or early retirement; instead individuals were eligible for it as long as they had worked for at least 30 years. Furthermore, the system had a so-called PAYGO, or pay-as-you-go, setup. Practically speaking this meant that the system was unfunded; in essence paid for by the current generation of workers to the current generation of retirees. The main guarantee for a future pension was thus the hope that when a certain generation retired, there would be another young generation around to pay the bills (Settergren 2001, Palmer, Wadensjö 2004).

During the early years of the old pension system, with the economy booming and the numbers of retirees low, the system did not experience any significant pressures from a fiscal point of view. Indeed, consistent surpluses in the pension system allowed the creation and growth of the National Pension Fund (Allmänna Pensions-fonderna), which would eventually grow in size to 40% of GDP. As the golden post-war boom came to an end, however, financial clouds would soon emerge on the horizon.

By the 1980s, it had become apparent that the pension system would become unsustainable in the coming decades. The main reasons for this were two-fold. On one hand, the generous predictions about future economic growth had fallen far short after the mid-1970s. Pensions were price-indexed to a real growth factor higher than the actual real wage- and economic growth. This meant that the pension liability was growing faster than the economy as a whole, and faster than the wages of the workers who were meant to support it. On the other hand, falling birth rates and an increasing life expectancy combined to create a rapidly growing elderly part of the population, both in absolute and relative terms. In essence, a pension system designed for smaller elderly cohorts and prosperous times had come under pressure (Lundberg, Lindbom et al. 2001).

The reform of the 1990s was thus a response to the challenges that had emerged in the old system. It would replace the old NDB-system with two new parts. Firstly, and primarily, it used a new Notional Defined Contribution (NDC) setup. Secondly, the reform also set up a Funded Defined Contribution (FDC) part. Rather than having a defined benefit determined from the last 15 years of working, the reform started by looking at the entire pension contribution an individual had made throughout their working life. Every pension contribution made by an individual during their youth would be split into two parts. 2.5 percentage points, out of 18.5, would be inserted into an individual account. Once there, the account holder could put the money into mutual funds and watch it grow over the decades until retirement, when it could be withdrawn. The remaining 16 percentage points would not be saved in an individual account. Instead it would be paid out to current retirees in a classic PAYGO-setup. However, unlike how the old system had worked, these 16 percentage points were notionally logged in an individual account. Once logged, it awarded the account holder with ‘pension rights’, which provided the holder with a claim on future pension contribution cash-flows. Explicit in the setup was a clear connection between what an individual had *contributed* to the system and what he could expect to *receive* from it in the future (Normann,

Mitchell 2000, Palmer, Wadensjö 2004, Sundén 2000). In addition, built into the system was a mechanism for automatic balancing of pension assets and liabilities. At any one point, the department responsible for the pension system could map out the assets of the system, in the form of the National Pension Funds (AP) and the expected future pension contributions. It could also calculate the liabilities of the system, in the form of expected future pension payments. If the liabilities of the system would outgrow its assets, then the department was empowered to re-calculate the pension liability. In other words, the department would reduce expected pension outflows by lowering the growth factor used in computing future pensions until the liability was again in balance with the assets (Settergren, Holmgren et al. 2000).

The Pension Reform's Impact on Expected Future Income

The pension reform of the 1990s changed the situation for a large number of future retirees. The reform entailed a shift from an unfunded system to a partly funded system, but the more significant result of the reform was shifting risk from the state, and thus the tax-payers, to the retiree. The risk expressed itself in the form of increases in life expectancy and pension reductions due to the automatic balancing mechanism. In the earlier system, it would have been the problem of the state and the taxpayers if pension payments exceeded pension contributions, which in turn would have forced the state to either indebt itself to the hilt or continually raise pension contributions from the taxpayers.

As mentioned earlier, in the new system pension contributions were more or less fixed at 18.5 percentage points of the gross wage. 2.5 percentage points went to the taxpayers' personal accounts, and 16 percentage points went to continuous pension payments. The contribution straitjacket implied that the burden of demographic shifts would mostly be borne by the retirees.

First, increasing life expectancy is taken into account when pension payments are made. In other words, a retiree would have their notional account calculated as an annuity adapted to the number of years they were expected to live in retirement, with a proportionate slice of the account paid out each year. A larger number of years in retirement would thus mean a lower pension in any single year.

Second, if an unfavorable demographic shift would develop between retirees and taxpayers, retirees would receive lower pensions due to the automatic balance mechanism. After all, taxpayers would continue to pay pension contributions of 16 percentage

points to cover pension outflows, no matter the number of taxpayers compared to retirees. The pool of retirees would thus have their pensions adjusted to account for the future expected flow of pension contributions of 16 percentage points.

The two unfavorable demographic shifts are increasingly making themselves known as large generational cohorts retire. On one hand, the retired live longer than ever before, and the numbers of retirees grow almost year by year. On the other hand, a relatively constant labor-force is expected to pay the pensions of the growing number of retirees.

Given the ramifications of the reform and in light of demographic shifts, expected income in retirement for those who will receive pensions according to the new rules can thus most likely be said to have fallen, given a constant retirement age (Laun, Wallenius 2012, Selén, Ståhlberg 2007). It would thus be fair to consider the reform as having a substantial impact on any individual's circumstances, due to said changes in expected future income in retirement.

Part 2 - Theoretical Framework

Past Work on Pension Reform and Their Effect on Savings

In the past, several studies have been performed on the effects of pension reforms on the *national* savings rate. A limitation of these studies is that they focus on a more or less complete transition from an unfunded to a fully funded pension system. An array of countries have reformed their pension systems in past decades. They have, however, often moved from unfunded systems towards more or less funded systems. Three notable examples are Chile in 1981, Switzerland in 1985 and Australia in 1992. Naturally, that has influenced the focus of pension reform studies in the past. In these studies, there seems to be some evidence suggesting that a fully funded system is conducive to a higher rate of *national* savings, but these results are not necessarily relevant when another kind of pension system prevails. Sweden constitutes a hybrid case, with only a small part of the payments in the new system being fully funded. Indeed, out of the pension contribution of 18.5% of gross wage, only 2.5 percentage points goes to the fully funded part.

Schmidt-Hebbel (1998) examines the results from a significant amount of studies on the effects of pension reform on savings. He argues that the size of the effects on *national* savings from pension reform depends critically on how the transition deficit is financed. It also depends on the strength of intergenerational transfer motives and on possible crowding out of voluntary *private* saving by mandatory fully funded pension saving (Schmidt-Hebbel 1998). Private savings, however, have to be treated differently than national savings as a whole, since the focus is on the saving decisions of households alone. Factors which might influence private savings in a pension reform will thus be examined below.

First, there will be no significant redistributive losers due to the pension reform, as might have been the case when transitioning from an unfunded to a fully funded system. In a full transition, one or two generations would have to carry the burden of transition by paying double pension contributions. The necessity of double pension contributions stems from past pension commitments. The elderly at the time of reform would still have to have their pensions paid by the current workers. The current workers, however, would have to fund both their own pensions and also pay for the elderly. They would therefore be so-called redistributive losers, as they would have to pay much more into the pension system than they

would be able to get back. That would have had a major impact on their ability to save privately. Temporarily high pension contributions would weigh significantly on the capacity of the double-paying transition generations to put aside private funds for their retirement. Since the Swedish reform did not go that far, that kind of problem was averted in Sweden. Therefore, the private savings rate should not have been negatively impacted because of double payments during the transition.

Second, the new system left the size of the mandatory pension contribution unaffected at 18.5% of gross earnings. Any possible crowding out of voluntary private savings by mandatory saving should thus not affect savings in Sweden, as mandatory contributions did not rise.

To conclude, the construction of the new Swedish pension system, as a hybrid between an unfunded and a funded system, does not by itself lead to an increase in the private savings rate. It would, however, increase the *national* savings rate somewhat in the medium-run due to the 2.5% of gross wages going into fully funded individual pension accounts. The thesis will instead use a broader set of theories to formulate a hypothesis on the effect of the reform of the pension system.

Life Cycle Hypothesis

The Life Cycle Hypothesis is an established theory in the field of private savings, first proposed by Modigliani and Brumberg (1954). The main point of the theory is to show that individuals smooth consumption over the course of a lifetime, no matter their earnings at a given point in time. The theory therefore predicts certain savings patterns for individuals depending on which part of the life cycle they are in. Individuals should tend to dissave when old, when incomes are lower than consumption. The old, being retired and out of the workforce, tend to live off accumulated savings and the social transfers of the collective in the form of pensions. Meanwhile, those in the working population are predicted to save a portion of their income over the course of their work-life, with a peak just before retirement (Deaton 2012).

In the classical scenario for retirement, a retiree lives off his own accumulated savings in retirement. In a collectivist system with Notional Defined Benefit (NDB) pensions, the individual situation looks different. A forward-planning individual does not need to smooth consumption by saving surplus income in the same way as an individual without

access to social security does. Rather, he can expect to receive a certain level of income in retirement from the state until his demise. This reduces the need to consciously temper consumption during his working years in order to afford a decent standard of living later. Instead, it is sufficient to merely save enough to cover the difference between the public pension and the preferred level of consumption in retirement. On an aggregate level savings thus fall, as working individuals save less whilst pension contributions are consumed by those in retirement.

Arguably, this might be seen to be offset by his pension contribution to current retirees. However, that assumption ignores demographic shifts over time. The pension contribution burden on workers in 1965 was, after all, much lower than that in 1995, for example. Furthermore, a fundamental detachment between benefits and contributions in the old system makes it dubious to see it as a proxy for personal savings, as one's expected benefits from the system were only weakly connected with one's contributions. For this reason, the expected benefits in retirement ought rather to be seen as a given flow of income independent of personal savings, rather than as a proxy for them.

In accordance with the LCH, one would then expect individuals to adapt their behavior to prevalent circumstances. All individuals would expect retirement benefits in their old age, and theoretically behave accordingly. That would generate a downward pressure on private savings, as they simply would not be needed to the same extent in order to finance a decent living in retirement.

The implication of the pension reform was then to partially tear down the fabric of the previous given old-age income. The reform introduced new elements of risk in the calculation of old-age living, and lowered the expected income in retirement. The LCH would thus predict an increase in the level of private savings in order to compensate the fall in expected income from collective systems.

Precautionary Savings

There are some alternative theories and extensions to the LCH on savings. Some of these try to explain that consumption only very slowly adjusts to changes in permanent income, in violation of the LCH-theory. One main approach is precautionary savings (Morley 2007). It offers valuable insight into the determinants of savings behavior in response to uncertain future income; uncertainty which increases with the pension reform.

The theory of precautionary savings questions the basic assumption that an individual's consumption primarily depends on their estimated stream of long-term income. In a LCH-framework, one would expect to see a change in savings (and a change in consumption) only when the basic assumptions about the total discounted future income changes. The uncertainty of the income should not matter as much, as long as the total expected value of future revenue streams is unaffected. Several studies show that people do in fact react strongly to changing risk of future income, by changing the size of their precautionary savings, or "buffer savings". For example, self-employed individuals, who face higher income uncertainty, are found in one study to save 12 percentage points more of their income than employed managers. Furthermore, individuals tend to discount the future heavily. They tend to be "unwilling to spend today a dollar that in expectation will, but just possibly might not, arrive tomorrow" (Carroll, Samwick 1997). Some studies indicate that the share of precautionary savings out of total savings could be as high as 56% of total savings (Skinner 1988).

An implication of this theory is that government programs designed to reduce uncertainty should lead to decreased levels of aggregate savings. Government programs which decrease the income uncertainty of many individuals should affect the individual's desired levels of precautionary savings, which would thus decrease aggregate savings.

As has been stated above, the reform of the pension system in Sweden has transferred retirement income risk from the state and the taxpayers to the individual. Part of that risk is the risk of increased life expectancy in the aggregate population, and insufficient long-term economic growth. Furthermore, some degree of market risk is introduced through the introduction of the funded part of the pension system. Finally, the risk of individual poor health is increased, as a result of greater incentives in the new system to work longer. The risk of poor health thus becomes another factor which increases future income uncertainty. The transfer of risk, in this case, has a similar effect as an increase in income uncertainty, affecting savings behavior. Under the LCH, savings should be affected if the future payments can rationally be expected to change, which would change total expected life income. According to PST on the other hand, the increased uncertainty over future payments from the new pension system, regardless of the size of the change of these payments, should increase the current optimal wealth level. In aggregate, this should lead to increased savings until a new, higher optimum wealth level is reached.

Another potentially important feature of a defined contribution system is that it becomes less likely for politicians to change the setup once it has been established. Politicians do not have an incentive to meddle with the contribution rates, and have less leeway to change the system of payments that the system generates. Since the former pension system was untenable in the long run, it was obvious to most that it had to be reformed. As a consequence, the former pension system had a degree of political risk, a risk that would force a precautionary saver to compensate by acquiring larger wealth. At the same time, given the very infrequent changes of the pension system and the very high political cost associated with change, it is unlikely that the effect on savings from the change in political risk would have been, or should be, significant. To conclude, the main implication of the precautionary savings theory is that the increased uncertainty for the individual with the new pension model should, ceteris paribus, lead to an increased optimal wealth level, with individuals increasing their savings rate in order to reach it.

Hypothesis

The rest of the analysis will operate under the following hypotheses:

i) There will be an increase in the private savings rate due to the Swedish pension reform.

ii) This increase should compensate for lost expected retirement income.

Part 3 - Method - Testing the Theory

To test these hypotheses, this thesis will specify an econometric model in order to estimate the impact of various variables on the private savings rate in Sweden over time. The model will be multivariate, in order to offset omitted variable bias, where missing explanatory variables correlate with both the private savings rate and the pension reform. By sorting out the other effects of the other variables, the aim of the model is to find the effect of the pension reform on the private savings rate. The included variables will be chosen when they have a theoretical connection to private savings and also a conceivable connection to the pension reform. The regression will use observations from 1987 to 2012, a period of 26 years, with one observation per year. It is inspired by the work of Fredrik Öhrström, who created an econometric model in his master thesis, when attempting to establish the determinants of the Swedish private savings rate (Öhrström 2008).

The model used in the thesis will be similar in form to Öhrström's, although there will be some key differences. For example, the model developed in this thesis will contain more dummies than the one used by Öhrström, in order to capture effects from financial crises and the pension reform, which Öhrström did not try to do. In addition, two of his variables that were statistically insignificant were excluded entirely from the model in this thesis. These two variables are the stock market and a measure of variation in inflation. The first reason for their exclusion was that they lack a theoretical connection to the pension reform, which is key to ensuring that they control for omitted variable bias. The second reason was that they were highly insignificant predictors of private savings in Öhrström's test.

Variables capturing changes in the *occupational* pension system are not included in the regression. The possible contribution to changes in the private savings rate from occupational pensions will be elaborated upon in the section "Substitutes to Private Savings".

Theoretical Justification and Data Collection of the Regression Variables

The private savings rate

One of the simplest ways to define savings is as the difference between income and consumption. When focusing on households, private savings thus represent the

difference between take-home household income and household consumption. This measure includes savings such as private pension savings that might be affected by the pension reform.

The private savings rate acts as the dependent variable in the regression. It has been collected from the databases of Statistics Sweden and OECD, and calculated as a portion of disposable household income.

Income level and income growth

The theoretical connection between income growth and savings is mixed. Some theories predict savings to be positively correlated with income growth, and others that they are negatively correlated. In a simple form of the Life Cycle Hypothesis (LCH), savings have a positive correlation with increasing income. The LCH assumes that the young are prone to saving and the old are prone to dissaving. In a world with no economic or income growth, these two groups will ideally balance each other in their saving and dissaving, with neither outgrowing the other. In a world with economic growth, the young people in the workforce will be richer than the old retirees due to rising incomes, and will thus save more than the old can dissave. For that reason, the hypothesis predicts a positive correlation between savings and income growth (Modigliani 1970, Agrawal 2001).

The issue in the scenario above is that it implicitly treats income growth as independent of savings. If exogenously given economic growth occurs, then society will save more, but without growth it will not. Assuming a positive correlation between growth and savings can thus be enriched by including the assumptions of various growth models. Harrod (1939), Domar (1946), Solow (1956), Romer (1986) and Lucas (1988) all constructed models which utilize savings as an integral part of income growth. The central assumption behind these models is that savings equal investment, and investment in turn equals capital formation. The accumulation of capital then supports the generation of income growth (Agrawal 2001).

However, other studies argue that there is a negative correlation between savings and income growth. Forward-looking individuals might anticipate rising incomes, which would invalidate the need for saving a large portion of their income today. Instead they might choose to consume more today and recoup their expenditure with rising incomes tomorrow (Carroll, Weil 1994).

Using the Precautionary Savings Theory, the main determinant of savings is the uncertainty of future income. In such a setting, rising future income would be discounted as

uncertain. Thus, rational individuals' savings decisions would be affected mainly by changes in the uncertainty of their future income. The savings decisions would thus remain largely unchanged by rising incomes as long as the overall uncertainty is unchanged.

Nevertheless, several empirical studies have shown that there is a positive correlation between income growth and savings, even though that does not establish the causality between income growth and savings (Fry 1980, Giovannini 1983, Giovannini 1985, Lahiri 1989, Carroll, Summers 1991, Edwards 1996). In addition, Agrawal (2001) argues that the income level is important as well, not just the growth. This assertion has some empirical support, as higher-income individuals have been observed to save more as a portion of income than their lower-income peers. Furthermore, there is a connection between the real income growth and the pension reform, since insufficient income growth was part of the reason the pension system had to be reformed. Indeed, the old pension system had indexed its payments to a growth factor higher than the overall economic growth, as it had assumed a higher level of growth than what was actually experienced. Not including income growth in the regression might thus skew the results. This justifies including real income growth in the regression.

The income data used for testing the regression has been collected from the databases of Statistics Sweden. It represents the median real disposable income of consumption units in Sweden from 1987 to 2012. From that data the real growth rate of household disposable income has been calculated.

Dependency ratio

The dependency ratio in a society represents the portion of the population not in the workforce. Essentially, it is a ratio of the non-productive part of the population to the population as a whole, although the unemployed are also included in the workforce. Usually sizeable components of the non-productive part of the population are the elderly, particularly in countries with growing numbers of retirees. The implication of the dependency ratio for savings can be explained as a connection between income, consumption and savings. It is inevitable for the dependent part of the population to consume more than it produces. After all, it generates no income and still needs to consume to sustain itself. The independent part of the population, however, is the one that generates the income which is used to feed the entire population. This connects neatly into the LCH. The elderly consume more than they produce - that is to say they dissave. The younger workers produce more than they consume

- that is to say they save (Agrawal 2001). For that reason, as a country's dependency ratio inches upwards, it might be theoretically predicted that its savings rate goes down. For that reason, there is a valid theoretical reason for including the variable in the regression. Likewise, the predicted growth in the number of retirees was a major reason behind the pension reform, which reiterates the connection between it and the reform. After all, the pension reform did not happen in a vacuum. It was the result of predicted future funding issues due to demographic changes and shortfalls in economic growth. The dependency ratio thus connects both to the savings rate and the pension reform, and ought therefore to be included in the model.

The data on the dependency ratio has been collected from the website Quandl, which in turn attained its data from the World Bank. It includes yearly measures from the years 1987-2012. The calculation for the dependency can take different forms. The sample data has been based on dividing the number of those below the age of 20 and above 64 to the total population. That is to say, it is a measure of the dependent population to the population as a whole.

Liquidity constraints

A common assumption in discussions about the trade-off between savings and consumption is that there is an easy access to a financial market where savings can be stored and credit drawn. However, in many countries financial markets might be far from attaining the sophistication required to facilitate savings and credit to the extent which enables theories such as the LCH to function flawlessly. Financial market depth might thus represent a critical element behind the private savings rate, since it would alleviate the ease with which individuals could save surplus income and draw credit to consume more than their current income level. Empirical observations also suggest that it might be easier to save than draw credit in countries with rudimentary financial markets. In such cases, the private savings rate might be higher than it would otherwise have been, as individuals seeking to consume more than their income are often unable to do so, while there is nothing stopping thrifty individuals from saving as much as they want (Jappelli, Pagano 1998).

In a normal economy it would not be far-fetched to find a connection between financial development and the pension reform, by way of endogenous economic growth. Swedish financial markets prior to the pension reform arguably played a role in the level of

economic growth that prevailed, by way of investment credit. In turn, that lackluster economic growth emphasized the need for reform of the pension system. Controlling for the level of financial development can thus be considered theoretically valid, which makes it worthy of being included in the regression.

One method for doing so is by calculating the ratio of money or quasi-money to disposable income (Hopf 2006). However, due to a gap of five years in available data on money and quasi-money, another method has to be used. It is based on a method suggested by Bérubé and Côté, who use a ratio of household debt to disposable income (Bérubé, Côté 2000). The data has been collected from Statistics Sweden, for the years 1987-2012.

The real interest rate

The real interest rate represents the gain from putting off consumption for tomorrow rather than consuming today. As such it is a measure of the value of saving. If the real interest rate is enough to offset the individual utility discount factor, saving today and consuming tomorrow will generate a higher utility than consuming what one has today. Thus, a higher real interest rate would entice more and more individuals to start saving more money in order to maximize their utility. This is called the substitution effect (Bérubé, Côté 2000).

The substitution effect, however, would merely be one side of the coin. Another effect, the income effect, also becomes relevant when evaluating what the change in the real interest rate actually entails. Individuals might be net lenders or borrowers, which impacts their behavior in the face of increased real interest rates. Net lenders might find themselves suddenly feeling wealthy, as their future capital income flows would rise. In line with the LCH, they might thus decide to save less, not more, since their future expected income would be higher than before. Net borrowers might attempt to save more by paying down debt, but might be hindered from doing so by rising interest costs, which in turn might lower their ability to save (Bérubé, Côté 2000).

Overall it is not possible to immediately point out which effect will prove more significant than the other. However, even though the net effect might be intuitively unclear, it is a variable worth including in the regression due to its theoretical connection to the savings rate. Likewise, the correlation between the real interest rate and the pension reform might be found through endogenous economic growth. Higher real interests rates make investments harder to justify, and might thus stifle economic growth. Since a lack of economic growth was

a reason behind the pension reform, there is a plausible correlation between the two variables.

The data has been collected from Statistics Sweden, with yearly real interest rate averages for each year from 1987-2012. Tax effects have not been taken into account, since they differ both over time and for individuals. Instead, for the sake of consistency, pre-tax real interest rates will be used instead.

The government fiscal balance

One of the first established theories for how individuals' private savings rate is affected by changes in public savings is reflected in the theory of Ricardian Equivalence. According to this theory, rational individuals would consider public dissaving today as the herald of public saving tomorrow. In other words, a budget deficit today would be the sign of a budget surplus tomorrow, with rising taxes covering the difference. Therefore, a rational individual would save when the government was dissaving, and vice versa. After all, today's budget deficit would have to be paid for tomorrow in new taxes. Likewise, today's budget surplus would be reflected by reduced taxes tomorrow. The government fiscal balance, or in other words public saving or dissaving, should therefore not be dismissed, even though the Ricardian narrative has faced criticism over the validity of its assumptions (Bérubé, Côté 2000).

The government fiscal balance will be taken into account when building the regression, since, as established above, it has a theoretical base for impacting the private savings rate. In addition, the government fiscal balance is connected to the pension reform by way of its impact on public finances. An increasingly expensive pension system prevailed in practice for much of the timespan in the data due to retirees being covered by the old system. This would have been reflected in the public finances, and thus correlated with the emergence of the pension reform.

Data on the public deficit or surplus as a percentage of GDP has been collected from Quandl for the years between 1987 and 2012. It will be presented in a lagged form, as changes in private savings according to the Ricardian Equivalence are a response to incurred governmental expenditures.

Tax reform

In 1991, a significant tax reform completely changed the Swedish tax system. It split incomes into different categories, such as labor, firm and capital income, and significantly

lowered marginal tax rates (Blomquist, Eklöf et al. 2001, Daunfeldt 2002). Lower, simpler taxes on capital income are conducive to saving, which would imply that the tax reform would impact the private savings rate. Its theoretical impact on savings makes it worth including in the regression. The tax reform did not, however, significantly affect the size of the payroll tax; that is to say the tax that the employer pays for social security, pensions and so on. It is thus reasonable to assume that the tax reform does not directly affect the size of the contributions to the pension system. Moreover, the great institutional changes of the 1990s would likely be connected to each other, which would entail a connection between the pension reform and the tax reform. A dummy from 1992 and onwards has been included to control for the reform.

Financial crises

During the period of 1987 to 2012, Sweden has experienced two significant financial crises, with recessions occurring afterwards. According to the theory of precautionary savings, these might have impacted savings patterns as future cash flows became more uncertain for large groups in society, inducing them to increase their savings to get back to a higher optimal wealth. For that reason, there is a sound theoretical argument for including controls for the crises in the regression. Therefore, a dummy for 1991-1994 and 2008-2010 will be included. Furthermore, given the circumstances under which the pension reform was first decided upon, during the financial crisis of the early 1990s, there is a plausible endogenous correlation between the two variables.

Pension reform

The pension reform was introduced into law in 1998, but was primarily meant to go into effect for younger generations. In order to find the effect of changed private savings patterns, the regression will be tested with a dummy from 1999 and onwards. Furthermore, the regression will also be tested with staggered dummies for the pension reform introduction. The dummies used will be: a dummy from 1999-2002, one from 2003-2006 and one from 2007-2012. The reason for using staggered dummies is to see if the shift in savings changes over the years, that is to say whether it takes a while for people to start saving more than before.

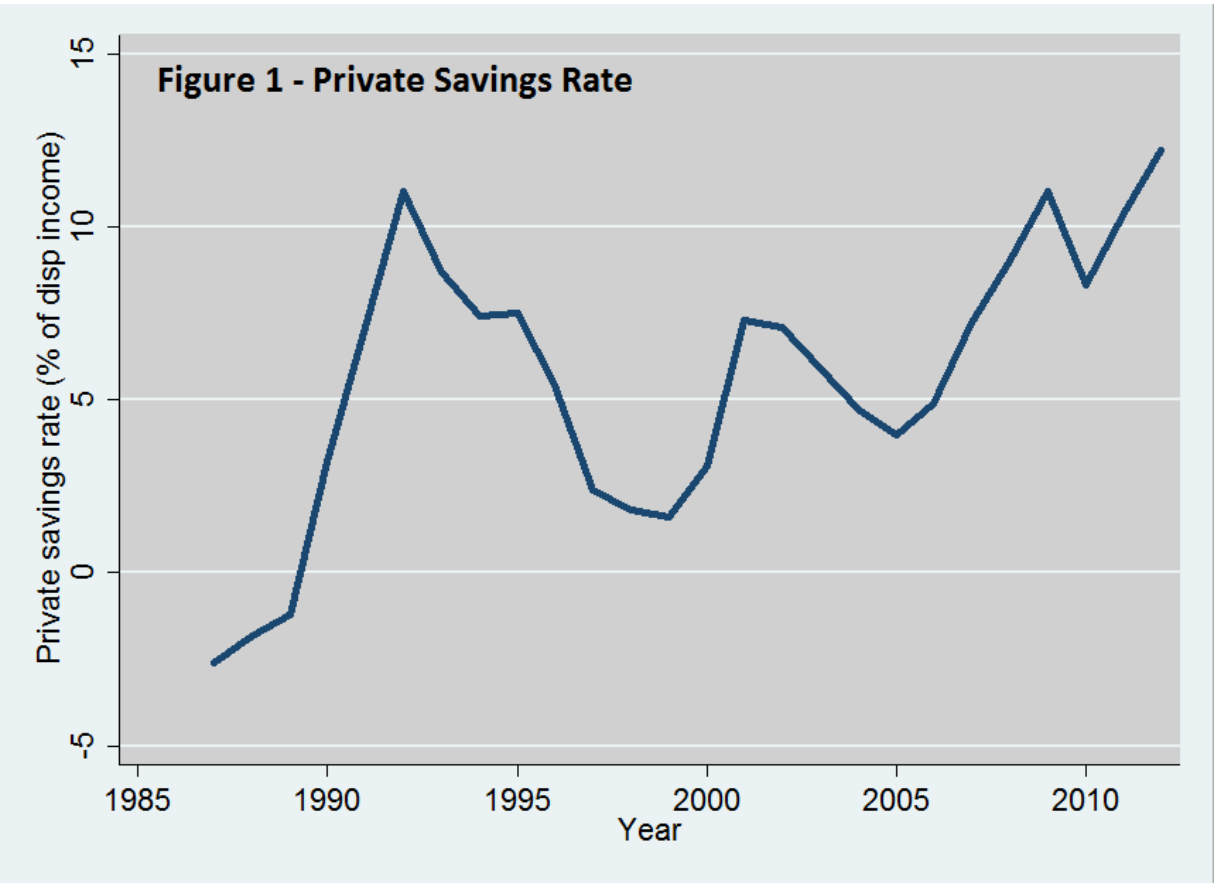
Part 4 - Empirical Results

Variables

The full set of variables in the regression can be seen below (for more information, see Appendix, part A and B). They have been presented in a table which outlines their expressed form, their unadjusted mean, as well as adjustments made to the variables for the final regression testing. The reason for using a first difference model is to sort away unit roots in the data due to its time series nature (See Appendix, part C). That allows the model to focus entirely on the relative changes of variables over time, rather than absolute levels. The three dummies in the regression have not been differenced, however. Instead the three dummies will be kept in the same form as they were in initially. In addition, three variables have been converted to a logarithmic form before differencing, for the sake of clarity when interpreting the results.

Table 2 - Variable information	**Form**	**Mean (unadjusted)**	**Adjustment**
Private savings rate	%	5.60	Diff
Pension reform	Dummy	-	-
Tax reform	Dummy	-	-
Financial crises	Dummy	-	-
Real disposable income	SEK	162.88	Ln, Diff
Real disposable income growth	%	2.033	Diff
Dependency ratio	%	45.07	Ln, Diff
Liquidity constraint	%	121.24	Ln, Diff
Government fiscal balance	%	1.00	Diff
Real interest rate	%	2.80	Diff

Over the period 1987-2012, the data shows that the private savings rate has been on average 5.6% of disposable household income. As conveyed in figure 1, however, this has varied greatly over the years.



Omitted Variable Bias and the Inclusion of Variables

Given that the objective of this thesis is to find the impact of the pension reform on the private savings rate, the primary purpose of all other variables in the regression has been to sort away the presence of omitted variables that would obscure the true connection between the private savings rate and the pension reform. For that reason, each variable was justified for inclusion not just for its theoretical connection to the savings rate, but also because of a conceivable correlation with the pension reform.

Regression Results

As discussed in the method part, this thesis aims at finding the effect of the pension reform. The output of the first regression can be seen below. The R-square of the regression is 0.8117, and the adjusted R-square is 0.6907 (See Appendix, part D).

Table 3 - Private Savings Rate (single pension dummy)		
Variables	**Coefficient**	**Significance**
Pension reform	1.459	0.156
Dependency ratio	-3.541	0.916
Real disposable income	47.162	0.063
Real disposable income growth	-0.291	0.066
Real interest rate	0.196	0.142
Governmental fiscal balance	0.092	0.456
Liquidity constraint	-33.895	0.003
Financial crises	-0.253	0.749
Tax reform	0.090	0.950
Constant	-0.806	0.540

In this first regression the pension reform has a significance level which is over 15%. However, some of the variables are highly insignificant, which raises questions as to their contribution to the model. Removing the variables with significance levels in excess of 0.5 gives a different outcome, as seen in table 4. This regression has an R-square which is 0.8102, and an adjusted R-square which is 0.7432, the latter which is substantially higher than the adjusted R-square from the previous regression (See Appendix, part D). The implication is that theoretically justified variables are dropped, which requires consideration for why they were

included in the first place, and how the results are impacted by removing them. However, the ultimately important thing is that control variables are relevant empirically, and correlate with both the private savings rate and to the pension reform. If they do not, it is not justified to keep them in the regression. The tax reform and the financial crises dummies were included because of the argument that they might potentially have correlated with the private savings rate and the pension reform. Since they were very highly insignificant, it seems this correlation is not strong, indicating that it is not necessary to control for them in the regression. Furthermore, dummy variables might be insufficient to measure the effect of the tax reform and the financial crises to an appropriate extent, which also supports that they should be excluded from the regression.

Table 4 - Private Savings Rate (single pension dummy)		
Variables	**Coefficient**	**Significance**
Pension reform	1.478	0.057
Real disposable income	46.844	0.006
Real disposable income growth	-0.287	0.033
Real interest rate	0.195	0.07
Governmental fiscal balance	0.110	0.265
Liquidity constraint	-33.314	0.000
Constant	-0.806	0.060

The pension reform coefficient above indicates that the introduction of the pension reform changed the private savings rate as a portion of disposable income by 1.478 percentage points. Furthermore, it is significant to a 5.7% significance level. There is thus reason to believe that the pension reform exercises a statistically significant effect on the private savings rate.

Another way to examine the pension reform is to utilize staggered dummies, which is done below. This regression has an R-square which is 0.8130, and an adjusted R-square which is 0.7133, lower than above (See Appendix, part D).

Table 5 - Private Savings Rate (staggered pension dummies)		
Variables	**Coefficient**	**Significance**
Pension reform 1999-2002	1.204	0.231
Pension reform 2003-2006	1.560	0.147
Pension reform 2007-2012	1.559	0.071
Real disposable income	48.649	0.008
Real disposable income growth	-0.294	0.041
Real interest rate	0.188	0.103
Governmental fiscal balance	0.112	0.286
Liquidity constraint	-33.633	0.000
Constant	-0.826	0.072

The regression above shows that the effect of the pension reform on the private savings rate seems to increase slightly over time. The effect also becomes more statistically significant. The implication of this is that people take some time to adapt to changes in circumstances, rather than changing immediately. Interestingly, what can also be seen in both regressions is that when first difference is used, all variables except for the government fiscal balance have fairly statistically significant variables. The three most significant ones, other than the pension reform, are touched upon below.

Since the liquidity constraint is in the logarithmic form, its coefficient implies that the private savings rate experiences a decrease of a third of a percentage point for every percentage point increase in the liquidity constraint. That is not surprising, as the measure for

the liquidity constraint is household debt through household disposable income. An increase in household debt implies, or at least correlates, with a fall in the private savings rate.

The coefficient on the logarithmic real disposable income shows that an increase of the real income level by one percentage point raises the private savings rate by 0.468 percentage points. This implies a fairly high propensity to save at higher income levels. This high level is not necessarily surprising, as prior studies have shown that individuals tend to save a higher portion of their income the more they earn. The median household in Sweden might have an income level where the marginal propensity to save is high.

The correlation between the change in the private savings rate and the change in real disposable income growth rate, RDIG, is shown to be negative. When the RDIG grows by one percentage point more *than the previous year*, the change in the private savings rate is -0.287 percentage points. At first sight that might appear strange. However, the outcome is supported by theory. When the RDIG is higher in the current year than the previous, individuals will alter their predictions for future wage levels. The higher income growth rate makes them believe that their future wages will be higher. Because of that, they will tend to save less today as a portion of income. Likewise, when the RDIG is lower in the current year than the previous, individuals alter their predictions so that their future expected wages are lower, due to a lower growth factor. They will then tend to save more of their income today than they previously did.

To test for the direction of causality of the results, a Granger causality test has been done (see appendix E). The test indicates that the causality is as suggested, going from the pension reform to the increase in private savings rate.

Rather than using the 1.559 percentage point change in the private savings rate from the 2007 to 2012 pension reform dummy, this thesis will continue using the 1.478 percentage point coefficient from the single dummy regression. The reason for doing so is that there is no clear indication of a statistically significant upwards moving trend. Furthermore, using a single dummy will avoid problems with an excessive use of dummies. The danger with grouped dummies, such as above, is that the different dummies might capture effects which are not due to the pension reform. For the purpose of clarity the thesis will thus use the single dummy regression as a basis for evaluating the effect of the pension reform.

Part 5 - Evaluation of the Results

5.1 Evaluation from the Perspective of Established Theories

Life Cycle Hypothesis

The prediction of the LCH is that a lower expected future income would be the trigger for an increase in private savings. After all, according to the LCH individuals are rational actors who seek to smooth consumption of their life-times. In this case, an arguably lower expected future pension would lead individuals to increase their savings in order to compensate for lost income in the years after the introduction of the pension reform in the 1990s. Lower incomes in retirement would, after all, imply an overall lower life-time income.

The findings in the empirical part confirm such an intuition. There is a statistically significant positive change in the private savings rate as a result of the pension reform, as shown by the use of a regression of the time-series data. Furthermore, the use of a Granger Causality test shows that the causality of the variables goes from pension reform to the savings rate, rather than the other way around. The change of private savings by 1.48 percentage points of disposable income therefore indicates that rational individuals perceived that the new pension reform would, on average, pay lower pensions than the old system. The data thus confirms the thesis hypothesis. Expectations of future income flows changed, and so did individual savings behavior in turn.

Precautionary Savings Theory

The view of the PST is that it is not necessarily a change in expected incomes which would change the saving patterns of individuals, but rather the perceived *risk* of future incomes. As has been argued, the pension reform did increase the measure of risk faced by individuals about their future prospects. For that reason, the anticipation from the PST was that the reform ought to have increased the level of precautionary savings; the protective armor of savings used to shield an individual from an uncertain future. Seen from the perspective of the PST, the empiricism of the case served to confirm the predictions of the theory. Uncertainty and risk increased, and thus savings rose in turn. The increase of 1.48 percentage points of disposable income was the change in savings deemed necessary to control for future uncertain cash flows. Uncertain cash flows might, after all, upset future standards of living for individuals, with great perceived disutilities in turn.

Combined consideration

The combined consideration of the LCH and the PST, where each consider a different aspect of the pension reform, brings forth the conclusion that the pension reform ought to have increased savings, and that it also empirically did so. So far, there is no problem in the theoretical conclusion of those two perspective. The major issue comes when one considers whether the increase in private savings was *enough*. It is not enough to conclude that saving patterns changed, one must also take into account whether the change was enough to offset the expected change in future incomes.

5.2 Insufficiency of Savings

In the empirical part, a statistically significant increase in private savings of approximately 1.48 percentage points of disposable income was found. According to the LCH, a certain increase in the private savings rate was expected. Rational forward-looking individuals who foresaw a decrease in pension payments would increase their savings to compensate for the loss of future income. Likewise, according to the PST, individuals who sensed an increased future pension uncertainty would start saving more to guard against adverse future income movements. However, the question becomes whether or not the observed changes in the private savings rate was large enough. The answer to this question depends on a number of variables. Examples are numerous, and include demographic projections on the future dependency-ratio, expected growth of the overall economy, changes in life-expectancy at retirement, and how occupational pensions have changed because of occupational pension reform in recent years.

The following will outline the size of the main pillars of the pension payments, calculated as replacement rates, i.e. the fraction of the last working year's salary that one gets paid out in pensions. The reasoning is based on Palmer, Wadensjö (2004).

Table 6. Replacement Rates (annuity as percentage of last earnings)

Age	NDC only (contribution rate 16%)[a]	Return for Funded Defined Contribution (FDC) (2,5%)[b]			Return for Private Savings (approx Δ1,1pp)[c]			Total replacement rate: NDC + FDC			Total replacement rate: NDC + FDC + ΔPS		
		2%	5%	8%	2%	5%	8%	2%	5%	8%	2%	5%	8%
61	24%	4%	7%	15%	2%	3%	6%	28%	31%	38%	30%	35%	45%
62	25%	4%	8%	16%	2%	4%	7%	30%	33%	41%	32%	37%	49%
63	**27%**	**5%**	**9%**	**18%**	**2%**	**4%**	**8%**	**31%**	**35%**	**45%**	**33%**	**39%**	**52%**
64	28%	5%	9%	20%	2%	4%	9%	33%	38%	48%	35%	42%	57%
65	30%	5%	10%	22%	2%	4%	10%	35%	40%	52%	38%	45%	61%
66	32%	5%	11%	24%	2%	5%	11%	38%	43%	56%	40%	48%	67%
67	34%	6%	12%	27%	3%	5%	12%	40%	46%	61%	43%	51%	72%
68	36%	6%	13%	29%	3%	6%	13%	43%	49%	66%	45%	55%	79%
69	39%	7%	14%	33%	3%	6%	15%	45%	53%	71%	48%	59%	86%
70	41%	7%	15%	36%	3%	7%	16%	48%	56%	78%	52%	63%	94%

Note. [a)] The table is based on a Swede born in 1975, with a life expectancy of roughly 86 years at age 65. The individual's earnings are assumed to grow at a real rate of 2 percent per year throughout the earnings career, which starts at age 22. Life expectancy estimates have been taken from Palmer, Wadensjö (2004).

[b)] The rate of growth used for indexation of capital in the NDC system is 1.6 percent. The pay-as-you-go, FDC and private savings annuities are all based on unisex life expectancy.

[c)] The 1.48 percentage point increase in private savings comes from the regression model. A tax rate of 25% has been assumed for the median household, which means that 1.48 percentage points of disposable income is roughly approximated to be 1.1 percentage points of gross income. Changes of pension payments due to expected changes in the dependency-ratio are not accounted for in the table. Lastly, pp signifies percentage points.

Table 6 gives a stylized estimate of how the replacement rates could look. As is made evident by the table, the current pension system incentivizes the individual to postpone retirement in order to acquire a higher replacement rate, especially in the FDC and private savings parts, where the return is higher. Indeed, an increase in the average pension age has been observed after the new pension system went into effect in 1990s. However, compared with the 1980s, average retirement age has been relatively constant at 63.4 years (Pensionsmyndigheten 2014; Korta pensionsfakta). For that reason, this thesis will treat retirement at 63 as the 'normal', and observations of a savings shortfall will be based on that.

Using the rough estimate from table 6, at age 63, the replacement rate would be 35%, assuming a 5% annual return on the FDC. The assumption of a 5% return is justified by the observed average return of 5.1% since the creation of the FDC (Pensionsmyndigheten 2014; Korta pensionsfakta). Palmer estimates an additional 17 percentage points in replacement rate from an average group occupational contribution.

The comparison with the replacement rates of the old pension system is unfavorable. In the old system, one would receive 60% of the average wage from the last 15 years of working, which implies a replacement rate of 52%, given a 2% real income growth per year (see

Appendix, part E). Furthermore, the former pension system included a *Folkpension*, which gave 96% of a base amount (*basbelopp*) to an unmarried pensioner and 78.5% of a base amount to a married pensioner. Given data on the proportion of married people in Sweden, an average pensioner would thus receive approximately 80% of a *basbelopp*. As a fraction of an average salary, this indicates a replacement rate of approximately 10 percentage points. The *folkpension* and income pension together would thus compensate approximately 63% of the last salary. Based on the assumptions above, the new pension system constitutes a decrease of 28 percentage points of the average retiree's pension as part of the final wage, given a retirement at age 63.

When taking the observed increase in private savings into consideration, the difference shrinks to 24 percentage points. The increased level of private savings thus accounts for approximately 15% of the increase in savings that one would expect to see under the LCH. In order to make up for the shortfall an individual would, under the assumptions above and a 5% annual real return, need to save 7.5% more of his gross wage. The observed change, however, is a mere 1.1% of the gross wage. In the following section, some alternative theories and practical issues are used to attempt to explain the shortfall.

5.3 Explaining the Shortfall of Savings

5.3.1 Habit Formation, Myopia or Intellectual Constraints?

Habit formation

Some studies modify the LCH with the notion of "habit formation". Habit formation relies on the idea that an individual's past consumption affects the utility he derives from present consumption. This model is usually used to explain aggregate "excess sensitivity" and "excess smoothness", relative to high or low income growth, observed in some studies. A person would on the one hand overreact to an expected future higher income, immediately increasing consumption and on the other hand "underreact" to a decrease in future income by not decreasing consumption enough. One way to explain the phenomenon is that people seem to be less concerned with changes in absolute consumption rather than changes in relative consumption (Alessie, Teppa 2010). The lack of a full adjustment for the expected decrease in future income, observed in the previous part, can be explained by this phenomenon. Individuals keep their consumption levels constant to a higher extent than the LCH suggests that they should, since they dislike relative decreases in consumption. The

theory would suggest a gradual adaptation to new circumstances. People adapt to a new, lower expected life income with inertia, and exhibit an excess smoothness in the change of consumption patterns. Different model specifications were tried to test this, including the use of staggered dummies over periods of years after the reform was introduced. A statistically significant increase in savings over time was observed, which pointed towards inertia in changing consumption patterns. One possible interpretation is that consumption is *still* untenably high; individuals exhibit a prolonged excess smoothness of consumption. Thus, the fully realised effects on savings from the pension reform will perhaps not be visible until at a later stage in the future, as yet unobserved. It is also possible that habit formation together with a high uncertainty as to what the actual future payments will be, could produce this prolonged consumption smoothness.

Myopia

Other studies also allow for boundedly rational phenomena, such as myopia in consumption decisions. Myopic individuals tend to have irrationally high discount factors when making consumption decisions between now and the future. A primary reason for this is their inability to realize today the actual utility they would derive from consumption in the future. Their consumption patterns today thus reflect the low present value they attach to future consumption. Myopic individuals can therefore have a hard time saving money today rather than consuming it, and might chronically under-save throughout their life. Once they retire they would feel the brunt of lower pensions, since they would have small private savings to compensate for the fall in future income. Such individuals would be better off if the government could force them to use their unrealized utility function in these choices by forcing them to save for their old age.

In that regard, the former pension system was more optimal for myopic individuals, as it forced them to contribute into a collective system. Once they retired, they had their contribution paid back to them in the form of pensions. The new system, on the other hand, provides lower payouts whilst leaving the responsibility of providing for the income shortfall to the individuals. Myopic individuals, with their irrationally high discount factors, would then fail to save sufficiently to have a decent standard of living in their old age. The increase in savings after the pension reform would thus be sub-optimally low. Indeed, the observed increase in savings represents approximately 15% of the increase that could be

expected, given a 5% return and a constant retirement at 63. This could be explained by a fraction of the population increasing their savings behavior according to the new lower future income, while the rest of the population acts myopically. In fact, it is usually modeled that a fraction of the population does indeed act upon more rational discount factors and utility functions than other portions of the population (Cremera, Pestieau 2011). The empirically observed shortfall of savings could thus simply be the result of myopic individuals failing to provide for the future adequately.

Intellectual constraints

Another theory that could explain the shortfall in private savings is that of intellectual constraints. In the modern world, information is power. Information is also asymmetric. Even rational individuals cannot keep track of every relevant piece of information, especially when the information is ambiguous. The pension system is an example of that. Relatively few people have a good understanding of how the system works and, more importantly, what they can realistically expect from it. As a result, rational individuals might act differently with incomplete information than they would have with complete information (Chan, Huff Stevens 2008). The observed increase in the private savings rate by 1.48 percentage points might thus be an insufficient response to a lower expected future pension. Indeed, given a 5% return and a constant retirement age of 63, an ideal increase in the private savings rate because of the pension reform would be 10 percentage points of disposable income. However, insufficient information makes rational individuals unable to comprehend the consequences of their actions. They might go on believing that they have taken sufficient measures to guard against future pension declines, only to find themselves surprised later on by the reality of their situation. Silentium, a consultancy in insurance, found in a study (2011) that Swedes believe that they will get 66% of their last salary as a pension, and furthermore that they believe that they would need 85%. Reaching a replacement rate of 66% is very optimistic, given the current level of savings, and it indicates a gap between expected pensions and the real pensions that most people will get. The Swedish Government seems to be aware of this problem, since they have launched the site “minpension.se”. This should, if adopted widely, help reduce the searching cost of calculating the size of one’s future pension. Over time that would allow rational people to better adjust their current labor supply and consumption decisions to a more accurate assumption of future pension income.

5.3.2 Substitutes to Private Savings

Occupational pensions

In Sweden, approximately 90% of the population is covered by contracts giving them some sort of group occupational pension (Pensionsmyndigheten 2014; Korta pensionsfakta). There are four different group occupational contracts, which on average pay 3.5% of the gross salary. In more modern contracts these funds go, like the FDC, to a personal account where the individual can invest them into pension funds (Palmer, Wadensjö 2004). *Changes* in the size of the occupational pension contribution would directly affect the expected replacement rate. In table 7 it is shown that a 3.5% contribution rate would add 12 percentage points to the total replacement rate, given a 5% real return and a retirement age of 63. With a 4.5% contribution rate, the occupational pension would add 15 percentage points to the total replacement rate under the same conditions. This effect is more articulated if one retires later, as one combines the effect of adding more money to the pension account, additional years' return on capital, and fewer expected years in retirement to split the pension payments.

Table 7. Replacement Rates (annuity as percentage of last earnings)[a]

	Group occupational pensions 3,5% contribution			Group occupational pensions 4,5% contribution			Total replacement rate: NDC + FDC + ΔPS + Occ. Pensions (Δ1 pp)		
Age	**2%**	**5%**	**8%**	**2%**	**5%**	**8%**	**2%**	**5%**	**8%**
61	6%	10%	20%	7%	13%	26%	31%	37%	51%
62	6%	11%	22%	8%	14%	29%	33%	40%	55%
63	**6%**	**12%**	**25%**	**8%**	**15%**	**32%**	**35%**	**43%**	**60%**
64	7%	13%	27%	9%	17%	35%	37%	46%	65%
65	7%	14%	30%	9%	18%	39%	40%	49%	70%
66	8%	15%	34%	10%	20%	43%	42%	52%	76%
67	8%	17%	37%	10%	21%	48%	45%	56%	83%
68	9%	18%	41%	11%	23%	53%	48%	60%	91%
69	9%	19%	46%	12%	25%	59%	51%	64%	99%
70	10%	21%	51%	13%	27%	66%	54%	69%	109%

[a)] This table has been calculated in the same way as table 6.

One way for individuals to compensate for the decrease in income from the new pension system is thus to bargain for an increase in their employer's contribution to their personal pension accounts. In fact, in 2008 SAF-LO with approximately 2.8 million members reached an agreement to raise the contribution rate from 3.5% to 4.5%. This might be seen as an indication that people indeed use the group occupational pension system to increase their

retirement savings (Pensionsmyndigheten 2014, Pensionsåldersutredningen 2011; Tjänstepensioner och utträde, Korta fakta). It would be the response of a rational individual who foresees a decrease in future income, and who seeks to compensate for the loss with increased savings, albeit not from a strictly personal source. At the same time, the change still doesn't compensate fully for the unrealized increase in savings which was expected from the pension reform. Furthermore, as of yet only a portion of the working population is covered by this more generous contribution to the pension savings. Finally, other factors affect the formation of occupational pensions, such as wage bargaining dynamics. However, larger occupational pensions might play a bigger role in an individual's planning for retirement in the years to come.

Substitution of savings by working longer

In the new pension system, the effect of working for an additional year has a significant impact on yearly incomes in retirement. For example, by working until 65 instead of 63, an individual would increase their replacement rate by approximately 6 percentage points. By working until 67, they would further increase it by 6 percentage points. For the individual, working longer is an easily available substitute for many years of private savings. Indeed, working from 63 to 67 has the same effect on final pensions as saving roughly 4 percentage points more of the gross wage throughout one's working life until 63. Given that the observed shortfall in private savings for a retirement at age 63 was 6.4 percentage points of gross wage, that is certainly not insignificant.

Until now, it seems that the substitution of savings with working longer has not been as strong as will be required to compensate for the loss of income. The actual retirement age in Sweden has changed substantially over the last fifty years. However, the historical trend has been opposite to the trend necessitated by the pension reform. The average retirement age has fallen from 68 years for men in 1963 to a nadir at 63 in the wake of the financial crisis of the early 1990s. Since then it has been slowly increasing to 63.4 years by 2013 (Pensionsåldersutredningen 2011; Motiv för och emot). However, the retirees who left the workforce in the last twenty years were mostly covered by the old pension system, which did not incentivize a later retirement age. Going forward, the majority of those reaching retirement age will be significantly impacted by new pension policies. The effect on retirement age from the pension reform might thus be lagged, and it could be expected to rise in coming

years. Indeed, the government has calculated that someone born in 1975 would need to work past age 68 in order to compensate for increasing life expectancy. They would face a strong incentive to do so due to falling pension annuities in case of early retirement (Pensionsåldersutredningen 2011; Alternativ pensionsålder).

Thus, retirement at a higher age provides a substitute for private savings. The nature of the annuity formula for calculating pension size provides a strong incentive for individuals to work longer, in order to get a higher pension. Therefore, there is good reason to believe that private expectations of a longer working-life are a key component for explaining the observed shortfall of private savings. The need to save is not as dire when individuals plan to increase their life-time incomes by working longer. From the perspective of the LCH, this means that people actually have two options in the years to come: either save income, or generate more life-time income by working longer. Judging from the fact that people do not save sufficiently today, a rational individual seems to be expecting to work longer in the future. Using the Precautionary Savings Theory, one can argue that this possibility to substitute between working longer and increasing savings alleviates some of the risk from the reform. Risk stemming from uncertain developments in future pension income can be offset by the possibility of working longer if there is a need to generate more income. One's optimal wealth would in such a case be lower than with a fixed retirement age, since one can compensate for unsatisfactory levels of pension payments by working longer instead of using accumulated wealth. On the other hand, this argument relies on the assumption that individuals are healthy enough to extend their working-life when necessary, which is not always reasonable.

Conclusion

The formulated hypothesis was that the reform of the pension system in the 1990s would, immediately or with time, permanently increase the private savings rate throughout the Swedish population. Furthermore, the hypothesis also expected that the change in the private savings rate be sufficient to fully cover the change in expected pension income in retirement.

The empirical investigation established that there was, indeed, a statistically significant change in the private savings rate. The shift from the old system to the new raised incentives to save, shown as an increase of the private savings rate. The first half of the hypothesis thus holds true. The second research question aimed at evaluating the size and significance of this result. Calculations on the size of the increase required to offset the expected shortfall in pension income as a result of the pension reform, show that the increase in the private savings rate is insufficient, assuming unchanged retirement age.

This shortfall of savings is analyzed through the use of several different theories. One way to increase savings for the individual is to negotiate a higher group occupational savings rate from one's employer. Some evidence of this has been found, albeit only covering a fraction of the population as of yet. Another explanation assumes an increase in the length of an individual's working life. Additional years in employment serve as a substitute for saving throughout life. It is possible to integrate this latter explanation with theories assuming both fully rational and boundedly rational agents making savings decisions.

The life-cycle hypothesis assumes that fully rational agents are able to maximize their utility by deciding whether they value consumption today more than a few additional years of work in the future. Individuals who dislike working might increase their savings, whilst individuals who derive more utility from immediate consumption might save less. Instead assuming boundedly rational agents, it is argued that they might save too little because of myopia, because of habit formation or due to intellectual constraints. This would give them lower pensions than they want, if they choose to retire at the current pension age. For these individuals, in order to maximize utility, they need to choose between working a few more years to improve their pensions or to retire as they planned, receiving a lower pension.

Thus, the option of working longer can be motivated both for some rational agents, who would choose to work longer in the future in order to consume more today, but

also for boundedly rational agents, who would compensate for earlier suboptimal savings by working for some more years.

One implication of this thesis for policy decisions and future studies focusing on the consequences of pension reforms on private savings, is to include also substitutes for savings in the analysis, such as substituting saving with working longer. Further studies should be made to see if the degree of substitution between saving and working is indeed increasing over time, leading to an increasing retirement age in Sweden in the coming decades.

Summary

This thesis has sought to investigate how the Swedish pension reform impacted the private savings rate. The thesis begins by describing of the pension system as it looked before the reform, as well as after. After doing so, a theoretical framework based on the Life Cycle Hypothesis and the Precautionary Savings Theory is established. Furthermore, an interpretation of the theoretical implications of the pension reform is made. Based on that, theoretical arguments are made using both theories, arguing as to what effect the pension reform should have on the private savings rate. In order to test the theoretical frameworks and predictions, an econometric regression based on a number of variables connected to both the private savings rate and the pension reform has been constructed and utilized. The empirical test of the regression has confirmed the hypothesis that the private savings rate has indeed increased as a result of the pension reform. However, calculations on the size of the increase required to offset the expected shortfall in pension income as a result of the pension reform, shows that the increase in the private savings rate is insufficient. Different theories trying to explain this shortfall is used, such as myopia and the substitution of private savings in the form of a longer work-life. Finally, it is concluded that the data supports that the private savings rate has increased, but that it did not do so to the extent necessary to offset the expected future decreased payments. It is predicted that substitutes for private savings, such as occupational pensions and a longer work-life, have diluted the need for increased private savings. Instead of a major change in the private savings rate, it is predicted that individuals will use other means to attain a good pension.

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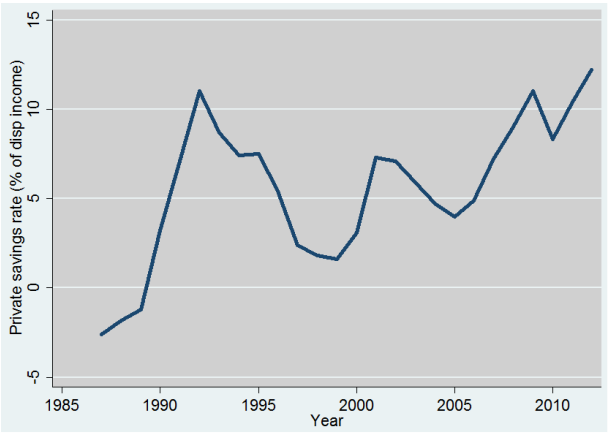
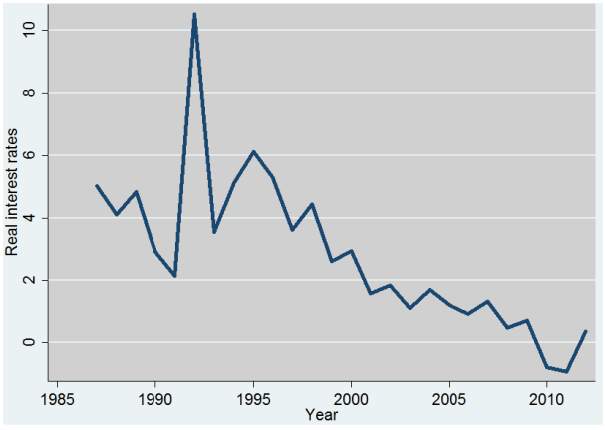
Appendix

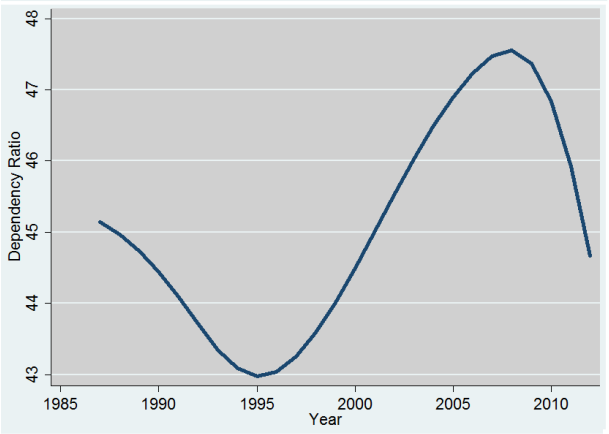
A. Descriptive Statistics

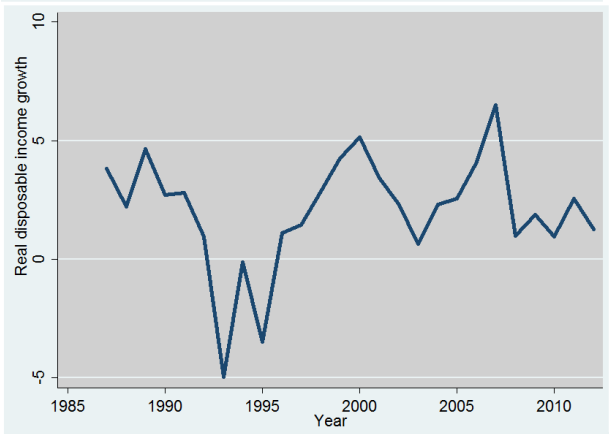
Variables	Observations	Mean	Std. Dev.
P_Saverate	26	5.6000	3.9754
PenR	26	0.5385	0.5084
Realincome	26	162.8769	26.0281
Realincomegrowth	26	2.0327	2.4030
RintRate	26	2.8000	2.4888
FinC	26	0.2692	0.4523
TaxR	26	0.8077	0.4019
DepRat	26	45.0715	1.5239
LiqC	26	121.2385	25.0923
Govfisc	26	1.0023	4.3521

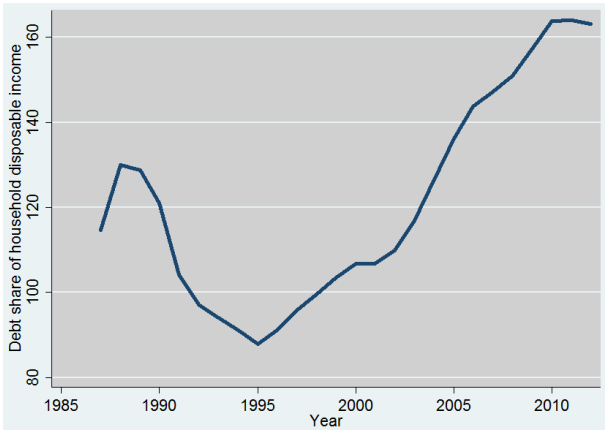
B. Sequence Charts of Unadjusted Variables

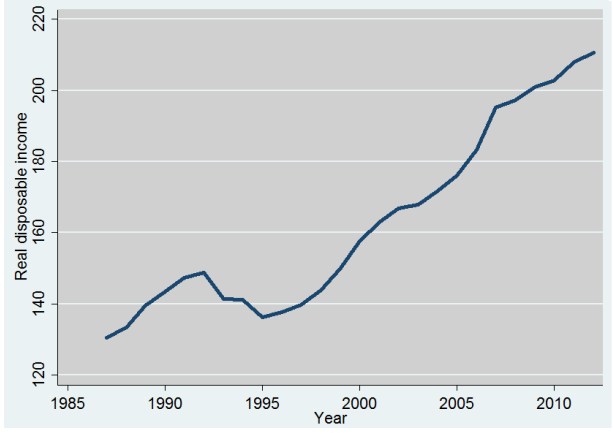












C. Unit Root Test

In a time-series data set there is a certain probability of variables having unit roots. That is to say, in any given year, the value of a variable might depend on the values in previous years. To test for unit roots an Augmented Dickey-Fuller test has been made.

The regression that has been tested is:

$\Delta Y_t = \beta_1 + \beta_2 T + \delta Y_{t-1} + u_t$

Where the hypothesis tested is:

H_0: $\delta = 0$

H_1: $\delta \neq 0$

H_0 implies the existence of unit roots, and thus a failure to reject the hypothesis suggests that there are unit roots present in the data. With 25 observations, the critical value of the Augmented Dickey-Fuller test for a 95% confidence interval is -3.6.

Decision Rule: Do not reject H_0 of unit root if the t-value is greater than -3.6.

Results:

Variables	**t-value**	**Decision**
Private Savings Rate	-1.927	Unit Root
Real Disposable Income Growth	-3.124	Unit Root
Real Disposable Income	-0.954	Unit Root
Real Interest Rate	-5.2	No Unit Root
Dependency Ratio	-0.75	Unit Root
Liquidity Constraint	-1.161	Unit Root
Government Fiscal Balance	-1.891	Unit Root

Since six out of seven variables contain indications of the presence of unit roots, the time series data will be converted to a first difference format for the empirical investigation, with the exception of the dummies.

D. Regression Estimations

Original regression model:

P_Saverate_diff	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
PenR	1.458608	.9733145	1.50	0.156	-.6289444	3.54616
ln_realincome_diff	47.16177	23.34864	2.02	0.063	-2.916079	97.23963
realincomegrowth_diff	-.2910097	.1457305	-2.00	0.066	-.6035706	.0215513
ln_LiqC_diff	-33.89533	9.282388	-3.65	0.003	-53.80407	-13.98658
RIntRate_diff	.1957558	.1259512	1.55	0.142	-.0743827	.4658943
Govfisclag_diff	.0916496	.1194771	0.77	0.456	-.1646033	.3479024
ln_DepRat_diff	-3.540845	32.82972	-0.11	0.916	-73.9536	66.8719
TaxR	.0904512	1.405783	0.06	0.950	-2.924654	3.105556
FinC	-.2529803	.7764843	-0.33	0.749	-1.918373	1.412413
_cons	-.8062497	1.284355	-0.63	0.540	-3.560918	1.948418

Regression model after clearing insignificant variables:

P_Saverate_diff	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
PenR	1.47819	.7231116	2.04	0.057	-.0474422	3.003822
ln_realincome_diff	46.84398	14.77849	3.17	0.006	15.6641	78.02386
realincomegrowth_diff	-.2872349	.1235899	-2.32	0.033	-.5479867	-.0264831
ln_LiqC_diff	-33.31425	6.35389	-5.24	0.000	-46.71979	-19.90872
RIntRate_diff	.1953651	.1015279	1.92	0.071	-.0188401	.4095704
Govfisclag_diff	.109657	.0952218	1.15	0.265	-.0912434	.3105574
_cons	-.8058673	.3991111	-2.02	0.060	-1.647918	.0361836

Staggered regression model:

P_Saverate_diff	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
penr_99to02	1.203864	.9637042	1.25	0.231	-.8502225	3.257951
penr_03to06	1.560235	1.019882	1.53	0.147	-.6135912	3.734061
penr_07to12	1.558585	.8009645	1.95	0.071	-.1486305	3.2658
ln_realincome_diff	48.64899	16.0684	3.03	0.008	14.40001	82.89798
realincomegrowth_diff	-.2939929	.1313513	-2.24	0.041	-.5739617	-.0140241
ln_LiqC_diff	-33.6326	7.149402	-4.70	0.000	-48.87119	-18.39401
RIntRate_diff	.1880104	.1084512	1.73	0.103	-.0431478	.4191687
Govfisclag_diff	.111664	.100908	1.11	0.286	-.1034163	.3267443
_cons	-.8261228	.4276283	-1.93	0.072	-1.737591	.0853454

E. Test for Granger Causality

The regression results outlined above do not firmly conclude in which direction the causality of private savings and the pension reform goes. This thesis has argued that the pension reform was the trigger for the change in private savings, as outlined in the theoretical part. However, there might be a causality going the other way. After all, one of the arguments behind the pension reform was the levels of private savings at the time were too low to be sustainable. For that reason, the Granger Causality test can be used to indicate which direction the predictive causality runs. Consideration has been taken for the small sample size, as well as the inclusion of exogenous control variables. In the table below, the results of a Granger Causality test are presented. The null hypothesis is that the tested variable does *not* cause the other one.

Table 6 - Granger Causality Test

Variables	**Lags**	**F_{obs}**	**F_{crit} (5%)**	**Decision**
Pension reform causes the savings rate	1	4.8454	3.841	Reject H_0
The savings rate causes the pension reform	1	0.02143	3.841	Does not reject H_0

As can be seen above, with just one lag of the pension reform, there is a highly significant indication of a unidirectional predictive causality between the pension reform and the change in the private savings rate. The pension reform seems to cause a shift in the private savings rate, in accordance with theoretical arguments up to this point. The following will evaluate what this change of private savings rate signifies.

F. Calculation of Size of Pensions in the New System

Calculation of contribution from NDC to replacement rate

Age[a]	Earnings[b]	Capital Index[c]	Capital Balance[d]	Unisex Life Expectancy[e]	Annuity[f]	NDC (16%)[g]
22	100.00	1.00	1.11			
23	102.00	1.08	2.33			
24	104.04	1.17	3.67			
61	216.47	20.12	361.05	24.24	13.70	6%
62	220.80	21.72	392.39	23.41	15.42	7%
63	**225.22**	23.46	426.28	22.59	17.37	8%
64	229.72	25.34	462.93	21.78	19.57	9%
65	234.32	27.37	502.57	20.97	22.08	10%
66	239.01	29.56	545.43	20.16	24.93	11%
67	243.79	31.92	591.77	19.36	28.17	12%
68	248.66	34.47	641.87	18.55	31.90	13%
69	253.63	37.23	696.03	17.76	36.14	15%
70	258.71	40.21	754.59	16.96	41.04	16%

Note. Source Palmer, but modified (Palmer 2002, Social Security Pension Reform)

[a)] The sample subject is an individual who begins work at age twenty-two and works every year until he or she decides to retire fully, sometime between age sixty-one and seventy.

[b)] The individual's earnings are assumed to grow at a real rate of 2 percent per year throughout the earnings career

[c)] The real rate of growth used for indexation of capital in the NDC system is 1.6 percent

[d)] The contribution rate from earnings is 16% PAYG and the capital is indexed with 1.6 percent real growth

[e)] Life expectancy estimates have been taken from Palmer & Wadensjö (2004) and refer to life expectancy at the age of 61, 62, … n for a Swede born in 1975.

[f)] Annuities are calculated from the capital balance and unisex life expectancy

[g)] Percent of earnings last year

G. Calculation of Compensation Rate of ATP + *Folkpension*

Total replacement rate from from ATP and average Folkpension

Year[a]	2% real wage growth[b]	Contribution from ATP[c]	Contribution from Folkpension[d]	Total replacement rate[e]
0	1.00	0.52	0.10	**0.63**
1	0.98			
2	0.96			
3	0.94			
4	0.92			
5	0.91			
6	0.89			
7	0.87			
8	0.85			
9	0.84			
10	0.82			
11	0.80			
12	0.79			
13	0.77			
14	0.76			

[a)] The ATP-part of the pension in the old system was calculated as an average of the last 15 working years.

[b)] A real growth of wages of 2% is assumed.

[c)] Assuming 2% real wage growth, the ATP would provide 52% replacement rate.

[d)] Calculated by multiplying the average amount of the base amount that pensioners were entitled to with the quota of salary/base amount. Data on divorce rates of pensioners is taken from Statistics Sweden

[e)] Replacement rate of ending salary, excluding occupational pensions

H. Calculating the average yearly salary/base amount

Calculating the average yearly salary/base amount

Year	Average salary[a]	Base Amount[b]	Quota (Salary/Base Amount)
2005	291600	39 400	0.14
2006	300000	39 700	0.13
2007	309600	40 300	0.13
2008	325200	41 000	0.13
2009	334800	42 800	0.13
2010	340800	42 400	0.12
2011	348000	42 800	0.12
2012	357600	44 000	0.12
			0.13

a) Data from Statistics Sweden, *månadslön* used, a measure including all types of remuneration to the employee

b) Data from BLinfo