

Savings Rates and the Business Cycle: A Comparison Between the Public Sector's and the Households' Savings Behaviour

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Abstract

In 2008 the world entered into what may be the worst economic crisis since the 1930's. Hence, stabilization policy is, once again, a very pressing subject. According to theory, there are reasons for both the public sector and households to smooth out their consumption over the business cycle. An interesting question to study is if such consumption smoothening actually takes place or not. This thesis compares how the Swedish public sector and households adjusted their savings rates to changes in the business cycle during the period 1950 to 2006. We find that the public sector acted in a countercyclical way, while it was not possible to find a clear pattern for how households acted.

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1. Introduction

Depression economics is back. In 2008 the world entered into what seems to be one of the worst economic crises since the great depression of the 1930's. Stabilization policy is, once again, in the centre of the public, as well as the academic, debate.

Currently there is, at least in some sense, a rather broad agreement on what the aim of stabilization policy should be, namely to prevent the economy from underutilizing its resources for longer periods of time than necessary. Some cyclical fluctuations in the economy could very well be beneficial in the long run, since they might act as a cleansing bath, thereby advancing structural development through what Schumpeter called the process of creative destruction.

The risk of the economy getting stuck in an inefficient state, or at least not returning to a state of full utilization of its resources quickly enough, is, however, often used as arguments for the need of discretionary policy to counter the effects of the business cycle.

Even though the aim of stabilization policy is close to uncontroversial, the views on what constitutes effective policy has, and continues to, differ greatly. This debate is anything but new. An early example of one way to smooth out consumption over the business cycle is found in the Bible. In Genesis 41:17-36 Joseph interprets one of the Egyptian pharaoh's dreams as meaning that Egypt is about to experience seven good years, followed by seven years of famine. Joseph's advice on how the Egyptians could smoothen out their consumption, via the use of changes in public savings, is as follows:

34 Pharaoh should do this – he should appoint officials throughout the land to collect one-fifth of the produce of the land of Egypt during the seven years of abundance. 35 They should gather all the excess food during these good years that are coming. By Pharaoh's authority they should store up grain so the cities will have food, and they should preserve it. 36 This food should be held in storage for the land in preparation for the seven years of famine that will occur throughout the land of Egypt. In this way the land will survive the famine.

This is not very different from the policy advice given by contemporary macroeconomists. The main theme of stabilization policy is still that a nation should save during good years in order to prevent the economy from overheating, and to spend these accumulated resources when the state of the economy worsens, in order to keep aggregate demand from plummeting.

Since Joseph formulated his policy advice, a lot has of course happened with respect to our understanding of the business cycle. We will return to this theoretical framework later on in the thesis. One can, however, note that most of the debate about stabilization policy has been about *how* savings and investments should be used during different states of the business cycle. Not as much has been written about the effects of *who* is in charge of these decisions. We intend to compare how the public sector¹ and households adjusts their savings to changes in the state of the economy. Theory does not give an unambiguous answer as to which of these actors that should be better at smoothening out their consumption over time. We will use Sweden, and the period 1950-2006, as an example in order to try to determine what the data can tell us about these issues.

Summarizing, the aim of this thesis is to answer the following question:

Have the Swedish public sector and/or the households smoothened out their consumption over the business cycle during the period 1950-2006?

The outline of the thesis is as follows. Section 2 provides the reader of an overview of the applicable theories regarding consumption behavior for both the public sector and the households. Readers who feel that they have acquired basic knowledge of theories regarding stabilization policy and consumption elsewhere might feel that it constitutes a more effective use of their time to skip this section. In section 3, models that examine the relationship between changes in the business cycle and the public sector's and households' savings are specified and tested. Finally, in section 4, the results from those tests are analyzed and commented.

¹ We will use the same definition of "the public sector" as Statistics Sweden (2008b), i.e. the whole public sector, including local governments.

2. Theoretical Framework

2.1 Public Savings and Stabilization Policy

2.1.1 The pre-Keynesian era²

It is a mark of the great importance of Keynes' work that one can actually classify a period of some hundred years, in which the world economy saw many macroeconomic regimes come and go, as being simply "pre-Keynes". It is actually not only possible to do so; it is, in the case of this thesis, rather suitable.

Before the theoretical argument for the use of countercyclical discretionary policy measures had been formulated by Keynes, the aim of monetary and fiscal policy was, first and foremost, to stabilize the price level and prevent inflation (Lindbeck 1981). This was done mainly through the natural restrictions that a convertible monetary regime puts on the monetary and fiscal authorities when it comes to the possibility of debt-financed expenditures. For a long time, many countries, including Sweden, had a monetary system based on bimetallism. This system, however, had some serious drawbacks. For example, it led to increased transaction costs, since people who were engaged in trade not only had to collect information on the relative prices of commodities, but also the relative price of the different types of money! If the scarcity of one of the types of metals changed relative to the other, the value of coins printed in that type of metal would change relative to the other coins (Wetterberg 2009).

In the second half of the 19th century, it became increasingly popular to switch to a system of monometallism, and the kind of specie that most countries tied their currencies to was gold. In 1873, Sweden, along with Norway and Denmark, had formed a monetary union based on a fixed rate at which legal tender could be converted into gold. This kind of convertible regime puts serious constraints on both monetary and fiscal policy with respect to their ability to pursue other goals than maintaining the fixed exchange rate, such as keeping unemployment below its natural level (Bordo & Jonung 2001).

² This section is, where nothing else is mentioned, based on Tson Söderström (2008).

There was, during the second half of the 19th century and first decades of the 20th century, also a widespread agreement that the public sector's budget ought to be balanced, not over the course of the business cycle, but every year. The common notion was that during recessions, the public sector should be a moral guidance to its subordinates and act according to the virtue of thrift. Expenditures were to be cut, until the state of the economy had improved.

This procyclical fiscal policy doctrine stands in stark contrast to the policy recommendations that Keynes were to formulate.

Implications for this thesis:

- Changes in macroeconomic regimes might very well influence the possibility for fiscal authorities to conduct a countercyclical policy as well as their desire to do so. Given that the period that is studied, such changes might need to be accounted for.

2.1.2 Keynesianism³

In his *magnum opus*, Keynes (1936) formulated the theoretical justification to the then growing consensus amongst both the general public and academics that the free market does not guarantee that the economy returns to a state of full utilization of its resources. This is the fundamental implication of the “Keynesian cross”, which describes how a state of high unemployment can be persistent, since that very unemployment reduces income and hampers an increase in aggregate demand, thus increasing the risk that the economy gets stuck with inefficiently high unemployment rates. The context in which Keynes wrote *The General Theory* was one of severe and prolonged recession. There was thus not only a theoretical (although his economic reasoning by itself is very impressive), but also a political, foundation for a radical shift in the way that people were thinking about macroeconomics.

It is not possible to do Keynes' theories justice by a few sentences of summarizing remarks. The interested reader can, however, turn to most any basic macroeconomic textbook for a more detailed description of the theoretical foundations of Keynesiansim. We will therefore

³ The title of this section is somewhat misleading, since we are actually interested in *all* schools of thought that view recessions as market failures, or at least believe that the free market will not make the economy return to a state of full employment in an optimal fashion. This, of course, includes a lot more schools than what is commonly referred to as classical Keynesianism.

simply note that one of the most influential policy implications of Keynes' work is that fiscal authorities can, and should, improve the economy's performance by conducting a countercyclical fiscal policy.

In Sweden, some of the "Keynesian" ideas had already been developed by the so called Stockholm School of Economics (Jonung 1991). This, in combination with a shift in political power during the 1930's that was about to become the start of an era of political stability, and a new consensus amongst the unions and employer organizations manifested in the so called Saltsjöbaden agreement, constituted the prerequisites for Sweden to be able to implement the Keynesian policy recommendations (Tson Söderström 2008).

During the same time, the size of public expenditures as a share of GDP also increased (Swedish National Financial Management Authority 2008). In addition to the growing political acceptance of the view that active fiscal policy had an important role to play, its possibility to fill that role thus increased, due to the fact that the effect of public deficits on the economy is dependent on the relative size of the public sector's budget (Lindbeck 1981).

The initial experience of the more active stabilization policy that was pursued from the 1950's and the following two decades, were indeed good. Sweden's success during the 1950's and 60's were not, however, exceptional in comparison to the rest of the world (at least not if one by "the rest of the world" mean comparable western countries), which also experienced a period of high and rather stable growth (Bordo & Jonung 2001). The exception is perhaps unemployment, an area in which Sweden did remarkably well (Forslund 2008).

The use of more active stabilization policies, however, also coincided with the creation of the Bretton Woods system, an international agreement which marked a return to a convertible regime, where different currencies were pegged to the dollar, which in turn was pegged to gold. This, in combination with the fact that there were no major macroeconomic shocks during the period, calls for caution when one evaluates the effects of the Keynesian policies.

Implications for this thesis:

- Even though classical Keynesianism is not held in as high regard as it was in its heydays, and we will return to why that is the case in the next section, it will be

assumed that fiscal authorities still have an ambition to use some measure of stabilization policy to counter swings in the business cycle. One can note that Sweden's current Minister of Finance, Mr. Anders Borg (2003), has criticized the "Keynesofobia" that he claimed characterized the academic debate. Even if, as Keynes put it, in the long run we're all dead, he is proof that even if that is true for people, it is not for their theories.

2.1.3 Critique of Keynesian Stabilization Policy

The Keynesian revolution, like most revolutions, eventually resulted in a counterrevolution. The critique did not, however, originate from a single school of thought. Nor was it centred on one specific part of Keynes' theory. One obvious reason for this wide dispersion is that Keynes' theory was simply too big, and consisted of too many separate parts, for any one critic to handle. What will be the focus of this segment is the critique – let's call it the practical critique – which aim was not primarily to prove Keynes' theories wrong, but rather to prove that it is useless as a practical tool for actually stabilizing economic fluctuations.⁴

The discussion which is most relevant for our understanding of the public sector's chances of succeeding in its effort to run a countercyclical fiscal policy, and thus for this thesis, is that of lags. The concept of lags is nearly as old as the Keynesian theory itself. To simplify, one can think of lags as being the risk that fiscal and monetary authorities run of implementing wrong policy measures due to the fact that it takes time to realize that something needs to be done, to decide on what specific measures to take, to implement those decisions and for the decisions that were implemented to actually have an effect. These risks are often called observation, decision, implementation and effect lags, respectively (Tson Söderström 2008). The first three of these four types of lags are called inside lags, while the fourth is often referred to as an outside lag.

A person who, probably to a larger extent than anyone else, has used the concept of lags in order to criticize Keynesianism, is Milton Friedman. Friedman is usually thought of as believing that monetary policies matter more than his contemporary colleagues did. Even so, he was actually rather sceptical, or realistic if you like, about the potential of discretionary

⁴ For an introduction on different macroeconomic schools of thought, and their views on the *theoretical* desirability of running a countercyclical fiscal and monetary policy, see Phelps (1990).

monetary policies (Friedman 1960). This was mainly due to the problem of long and variable lags that he claimed was tied to the use of monetary policy.

This skepticism formed the base for his proposal that central banks should target the money supply, and let it grow at a fixed rate (Kilponen & Leitemo 2007, Svensson 2008a):

Surely, you will say, it is easy to do better [than to let the money supply grow at a fixed rate]. Surely, it would be better to 'lean against the wind' ... rather than to stand straight upright whichever way the wind is blowing. Some of my previous comments perhaps suggest that the matter is not so simple. We seldom in fact know which way the economic wind is blowing until several months after the event, yet to be effective, we need to know which way the wind is going to be blowing when the measures we take now will be effective, itself a variable date that may be a half year or a year or to years from now. Leaning today against next year's wind is hardly an easy task in the present state of meteorology. (Friedman 1960, p. 93)

The size and variability of the lags of fiscal and monetary policies has been the subject of a long and heated debate amongst academics (Culbertson 1960, Friedman 1961, 1968, 1972, Gordon 1965, Hendershott 1966). Modern research has to a large extent confirmed Friedman's view that the lags of fiscal and monetary policy are rather substantial (Batini & Nelson 2002, Taylor 2000).

Monetary policy is often said to suffer from long outside lags, whereas fiscal policy is mainly subject to inside lags (Taylor 2000). Blanchard & Perotti (1999), however, presents evidence that the outside lag of fiscal policy is rather long as well.

Another example of a phenomenon that has caused people to become more doubtful when it comes to the Keynesian policies' usefulness is the existence of time inconsistency (Mishkin 1999). We will return to a more detailed discussion of time inconsistency later on. For now, it is sufficient to note that what is economically optimal in the long run is not always optimal, not economically nor politically, in the short run.

The actual effect of trying to apply the Keynesian theory in day-to-day policy decisions is thus by no means certain, and the debate on the merits of discretionary fiscal policy continues (Jonung et al. 1989, Kopcke et al. 2006).

Implications for this thesis:

- Even if one assumes that fiscal and monetary authorities have the ambition to implement countercyclical policy measures, it is not obvious that they will succeed. There is a substantial risk that the measures will be poorly timed, because of the difficulties imposed by the existence of lags. Moreover, the long-term goals of fiscal and monetary authorities do not necessarily coincide with the incentives that they face in the short run.

2.1.4 Modern Keynesianism – What’s new?⁵

Since the publication of *The General Theory*, a lot has happened with respect to our understanding of macroeconomics. The prospect of this thesis contributing to our knowledge of which institutions are “best” at conducting countercyclical adjustments of their savings ratio is, however, not conditional on the reader acquiring a thorough understanding of all aspects of modern stabilization policy (for examples of differences in how classical and modern stabilization policy is conducted, see Mankiw 1991 and Kopcke et al. 2006). It is sufficient to note that even though a lot has happened since the 1930’s, the theoretical foundation is still very similar to the original. It is still many fiscal authorities’ intention to adjust the level of public spending and taxes to increase aggregate demand in recessions and reduce it in booms (Mankiw 1991).

One can also note that even though, as has been mentioned earlier, lags are still a big issue when it comes to the use of discretionary fiscal and monetary policies, there have been attempts to reduce these lags. An example of how this could be done would be to give an independent council, or the president, the power to adjust the levels of different taxes without the consent of parliament (Okun 1970, Blinder 2006). This would, it is argued, reduce the inside lags of fiscal policy. It is, however, not obvious that these attempts to reduce the lags have been successful. We will return to this question in our empirical study of the Swedish case.

⁵ Since time and ink are scarce resources, we will not waste our share of them trying to define what characterizes all the different schools of thought that claim to be based on Keynes’ theories. For an introduction to that kind of linguistic exercises, see for example Crotty (1980). Instead, we continue to use the term Keynesianism when we refer to any macroeconomic theory that claims that countercyclical fiscal and/or monetary policies should be used to dampen the cyclical swings in economic output, either because it is believed that there exists an equilibrium of underemployment or because the adaptation of the free market to economic fluctuations is suboptimal.

Implications for this thesis:

- There exists no *a priori* reason to reject the possibility that lags still risk to interfere with attempts to run a countercyclical fiscal or monetary policy.

2.1.5 Political Economy and Public Choice

Another reason to expect fiscal authorities to have a hard time actually implementing the optimal countercyclical policy, is the temptation to pursue other goals than that of keeping the economy at a state of full utilization of its resources. One such goal could be the desire to acquire political power.

The branch of economics in which such incentives are studied, and where politicians are assumed to be no different from other economic actors in that they to pursue their self-interest, is called public choice.

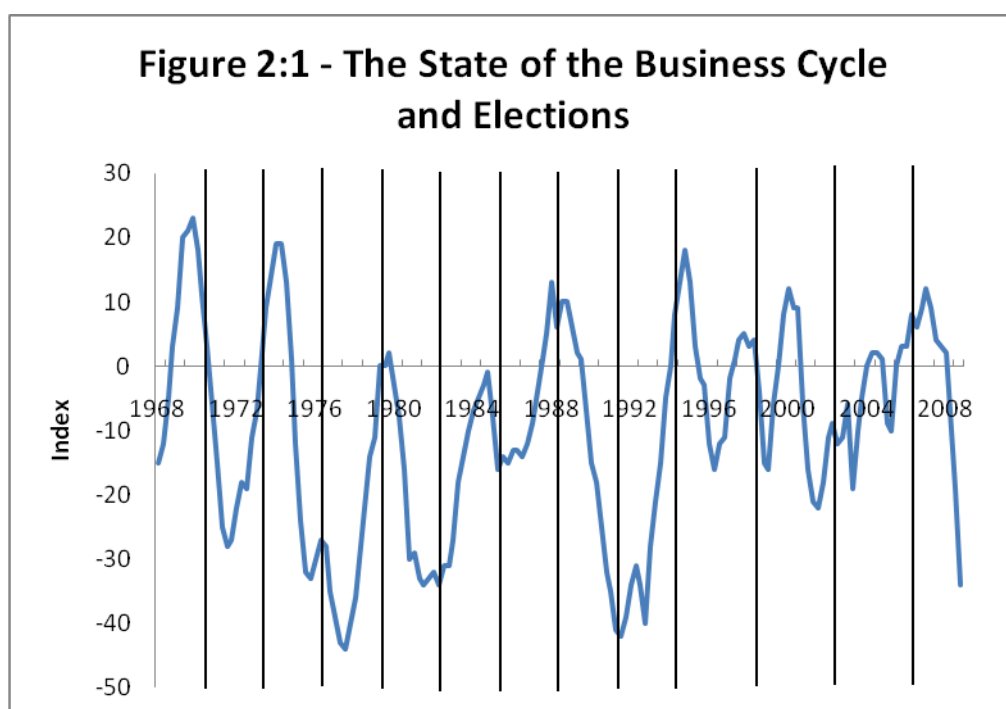
One effect of assuming that politicians are vote-maximizing, rather than people who by definition work for the common good, could be that it is not just the business cycle, but also the political cycle, that effects what policy measures that are taken and at what point in time they are taken. Dahlberg & Mörk (2008), for example, find that during election years, Swedish and Finnish local governments employ more people, spend more money and have lower tax levels than during non-election years.

But is there really anything to gain from short-term attempts to artificially control the business cycle? Shouldn't rational voters call this bluff and punish this irresponsible behaviour? It seems as if they do not. Jordahl (2002), for example, shows that the levels of inflation and unemployment are negatively correlated with the probability of the electorate voting for the incumbent government. Wolfers (2002) shows that the state of the economy is an important determinant of what people vote for, even in situations where it is obvious that the serving government can't influence the relevant economic variables.

Fregert & Jonung (2003) looks at a graph similar to Figure 2:1, which shows the relationship between the state of the business cycle in Sweden, as measured by the performance of the

manufacturing sector (National Institute of Economic Research 2009), and outcomes in Swedish elections. They comment that:

In elections that have taken place during years of economic downturns, like the elections of 1976, 1982, 1991 and 1994, the incumbent Government has been voted out of office. ... At all elections that have taken place during years of explicit booms, the incumbent Government has been able to retain power, though with a slightly weakened support in parliament. That was the case 1970, 1973, 1979, 1985, 1988 and 1998. The 1994 and 1998 are exceptional in the sense that they took place in a phase where unemployment rates were far above the level that had been the norm since the end of World War II. The 1994 election is characterized by an improving state of the economy and of high unemployment rates. (Fregert & Jonung 2003, p. 451, translation by the authors of this thesis)



Their conclusion is that “there is a strong correlation between the state of the business cycle and the results of elections” (Fregert & Jonung 2003, p. 452, translation by the authors of this thesis). One should note, however, that the 2002 and 2006 elections are not part of Fregert & Jonung’s analysis, and that these elections do not conform as well to the pattern that Fregert & Jonung claim exist. They do, however, also study what policies have been enacted right before elections and conclude that “[Swedish] governments ... have shown the will, but not the ability, to control the state of the business cycle” (Fregert & Jonung 2003, p. 462, translation by the authors of this thesis).

There is thus strong incentives for politicians to design policy measures that not only take into account the state of the economy, but also the political cycle. As was mentioned earlier, there are signs of politicians trying to do this, but on an aggregate level Fregert & Jonung (2003) conclude that there isn't much sign of them actually succeeding.

Implications for this thesis:

- There is a possibility that goals other than economic ones are taken into account when fiscal policies are formulated. This, in turn, increases the risk that fiscal authorities will fail in their attempts to implement countercyclical policies.

2.1.6 Summary

The way in which to conduct stabilization policy has been, and continues to be, a widely debated issue. It deserves to be emphasized that, in this thesis, no judgement on the validity of the Keynesian theories, or related theories, is made. What is here to be investigated is whether or not the public sector actually changes its savings ratio in response to changes in the business cycle, not if that type of behaviour is desirable from a theoretical point of view.

The thesis is based on the assumption that fiscal authorities would like to run a countercyclical policy. We've examined two main explanations as to why such attempts might fail. First, fiscal policy is subject to different lags, making timing and forecasting pressing issues that must be dealt with. Second, there is evidence of other, possibly conflicting, goals also being taken into account when policy is formulated. Attempts to achieve politically desirable outcomes might result in policy measures being taken that are not optimal from a stabilization point of view.

There is international evidence of a lot of governments actually implementing a procyclical fiscal policy (Pisani-Ferry et al. 2008). It is thus by no means obvious that Sweden's fiscal authorities can be expected to have managed to implement countercyclical policies. It would therefore be desirable to take the theories examined above to the data, in order to conclude what forces have been dominant.

2.2 The Households' Consumption Function and its Effects on the Need for Stabilization Policy

2.2.1 Keynes' Absolute Income Hypothesis⁶

In one of his most famous quotes, Keynes claimed that "[t]he fundamental psychological law, upon which we are entitled to depend with great confidence both *a priori* from our knowledge of human nature and from the detailed facts of experience, is that men are disposed, as a rule and on the average, to increase their consumption as their income increases, but not by as much as the increase in their income" (Keynes 1936, p. 96). This is equivalent to claiming that the marginal propensity to consume (MPC) is between zero and one.

The average propensity to consume (APC), Keynes argued, will tend to fall as income increases. This is due, for example, to the fact that "the satisfaction of the immediate primary needs of a man and his family is usually a stronger motive than the motives towards accumulation, which only acquire effective sway when a margin of comfort has been attained" (Keynes 1936, p. 97).

The absolute income hypothesis gets its name from the fact that, according to Keynes, it is the amount of income that an individual receives in period t that determines his level of consumption in that period. His conclusion is that "... the aggregate income ... is, as a rule, the principal value upon which consumption-constituent of the aggregate demand function will depend" (Keynes 1936, p. 96). Other factors, such as changes in the interest rate, are of minor importance and, "are not likely to be important in ordinary circumstances" (Keynes 1936, p. 96), Keynes argued. A common description of the absolute income hypothesis is thus to state it in similar terms as equation (2:1):

$$C_t = \alpha + \beta Y_t \quad (2:1)$$

where C_t denotes consumption in period t , Y_t denotes disposable income in period t , $\alpha > 0$ is a constant and $0 < \beta < 1$ is the MPC. The fact that $\alpha > 0$ implies that, as income rises, the APC declines.

⁶ This section is based on Keynes (1936).

2.2.2 Kuznets' Critique of the Absolute Income Hypothesis

One of the central implications of the absolute income hypothesis is that as income rises, the APC should decline. Even though early evidence supported the Keynesian view, it would later be shown to be fallacious. Kuznets (1942) used time series data for the period 1879-1938, to show that the aggregate savings ratio, despite large increases in national income, had remained remarkably stable. This introduced somewhat of a paradox, where cross-sectional data showed a positive relationship between income and average savings ratios, but time series showed no sign of such correlation over the longer run (Berg 1983).

It was this paradox that inspired much of the debate about the nature of the consumption function, and led to the formulation of many of the hypothesis that will be examined in subsequent sections.

2.2.3 The Relative Income Hypothesis⁷

Even though Duesenberry is often credited for formulating the so called relative income hypothesis (RIH), the same line of reasoning that he used is found in earlier work by Brady & Friedman (1947). Modigliani (1949) independently also reached more or less the same conclusions as Duesenberry.

The RIH is based on two assumptions. First, a consumer unit's consumption decisions are assumed to be dependent on that consumer unit's position in the income distribution. Consumer units in higher income brackets save more than consumer units in lower income brackets. This is consistent with cross-sectional data. It also implies that if a consumer unit remains at a certain position in the income distribution even if its absolute income increases, its savings ratio will not be affected. On an aggregate level, the savings ratio will not be affected by the fact that consumer units change places in the income distribution. The effects of such changes tend to offset each other on an aggregate level. This is consistent with time series data.

Second, consumption decisions are, at least partially, irreversible over time, which means that those decisions to some extent are based on the highest position in the income distribution that has previously been achieved. The effect of this assumption is that consumption

⁷ This section is, where nothing else is indicated, based on Berg (1983).

expenditures will not decline proportionally to a decrease in income, which in turn explains the countercyclical pattern of savings ratios, i.e. the smoothening of consumption over time.

On an aggregate level, the RIH can be described as:

$$S_t / Y_t = \alpha + \beta(Y_t / Y^0) \quad (2:2)$$

where S_t is the households' savings, Y_t their disposable income and Y^0 the highest level of income reached in the previous periods. This implies that in recessions, when $YD < YD^0$, the savings ratio will decrease if $\beta > 0$, resulting in a behaviour that smoothenes out consumption over the business cycle and thereby help stabilize the economy's output.

Implications of this thesis:

- Even though the RIH is not viewed as an accurate way of explaining people's savings behaviour, it highlights the hazards of using aggregate data to test the validity of microeconomic models. If people in different income groups are not affected in the same way by a change in the business cycle, the distribution of savings becomes an important determinant of the aggregate effects.

2.2.4 Fisher's Two-Period Model

Irving Fisher contribution to the evolution of consumption theory is twofold. First, he made suggestions on what factors that might determine the ratio of income that is saved by individuals. Second, and perhaps more importantly, he also he presented a model that helped economists think about consumption decisions in a much simpler way. This "two-period model" still remains the starting point for much work on consumption theory.

In his *The Theory of Interest* Fisher (1930) suggested that the propensity to consume, or "impatience", as he called it, is dependent on both objective and subjective factors. Amongst the objective factors was the size of the expected income, the nature of this income, its distribution over time and the degree of uncertainty facing individuals.

One can note that Fisher, before Keynes introduced the absolute income hypothesis, claimed that people acted according to the devise "the smaller the income, the higher the preference

for present over future income; that is, the greater the impatience to acquire income as early as possible” (Fisher 1930, p. 72). Thus, a rise in income will, according to Fisher, lead to a rise in the savings ratio. With respect to the distribution in time of income streams, Fisher claimed that:

If income is particularly abundant in the future; that is, if the person expects an increase in his income stream, he would willingly promise to sacrifice out of that increase, when it comes, a relatively large sum for the sake of receiving a relatively small sum at once. ... On the other hand, if immediate income is abundant but future income scarce, the opposite relation may exist. (Fisher 1930, p. 67)

The consumer thus adjusts his savings ratio to smooth out his consumption over time. Fisher also pointed to the effect of changes in risk on savings, a subject that we will return to later on.

Let us turn to Fisher’s second contribution to the developments consumption theory; his two-period model. In order to simplify the effects of all of the factors said to influence savings, Fisher created a model in which people are assumed to live for two periods. In the first period, the consumer earns an income of Y_1 and in the second period he earns Y_2 . He is assumed to have no initial wealth. The present value of his total income thus equals:

$$Y_1 + Y_2(1+r) \quad (2:3)$$

This income, that either can be saved or spent on a nondurable good, is assumed to be known with perfect certainty, and it can be redistributed across time by borrowing or lending at the risk free rate. This in turn implies perfect capital markets. Out of his income, the consumer consumes C_1 and C_2 in period one and two respectively. As a result, savings in the first period equal:

$$S_1 = Y_1 - C_1 \quad (2:4)$$

Since there exists no third period, there is no reason for savings in period two. Consumption thus equals:

$$C_2 = (1+r)S_1 + Y_2 \quad (2:5)$$

where r denotes the real interest rate. Note that this step assumes that people in generation i does not intend to leave any bequests to members of generation $i + 1$, just as they didn't receive any bequests from members of generation $i - 1$. If equation (2:4) and (2:5) are combined, we get:

$$C_2 = (1+r)(Y_1 - C_1) + Y_2 \quad (2:6)$$

This simplifies to:

$$(1+r)C_1 + C_2 = (1+r)Y_1 + Y_2 \quad (2:7)$$

Which in turn can be divided by $(1 + r)$, resulting in the following expression:

$$C_1 + C_2 / (1+r) = Y_1 + Y_2 / (1+r) \quad (2:8)$$

This is the intertemporal budget constraint that faces the consumer. One useful interpretation of it is that it states that the present value of consumption must equal the present value of income.

Since all consumption decisions on, and inside, this line are feasible, one might wonder which actual consumption decision is taken. To solve this problem, Fisher introduces what he calls a "Willingness line", what we would now call an indifference curve. Optimization, he claims, takes place by choosing a point of consumption that makes the Willingness line tangent to the intertemporal budget constraint (which implies that individual's utility functions are functions of the present value of consumption).

Implications for this thesis:

- Changes in the level of uncertainty corresponding to expected income streams could induce changes in the savings ratio.

- Changes in the distribution of income over time might do the same. One such example to which we will return is the expansion of social security and retirement benefits, which depresses current income but increases future income.
- The interest rate affects the slope of the intertemporal budget constraint and thus has implications for decisions about savings.
- It is not necessarily current income, but rather the present value of total income, which is the relevant determinant when people make decisions about how much to save. Future income thus plays an important role.
- The state of capital markets, and how close they are to being perfect, is a relevant variable to study. People might want to save less than they are able to do, if they cannot borrow against all their assets and future income at the same rate of interest at which they can lend.
- The demographical structure of the population is relevant for explaining changes in the aggregate savings ratio since people's expected income varies systematically with age.

2.2.5 The Life Cycle Hypothesis⁸

The life cycle hypothesis (LCH) was formulated by Modigliani & Brumberg (1954), and then refined by Ando & Modigliani (1963, 1964). As was noted in the preceding section, however, their main conclusions are just a refined version of the suggestions made by Fisher some 20 years earlier. The LCH stresses that peoples' income varies in a systematic way during the course of their lives.

Let's start with a brief summary of the notation that will be used:

C_t = Consumption during year t , where t denotes how long into his economic life, i.e. the part of his life where he starts earning an income, a person is.

Y_t = Income (not coming from interest) during year t

S_t = Savings during year t

a_t = Assets at the start of year t

r = Interest rate level

N = Earning span, i.e. the period of adulthood in which a person earns an income

M = Retirement span

⁸ This section is, when nothing else is indicated, based on Modigliani & Brumberg (1954).

$$L = \text{Life span} = M + N$$

The LCH assumes that the price level is constant. It also assumes that $a_1 = 0$ and that $a_{L+1} = 0$, i.e. that people neither receive, nor give, bequests. This implies that assets can only be accumulated by saving by the individual himself. It also implies that individuals save only for precautionary reasons or to smoothen out their consumption over time.

The individual's utility function is assumed to be a function of his total consumption. This utility function is also assumed to be homogenous, which implies that the share of a person's total resources that is planned to be spent on consumption in each period depends only on that person's preferences, and not on the size of the resources. Furthermore, it is assumed that the interest rate is 0, i.e. $r = 0$, and that the utility function is such that a person's utility is maximized if he consumes the same share of his total resources throughout the balance of his life. Another way of formulating this last assumption is to say that the marginal utility of consumption is positive but decreasing, which implies that an unevenly distributed consumption results in less utility than an evenly distributed consumption with the same present value.

The budget constraint facing the consumer can be expressed as:

$$\sum_1^L \frac{C_t}{(1+r)^t} = a_1 + \sum_1^L \frac{Y_t}{(1+r)^t} \quad (2:9)$$

What this means is that the present value of consumption cannot exceed the present value of income. Since we have assumed that $r = 0$ and $a_1 = 0$, this simplifies to:

$$\sum_1^L C_t = \sum_1^L Y_t \quad (2:10)$$

The assumption that consumption is planned to take place at an even rate gives us the following expression:

$$C = \frac{1}{L_t} * Y + \frac{(N-t)}{L_t} * Y^e + \frac{1}{L_t} * a \quad (2:11)$$

where Y^e denotes expected average future income during an individual's earning span, L_t denotes the expected remaining life span in period t and all other terms relate to the same period in time.

The LCH explains the discrepancy between cross-sectional and time series data by noting that in the short run, realized income can deviate from the average. If realized income exceeds the average expected future income, more of it is saved. Since people with high incomes to a larger extent than others can be assumed to be above their long-term average, the LHC implies that these people should save more. This is consistent with cross-sectional data. Over longer periods of time, the expected and realized values of income tend to coincide, making the savings ratio constant. This is consistent with time series data.

Implications for this thesis:

- Since individuals plan to consume at a certain level over the entire course of their lives, short run deviations from the expected income will, at least to some extent, be offset by changes in the savings ratio. This type of behaviour could be expected to induce a countercyclical pattern in the households' savings ratio, thus stabilizing aggregate demand over the business cycle (Berg 1983).
- Since the trend in consumption is based on long-term expectations of income and life-expectancy, one could assume that changes in income that are viewed by households as being transitory, such as most stabilizing measures taken by fiscal and monetary authorities, should affect households' aggregate savings less than permanent changes.
- The extent to which transitory changes in income are offset by corresponding changes in the households' savings ratio are partly dependent on how well the capital markets function. People who are not able to consume at their potential intertemporal optimum due to failures in the capital markets, i.e. can't consume as much as they would like because the possibilities to borrow against future income is limited, can react rather strongly even to measures that are known to be transitory, thus increasing the effect on aggregate savings.

- Demographical changes in the population could be expected to bring about changes in the aggregate savings ratio.

2.2.6 The Permanent Income Hypothesis⁹

Parallel to the formulation of the LCH, Milton Friedman formulated what he calls the permanent income hypothesis (PIH). It states that an individual's consumption ought to equal the annuity value of his total wealth, given by the sum of financial and human wealth. As the LCH, the PIH is based on Fisher's two-period model in the sense that an important reason for saving, according to Friedman, is to counter the fact that income for an individual in a certain time period does not necessarily equal that individual's optimal level of consumption, given his intertemporal budget constraint.

As the LCH, the PIH assumes that people maximize a utility function which depends on the level of total consumption. It also assumes that the marginal utility of consumption is positive and diminishing, making a smooth consumption better than an unevenly distributed consumption in utility terms. Friedman also assumes that people plan to leave bequests equal to the size of bequests that they themselves received.

The assumption that distinguishes the permanent income hypothesis from other theories is that which says that measured income, and measured consumption, consists of two parts; one permanent, and one transitory:

$$Y = Y_p + Y_t \quad (2:12)$$

$$C = C_p + C_t \quad (2:13)$$

Consumption, Friedman argues, will not be proportional to measured income, but rather to the part of it which is permanent. Given the assumptions above, Friedman shows that the individual's consumption function takes the form:

$$C_p = k(r, u) Y_p = k(r, u) W_1 \quad (2:14)$$

⁹ This section is, where nothing else is indicated, based on Friedman (1957).

where W_1 is the present value of all future income and k , the proportion of permanent income that is consumed in each time period, is a function of the interest rate, r , and all other factors that shape a person's time preferences, denoted by u .

If uncertainty is introduced into the analysis, the function is altered. The most important effect of uncertainty is that it creates another reason for saving, namely to build a reserve from which one can take resources to counter the effects of unexpected, negative economic shocks. If all forms of savings could serve equally well as precautionary savings, not much would change. Friedman, however, argues that different forms of savings differ with respect to their usefulness when it comes to acting as a reserve. The most explicit difference is between human and nonhuman wealth, since it is often easier to borrow against the security of nonhuman wealth. The consumption function in a world of uncertainty thus takes the form:

$$C_p = k(r, w, u)Y_p = k(i, w, u)W_1 \quad (2:15)$$

where w is the ratio of nonhuman wealth to permanent income. Under certain simplified assumptions, the general attributes of the individual's consumption, that permanent consumption is a function of permanent income, is also true for society as a whole. But what is this permanent income? One can think of it as the expected value of the probability distribution of all relevant factors that determines the value of a consumer unit is total wealth. It is the amount of money that one can expect to be able to spend each year without, over the course of a person's life, changing the level of wealth that one started with. It is the interest, or rate of return, on one's total wealth. As Hall (1978) noted, if the PIH is true and people set their level of consumption according to their rational expectations about the future, the level of consumption should follow a random walk.

The PIH predicts that people in higher income brackets will tend to have higher transitory incomes than people in lower income brackets, and thus have a higher savings ratio. This is consistent with cross-section data. It, however, also predicts that over longer periods of time, realizations of the transitory part of income will tend to have an average value of zero, i.e. expected and realized income will tend to coincide, making the APC constant. This is consistent with time series data.

Implications for this thesis:

- Since people are assumed to choose their level of consumption based on their long-term expectations of the future, short-term fluctuations around the mean, due, for example, to changes in the state of the business cycle, will tend to be offset by corresponding changes in the households' savings ratio. This will help stabilize the economy.
- Changes in the interest rate levels can influence the households' savings ratio.
- If the relationship between measured income and permanent income has changed during the period which is studied, there is a risk that estimates based on measured income are biased.

2.2.7 Ricardian Equivalence and Rational Expectations

“How is it possible that society merely by the device of incurring a debt to itself can deceive itself into believing that it is wealthier?” Tobin (1971, p. 91) asked, as he reflected on Keynesian stabilization policy. In a famous paper, Barro (1974) replied: It can't. At least not under certain assumptions. The classical argument for why government debt should be viewed as net wealth by consumers is that the cost of increased budget deficits, at least to some extent, will be paid by others, i.e. coming generations. This means that stabilization policy works since people have finite lives.

Barro noted that if generations were connected via intergenerational transfers such as bequests, this does not necessarily matter. If, for example, the bequests from generation i to members of generation $i + 1$ don't equal zero, which seems reasonable to assume given the relative large amounts of money that are actually transferred between generations (Kotlikoff 1988), generation i has shown that it does not want to exploit generation $i + 1$ economically. If the government redistributes resources, from generation $i + 1$ to generation i , via an increase in government debt, members of generation i can be expected to adjust their level of bequests so that the total effect of increased government debt is mitigated. People thus act as if they have infinite lives, even though they only care about the consumption of themselves and their children.

Another implication of the theory is that an expansionary fiscal policy might have contractive effects. This might be the case if the net present value of increased government debt is

negative due, for example, to the fact that it has to be financed by higher taxes in the future, and these taxes are assumed to distort the economy (Auerbach 2002). Especially changes in taxes and public spending that are expected to be transitory could be expected to be offset by changes in the households' behavior. This seems consistent with various natural experiments (Feldstein 2009).

This rather extreme result is, of course, based on assumptions of perfect capital markets, rational expectations and so on, so whether or not it is relevant for understanding reality is not obvious. The debate about the validity of Ricardian equivalence has been a heated one. Bernheim (1987) and Blinder (2006), for example, claim that the equivalence proposition does not hold up to scrutiny. Häggström & Kinnwall (2001) is of the opposite view. Becker (1995) and Leiderman & Blejer (1987), notes that most evaluations of Ricardian equivalence assumes a deterministic world. If, instead, one assumes that changes in government debt is allowed to have a signaling effect due to the fact that the future isn't deterministic, the equivalence proposition seem to fit the data rather well. Some view the equivalence to partly true and partly false (Svensson 2008b).

Implications for this thesis:

- It seems reasonable to assume that public and private savings are negatively correlated with one another. This means that in testing whether households smooth out their consumption over the business cycle, one needs to account for parallel changes in the public sector's savings ratio.

2.2.8 Irrationality and Issues of Self-Control

This far, we have isolated two major reasons why people might not be able to save in an optimal fashion. First, they might not have the knowledge of the future that is required. Second, capital markets might not function optimally. One should, however, note that even if people have perfect foresight, they might not be able to act completely rational. Problems of self-control are well known by behavioural economists, and savings is one area in which such problems might be rather large. This is due to the fact that the cost of savings, i.e. limiting the level of current consumption, is incurred immediately, while the benefits, e.g. the possibility to retain a high standard of living when one retires, will be realized in the distant future (see Thaler & Sunstein 2008 and Schelling 1984 for some illustrative examples).

This adds another obstacle to be overcome by individuals if the theories are to be consistent with real world observations. Not only do they need to acquire knowledge of rather complex issues and make forecasts about the distant future; they also need to adjust their way of life to their knowledge and forecasts in a rational way.

2.2.9 Summary

There is a theoretical foundation for assuming that households, given a fixed degree of uncertainty, will tend to smooth out their consumption over time. If changes in the business cycle is assumed to be positively correlated with changes in income, one would think that households would help stabilize economic output by countercyclical changes in their savings rates. The business cycle can, however, also be negatively correlated with the level of uncertainty, thus implying a higher degree of savings during recessions and thereby a procyclical behaviour by households. Theory alone cannot give an unambiguous answer to the question of whether or not household change their savings ratio in a way that helps stabilize aggregate demand or not. An empirical test could thus be useful.

3. Model Specification and Econometric Estimates

3.1 Data

3.1.1 Growth

Data on growth in GDP that is used is that which is reported in Statistics Sweden (2008a). It's reported in fixed prices, 2000 being the reference year.

3.1.2 GDP Gap

A detailed description of how we have calculated the GDP gap can be found in Appendix C.

3.1.3 The Public Sector's Savings

We have chosen to use the public sector's net lending as a share of GDP, as defined by Statistics Sweden (2008b) as a measure of its savings. This is due to the fact that net lending is the amount of savings that are not used for investments. The reason for this being desirable is that investments are often used as fiscal stimulus. An increased discrepancy between income and consumption therefore does not necessarily indicate that a more contractive fiscal policy is conducted, since that discrepancy might be used to finance investments. Net lending thus constitutes a more relevant measure of savings when it comes to its potential to help answer the questions raised in this thesis.

3.1.4 Public Debt

Figures of public debt as a ratio of GDP for the period studied are taken from the Swedish National Debt Office (2009). In our regressions, we try to capture the general development of public debt that is not due to changes in the business cycle by calculating an average level of public debt during the past five years.

3.1.5 The Public Sector's Cyclically Adjusted Savings Ratio

In order to see how much of a change in the public sector's savings ratio is due to discretionary fiscal policies and how much it is an effect of a change in the business cycle via the so called automatic stabilizers, one needs to calculate a cyclically adjusted savings ratio. The way we have chosen to do this is described in more detail in Appendix D.

3.1.6 The Households' Savings Ratio

When deciding on what definition of savings one wants to study, several aspects of different measures need to be considered. First, the definition should, at least to some extent, be comparable to the measure of public savings, in this case its net lending. Second, the measure should be relevant when it comes to its ability to answer the questions raised in this thesis. Third, there need to be data available for the entire time period studied.

The first aspect indicates that the households' net lending should be used, but it's not obvious that this is the most relevant measure, since there is a wide range of different types of savings that are not covered by this measure. As it turns out, the choice isn't as difficult as one might fear. Figure B2 in Appendix B shows the relationship between the households' net lending and their total saving, as it is defined by Statistics Sweden (2009), both being expressed as shares of GDP. The two measures are highly correlated during large part of the period studied. During 1950 to 1980, the correlation coefficient was 0.9234, and during the period 1987 to 2006 it was 0,8018. The exception to the rule is the period 1980 to 1986, a period when the two variables moved in opposite directions. The effect of the rather high correlation is that the effect of choosing one measure over the other can be expected to be of less importance than one might initially fear.

We have decided to use data on the households' net lending as the measure of their savings, mainly due to the fact that this makes comparisons with the actions taken by fiscal authorities easier.

3.2 Common Themes in Our Models

The aim of our empirical tests is to determine if there are any significant relationships between savings rates (both public and private) and growth or the GDP gap. To do this, we have chosen to study Sweden during the period 1950 to 2006. Our regressions, hence, are based on time series data. Estimating such regressions by OLS imply that one makes a number of assumptions regarding the nature of the data that is used. A summary of, and explanation to, these assumptions can be found in Wooldridge (2006).

It needs to be emphasized that we are *not* interested in explaining all factors that affect the savings rate. An attempt to do that is, however, undertaken in Appendix E in order to provide a basis for the analysis of our results. Here, we are only interested in the estimate of the relevant coefficient, i.e. the coefficient on growth or the GDP gap. If a variable affects the savings rate, but is not correlated with the variables which we are interested in or a variable which is correlated with these variables, it can be omitted without making our estimates biased.

The reason why we do not want to control for all variables which affects savings is that we are interested in both direct and indirect effects of changes in the state of the business cycle on savings. If, for example, we were to control for income, the interpretation of the variable used for describing the state of the business cycle would be something like ‘what effect on savings does a change in the business cycle have, given a fixed level of income’. This is not desirable since we want our business cycle variable to include the fact that income might change when the state of the economy changes. By controlling for variables which are affected by changes in the state of the business cycle, less and less of those changes are captured by the variable that we are really interested in estimating.

Another important point to make is that our estimates of the coefficients for the growth and GDP gap variables can be expected to be biased downward. There are mainly two reasons for this. First, if, for example, households increase their savings ratio, aggregate demand can be expected to drop. This, in turn, can be expected to lead to a worsened state of the economy, i.e. a lower growth rate and GDP gap. The opposite is of course true if households suddenly decrease their savings ratio. This relationship leads to a negative correlation between savings and the state of the business cycle, but it does not imply that a worsened state of the economy *causes* a peak in savings. Second, both the households’ and the public sector’s net lending is measured as a ratio of net lending to GDP. In a boom, GDP goes up, and even if the households and public sector does not change their savings ratio at all the ratio of savings to GDP will fall. This might give the impression that savings is adjusted in a procyclical way. It is, however, not obvious that the example just given should be counted as a procyclical adjustment.

The effect of the fact that causation does not move in just one direction is that one could find a negative relationship between savings and the state of the economy even if consumption

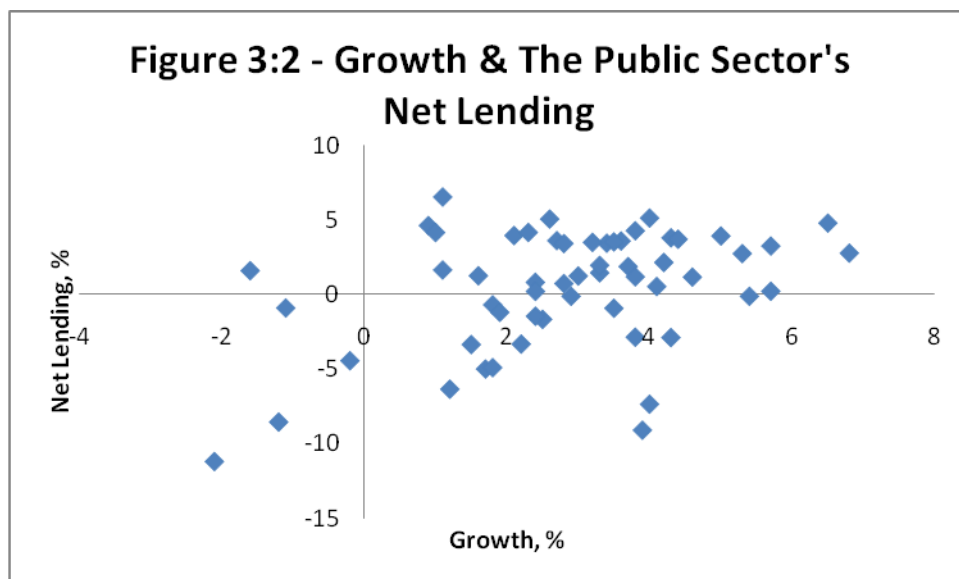
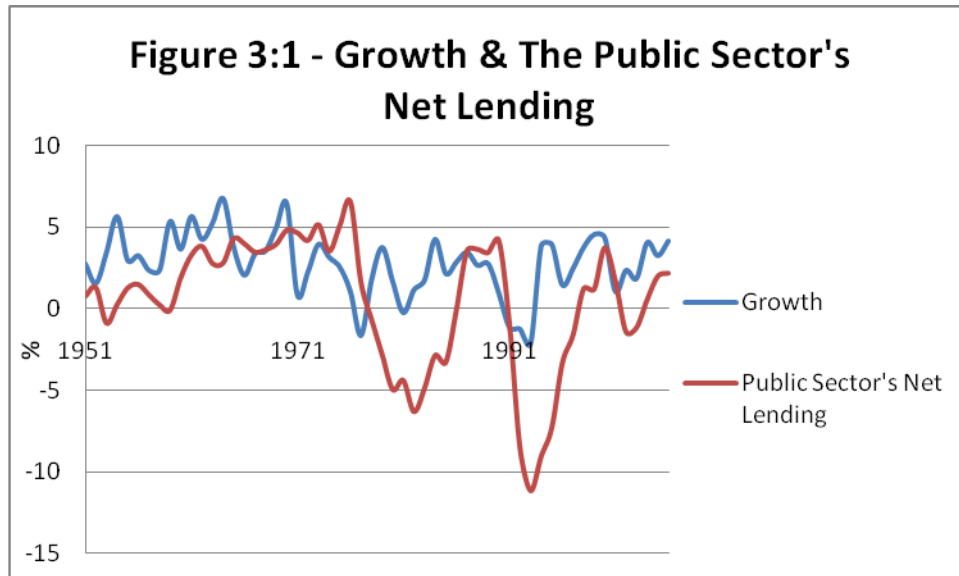
smoothing over the business cycle takes place. This problem is very important to keep in mind when analyzing the results, and we will return to a discussion of how it might be solved.

When estimating our models, we have found that heteroskedasticity is a problem which needs to be dealt with. Hence, when nothing else is mentioned, the presented estimates are robust to heteroskedasticity. We have also tested all regressions for AR(1) serial correlation. This has been done by taking the residuals from the OLS estimations and regressing these residuals on a lagged version of themselves. In all (!) of our estimates, AR(1) serial correlation was present. To adjust for this, we also report Prais-Winsten estimates of all regressions (Wooldridge 2006). Another way of correcting for serial correlation is to estimate heteroskedasticity and autocorrelation consistent (HAC) standard errors. These can then be used to make standard OLS estimates robust to heteroskedasticity and serial correlation. The advantage of this is that it allows for adjustment for higher order serial correlation. We have therefore also estimated most of our regressions with Newey-West standard errors, correcting for up to third order serial correlation (Wooldridge 2006). The choice of how many orders of serial correlation to control for is somewhat arbitrarily, and the estimates do not change substantially if higher or lower orders are controlled for. We, however, also keep the regular OLS estimates as a point of reference.

We would, as a final point, like to remind the reader that when dealing with time series data, there is an implicit trade-off between the quality and quantity of data series. We have chosen to study a rather long period of time, which means that some of our variables are of poorer quality than could have been the case if we had chosen a shorter period of time. This makes it more important not to be irresponsible when interpreting our results, but instead practice the virtue of humility.

3.3 Models and Testing

3.3.1 The public sector's Net Lending



Looking at the graph showing the development of GDP growth and the public sector's net lending over time and the scatter plot of the two variables, it seems like there could be a positive correlation between the two variables. To test if there is such a relationship, and whether it is a statistically significant one, we start by estimating the simplest regression,

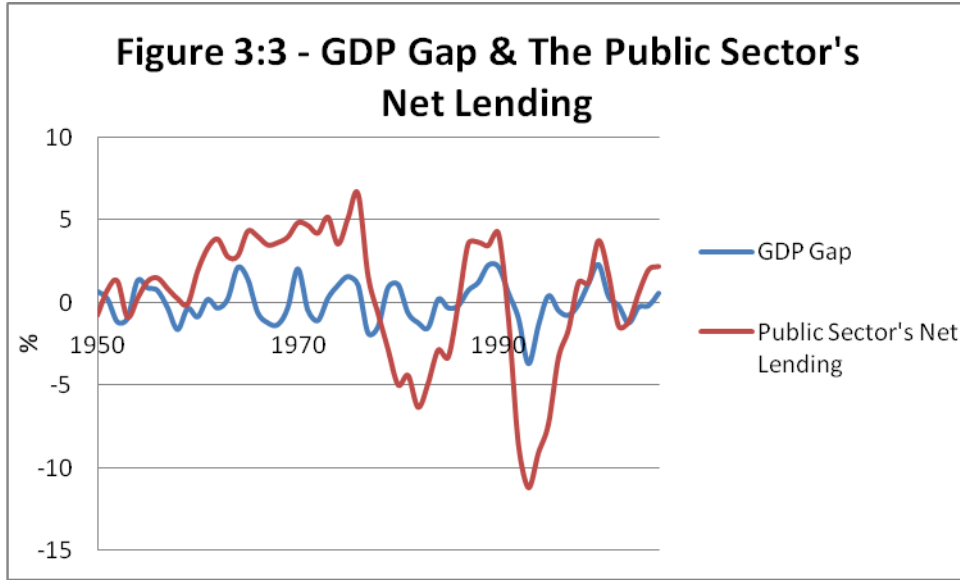
$$S^G = \beta_0 + \beta_{GDP}GDP + u \quad (3:1)$$

where S^G stands for the public sector's net lending, GDP for GDP growth and all variables refer to the same point in time (a trait that is common in all regressions, if nothing else is mentioned). The result from the regression is presented in Table A:1, A:2 and A:3 (three tables for the three different estimation techniques) which, as all tables, are found in Appendix A. The OLS and Newey-West estimates indicate that changes in the growth rate has a positive and statistically significant affect of on the public sector's net lending, i.e. that the public sector adjust its savings rate in a countercyclical way, while the Prais-Winsten estimates are insignificant.

It is, however, not obvious that growth is the most relevant independent variable. A high growth rate that is sustainable does, for example, not call for contractive fiscal policies. A more suitable regression to run might therefore be:

$$S^G = \beta_0 + \beta_{GDP-trend}(GDP-trend) + u \quad (3:2)$$

where (GDP-trend) refers to the GDP gap described in Appendix C. The GDP gap indicates when growth is higher or lower than its potential level, and might therefore be considered to be a more relevant indicator of when fiscal policy needs to be used. Figure 3:3 is the visual interpretation of the link between the two variables. The results from the estimation of equation (3:2) are presented in Table A:4, A:5 and A:6. The GDP gap seems to have a positive and statistically significant effect on the public sector's savings rate.



It seems reasonable to suspect that changes in the business cycle during previous years might induce changes in the public sector's net lending today, due to the lags discussed earlier in the thesis. We therefore estimate the following two regressions, to control for the effect of lags:

$$S^G = \beta_0 + B_{GDP}GDP + \beta_{GDP_1}GDP_{-1} + \beta_{GDP_2}GDP_{-2} + \beta_{GDP_3}GDP_{-3} + u \quad (3:3)$$

$$S^G = \beta_0 + B_{(GDP-trend)}(GDP-trend) + \beta_{(GDP-trend)_{-1}}(GDP-trend)_{-1} + \beta_{(GDP-trend)_{-2}}(GDP-trend)_{-2} + \beta_{(GDP-trend)_{-3}}(GDP-trend)_{-3} + u \quad (3:4)$$

where the subscripts indicate what of the previous years the lags refer to. The results are presented in Table A:1, A:2 and A:3 and Table A:4, A:5 and A:6 respectively. The estimates of equation (3:3) are ambiguous. The OLS and Newey-West estimates indicate that the effect of growth is smaller and less significant, while the Prais-Winsten estimates are larger and dramatically more significant. It also seems as though previous years' growth rates might have had a positive and statistically significant affect on the public sector's present net lending. One should, however, be cautious when interpreting the results, since the lags are heavily correlated with each other.

The results from estimating equation (3:4), on the other hand, do not indicate that the lags have a significant effect to the extent that (3:3) did. The present year's state of the business cycle, however, continues to affect the savings rate in a positive and significant way.

When studying Figure 3:2, it seems as though the positive relationship between the public sector's net lending and economic growth is dependent on the observations during years of negative growth. To test whether this is the case, we estimate equations (3:1) through (3:4) again, omitting years where growth has been negative. For estimates with growth as an independent variable, the results are presented in Table A:7 and A:8 and for estimates with the GDP gap as an independent variable, the results are presented in Table A:9 and A:10.

The general trend is that when years with negative growth rates are excluded, the present year's growth and GDP gap becomes less significant, both statistically and economically, as an explanatory variable. This is consistent with the visual interpretation of Figure 3:2.

Two factors which might influence the public sector's net lending are the political business cycle we mentioned in chapter 2.1.5 and the level of public debt. Omitting the first of these should not make our estimates biased, since the GDP growth and the election cycles probably are not correlated. We would not like to control for all changes in the level of public debt, since some of those changes are related to the business cycle and, as has been mentioned earlier, we do not want to control for indirect effects of changes in the business cycle. For the sake of formality, however, we repeat regressions (3:1) through (3:4), controlling for election years, years before election years and the long-term development of public debt, measured as a five-year adjustable average. The estimated regressions are thus:

$$S^G = \beta_0 + \beta_{GDP}GDP + \beta_{election}election + \beta_{election_{+1}}election_{+1} + \beta_{debt}debt + u \quad (3:5)$$

$$S^G = \beta_0 + \beta_{GDP-trend}(GDP-trend) + \beta_{election}election + \beta_{election_{+1}}election_{+1} + \beta_{debt}debt + u \quad (3:6)$$

$$S^G = \beta_0 + \beta_{GDP}GDP + \beta_{GDP_1}GDP_{-1} + \beta_{GDP_2}GDP_{-2} + \beta_{GDP_3}GDP_{-3} + \beta_{election}election + \beta_{election_{+1}}election_{+1} + \beta_{debt}debt + u \quad (3:7)$$

$$\begin{aligned}
S^G = & \beta_0 + B_{GDP-trend}(GDP-trend) + \beta_{(GDP-trend)_{-1}}(GDP-trend)_{-1} \\
& + \beta_{(GDP-trend)_{-2}}(GDP-trend)_{-2} + \beta_{(GDP-trend)_{-3}}(GDP-trend)_{-3} + \beta_{election}election \\
& + \beta_{election_{+1}}election_{+1} + \beta_{debt}debt + u
\end{aligned} \tag{3:8}$$

The results from estimates with growth as an independent variable are presented in Table A:1, A:2 and A:3, while the results for estimates with the GDP gap as an independent variable are presented in Table A:4, A:5 and A:6.

The results from estimating equation (3:5) does, as expected, not differ from previous results when it comes to the coefficient of growth. It is still positive and significant with OLS and Newey-West estimates, and insignificant with Prais-Winsten estimates. When estimating (3:7), however, the growth variable is no longer significant with OLS, but the Prais-Winsten estimates continue to indicate that growth has a positive and statistically significant effect on the public sector's net lending. Again, one should remember that the OLS estimates are presented more as a point of reference.

The results from estimating equation (3:6) and (3:8) are, as expected, similar to the previous ones; the GDP gap continues to be positively and statistically significantly correlated with the public sector's net lending according to all of our estimates.

Another interesting topic to study is that of how much of an actual change in the public sector's net lending that is due to discretionary policies, and how much is due to the effect of the state of the business cycle via the automatic stabilizers. In order to separate between the two, we have estimated the public sector's cyclically adjusted net lending. A more detailed description of how this was done can be found in Appendix D. We use the cyclically adjusted savings rate as the dependent variable instead of the net lending, and run the regressions corresponding to equations (3:1) through (3:4) with this change. The estimated regressions are:

$$S^{GC} = \beta_0 + \beta_{GDP}GDP + u \tag{3:9}$$

$$S^{GC} = \beta_0 + \beta_{GDP-trend}(GDP-trend) + u \tag{3:10}$$

$$S^{GC} = \beta_0 + B_{GDP}GDP + \beta_{GDP_{-1}}GDP_{-1} + \beta_{GDP_{-2}}GDP_{-2} + \beta_{GDP_{-3}}GDP_{-3} + u \tag{3:11}$$

$$S^{GC} = \beta_0 + B_{(GDP-trend)}(GDP-trend) + \beta_{(GDP-trend)_{-1}}(GDP-trend)_{-1}$$

$$+ \beta_{(GDP-trend)_{-2}} (GDP-trend)_{-2} + \beta_{(GDP-trend)_{-3}} (GDP-trend)_{-3} + u \quad (3:12)$$

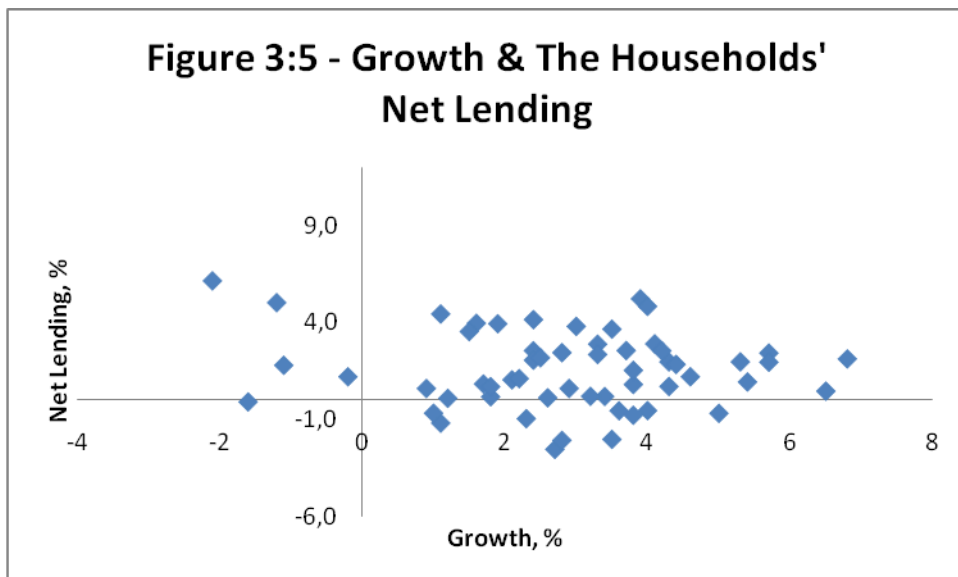
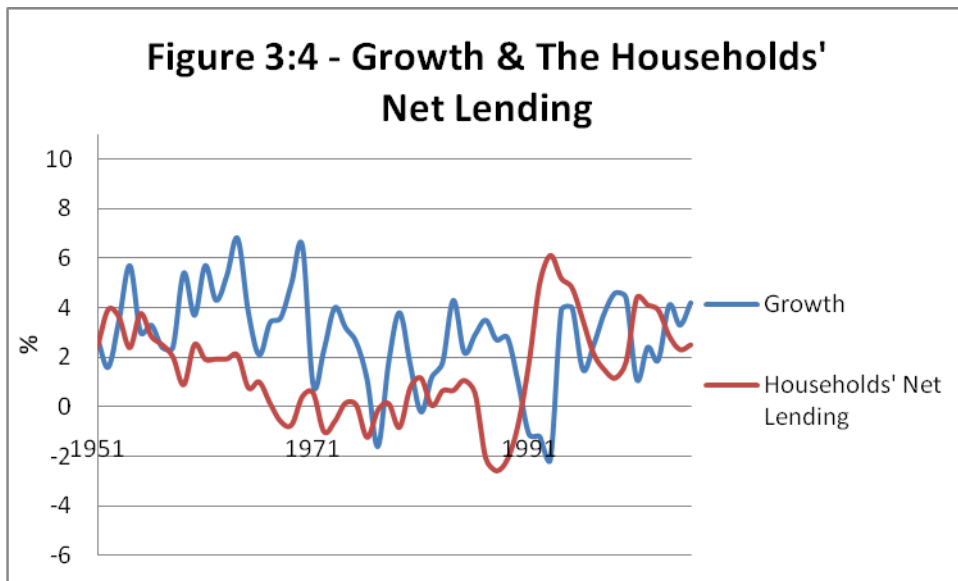
where S^{GC} denotes the public sector's cyclically adjusted net lending. The results for estimates with growth as an independent variable are presented in Table A:11, A:12 and A:13, and the results for the estimates where the GDP gap is an independent variable are presented in Table A:14, A:15 and A:16.

When it comes to regression (3:9) and (3:11), growth no longer seem to affect savings in a significant way. The lagged growth variables, however, are positively and significantly correlated to the public sector's net lending.

When it comes to regression (3:10) and (3:12), where the GDP gap is used as an independent variable, the estimated coefficient for the present year's GDP gap is no longer significant when using Prais-Winsten estimates. It, however, continues to be positive and significant when using standard OLS and Newey-West estimates. The estimated coefficients are smaller when the public sector's cyclically adjusted net lending is used as an independent variable than when total net lending is used.

3.3.2 The Household's Net Lending

We turn now to the households, and their savings behavior. As already mentioned, we are not interested in controlling for any indirect affects of changes in the business cycle. Figure 3:4 acts as a point of reference, and shows the relationship between the state of the business cycle and the household's savings.



One can not simply by conduction eyeball-econometrics conclude that there is any significant relationship between the two variables. The econometric estimate of Figure 3:5 is received by running regression (3:13),

$$S^H = \beta_0 + \beta_{GDP}GDP + u \quad (3:13)$$

where S^H denotes the household's net lending and GDP the rate of growth. The results are presented in Table A:17, A:18 and A:19.

It seems as though there is a small negative affect of changes in growth rates on the households' net lending, but the estimates are only statistically significant when Prais-Winsten estimates are used. Just as in the section dealing with the public sector it can, however, be of greater relevance to use the GDP gap as an independent variable. Equation (3:14) is therefore estimated.

$$S^H = \beta_0 + \beta_{GDP-trend}(GDP-trend) + u \quad (3:14)$$

The results are presented in Table A:20, A:21 and A:22. The estimated coefficient is negative and statistically significant. This indicates that households might adjust their consumption in a procyclical way. It is, however, important to remember that the households could be affected by what the fiscal authorities are doing. If, for example, the public sector runs a countercyclical fiscal policy, one could suspect that the household's savings behavior is affected in a procyclical way (due, for example, to Ricardian effects). An initial attempt to control for the effect of changes in fiscal policy is made by estimating regression (3:15) and (3:16).

$$S^H = \beta_0 + \beta_{GDP}GDP + \beta_{S^{GC}}S^{GC} + u \quad (3:15)$$

$$S^H = \beta_0 + \beta_{GDP-trend}(GDP-trend) + \beta_{S^{GC}}S^{GC} + u \quad (3:16)$$

Where S^{GC} denotes the public sector's cyclically adjusted net lending. The results are presented in Table A:17, A:18 and A:19, and Table A:20, A:21 and A:22 respectively. The estimated coefficient for growth in equation (3:15) continues to be negative and significant with Prais-Winsten estimates, while it is insignificant when standard OLS and Newey-West estimates are made. The estimated coefficient for the GDP gap in equation (3:16) is not affected substantially when one controls for the public sector's cyclically adjusted net lending. It is still negative and significant when one uses Prais-Winsten estimates, and insignificant when OLS and Newey-West is used. In all estimates of regressions (3:15) and (3:16), the public sector's cyclically adjusted net lending is negatively correlated with the households' net lending in a way which is both statistically and economically significant.

Just as when we were dealing with the public sector's net lending, we would also like to test whether or not the households respond to changes in the business cycle with a lag. We thus estimate the following equations:

$$S^H = \beta_0 + \beta_{GDP}GDP + \beta_{GDP_{-1}}GDP_{-1} + \beta_{GDP_{-2}}GDP_{-2} + \beta_{GDP_{-3}}GDP_{-3} + \beta_{S^{GC}}S^{GC} + u \quad (3:17)$$

$$S^H = \beta_0 + \beta_{GDP-trend}(GDP-trend) + \beta_{(GDP-trend)_{-1}}(GDP-trend)_{-1} \\ + \beta_{(GDP-trend)_{-2}}(GDP-trend)_{-2} + \beta_{(GDP-trend)_{-3}}(GDP-trend)_{-3} + \beta_{S^{GC}}S^{GC} + u \quad (3:18)$$

The results are presented in Table A:17, A:18 and A:19, and Table A:20, A:21 and A:22 respectively. The estimates from regression (3:17) indicate that the lags do not have a statistically significant effect, except when using Newey-West estimates. The same is true for estimates of regression (3:18), with the exception of the first lag. The other results do not change either; the growth coefficient from equation (3:17) continues to be small and negative when using Prais-Winsten and insignificant when one uses OLS and Newey-West estimation techniques.

When it comes to the results from regression (3:18), the coefficient that captures the effect of changes in the GDP gap is negative and significant on the ten percent level when standard OLS and Newey-West techniques are used. When Prais-Winsten estimates are made, they are economically smaller, but also statistically more significant. The public sector's cyclically adjusted net lending continues to affect the households' net lending in a negative and significant way in all regressions made.

4. Analysis

4.1 The Public Sector

As we mentioned in the theory description in chapter two, this thesis is based on the assumption that fiscal authorities would like to run a countercyclical policy. The aim of our empirical study of the relationship between the public sector's net lending and the business cycle has been to examine if the authorities actually have managed to implement such policies. If they have, we would expect to see a positive relationship between the public sector's net lending and GDP growth/gap; in booms, when the GDP gap is high and positive, they ought to save more and in busts, when the GDP gap is negative, they ought to have lower, or even negative, savings rates. The general result of our empirical study is that the public sector's net lending is positively correlated with growth and the GDP gap. Thus, it seems like the fiscal authorities, on average, actually have managed to implement countercyclical fiscal policies.

Looking only at observations where growth is positive, the relationship between the public sector's net lending and the business cycle is not as clear as it was when all observations were included. These results could be viewed as indicating that the public sector has been better at countering larger shocks in the economy than to fine tune the state of the business cycle.

We have also examined to what extent the relationship described above is an effect of the automatic stabilizers. This is an interesting topic to study if one is interested in passing judgment on the merits of trying to use discretionary measures to run a countercyclical fiscal policy. In our empirical study, we find that the relationship between the state of the business cycle and the public sector's cyclically adjusted net lending is substantially weaker than when total net lending is used as the dependent variable. It is actually not even statistically significant in half of our estimates. This implies that the countercyclical relationship between the public sector's net lending and the business cycle might mainly be due to the automatic stabilizers.

One should, however, remember that our estimates can be expected to be biased downward, as was discussed in chapter 3.2. This makes it reasonable to be somewhat cautious when it

comes to analyzing the results. The fact that different econometric estimation techniques have been made, which not always show the same thing, also makes it necessary not to be too eager to jump to any conclusions.

4.2 The Households

The households' behavior is not as easy to comment on as that of the public sector. It seems as though the households have adjusted their net lending in a procyclical way during the period studied. The estimated effect of a change in the business cycle is not a huge one, but it continues to be statistically significant in all of our Prais-Winsten estimations, and it is on the verge of being significant when Newey-West estimates are used. Is this consistent with what could be expected purely from theory? The answer is not self-evident. One can formulate rather specific hypothesis about the effects of a change in a certain variable on the households' net lending if all other factors are assumed to remain constant. The problem with changes in the business cycle, however, is that a lot of things change simultaneously, i.e. all other factors are not constant.

In Appendix E, we have tried to estimate the determinants of the households' savings. What we find is that increases in income affects savings in a positive way. This indicates that savings should rise in booms and decrease in busts, leading to a countercyclical pattern. We, however, also find that the rate of unemployment is negatively correlated with savings. This is interpreted as showing that when uncertainty rises (unemployment is used as a proxy for uncertainty), so does savings, due to an increase in precautionary savings. Inflation, which can be expected to be higher in booms, also affects savings in a positive way, something that makes savings adjust in a countercyclical way.

The amount of credit that is available in the economy has a negative relation to savings and it is also negatively correlated with the state of the business cycle. People who face borrowing constraints in booms can, all of a sudden, consume more in busts. This should give rise to a countercyclical pattern of households' savings. As has been mentioned earlier, the public sector's net lending, which has been shown to be negatively correlated with the state of the business cycle, is also negatively correlated with the households' net lending. This affects the households' saving in a way that makes it vary in a procyclical way.

One possible interpretation of our findings is thus that there are several, and possibly opposing, effects of a certain change in the business cycle on the households' savings. In a worsened state of the economy, for example, the effect of increased uncertainty might outweigh the effect of a drop in income below that which an individual consider to be his permanent income. This does not mean that there is no consumption smoothening present, it just means that other effects are dominant.

A second explanation of our findings can be formulated if one thinks about the fact that people who manage to stay employed in a recession may be better off than in booms, since interest rates and prices can be expected to be lower. For these people, a higher degree of savings might be rational, even though it might not be for those who actually become unemployed or even for the nation as a whole. If total savings are unequally distributed among different groups, an assumption that seems plausible, the effect on the aggregate level of savings of changes in the business cycle might be very different from a situation in which savings were equally distributed among citizens.

If, for example, the majority of savings is held by people who are better off in recessions, aggregate savings might increase in economic downturns, even though the average citizen decreases his savings ratio. This point to the fact that one needs to be cautious when analyzing our estimates, since they are based on aggregate data series while the theory that has been used mainly has microeconomic implications.

Another way of explaining the results is to assume that they are simply due to the negative bias which has been discussed earlier. Maybe drops in aggregate demand which are caused by increases in savings lead to a worsened state of the economy and not the other way around. Or, maybe the households' net lending is uncorrelated with the business cycle, but the fact that we define net lending as a ratio of net lending to GDP make it seem as though it adjusts in a procyclical way.

A fourth option is of course that our estimates are due to "something else"; a phenomenon which we have omitted from the analysis and has been correlated with the state of the business cycle historically, but which can not be expected to continue to have the same influence in the future. Our estimates of a correlation does, of course, not necessarily imply

that there is a causal relationship between the households' net lending and the state of the business cycle.

4.3 Critique of the Results

There are a number of things that one needs to have in mind when analyzing the results presented in the preceding chapters. First, it should be emphasized that the estimations of the magnitude and timing of changes in the savings ratio in response to changes in the state of the business cycle does not say anything about whether those changes were optimal or not. In this thesis, no attempt to decide on how much (or in what way) savings should react to a certain change in the business cycle has been made. In that respect, the results are positive and not normative; they describe how households and the public sector have reacted, not how they should have reacted.

Even if one were to pass judgement on the desirability of the changes in the public sector's and households' savings ratios that actually have taken place, that judgement would by definition be based on *ex post* knowledge. This thesis has used data that in some cases have been gathered in a time period very remote to that in which households and the public sector had to make their savings decisions. To decide on what would have been an optimal behaviour, given the information available in each time period, one would instead have to use real-time data.

Second, for the results to be relevant for thinking about the future, one has to make the implicit assumption that the relevant aspects of the future will be similar to the past, or at least resemble the past to some extent. Nothing in the preceding chapters guarantees that the historic pattern will continue to be valid in the future. Caution is therefore advised if one wants to use the results to formulate normative policy advice.

Third, it should be emphasized that the data studied in this thesis is on an aggregate level. The hypotheses on how people react to changes in their economic environment are, however, based on microeconomic theories. As was discussed in the previous section, changes in the business cycle might affect different groups or people in different ways, thus inducing different, and sometimes opposite, effects on the aggregate savings ratio. If the distribution of

savings, or the way in which fluctuations in the business cycle affect different groups, changes, the results in this thesis can be expected to become less relevant.

Fourth, one should be careful not to take the results in this thesis and try to apply them to other countries. Sweden is, in many ways, a rather special case. As has been shown, it has a public sector which is larger than in most countries. This is of course financed via taxes which also have been rather high. This might be expected to influence the households' need an ability to save. It is in no way obvious that what has been true for Sweden has been true for any other country. Our results should not be treated as if they describe some sort of universal truth.

4.4 Concluding Remarks

Returning to the question that we set out to answer, we conclude that there is evidence of the Swedish public sector adjusting its net lending in a countercyclical way during the period studied. One should remember that this is despite the fact that the results can be expected to be biased in the opposite direction. The positive relationship between the public sector's net lending and the state of the business cycle, however, seem to be mainly an effect of the automatic stabilizers and not discretionary policies.

The households' savings behaviour has not had a relationship to the state of the business cycle which has been as easy to analyze. Due to the fact that the results can be expected to be biased in a way that makes them appear more procyclical than they actually are, it would be reckless to conclude that the households have adjusted their savings rate in a procyclical way. It is, however, also obvious that one can not conclude that the opposite is true. The data, regardless of its deficiencies, does not show much sign of the households changing their savings in a countercyclical way.

Thus, during the period studied, the Swedish public sector seems to have smoothened out its consumption over the business cycle, whilst the households appear not to have followed this pattern. So, what next? Below is a short list of proposals for future research that we have come to think of during the work on this thesis.

It would be interesting to try to separate changes in the households' savings from the effects of those changes on the state of the business cycle. The interdependence between the two variables, and the bias that it results in, e.g. that a rise in the households' savings might induce a worsened state of the economy, thereby making it seem as though households adjust their savings in a procyclical way, would be interesting to try to circumvent. One way in which this could be done is to study changes in the business cycle which can be suspected to be exogenous, or at least are not due to changes in aggregate demand.

Another interesting topic to study is that of whether the countercyclical changes in the public sector's net lending actually has had an effect when it comes to stabilizing aggregate demand. As we have mentioned earlier, our tests are positive, i.e. they do not pass judgment on whether certain changes have been good or bad. It would, nonetheless, be interesting to compare the actual behavior of the public sector and the households to that which would have been optimal, given the state of the economy in different points in time.

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Appendix A – Tables

In all tables, the number presented in parentheses in the title of a column denotes what regression the results in that column refer to. In the name of each table, the econometric estimation technique used is also mentioned. The number of asterisks under an estimated coefficient indicates how significant the estimate is. Three asterisks means that the estimate is significant on the one percent level, two asterisks indicate significance on the five percent level and one asterisk means that the estimates are significant on the ten percent level.

	(3:1)	(3:3)	(3:5)	(3:7)
β_0	-1.79826	-6.478351	1.783072	-5.032861
		***		***
β_{GDP}	.804356	.3530207	.736161	.3303567
	**	*	**	
β_{GDP-1}		.7081259		.7014072
		***		***
β_{GDP-2}		.6169826		.5975879
		***		***
β_{GDP-3}		.7922079		.6853114
		***		***
$\beta_{election}$			-.2824091	.2707527
$\beta_{election+1}$			.2553806	.2871968
β_{debt}			-.0831649	-.0291991
			***	*
R ²	0.1481	0.6632	0.2934	0.6789
No. Obs	56	53	53	53

Table A:1- Growth & The Public Sector's Net Lending (OLS)

	(3:1)	(3:3)	(3:5)	(3:7)
β_0	.2188335	-5.85733	-1.681127	-4.95129
		***		***
β_{GDP}	.1485722	.4727859	.1337363	.4618229
		***		***
β_{GDP-1}		.663955		.6891665
		***		***
β_{GDP-2}		.5875667		.5878689
		***		***
β_{GDP-3}		.5057112		.4579282
		***		***
$\beta_{election}$			.3328284	.3992829
$\beta_{election+1}$			.3802088	.4115759
β_{debt}			.0416686	-.02635
R ²	0.0181	0.4494	0.0387	0.4699
Roh	.8487132	.7570591	.8802822	.7467963
No. Obs	56	53	53	53

Table A:2 - Growth & The Public Sector's Net Lending (Prais-Winsten)

	(3:1)	(3:3)	(3:5)	(3:7)
β_0	-1.79826	-6.478351	1.783072	-5.032861
		***		**
β_{GDP}	.804356	.3530207	.736161	.3303567
	***		***	
$\beta_{\text{GDP-1}}$		.7081259		.7014072
		***		***
$\beta_{\text{GDP-2}}$		.6169826		.5975879
		***		***
$\beta_{\text{GDP-3}}$		.7922079		.6853114
		***		***
β_{election}			-.2824091	.2707527
$\beta_{\text{election+1}}$			.2553806	.2871968
β_{debt}			-.0831649	-.0291991
			**	
No. Obs	56	53	53	53

Table A:3 - Growth & The Public Sector's Net Lending (Newey-West, 3 lags)

	(3:2)	(3:4)	(3:6)	(3:8)
β_0	.4720964	.4850081	4.042989	3.927135
			***	***
$\beta_{\text{GDP-trend}}$	1.572536	1.606605	1.714355	1.597432
	***	***	***	***
$\beta_{\text{GDP-trend-1}}$		.3292891		.277478
$\beta_{\text{GDP-trend-2}}$		.584125		.5000329
$\beta_{\text{GDP-trend-3}}$		-.0295361		-.2441174
β_{election}			.044077	.2413237
$\beta_{\text{election+1}}$			.7934141	.6715558
β_{debt}			-.0947739	-.0922102
			***	***
R ²	0.2353	0.3050	0.4390	0.4774
No. Obs	57	54	53	53

Table A:4 - GDP Gap & The Public Sector's Net Lending (OLS)

	(3:2)	(3:4)	(3:6)	(3:8)
β_0	.442397	.6151092	-1.548842	-3.947452
$\beta_{\text{GDP-trend}}$	.6740149 ***	.8218631 ***	.7350291 ***	.8221857 ***
$\beta_{\text{GDP-trend-1}}$		.4496928 **		.5432354 **
$\beta_{\text{GDP-trend-2}}$		.2718053		.2455834
$\beta_{\text{GDP-trend-3}}$		.0917059		.1269467
β_{election}			.3329472	.4856915
$\beta_{\text{election+1}}$			.5559295	.6377541
β_{debt}			.0443261	.1070235
R ²	0.1587	0.2690	0.2077	0.3300
Roh	.851391	.8606973	.8908948	.9298347
No. Obs	57	54	53	53

Table A:5 - GDP Gap & The Public Sector's Net Lending (Prais-Winsten)

	(3:2)	(3:4)	(3:6)	(3:8)
β_0	.4720964	.4850081	4.042989 **	3.927135 **
$\beta_{\text{GDP-trend}}$	1.572536 ***	1.606605 ***	1.714355 ***	1.597432 ***
$\beta_{\text{GDP-trend-1}}$		.3292891		.277478
$\beta_{\text{GDP-trend-2}}$		.584125		.5000329
$\beta_{\text{GDP-trend-3}}$		-.0295361		-.2441174
β_{election}			.044077	.2413237
$\beta_{\text{election+1}}$			.7934141	.6715558
β_{debt}			-.0947739 ***	-.0922102 **
No. Obs	57	54	53	53

Table A:6 - GDP Gap & The Public Sector's Net Lending (Newey-West, 3 lags)

	(3:1)	(3:3)
β_0	-.2091375	-5.338865 ***
β_{GDP}	.3719136	.1897782
β_{GDP-1}		.6100812 ***
β_{GDP-2}		.5682224 ***
β_{GDP-3}		.7710046 ***
R ²	0.0236	0.6090
No. Obs	51	48

Table A:7 Positive Growth & The Public Sector's Net Lending (OLS)

	(3:1)	(3:3)
β_0	.0752608	-3.938269 **
β_{GDP}	.0005626	.2717419 *
β_{GDP-1}		.4693694 ***
β_{GDP-2}		.4316721 ***
β_{GDP-3}		.4451516 ***
R ²		0.2620
Roh	.8566282	.8028108
No. Obs	51	48

Table A:8 - Positive Growth & The Public Sector's Net Lending (Prais-Winsten)

	(3:2)	(3:4)
β_0	.8155407 *	1.11226 **
$\beta_{GDP-trend}$	1.181416 ***	1.002832 **
$\beta_{GDP-trend-1}$		.8548745
$\beta_{GDP-trend-2}$		.7088723
$\beta_{GDP-trend-3}$		.3449235
R ²	0.1431	0.3540
No. Obs	52	49

Table A:9 - GDP Gap & The Public Sector's Net Lending (OLS), years with negative growth excluded

	(3:2)	(3:4)
β_0	-.1155155	.011502
$\beta_{\text{GDP-trend}}$	.3320199 *	.5324297 **
$\beta_{\text{GDP-trend-1}}$		.4700497 **
$\beta_{\text{GDP-trend-2}}$		.2719047
$\beta_{\text{GDP-trend-3}}$		.2328034
R^2		0.1008
Roh	.8661094	.857576
No. Obs	52	49

Table A:10 - GDP Gap & The Public Sector's Net Lending (Prais-Winsten), years with negative growth excluded

	(3:9)	(3:11)
β_0	-1.24393	-5.699756 ***
β_{GDP}	.6210802 **	.242719
$\beta_{\text{GDP-1}}$		.5506738 ***
$\beta_{\text{GDP-2}}$		.5796734 ***
$\beta_{\text{GDP-3}}$		.8314851 ***
R^2	0.1058	0.6537
No. Obs	56	53

Table A:11 - Growth & The Public Sector's Cyclically Adjusted Net Lending (OLS)

	(3:9)	(3:11)
β_0	1.039359	-3.911419 **
β_{GDP}	-.124248	.1492959
$\beta_{\text{GDP-1}}$		.4481692 **
$\beta_{\text{GDP-2}}$		.486334 ***
$\beta_{\text{GDP-3}}$		.4827677 ***
R^2	0.0157	0.3368
Roh	.8671902	.7416186
No. Obs	56	53

Table A:12 - Growth & The Public Sector's Cyclically Adjusted Net Lending (Prais-Winsten)

	(3:9)	(3:11)
β_0	-1.24393	-5.699756 ***
β_{GDP}	.6210802 **	.242719
$\beta_{\text{GDP-1}}$		.5506738 ***
$\beta_{\text{GDP-2}}$		.5796734 ***
$\beta_{\text{GDP-3}}$		.8314851 ***
No. Obs	56	53

Table A:13 - Growth & The Public Sector's Cyclically Adjusted Net Lending (Newey-West, 3 lags)

	(3:10)	(3:12)
β_0	.4995196	.5144495
$\beta_{\text{GDP-trend}}$	.9816579 **	1.013071 **
$\beta_{\text{GDP-trend-1}}$		.3264899
$\beta_{\text{GDP-trend-2}}$		.5893104
$\beta_{\text{GDP-trend-3}}$		-.0284092
R ²	0.1098	0.1886
No. Obs	57	54

Table A:14 - GDP Gap & The Public Sector's Cyclically Adjusted Net Lending (OLS)

	(3:10)	(3:12)
β_0	.4809727	.6244571
$\beta_{\text{GDP-trend}}$	.0862445	.2339619
$\beta_{\text{GDP-trend-1}}$		.4459598 ***
$\beta_{\text{GDP-trend-2}}$		.2777998
$\beta_{\text{GDP-trend-3}}$		.0985336
R ²	0.0015	0.1163
Roh	.8521939	.8604956
No. Obs	57	54

Table A:15 - GDP Gap & The Public Sector's Cyclically Adjusted Net Lending (Prais-Winsten)

	(3:10)	(3:12)
β_0	.4995196	.5144495
$\beta_{\text{GDP-trend}}$	.9816579 ***	1.013071 **
$\beta_{\text{GDP-trend-1}}$		.3264899
$\beta_{\text{GDP-trend-2}}$		.5893104
$\beta_{\text{GDP-trend-3}}$		-.0284092
No. Obs	57	54

Table A:16 - GDP Gap & The Public Sector's Cyclically Adjusted Net Lending (Newey-West, 3 lags)

	(3:13)	(3:15)	(3:17)
β_0	1.875204 ***	1.503013 ***	-.4033664
β_{GDP}	-.1302533	.0555772	.042889
β_s^{GC}		-.2992054 ***	-.5128721 ***
$\beta_{\text{GDP-1}}$			.2519607 *
$\beta_{\text{GDP-2}}$			.2336985
$\beta_{\text{GDP-3}}$			.2043991
R ²	0.0160	0.2906	0.4124
No. Obs	56	56	53

Table A:17 - Growth & The Households' Net Lending (OLS)

	(3:13)	(3:15)	(3:17)
β_0	2.352149 **	2.719674 ***	2.180907 **
β_{GDP}	-.225428 ***	-.2645211 ***	-.2174013 ***
β_S^{GC}		-.2962269 ***	-.3299921 ***
$\beta_{\text{GDP-1}}$			.076291
$\beta_{\text{GDP-2}}$			.0506243
$\beta_{\text{GDP-3}}$			-.0013599
R^2	0.1631	0.4209	0.4462
Roh	2.352149	.8900127	.8817646
No. Obs	56	56	53

Table A:18 - Growth & The Households' Net Lending (Prais-Winsten)

	(3:13)	(3:15)	(3:17)
β_0	1.875204 **	1.503013 ***	-.4033664
β_{GDP}	-.1302533	.0555772	.042889
β_S^{GC}		-.2992054 ***	-.5128721 ***
$\beta_{\text{GDP-1}}$			.2519607 **
$\beta_{\text{GDP-2}}$			.2336985 **
$\beta_{\text{GDP-3}}$			.2043991 *
No. Obs	56	56	53

Table A:19 - Growth & The Households' Net Lending (Newey-West, 3 lags)

	(3:14)	(3:16)	(3:18)
β_0	1.494547	1.620538	1.585063
	***	***	***
$\beta_{\text{GDP-trend}}$	-.5649327	-.3173347	-.4115448
	***		*
β_S^{GC}		-.2522244	-.2721454
		***	***
$\beta_{\text{GDP-trend-1}}$			.2510987
$\beta_{\text{GDP-trend-2}}$			-.0974733
$\beta_{\text{GDP-trend-3}}$			-.0661576
R ²	0.1249	0.3196	0.3509
No. Obs	57	57	54

Table A:20 - GDP Gap & The Households' Net Lending (OLS)

	(3:14)	(3:16)	(3:18)
β_0	1.561652	1.671692	1.974492
	**	***	**
$\beta_{\text{GDP-trend}}$	-.3089528	-.2876274	-.3035713
	***	***	***
β_S^{GC}		-.2366689	-.3240467
		***	***
$\beta_{\text{GDP-trend-1}}$			.2936549

$\beta_{\text{GDP-trend-2}}$			-.0345275
$\beta_{\text{GDP-trend-3}}$			-.0901128
R ²	0.1198	0.2860	0.4784
Roh	.8371944	.82613	.8711859
No. Obs	57	57	54

Table A:21 - GDP Gap & The Households' Net Lending (Prais-Winsten)

	(3:14)	(3:16)	(3:18)
β_0	1.494547 ***	1.620538 ***	1.585063 ***
$\beta_{\text{GDP-trend}}$	-.5649327 *	-.3173347	-.4115448 *
β_s^{GC}		-.2522244 **	-.2721454 **
$\beta_{\text{GDP-trend-1}}$			.2510987
$\beta_{\text{GDP-trend-2}}$			-.0974733
$\beta_{\text{GDP-trend-3}}$			-.0661576
No. Obs	57	57	54

Table A:22 - GDP Gap & The Households' Net Lending (Newey-West, 3 lags)

Appendix B – The Households' Net Lending

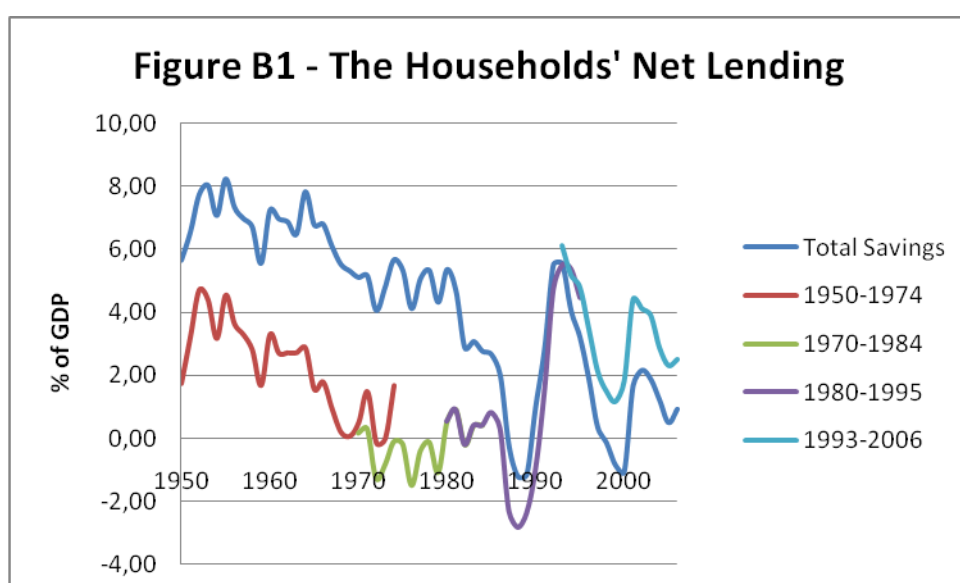
There is, as far as we know, no time series of the households' net lending that cover the entire period of 1950 to 2006. We therefore have decided to construct one ourselves. Data on the absolute levels of the households' net lending during the period 1950 to 1974 is provided by the National Central Bureau of Statistics (1975). For the period 1970 to 1985, data is supplied by Statistics Sweden (1987). Statistics Sweden (1997) provides the data for the period 1980 to 1995, and Statistics Sweden (2008), finally, provides the data for the period 1993 to 2006.

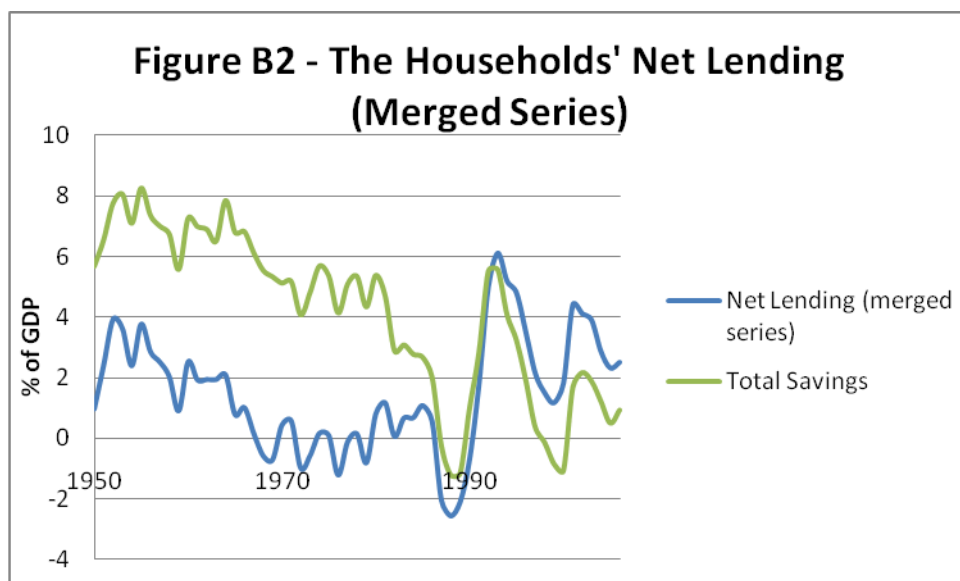
It should be noted that non-profit institutions serving the households are also included in these figures. In the cases where there is a discrepancy between the net lending reported in the financial and real accounts, the financial accounts have been used.

These absolute values of the households' net lending have then been divided by the GDP, measured in current prices, to get the ratio of net lending to GDP. Data on GDP is provided by Statistics Sweden (2008).

We now have four separate time series of the ratio of net lending to GDP covering the whole period. In order to merge these four different time series into one, we calculate the mean difference during the periods where the two most modern series overlap. The years in the series preceding the most modern one which are not part of the overlapping spectrum is then shifted with the amount equal to the mean difference during the overlapping years. The procedure is then repeated for the second and third most modern series. Here, the year 1985 was not taken into account when the mean difference during the overlapping years was calculated, since the discrepancy seemed unnaturally large. The third most modern series was then adjusted with the calculated mean difference. Finally the procedure was repeated again, now with the two oldest series.

Figure B1 shows the four separate time series while Figure B2 shows the continuous series, which is the result of the merging of the four separate ones. For comparison the households' total savings reported by Statistics Sweden (2009), as a share of GDP, is also shown in both figures.





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Appendix C – The GDP Gap

There are many ways in which the GDP gap, i.e. how much actual GDP differs from potential GDP, can be calculated. We start by defining the GDP gap as:

$$Y_{gap} = \frac{Y_t - Y_t^P}{Y_t^P} \quad (C:1)$$

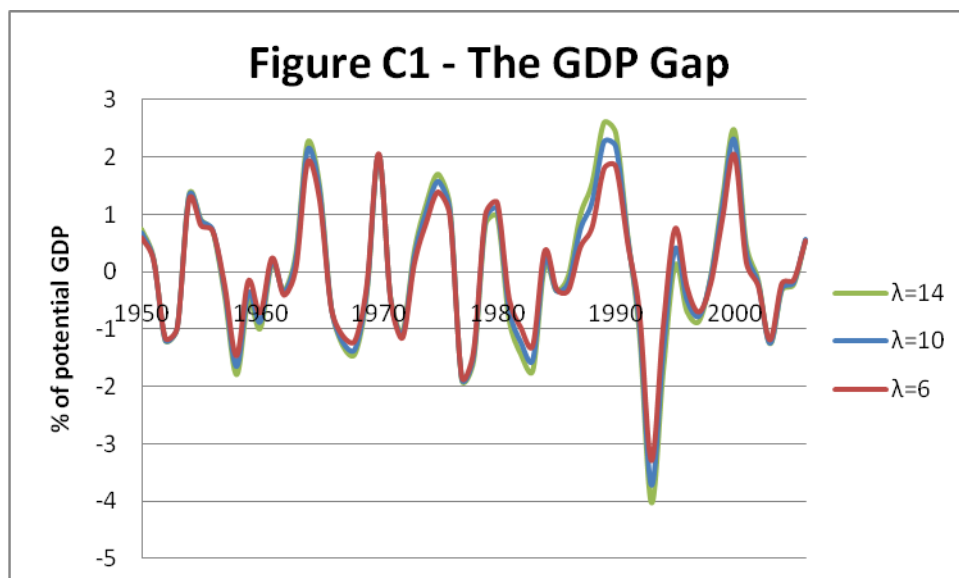
where Y_t is the realized GDP at year t and Y_t^P is the potential GDP at year t . We then assume that GDP growth can be divided into two components: trend growth and cyclical growth:

$$y_t = \tau_t + c_t \quad (C:2)$$

where y_t is the natural logarithm of Y_t , τ_t denotes the trend and c_t denotes the cyclical component. We have chosen to use a Hodrick-Prescott filter to separate our GDP data (Statistics Sweden 2008) into these two different components. It is a method that has been used by others for the same purpose (Central Bank of Iceland 2005), but it is by no means uncontroversial (Razzak 1997). The Hodrick-Prescott filter minimizes the following equation:

$$\sum_{t=1}^T (y_t - \tau_t)^2 + \lambda \sum_{t=2}^{T-1} ((\tau_{t+1} - \tau_t) - (\tau_t - \tau_{t-1}))^2 \quad (C:3)$$

The choice of the value of λ is important, but there is no consensus about what exact value that should be used for annual data. Maravall & del Rio (2001) recommends that λ should be set at some value between six and fourteen. We have estimated a GDP gap, i.e. the cyclical component given by the Hodrick-Prescott filter, with λ set to six, ten and fourteen respectively. The results are presented in Figure C1:



As is shown by the figure, the effect of setting λ to any particular value in the interval does not have any substantial effect on the estimated GDP gap. We have, somewhat arbitrarily, chosen to work with the GDP gap which is estimated by setting λ to ten.

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Appendix D – The Public sector's Cyclically Adjusted Net Lending

In order to estimate the public sector's cyclically adjusted net lending, one needs to determine the size of the budget elasticity, i.e. how much a one percent increase of growth, relative to its potential level, automatically affects the public sector's net lending via the so called automatic stabilisers.

In 2004, Boije (2004) estimated the Swedish budget elasticity to be approximately 0,75, an estimate which he notes is relatively close to that used by the Riksbank and the Ministry of Finance. Recently, however, the Swedish government has stated that it uses the OECD (2009) estimate of a budget elasticity equal to 0,55. The National Institute of Economic Research (2008) also estimates the elasticity to be 0,55, a value which it claims is a realistic assumption of the mean elasticity during the past years, but emphasizes that the true elasticity depends on what the cause of a change in the GDP gap is. Braconier (2000) estimate the development of the budget elasticity over time and shows that, during the period 1977-1991, it has varied between 0,5 and 0,9 for what he calls a balanced shock. Braconier & Holden (1999) reach the conclusion that the semi-elasticity of the primary balance with respect to GDP, for the period 1971-1997, has varied between 0,45 and 0,8. The Swedish Fiscal Policy Council (2009) has estimated the development of the budget elasticity during the period 1998-2009, and finds that it has fallen from 0,584 to 0,532.

To calculate precise estimates of the budget elasticity for the whole period studied in this thesis is not feasible. Instead, we will construct a rather coarse proxy for how the budget elasticity can be assumed to have developed during the period. But before that is done, one needs to think about the effects of over- or underestimating the budget elasticity.

If one were to overestimate the size of the budget elasticity, and then tried to determine how much of a countercyclical pattern in the public sector's net lending that was due to discretionary fiscal policies, one would underestimate the discretionary effect. The opposite would happen if one underestimated rather than overestimated the budget elasticity. In order not to give the public sector a disadvantage that it does not deserve, we would like to underestimate the budget elasticity rather than overestimate it (the optimal would of course be to have an exact measure of the budget elasticity).

This is because it would make our results more likely to be biased in a way that makes them overestimate the part of a change in net lending that is due to discretionary policies than the other way around. If we, given our low estimate of the budget elasticity, conclude that we can't find a statistically significant effect of changes in the state of the business cycle on the public sector's cyclically adjusted net lending, we can be confident that this conclusion is not due to an unfair estimate of the budget elasticity.

As Braconier (2000) notes, a simple rule-of-thumb when it comes to the development of the size of the budget elasticity over time is to assume that it is proportional to the ratio of public expenditures to GDP. Countries with larger public sectors tend to have larger automatic stabilisers.

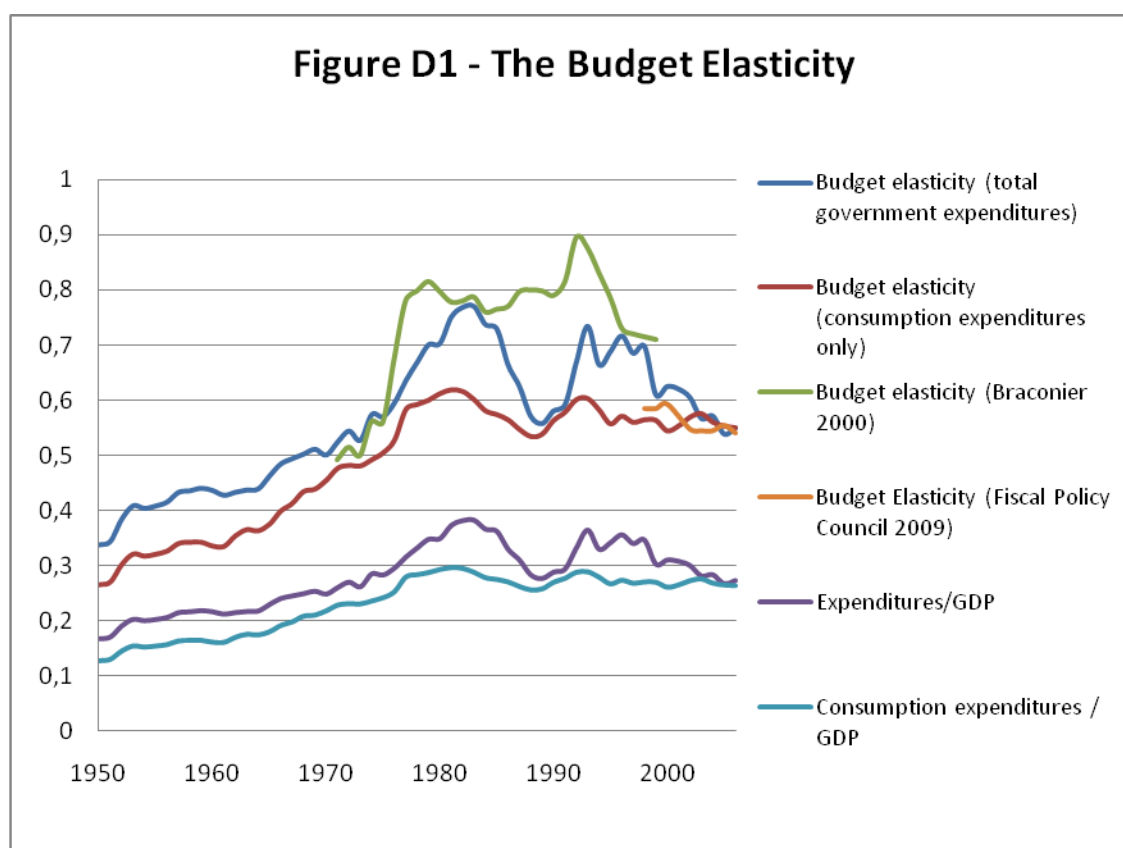
In this thesis, we will assume that the size of the budget elasticity in Sweden 2006 was 0,55 and that its relationship to the ratio of public expenditures to GDP has been constant over the whole period. These are of course extremely simplified assumptions since we don't know exactly what the size of the budget elasticity was, because it's very unlikely that the relationship of budget elasticity to public expenditures as a share of GDP has remained

constant over such a long period of time and since the shocks that has faced Sweden during the period 1950-2006 probably has not been of an identical sort.

The assumption might, however, give at least some kind of hint as to in what direction the size of the automatic stabilisers have developed.

Data on the public expenditures is provided by the Swedish National Financial Management Authority (2008) for the period 1957-2006. During 1957-1970, the budget year didn't equal the calendar year, so the size of public expenditures for 1958 has been set to the average of the budget years 1957/58 and 1958/59. The same procedure has been used for the whole period 1958-1969. For the period 1950-1957, data on public expenditures are lacking. For this period, we have assumed that total public expenditures follow the development of public consumption expenditures. Data on public consumption expenditures is provided by Statistics Sweden (2008).

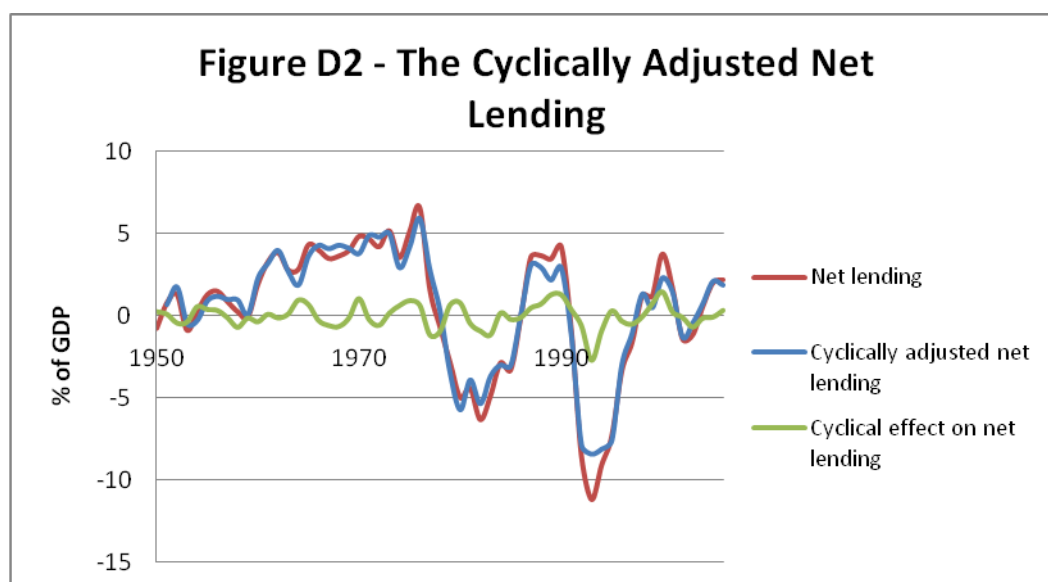
In Figure D1 below, the estimated size of the budget elasticity if one uses total public expenditures and if one uses public consumption expenditures are presented, as well as the estimates made by Braconier (2000) and the Swedish Fiscal Policy Council (2009). For the sake of comparison, the share of total public expenditures as a share of GDP and the public consumption expenditures as a share of GDP are also included.



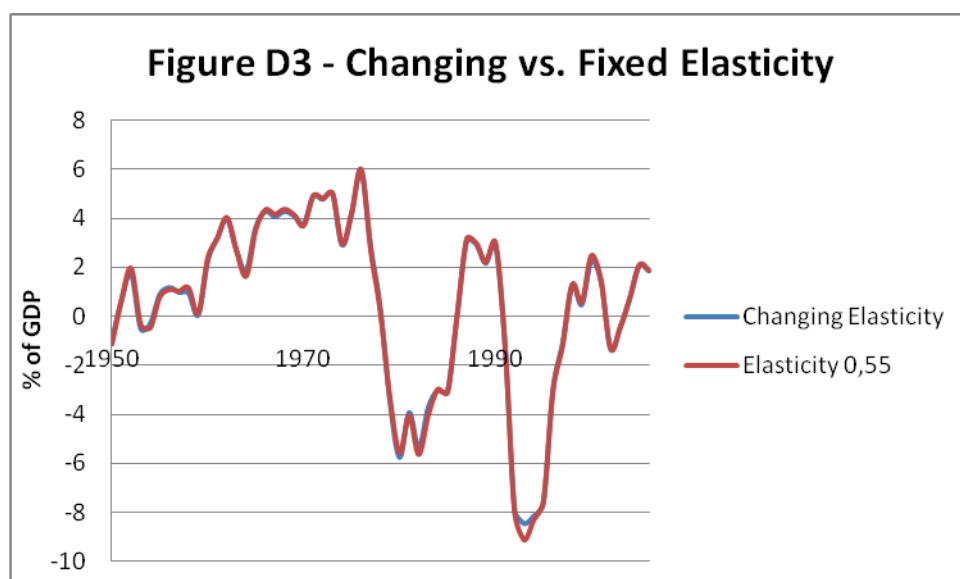
We will, as was mentioned above, use the budget elasticity that was estimated using the total public expenditures. As is seen in Figure D1, our estimates are lower than those of Braconier (2000) for all periods of time except for the earliest years of the 1970's. Our estimates also seem to indicate a drop in the budget elasticity during the later half of the 1980's that might not correspond to an actual change, if one compares our estimate to those made by Braconier

(2000). One thus needs to keep in mind that our estimates are nothing but a proxy for the true values of the budget elasticity.

The cyclically adjusted savings rate is, following Boije (2004), the actual net lending less the budget elasticity times the GDP gap (see Appendix C for a detailed description of how the GDP gap has been estimated). Figure D2 shows the public sector's actual net lending, the cyclically adjusted net lending and the cyclical part of the net lending.



As a sort of sensitivity analysis, we compare our estimate of the cyclically adjusted net lending to that which is estimated if the budget elasticity is assumed to have remained constant at a value of 0,55. This comparison is presented in Figure D3.



The estimates are so similar that it is actually hard to even see that the graph contains two series! This indicates that results that are obtained from using the cyclically adjusted net lending in regressions are not very sensitive to our estimates of the budget elasticity.

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Appendix E – What Determines the Households' Savings Rate?

As was shown in chapter 3, it is not obvious what determines the development of the households' savings. In order to be able to analyze the results presented in chapter 3 more thoroughly, one first need to know what actually determines the households' savings rate. When those factors are known, their relation to the state of the business cycle might give a hint as to whether or not there are offsetting effects of a particular change in the state of the economy.

One way to get an initial point of reference when it comes to why people save is to ask them. This has been done by Bucks et al. (2009), and the answers are reported in Table E:1.

Type of reason	1998	2001	2004	2007
Education	11	10,9	11,6	8,4
For the family	4,1	5,1	4,7	5,5
Buying own home	4,4	4,2	5	4,2
Purchases	9,7	9,5	7,7	10
Retirement	33	32,1	34,7	33,9
Liquidity	29,8	31,2	30	32
Investments	2	1	1,5	1,6
No particular reason	1,3	1,1	0,7	1,1
When asked for a reason, reported do not save	4,9	4,9	4	3,3
Total	100	100	100	100

Table E:1 - Survey of Why People Save

Retirement has been the dominant reason for saving. The “liquidity” answer has generally been interpreted as a sign of precautionary savings, and as is shown in Table E:1 it has been almost as important a factor as retirement. One should, however, keep in mind that the results presented above are from the U.S., and they might very well differ from the answers that one would get if one were to ask Swedes the same question.

When trying to define the determinants of the households' savings rate, we will continue to use time series data from Sweden. Our main source of inspiration when it comes to which factors should be controlled for is Berg (1983). Below is a summary of where our data is from:

The Households' Net Lending

We will use two measures of the households' net lending. The first of these is very similar to that which was presented in Appendix B, but with the difference that we do not use the ratio of net lending to GDP. Instead, we will use net lending as a share of disposable income as the dependent variable. The difference between the two measures is, however, small. The correlation coefficient between them is 0,987. Despite this, we feel that it makes more sense to use disposable income, since it is out of disposable income, and not GDP, that people actually saves.

The second measure that will be used is the actual values saved. In order to construct this variable, we just multiply the net lending as a share of GDP which was calculated in Appendix B with GDP. We also adjust the data in order to compensate for increases in

savings which are purely due to inflation. This is done by dividing the data with the consumer price index reported by Statistics Sweden (2009a). However, we change the base year from 1914 (which is the default setting in the database) to 2006. We thus end up data on the households' net lending in fixed prices, 2006 being the reference year.

The Households' Disposable Income

Data on the households' disposable income is taken from Statistics Sweden (2009b), and refers to real values with 2000 as the reference year. In order to make the estimates more easily interpreted, we have constructed an index based on this data. This index takes on the value of 100 in the year 1950. Following Berg (1983), we use lags of this variable as a proxy for expected future income.

Dependency

Demographical statistics for the period 1950-2008 is collected from Statistics Sweden (2009c). The term dependency ratio, when used in this thesis, refers to the ratio of the total number of citizens to those who are between 20 and 64 years of age.

Inflation

The rate of inflation refers to annual changes in a consumer price index and is reported in Statistics Sweden (2009d).

The Short-term and Risk-free Interest Rates

Historical values of the Riksbank's nominal, short-term interest rate have been collected from Waldenström (2008). His definition therefore also applies to the data in this thesis. The real interest rate is calculated by subtraction the inflation rate from the nominal interest rate. The data serves as a proxy for the risk-free rate.

Wealth

A detailed description of how a proxy for household owned wealth has been calculated is found in Appendix F. We also use the stock market index reported by Waldenström (2008), as a proxy for wealth.

Unemployment

The level of unemployment has, in other studies of savings behavior, been used as a proxy for the level of uncertainty facing households (Berg 1983). We will use the unemployment levels in the very same way, and the specific values that will be used are those reported in Forslund (2008).

Access to Credit

To measure the access to, or lack of, credit, we use data from Beck et al. (2008). The variable we use is called Private Credit by Deposit Money Banks and Other Financial Institutions and is a ratio of the amount of credit in the economy to GDP. It has been used by the International Monetary Fund (2005) for purposes similar to ours. This variable, however, is only reported from 1960 onwards, making our time series shorter than before.

Social Security and Retirement Benefits

We have chosen to include a dummy variable to capture the effect of the major reform of the Swedish pension system in 1994.

The Public Sector's Net Lending

We use the same measure of the public sectors net lending as in the main body of text, i.e. that which is reported in Statistics Sweden (2008).

The first regression we run is (E:1), which is specified below:

$$S^H / Y^D = \beta_0 + \beta_{Y^D} Y^D + \beta_{Y^{D-1}} Y^{D-1} + \beta_{Y^{D-2}} Y^{D-2} + \beta_{Y^{D-3}} Y^{D-3} + \beta_{Y^{D-4}} Y^{D-4} + \beta_{CRED} CRED + \beta_{DEP} DEP + \beta_{\pi} \pi + \beta_r r + \beta_{WLT} WLT + \beta_U U + \beta_{SSC} SSC + \beta_{S^G} S^G \quad (E:1)$$

S^H / Y^D denotes the ratio of net lending to disposable income, Y^D_t denotes disposable income in period t , $CRED$ is the credit variable, DEP is the dependency ratio, π is the inflation rate, r is the real short-term interest rate, WLT is the wealth proxy which is defined in Appendix F, U denotes unemployment, SSC is the dummy variable that equals unity from 1994 onwards and S^G is the public sector's net lending.

The results from running regression (E:1) is presented in Table E:2. The second regression that we run is (E:2):

$$S^H = \beta_0 + \beta_{Y^D} Y^D + \beta_{Y^{D-1}} Y^{D-1} + \beta_{Y^{D-2}} Y^{D-2} + \beta_{Y^{D-3}} Y^{D-3} + \beta_{Y^{D-4}} Y^{D-4} + \beta_{CRED} CRED + \beta_{DEP} DEP + \beta_{\pi} \pi + \beta_r r + \beta_{WLT} WLT + \beta_U U + \beta_{SSC} SSC + \beta_{S^G} S^G \quad (E:2)$$

The only difference is that in (E:2), the dependent variable is not the ratio of net lending to disposable income, but actual net lending. The results are presented in Table E:2. We also estimate regressions (E:3) and (E:4), which only differ from (E:1) and (E:2) in that we use the stock market index (SM) instead of our own wealth variable. The results are presented in Table E:2.

$$S^H / Y^D = \beta_0 + \beta_{Y^D} Y^D + \beta_{Y^{D-1}} Y^{D-1} + \beta_{Y^{D-2}} Y^{D-2} + \beta_{Y^{D-3}} Y^{D-3} + \beta_{Y^{D-4}} Y^{D-4} + \beta_{CRED} CRED + \beta_{DEP} DEP + \beta_{\pi} \pi + \beta_r r + \beta_{SM} SM + \beta_U U + \beta_{SSC} SSC + \beta_{S^G} S^G \quad (E:3)$$

$$S^H = \beta_0 + \beta_{Y^D} Y^D + \beta_{Y^{D-1}} Y^{D-1} + \beta_{Y^{D-2}} Y^{D-2} + \beta_{Y^{D-3}} Y^{D-3} + \beta_{Y^{D-4}} Y^{D-4} + \beta_{CRED} CRED + \beta_{DEP} DEP + \beta_{\pi} \pi + \beta_r r + \beta_{SM} SM + \beta_U U + \beta_{SSC} SSC + \beta_{S^G} S^G \quad (E:4)$$

All regressions were tested for the presence of heteroskedasticity and serial correlation. Heteroskedasticity was not a problem in any of the regressions. Regressions (E:1) and (E:2) were also tested for functional form misspecification using the so called RESET test without the null hypothesis of a correct specification being rejected. When estimating (E:3) and (E:4), however, AR(1) serial correlation was present, so the reported results from those regressions are Prais-Winsten, and not OLS, estimates.

To summarize the findings, it seems as though a higher income in the present period leads to higher savings, both in absolute terms and as a ratio of savings to income. This effect, however, might be mitigated in subsequent years when households adjust to the new level of income.

As expected, the access to credit is negatively correlated with savings, indicating that at least some households act as if they faced borrowing constraints. The dependency variable also

takes on the expected sign; a larger proportion of young and old people depress savings. This is consistent with the predictions made by the life cycle hypothesis.

Inflation has a positive influence on savings in all four regressions. One should not be fooled by the estimated coefficients for the two wealth variables. Since higher savings lead to higher wealth, the estimated coefficient does not have to indicate that a higher wealth leads to higher savings. As expected, when the stock market index (which is affected less by savings) is used as a proxy for wealth, the positive effect disappears.

Unemployment seem to have had a positive, strong and significant effect on savings. This could reflect the increases in precautionary savings that are due to increased uncertainty. The public sector's net lending has also had a strong and significant effect on the households' net lending, as could be expected from the ricardian equivalence theorem. To evaluate the validity of the theorem itself, however, requires a more thorough analysis than what is feasible to conduct here and now.

	(E:1)	(E:2)	(E:3)	(E:4)
β_0	98.4794 **	14807.2 ***	158.2116 **	15022.99 **
β_Y^D	0.3115472 ***	31.78173 ***	0.2769113 ***	29.05263 ***
β_{Y-1}^D	-0.1280979	-11.04422	-0.1018468	-8.7311
β_{Y-2}^D	-0.1381014	-13.19112	-0.1079461 *	-10.80656 *
β_{Y-3}^D	0.0385386	4.953695	-0.0417379	-2.842951
β_{Y-4}^D	-0.1536622 ***	-16.28667 ***	-0.0275477	-3.946298
β_{CRED}	-4.551014 **	-519.6473 **	-6.454801 **	-734.3272 ***
β_{DEP}	-53.40134 *	-8478.462 ***	-92.50348 **	-11356.11 **
β_π	0.38077 **	34.92218 **	.4352077 ***	35.59017 **
β_r	-0.0202268	-3.876518	0.0907288	6.4396
β_{WLT}	0.0084451 ***	.6984822 ***		
β_U	1.593318 ***	143.5022 ***	1.57493 ***	146.4412 ***
β_{SSC}	-2.140013	-244.2099	-0.3300773	-50.40193
β_S^G	-.6432743 ***	-67.70889 ***	-0.4307312 ***	-44.84039 ***
β_{SM}			-0.0080601	-1.513433
R^2	0.9365	0.9523	0.7967	0.8294
No. Obs	47	47	47	47

Table E:2 - Determinants of the Households' Net Lending

The interpretation of the asterisks in Table E:2 is the same as those in Appendix A.

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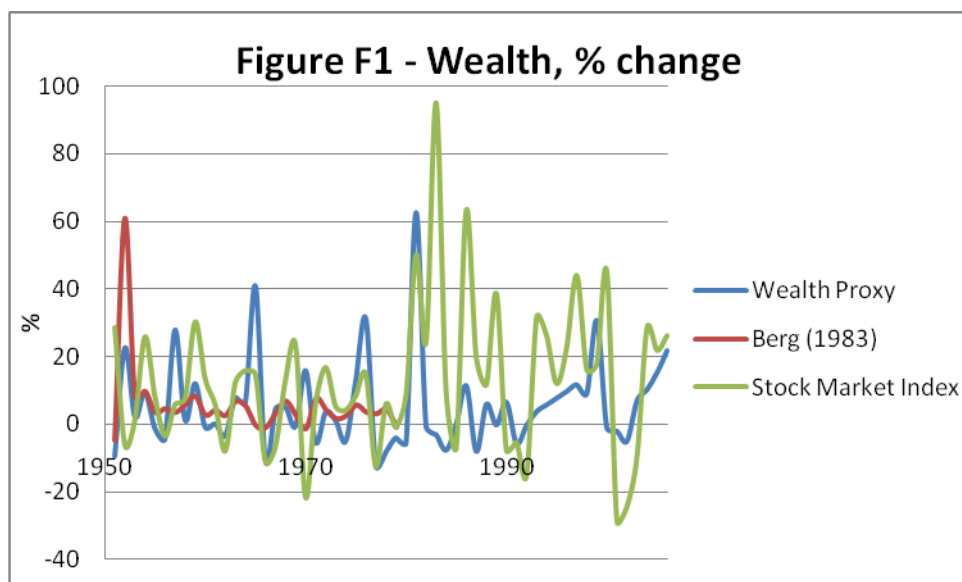
Appendix F – The Households’ Wealth

When creating our proxy for household wealth, we use mainly data on wealth that is subject to taxation. This is of course problematic, since the rules and laws defining what is to be viewed as wealth has changed over time. The biggest problem caused by changes in definitions is that data on wealth below a certain value is not collected at all. This limit has also changed over the years. Other changes worth noting are, for example, that from 1967 onwards the data does not refer to samples but to the whole population and in 1972 the collective taxation of married couples are abandoned. One should also note that there are rather large discrepancies even between overlapping series. All of this calls for caution when analyzing the data.

The most important assumption that we make is that the rate at which wealth increases or decreases is the same as the rate of change in the data that we have, i.e. the wealth subject to taxation. That is, if total wealth worth more than 200 000 SEK increases by one percent we assume that so does total wealth. This assumption is needed in order to merge series with different definitions of wealth.

We start by creating a wealth index that equals 100 in 1950. This index is then adjusted at the same rate of change as the data on wealth per capita less inflation. Data on population size, which the data on wealth is divided by, is from Statistics Sweden (2009a) and data on inflation is from Statistics Sweden (2009b).

For years where series overlap, the mean change has been used. For years where data is lacking, the mean change during the previous and following year is used. Figure F1 shows the development of the wealth index, an index of the value of the stock market (Waldenström 2008) and the variable of household wealth used by Berg (1983).



It is not obvious how, or even if, the variables are correlated. Below is the correlation coefficient between our proxy and the two other measures:

$$\rho_{W,B} = 0,951$$

$$\rho_{W,S} = 0,933$$

W denotes our proxy, B the variable used by Berg (1983) and S denotes the development of the stock market index. The measures are positively correlated, but one should always be cautious when choosing amongst variables which are supposed to be measures of the same thing but which differ as much as these three when it comes to the way in which they are calculated.

Below is a summary of the references that were used when our wealth proxy was estimated. They are organized both when it comes to the different periods in time which they refer to, and the different lower limits on how much wealth one needed to possess in order to be included in the data:

Wealth > 50 000 SEK

- 1950-1953 Central Bureau of Statistics (1955), Tax Assessments and Distribution of Income and Property: Assessment Year 1954 (SOS), Stockholm
- 1954-1956 Central Bureau of Statistics (1958), Tax Assessments and Distribution of Income and Property: Assessment Year 1957 (SOS), Stockholm

Wealth > 80 000 SEK

- 1953-1957 Central Bureau of Statistics (1959), Tax Assessments and Distribution of Income and Property: Assessment Year 1958 (SOS), Stockholm
- 1958-1960 Central Bureau of Statistics (1962), Tax Assessments and Distribution of Income and Property: Assessment Year 1961 (SOS), Stockholm
- 1961 Central Bureau of Statistics (1963), Tax Assessments and Distribution of Income and Property: Assessment Year 1962 (SOS), Stockholm
- 1962 Central Bureau of Statistics (1964), Tax Assessments and Distribution of Income and Property: Assessment Year 1963 (SOS), Stockholm
- 1963 Central Bureau of Statistics (1965), Tax Assessments and Distribution of Income and Property: Assessment Year 1964 (SOS), Stockholm
- 1964 Central Bureau of Statistics (1966), Tax Assessments and Distribution of Income and Property: Assessment Year 1965 (SOS), Stockholm

Wealth > 100 000 SEK

- 1964-1965 Central Bureau of Statistics (1967), Tax Assessments and Distribution of Income and Property: Assessment Year 1966 (SOS), Stockholm
- 1966 Central Bureau of Statistics (1968), Tax Assessments and Distribution of Income and Property: Assessment Year 1967 (SOS), Stockholm
- 1967 National Central Bureau of Statistics (1970), Income and Wealth Statistics 1967 (SOS), Stockholm
- 1968 National Central Bureau of Statistics (1971a), Income and Wealth Statistics 1968 (SOS), Stockholm

1969 National Central Bureau of Statistics (1971b), Income and Wealth Statistics 1969 (SOS), Stockholm

Wealth > 150 000 SEK

1969 National Central Bureau of Statistics (1971), Statistical Reports 1971, N 1971:80, Stockholm

1970 National Central Bureau of Statistics (1972), Income and Wealth Statistics 1970 (SOS), Stockholm

1971 National Central Bureau of Statistics (1973), Income and Wealth Statistics 1971 (SOS), Stockholm

1972 National Central Bureau of Statistics (1974), Income and Wealth Statistics 1972 (SOS), Stockholm

1970-1974 National Central Bureau of Statistics (1975), Tax Assessments 1975, Statistical Reports, N 1975:92 (SOS), Stockholm

Wealth > 200 000 SEK

1975 National Central Bureau of Statistics (1975), Tax Assessments 1975, Statistical Reports, N 1975:92 (SOS), Stockholm

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Wealth > 0 (?) SEK

It's not obvious what lower limit was used during these years, but at least the values seem to have been calculated using the same measurement method, and it was not until 1994 that the measurement was explicitly changed.

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- 1992 Statistics Sweden (1995), Statistical Yearbook of Sweden 1995 (SOS), Vol. 81, Stockholm
- 1993 Statistics Sweden (1996), Statistical Yearbook of Sweden 1996 (SOS), Vol. 82, Stockholm

Wealth > 800 000 SEK

- 1994 Statistics Sweden (1997), Statistical Yearbook of Sweden 1997 (SOS), Vol. 83, Stockholm
- 1995 Statistics Sweden (1998), Statistical Yearbook of Sweden 1998 (SOS), Vol. 84, Stockholm

Wealth > 900 000 SEK

- 1996 Statistics Sweden (1999), Statistical Yearbook of Sweden 1999 (SOS), Vol. 85, Stockholm
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