NORWEGIAN SCHOOL OF ECONOMICS AND BUSINESS ADMINISTRATION
Bergen, Spring 2011

Political Budget Cycles in a Small, Open Economy

The Independent Central Bank as an Institutional Constraint Conditional on the Exchange Rate Regime

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Master Thesis - Economic Analysis Profile

NORWEGIAN SCHOOL OF ECONOMICS AND BUSINESS ADMINISTRATION

Two points are here to be noted. First, that a people deceived by a false show of advantage will often labour for its own destruction; and, unless convinced by someone whom it trusts, that the course on which it is bent is pernicious, and that some other is to be preferred, will bring infinite danger and injury upon the State. And should it so happen, as sometimes is the case, that from having been deceived before, either by men or by events, there is none in whom the people trust, their ruin is inevitable.

Discourses on the first decade of Titus Livius, chapter LIII

Niccolò Machiavelli

Summary

This thesis investigates political budget cycles (PBC) in a modern democracy. A model of PBC in a small, open economy is developed using the New-Keynesian methodology, incorporating separate fiscal and monetary authorities. The model is based on that the competence of the politicians cannot be directly observed, and that the interest rate is a variable of high visibility for consumers.

The model predicts that if there are no constraints to the central bank in the form of nominal limits to the exchange rate, there will be no PBC.

An empirical analysis tests the model predictions on a panel data set of 141 countries over the years 1990-2009, and finds that they have good support.

The lesson that can be drawn from this thesis is that an independent central bank is not by itself a hindrance to PBC. An independent central bank will only be an institutional constraint to politicians if there are no constraints that bind the central bank.

Preface

This thesis is written as part of my Master of Science degree in Economics and Business Administration, taken at the Norwegian School of Economics and Business Administration. Although the thesis in its entirety has been written during the first half of 2011, the process of creating it has lasted for a year and a half.

The course Econometric Analysis and Applications proved invaluable for squaring in the research question at an early stage in the spring of 2010, spurring the work of building a first Mundell-Fleming type model of budget cycles the summer of 2010. The preparatory work continued until the onset of the writing of thesis January 2011.

I would like to thank Professor Rögnvaldur Hanneson for demonstrating the beauty of mathematical analysis through the course Resource Economics held at NHH. I would also like to thank Associate Professor Karl R. Pedersen for reading through material and providing feedback in the early stages of the work with this thesis.

I would also like to thank my advisor, Associate Professor Gernot Doppelhofer, for all his help, but also for providing me with challenges that I at the outset was not aware of were surmountable.

Finally, I would like to thank Helena for all the encouragement while enduring my commitment to this project, and Frida and Johan Samson for all the joyful noise.

Bergen, June 2011

Ole-Petter Moe Hansen

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1. Introduction

1.1 Background

Political budget cycles (PBC) have been studied by economists for decades, and are in general understood as expansive fiscal policies in election years that should help the incumbent politician to get re-elected. There are several reasons for why PBC is an interesting topic. First, PBC has implications for a number of economic variables; there are the direct effects on fiscal variables, but macroeconomic variables such as production and inflation will also be affected by the PBC. Second, the PBC are a product of interactions between politicians, the electorate and institutions such as the central bank. Thus, understanding the PBC will give greater understanding of how a country works; both as a democracy and as an economy.

The research on political budget cycles have tried to identify which factors that influences these cycles, and in which countries and in which time periods political budget cycles are present. The findings of recent articles (Hagen (2010), Alt and Lassen (2006), Shi and Svennson (2006)) is that cycles are found in both developed and developing countries, and that factors such as access to information and political polarization are important determinants of the size of the cycles.

Clark and Hallerberg (2000) lays out a model which concludes that capital controls, central bank independence and the type of exchange rate regime are crucial determinants for political budget cycles. A brief empirical investigation supported these findings. However, the ideas brought forward in this paper seem not to have gained ground.

Several authors (Drazen (2001a), Clark and Hallerberg (2000), Leith and Wren-Lewis (2009)) points out that there is a need for improving the existing models of political business cycles. As will be discussed in detail later on, all of the existing modelling of political business cycles can be subjected to one or more of the following points of critique; i: the model is not micro founded, or ii: the model abstracts from the independent central bank, or iii: the model keeps production and inflation exogenously fixed.

This thesis addresses all three point of critique. This is done by developing a small, open economy model using the New-Keynesian methodology. Further, separate fiscal and monetary authorities are included, where it is assumed that the central bank is independent.

1.2 Research Question

The research question that this master thesis aims to answer is the following:

How does an independent central bank and various exchange rate targeting regimes affect the political budget cycles?

The perspective taken in this thesis is a stylized country that is both a modern democracy and a small, open economy. The following sections define in detail what is meant by both the research question and the perspective of the thesis.

This thesis builds on the work in Clark and Hallerberg (2000). However, contrary to this article, this thesis will discuss independent central banks only. The reason for this is that there has been a long trend towards more central bank independence (Arnone et al 2006). An independent central bank is therefore a feature consistent with the case of a modern democracy, which is the baseline case this thesis sets out to investigate.

Clark and Hallerberg (2000) discuss the effect of capital controls. The focus of this thesis is the small, open economy, with corresponding full capital mobility. Thus, capital controls and the closed economy case will not be discussed in this thesis.

Yet another limitation of this thesis is that it discusses opportunistic politicians only – an alternative would be to write about partisan politics. The choice of focus is not arbitrary as the research question deals with the interaction between voters, politicians and the independent central bank. Therefore, heterogeneous politicians are left out to allow for a thorough treatment of the factors most relevant to the research question.

Finally, it should be stressed that the underlying focus of this paper is positive. The thesis aims to understand how the political budget cycles work, hence normative questions and policy implications are relegated to section 5 and 6.

1.3 Structure and Methods

Section 2 will provide the reader with some the most important developments with respect to the topic of opportunistic political business cycles.

Section 3 develops a model of political budget cycles in a small, open economy. The model is micro-founded, incorporates separate monetary and fiscal authorities and it models output and inflation using the recent New-Keynesian methodology. The model results in theoretical predictions that can be empirically tested. Further, the model is simulated, demonstrating the effects of the political budget cycle on government expenditures, production and inflation.

The empirical analysis can be found in section 4. The analysis is performed on a panel data set of over 2 600 observations, where the sample period extends from 1990 to 2009, and covers 141 countries. The baseline results are that political budget cycles are found in countries with a fixed or "semi fixed" exchange rate, whereas the budget cycles are not found when the exchange rate is independently floating. Also, it is shown that the magnitude of the budget cycles depend on both access to information and corruption, conditional on the exchange rate regime allowing for budget cycles. Finally, the empirical section explores the dynamics of the PBC, by examining the changes in government expenditures before, during and after elections. It is found that the increase in spending is not restricted to the election year, and further that there appears to be different dynamics in countries with different exchange rate regimes.

Section 5 will discuss the findings of the thesis, and section 6 concludes.

1.4 Definitions

A political budget cycle is cyclical movement in fiscal policies, which is found in conjunction with elections. In general, the budget cycle indicates that fiscal policies will be expansionary in the election year. However, the political budget cycle could also be defined by its cause. Given the focus on opportunistic PBC, an inherent feature of the concept of PBC lies in its motivation, as the objective of the political budget cycles is to improve the re-election probability of the incumbent. Thus, the term political budget cycles as it is used in this thesis refer to both of these aspects; it is an expansive fiscal policy in the election year, the objective of which is to improve the re-election probability of the incumbent.

A slightly different term is political business cycles. Rather than pointing at any economic policy instrument, the term points at the effect of an expansionary policy in conjunction with an election; a change in the business cycle. It could also be used more generally as "*...political determinants of macroeconomic cycles"* (Drazen 2001a:75). In any case, the term can be used both for expansionary monetary and fiscal policies in or around election years. It should then be noted that the term political budget cycle is more precise than political business cycles. The focus of this thesis is on political budget cycles.

Opportunistic politicians can be defined as being *"...purely self-interested: they care about being in office per se, or about the rents they receive. They choose policy so as to further these goals, but otherwise do not care about what policy is implemented"* (Persson and Tabellini 2000:11). This is the definition that will be utilized in this thesis.

The baseline case in this thesis is a country that is both a modern democracy and a small, open economy. As the political science aspect is not the main focus of this thesis, the term "modern democracy" refers to a country that has the following two features: i: it chooses its leaders through elections, and ii: it has an independent central bank. Hence, the term "modern" refers to the institution of an independent central bank. The term "small, open economy" refers to a country that has no restrictions on the flows of goods and capital across its borders. Also, the country is so small that domestic production, prices and policies has no impact on the rest of the world.

Throughout this paper, the definition of central bank independence proposed by Fischer and Debelle (1994) which they called *Instrument Independence* is utilized. By this, it is meant that it is the politicians who set the goals for the monetary policy (e.g. an inflation target), and the central bank who determines how to reach those goals (setting the interest rate, credit limits etc). As Alesina et al points out: *"this is a rather "minimalist" view of the meaning of central bank independence".* (2010:15). However, the results in this thesis will be just as valid for countries with central bank goal independence, i.e. that the central bank decides on the goals for the monetary policy, in addition to central bank instrument independence. Hence, this wide definition of central bank independence increases the relevance of the results in this thesis.

Throughout, this thesis considers institutions as *"constitutional"*, i.e. that they are not subject to change in the short run. Such institutions could be the organisation of the central

bank, the exchange rate regime, election processes etc. This paper will extensively discuss how such institutional features will affect political business cycles, but abstracts from any possible feedback from the political budget cycles to the institutions themselves. Such a procedure is common in political economy, and allow for giving the research question a thorough treatment. However, the empirical section does to some extent control for this, by running regressions conditional on e.g. the central bank being independent. The exchange rate regime is considered constitutional as well. Blomberg et al (2005) provides a discussion on the impact of elections on the exchange rate regime, although the arguments presented in this paper is mostly relevant for countries without an independent central bank. This thesis does not pursue the topic of non-constitutional exchange rate regimes any further.

1.5 Summary of model

In order to motivate the derivations in sections 2 and 3, this part will briefly discuss the highlights of the model which will be laid out in section 3. As already stated, the perspective of the model is on a country that is both a small, open economy and a modern democracy. The model is a micro-founded model of political budget cycles that is developed using the New-Keynesian methodology, incorporating separate fiscal and monetary authorities.

The model is based on that the competence of politicians is changing over time, and that it cannot be directly observed by consumers. Consumers can at their leisure calculate the competence of the incumbent politician using observed prices and production levels, but that is assumed to give them disutility. However, if the central bank changes the interest rate in response to government spending, consumers can costlessly use the observed interest rate to learn of the governments dealings and thereby learn the competence of the incumbent.

The sequence of events is such that politicians move first by deciding on public expenditures and debt. This is followed by the central bank which decides on the interest rate. Thereafter consumers make their consumption and labour supply decisions and firms decide on prices. Elections are held biannually.

The model predicts that if the central bank follows a Taylor-type loss function, the central bank will respond to increased government spending by increasing the interest rate. Thus, consumers will observe the interest rate response to government expenditures, and learn if the incumbent uses fiscal policies to try to improve the re-election probability. The model

predicts that in this case, voters will not be more likely to vote for the incumbent if an expansionary fiscal policy is undertaken. Therefore, the incumbent will not carry out an expansive fiscal policy in the election year as it will not improve the probability of re-election.

If on the other hand the central bank follows an exchange rate target, the central bank will not adjust its interest rate in response to domestic macroeconomic variables such as inflation, production, and hence government spending. In this case consumers cannot learn anything from the central banks response, leaving some room for the incumbent politician to try to manipulate the electorate through fiscal policies. The model predicts that with an exchange rate peg, or nominal limits to the exchange rate, political budget cycles will be the equilibrium policy.

The main contributions of section 3 are therefore to i: merge a model of PBC that assumes voters are rational with micro founded macroeconomic modelling, and ii: include the independent central bank in the analysis, and iii: explicitly model various central targeting regimes. Finally, the model is used to confirm some earlier findings of that access to information and corruption are important determinants of the magnitude of the budget cycles.

2. Literature Review

2.1 Theory

Different sources are attributed as the genesis of the analytical modelling of political business cycles[1], however, Nordhaus (1975) is a definitely a milestone in this respect. The Nordhaus model is essentially built around four equations

First, the Philips curve demonstrates the tradeoff between output and inflation:

$$y_t^g = \pi_t + \pi_t^e \quad (2.1)$$

Here y^g is the output gap, π is inflation and π^e is expected inflation. Second, voters have preferences over output and inflation, given by the following loss-function:

$$L_t = \alpha \frac{\left(y_t^g - \bar{y}^g\right)^2}{2} + \frac{(\pi_t - \bar{\pi})^2}{2} \quad (2.2)$$

Here $\bar{y}^g$ and $\bar{\pi}$ are the desired levels of the output gap and inflation, and α is a positive constant. When voters are to decide who they will vote for, they assess the economic performance since the last election. However, voters forget events in the past. When they are to determine whether to vote for the incumbent or not, they sum up the "memory discounted" losses from the last election up until the present. The number of votes the incumbent receives, N_t, is given by:

$$N_t = N\left(\sum_{s=0}^{T} \delta^s L_{t-s}\right) + \epsilon_t \quad (2.3)$$

Here $0 < \delta < 1$ is the forgetfulness factor, $N'(.) < 0$ and elections are held every T+1 years. ϵ_t is a stochastic, zero-mean term.

The final part of the Nordhaus model is the formation of expectations. The model assumes voters form expectations based on the following equation:

[1] Some attribute this to Michal Kalecki (1943), although these political business cycles were not related to elections.

$$\pi_t^e = \pi_{t-1} + \theta(\pi_{t-1}^e - \pi_{t-1}) \ (2.4)$$

$$0 < \theta < 1 \ (2.5)$$

The parameter θ determines how fast expectations adapts to inflation in the preceding period. The key element here is that the both expected inflation and voting behaviour is exclusively backward looking.

Rational expectations means that the expected difference between the expected and realised value is zero, i.e. that one should not expect there to be a difference between expected inflation and realised inflation. This implies that the expectations should be forward looking. This is not the case here, as the expectations are formed on the basis of past and contemporaneous events only – thus a key feature of the Nordhaus model is that the inflation expectation is not rational.

As politicians are assumed to control monetary policy and want to maximise their re-election probability, the model can be solved by maximising N_S with respect to π_S, π_{S-1}... π_t, where S is time of the next election and t is the current period. Given that the politician has just been elected, the solution is a cycle where the incumbent politician keeps inflation and production low after the election, in order to lower the expected inflation. Immediately before the election the politicians initiate a boom, allowing both high production and low inflation in the election year.

Drazen (2001a) lists three points of critique that can be held against the Nordhaus-model. First, the assumption that politicians control monetary policy is unrealistic. Second, voters are not rational, which is visible both through their inflation expectations and voting behaviour. Third, he *"...questions the central role assigned to moving along the Philips curve to reduce unemployment via inflation surprises"* (Drazen 2001a:81). Also, he notes that the model abstracts from all fiscal policy instruments.

A great improvement of the Nordhaus model came in Rogoff (1990) and Rogoff and Sibert (1988). Voters in these models are rational, and the mechanism that drives the cycles is asymmetric information. Rogoff (1990) assumes that the politicians observe their own performance in providing public goods before the voters. Also, performance is assumed to be positively correlated over time, hence the current performance of a politician can be

useful in forecasting future performance. So, the incumbent politician will wish to signal that he is competent before the election.

In Rogoff (1990), only fiscal instruments are available to politicians. Rogoff shows in his article under some mild assumptions there exists a separating equilibrium only, and therefore voters are able to infer the incumbent's competence level by observing the level of government spending. Also, it is shown that the magnitude of the cycles will depend on the rents enjoyed by the politician from remaining in office.

Shi and Svennson (2006) modified the model by Rogoff (1990). This new model is simpler in that all types of politicians have an incentive to run a deficit in election years, even those that are less competent. Also, Shi and Svennson (2006) shows that the magnitude of the budget cycles depend on the electorate's ability to obtain information on fiscal policies.

Drazen proposes an alternative model that augments Rogoff by adding a separate monetary authority (2001a, 2001b). The model is labelled the "Active fiscal – passive monetary"-model. The politicians, who control fiscal policies, are opportunistic and wish to remain in office. The central bank targets a Taylor-type loss function with the properties that it i: assign more weight to deviations from the inflation target compared to the average voter, and ii: have lower inflation and production targets compared to the average voter. Also, money growth is assumed to be unobserved, implying that voters cannot use the observed interest rate to learn the incumbent politicians' competence level.

The probability of getting re-elected is assumed to depend on two factors. First, there is a mechanism of targeted public spending, corresponding to the mechanism described in Rogoff (1990). Second, the probability will also depend on the general state of the economy. The foundation for the "state of the economy" argument is empirical, where it is referred to the findings of e.g. Fair (1978). The timing of events is important for the model outcome, in that the politicians move first, and the central bank responds to the politicians' actions.

As in Rogoff (1990), there exists a separating equilibrium where the competent politicians will signal their competence. However, the central bank will wish to offset the demand shock associated with increased government spending. As the central bank is assumed to be more conservative with respect to inflation compared to voters, the politician will pressure the central bank to undertake a more accommodating monetary policy. This would lead to increased production and would improve the probability of getting re-elected.

The Active Fiscal – Passive Monetary-model is most interesting in that it explores the interaction between the fiscal and monetary authority. However, there are some arguments against it. First, is the lack of micro-foundation; the assumption that an improved state of the economy will improve the re-election probability is based on empirical evidence only. So, even though it may be true the model does not help in explaining why this is so. Also, as there has been a trend towards more central bank independence (Arnone et al (2006), the relevance of a model relying on the assumption of an accommodating central bank is questionable.

Clark and Hallerberg (2000) use the Mundell (1963) - Fleming (1962) framework to discuss the topic of political business cycles. First, they impose that the incumbent politician will prefer a higher output in election years. Thereafter, they solve the model for six different cases depending on three institutional features; whether the central bank is independent, whether there is capital mobility and whether exchange rates are fixed of flexible. The findings from the model is summed up in table 2.1 (The closed economy results are omitted).

	Central Bank Independence	**No Central Bank Independence**
Fixed Exchange Rates	Fiscal Cycles, No Monetary Cycles	Fiscal Cycles, No Monetary Cycles
Floating Exchange rates	No Fiscal or Monetary Cycles	Monetary Cycles, No Fiscal Cycles

Table 2.1 (Clark and Hallerberg 2000:330)

A result of the Mundell-Fleming framework is that if the exchange rate is fixed, there is no room for any cycles in monetary policy. This is because the monetary policy will be "occupied" maintaining the exchange rate, leaving no room for pursuing alternate goals. Hence, given that the exchange rate is fixed it is unimportant whether the central bank is independent or not; there will not be cycles in the monetary policies in either case[2]. The only possible way to increase output is through an expansionary fiscal policy, so this will be the solution in both "fixed exchange rate" cases.

[2] This result abstracts from issues relating to the credibility of the exchange rate peg – i.e. it is assumed that even in the presence of a non-independent central bank, the exchange rate peg is credible.

Another result of the Mundell-Fleming framework is that if the exchange rate is allowed to float freely, government expenditures have no impact on total production. This is because increased government spending will cause domestic interests rates to increase, which will cause capital inflow and an appreciation of the exchange rate and hence a reduction of exports. This reaction is assumed to be instantaneous. Thus, in order to improve output politicians will have to use monetary policies. If the exchange rate is flexible and the central bank is independent, there are no cycles at all; government expenditures have no effect on output, and the central bank cannot be forced to change its policies. If however the central bank is not independent, the model predicts an expansionary monetary policy in the election year.

The Clark and Hallerberg (2000) model reach some very clear cut results, and introduce the idea that not only central bank independence but also the exchange rate regime matters for the PBC. However, the model has a clear drawback in that it completely abstracts from micro-foundations both with respect to voters assessment of political candidates, and the macro-framework.

To conclude, there are some gaps in the modelling of PBC. There are micro-founded models, models that include the central bank, and models that assume rational voters. However, there has not been constructed a model that includes all of these features.

Finally, note that this section has dealt with some of the most important theoretical contributions to opportunistic political budget cycles. However, there are models based on e.g. partisan politics or intra-governmental arguing that aim to explain political budget cycles. This will not be a subject for discussion in this thesis.

2.2 Empirics

There has been published numerous articles on political business cycles, so this section will only go through some of the most recent findings. Some econometric challenges in implementing the model are discussed in section 4.

One of the empirical studies of political budget cycles is found in Brender and Drazen (2005). Using a panel data set over 106 countries over the period 1960 to 2001, they find budget cycles in a cross section of all democracies. However, when they remove the so-

called “new democracies” from the sample the budget cycle disappear. Hence, they conclude that budget cycle is a phenomenon associated with inexperienced democracies, and provide lack of information and lack of democratic experience compared to established democracies as possible explanations for their finding.

Shi and Svensson (2006) use a data set over 85 countries covering the years 1975 to 1995. Their conclusion was similar to that of Brender and Drazen (2005), as they find that the cycles are larger in developing countries. Also, they show that access to information and corruption are important determinants for the magnitude of the budget cycles.

Hagen (2010) and Alt and Lassen (2006) test for budget cycles using similar data sets over OECD-economies from the 1990’s and onwards. Both papers find significant budget cycles, even when controlling for “new democracies”. Thus, it seems clear that budget cycles is not a phenomenon relevant for new democracies only.

There have been a few attempts at testing the propositions from Clark and Hallerberg (2000). The same article provides an empirical analysis on a small samples consisting of EU- and OECD countries around the 1980’s. The model predictions have in general support, both with respect to monetary and fiscal policies. It is found cycles in monetary policy in countries with low central bank independence and flexible exchange rates. There is no trace of a monetary cycle in the cases where either the central bank is independent or the exchange rate is fixed. Also, the article finds traces of cycles in fiscal policies in the cases with fixed exchange rates, whereas the estimated cycle is small when the exchange rate is flexible.

The hypotheses from Clark and Hallerberg (2000) has also been tested in other papers using smaller data sets over Brazil (Hiroi (2008)) and 33 developing countries between 1977 to 2001 (Hall (2008)). The predictions from the Clark and Hallerberg model are in general supported.

This section has briefly reviewed some of the empirical contributions to the research on political budget cycles. There exists a vast literature on PBC in general, so the selection here is by no means exhaustive. Drazen (2001a) reviews the literature on PBC up until 2000.

Section 3 will now proceed by building a model of PBC, where an important part of the model will be the New Keynesian macroeconomic modeling. However, as the main focus of

this thesis is political economy, this thesis does not review the literature on macroeconomics. Woodford (2003) provides a textbook approach to New-Keynesian modeling.

3. The model

3.1 Introduction: Model setup and assumptions

In order to answer the research question through building a model, the model by Shi and Svennson (2006) is a natural starting point. This is because it is a micro-founded model of opportunistic PBC, whereas it abstracts from some of the more fine points made in e.g. Rogoff (1990) about separating equilibria. The consequence of using a model that has a pooling equilibrium is firstly that it simplifies the model substantially, and secondly that there is no gain from the cycles in the sense that it helps voters choose competent leaders. This is because all types of politicians, regardless of competence, will follow the same strategy.

The contribution of this thesis is to fill a gap in the literature by building a model of PBC that is micro-founded and includes the independent central bank. However, the independent central bank reacts to macroeconomic variables such as production, inflation and possibly exchange rates. In order to be able to describe the central banks reactions it is necessary to explain how variables are affected by the political game between the monetary and fiscal authorities. Augmenting the model by including the central bank thus necessitates endogenizing production and inflation.

Gali and Monacelli (2005) lay out a New Keynesian macroeconomic model for a small, open economy. This is a modern macroeconomic model, but does not include the public sector. In an extension of Gali and Monacelli (2005), Leith and Wren-Lewis (2005) derive a model that includes not only the public sector, but also other factors such as sticky nominal wages. The model in this thesis is built on the model laid out in Leith and Wren-Lewis (2005). It is however simplified by removing both sticky wages and the distortionary fiscal instruments: sticky wages will not qualitatively add anything to the model, and a multitude of fiscal instruments goes beyond what the competence model of PBC from Shi and Svennson (2006) can utilize. Also, the only shocks in the model are those that affect the politicians' competence. A richer model than the one developed here could introduce shocks to costs, demand etc, but that is unfortunately beyond the scope of this thesis.

Upon starting the work of building the model, it became apparent that the consumers are treated quite differently in models of political economy and modern macroeconomics.

Although consumers are assumed to be rational, in the sense that they are forward looking, in both types of models, models of political economy place restrictions on which variables the consumers are able to observe, and each period is a sequence of events taking place in a specified order. So, in order to build a functioning model with these building blocks a number of assumptions and innovations are needed.

The following section briefly discusses the main components of the model, and how these are modelled.

The government

In the model, a distinction is made between government production and consumption. Government consumption is simply the amount of goods purchased by the public sector each period. Government production on the other hand consists of the sum of two parts; public consumption and the competence of the incumbent politician. The objective of the public sector is to provide the consumers with goods they would otherwise not be able to obtain, at least not as efficiently. Examples of such goods are territorial defence and policing. In its production of these goods the public sector will consume regular consumer goods, but still there is a clear distinction between public consumption and public production. Further, public goods can be provided with varying degrees of efficiency. The model assumes that the competence of the incumbent politician will determine the effectiveness of the public sector. Competence takes the form of a moving average process, which is standard in these applications. The interpretation of this is similar to that found in Shi and Svennson (2006), e.g. that *"circumstances change over time and a policy-maker that is competent in some tasks need not be competent in other tasks in other periods"* (Shi & Svennson 2006:1376)

Taxes are assumed to be fixed indefinitely. This is similar, but not quite equivalent to Shi and Svennson (2006), who used log-linear utility from private and public goods that allowed taxes to be fixed and hence reduce the remaining number of fiscal variables that are to be determined to two. However, this "trick" is not applicable in a setup where consumers are not liquidity constraint and determine by themselves the consumption path of their wealth. Thus, what remains is the not as attractive option of simply fixing taxes per assumption. There is empirical evidence of that taxes are an important part of PBC (Brender and Drazen (2005)), therefore, augmenting the model further by allowing for endogenous determination of taxes as well would be a most interesting extension. However, this goes beyond the scope of this master thesis.

Politicians

Politicians are assumed to derive utility from remaining in office only. Such rents need not be pecuniary, but could be the status associated with being the executive of a country. Abstracting from that politicians may derive utility from factors such as income, labour supply and so on is a simplification, and is discussed further in the text. It turns out it is does not affect the qualitative results of the model significantly. It will, however, simplify the model greatly.

The Central Bank

To support the positive focus of this thesis, the objective function of the central bank that will be incorporated in the model should have some resemblance to its counterparty in the real world. In that respect, the International Monetary Fund has published classifications over various types of exchange rate regimes. The three main types of regimes are exchange rate targeting, inflation targeting and monetary aggregate targeting. However, in the most recent classification as of April 31 2008, no OECD countries follow a monetary aggregate target. Thus, the two types of regimes that are consistent with the modern democracy focus in this thesis are exchange rate and inflation targeting.

It is evident from IMF's classification of de facto exchange rate regimes that exchange rate targeting and inflation targeting are not necessarily mutually exclusive regimes, as there are countries that both have an inflation target and to some extent interfere in the exchange rate market. This thesis therefore presents the central banks objective function in a unified manner that can be used to cover both the case of an exchange rate target and an inflation target. The central bank is assumed to be targeting a Taylor-type loss function, consisting of the sum of squared divergence from the inflation and output targets. The side constraints are the demand and supply equations of the economy, the IS- and Philips – curves. So far, the optimisation problem is quite standard. However, there are two more side constraints, in the form of inequalities that govern the upper and lower permissible limit for the nominal exchange rate.

Dependent on the numerical values of the nominal exchange rate limits, the central bank's objective function that is adopted in this thesis can be used to model i: an inflation target, ii: an exchange rate peg, or finally iii: an intermediary regime where there is a gap between the upper and lower nominal exchange rate limit.

It should be stressed again that the focus of this thesis if positive, and considers institutional features as constitutional. This implies that this thesis will discuss neither which monetary regime that will maximise consumer welfare, nor will it discuss why some countries choose a particular type of monetary regime. A second implication is that the monetary regime is assumed to be given to the central bank through the constitution or a similar device. Thus, it is assumed that the monetary regime is not subject to change.

A simplifying solution is chosen with respect to the central banks optimisation problem. The Taylor loss function is assumed to contain the domestic producer price inflation, as opposed to consumer price inflation. The benefit of this approach is both that it simplifies the model, but also that it allows for a purebred inflation target regime where the central bank does not respond to exchange rate movements.

Consumers

The most fundamental assumption of this model, of which the entire conclusion hinges, comes from on to what extent various variables are observable for the consumers. Shi and Svennson (2006) assume that a fixed share of the population that cannot observe i: the competence level of the incumbent and ii: the debt level of the government. However, a change in government consumption will in general lead to changes in a number of macroeconomic variables that are observable for the consumers such as the price level, wages and so on. Thus, the assumption that a fixed proportion of the population is unable to distinguish between fiscal expansionary policies and a highly competent politician seem questionable.

The solution adopted in this thesis is to introduce the idea of costly inference in terms of utility. In the model, consumers can directly observe all variables in the economy, except the competence level of the incumbent, and the current public debt level. However, the consumers can at their leisure calculate these variables, but that will reduce their utility. At the beginning of each period, voters form a belief of how much debt they think will be issued by the public sector. If the important macroeconomic variables pan out about as expected, consumers retain their beliefs. If, however, there is a large divergence between their beliefs and he realised economic outcome then the beliefs are recalculated again. So, in the model presented in this paper, the inobservant share of the population is endogenous.

The interest rate is given special treatment. If the central bank adjusts its interest rate in response to altered government spending, all consumers are assumed to recalculate their beliefs, setting the inobservant share of the population to zero. There are several arguments for why this could be an appropriate assumption:.

- In the model, the domestic interest rate is one single variable that is highly visible and most important for consumers both through their intertemporal consumption decisions and their wealth. Other macroeconomic variables, such as production and inflation, are aggregates. This is an argument for that if inference is costly it should be less costly if based on the interest rate.
- In reality, only a very small fraction of prices are directly observed by voters through their own purchases, and the inflation and production indexes that can be observed by the voters may not fully capture the effects of altered government spending. Also, the composition of government spending may be subject to change, making it even harder to use production and prices to learn of the governments dealings.
- Production and inflation is continually changing, whereas the discount rate target usually only changes at fixed intervals weeks or months apart. Thus, consumers should be more attentive to the interest rate decisions compared to the continuous changes to other macroeconomic variables.
- There is a lag from when a change in both fiscal and monetary policy takes place, until the effect is visible on macroeconomic variables. Thus, identifying e.g. a contemporaneous expansionary fiscal policy by observing current inflation is likely to be difficult. However, the central bank will try to anticipate the movements in inflation, and will then adjust its interest rate before the increase in inflation takes place.

It is vital to point out that this assumption says nothing about what monetary policy the consumers expect – it is irrelevant whether the central bank is very open about the monetary policy it plans to undertake or not. This means that the assumption is as valid for both extremes such as Norges Bank as Bank of Japan. It is more important that the central bank explains why the policy it has already employed is followed.

Sequence of events

The timing of events is quite crucial in this model, and the following sequence of events takes place every period:

- Politicians decide on the debt level, and the consumers' beliefs are formed.
- There is a shock to the politicians competence level
- The central bank sets the interest rate
- Consumers and firms optimize their behavior
- Every other year, an election is held

Decisions regarding public spending and debt are usually undertaken once or twice a year, whereas actions by the central bank are far more frequent. The central bank will therefore respond to the decisions regarding fiscal policies. Consumers and firms can revise their economic decisions at their leisure, so they should move after the central bank. The second point, the shock to the incumbent's competence level, will be developed further later on. Suffice it to say politicians cannot with certainty know how well they will perform in the coming period. Finally, voters use all information available at the election date, so the election is the last event. Elections are held biannually.

Capital Markets

The model will throughout assume complete capital markets. Also, the model abstracts from risk premia and does not use a strict No-Ponzi condition when discussing government debt. The reason for this is first and foremost that the focus of this thesis is on the short term cycles in fiscal policies. Thus, fiscal sustainability and hence risk premia are not the main points of interest in this thesis.

However, as will be further motivated in section 4 and 5, the effect of the cycles on fiscal sustainability is a topic that should be examined further. This is unfortunately beyond the scope of this thesis.

Section 3.2 will proceed in solving the model by backwards induction. First out is step 4, the actions by firms and consumers. Thereafter, step 3, the response by the central bank is analysed. Finally, the actions by the politicians are determined.

The model takes as much as possible "off the shelf" from its two sources Leith and Wren-Lewis (2005) and Shi and Svennson (2006). I have throughout taken care to explicitly write what I have added to the models, however, the exposition may be too parsimonious in the cases where the original models have been left unchanged. Thus, if the reader wishes to redo all calculations, additional details can be found in the original sources.

3.2 The model

3.2.1 Consumers

A list of all variables and their definitions can be found in appendix 1.

There is a continuum of consumers, of size one. The objective function for a consumer is given by:

$$E_0 \sum_{t=0}^{\infty} \beta^t \left(lnC_t + \widetilde{\mathrm{G}}_t - \frac{{N_t}^{1+\varphi}}{1+\varphi} + \theta^i z_t \right) (3.1)$$

The utility of consumers depends on consumption, C, public services provided $\widetilde{\mathrm{G}}$, labour supply N, and the utility derived from having a particular candidate in office. Here θ^i is a parameter that differs between voters, which captures the heterogeneity of voter preferences. z_t is a binary variable that can take the values -0.5 or 0.5, depending on whether candidate a or b is in office, respectively. θ^i is uniformly distributed along [-0.5, 0.5]. β is the subjective discount factor for utility φ is a labour supply parameter.

The consumers' budget constraint is given by:

$$\int_0^1 P_{H,t}(j) C_{H,t}(j) dj + \int_0^1 \int_0^1 P_{i,t}(j) C_{i,t}(j)\, djdi + E_t\left(Q_{t,t+1} D_{t+1}\right) = \Pi_t + \mathrm{D_t} + \mathrm{W_t N_t} - \mathrm{T} (3.2)$$

$P_H(j)$is the price of the domestically produced consumption good j, whereas $P_i(j)$ is the price of consumption good j produced in country i. Some derivations and definitions regarding exchange rates and prices are found in appendix 3. $C_H(j)$ is the consumption of domestically produced consumption good j, and $C_i(j)$ is the consumption of consumption good j produced in country i. Π is profits that are received from the households ownership in firms. D is the nominal value of the portfolio that is held by the consumer, and Q is the discount factor. T is the fixed lump sum tax. W is wage per labour supply unit.

Appendix 2 shows that the budget constraint (3.2) can be rewritten to the following:

$$P_t C_t + E_t\left(Q_{t,t+1} D_{t+1}\right) = \Pi_t + \mathrm{D_t} + \mathrm{W_t N_t} - \mathrm{T} (3.3)$$

Optimising (3.1) subject to (3.3) with respect to C and D yields the following:

$$\beta \frac{C_{t-1}}{C_t} \frac{P_{t-1}}{P_t} = Q_{t,t+1} (3.4)$$

Defining $\mathrm{R_t} \equiv 1/\mathrm{E_t Q_{t,t.+1}}$, (3.4) can be rewritten to:

$$\beta R_t \frac{C_{t-1}}{C_t}\frac{P_{t-1}}{P_t} = 1 (3.5)$$

Taking logs of (3.5) and rearranging gives:

$$c_t = E_t c_{t+1} - (r_t - E_t \pi_{t+1} - \rho) (3.6)$$

Lowercase letters indicate the logarithm of the level variable, with the exception of $\rho \equiv \ln\left(\frac{1}{\beta}\right)$. Inflation is defined as $\pi_t \equiv p_t - p_{t-1}$. The result in (3.4), (3.5) and (3.6) is that consumers wish to smooth consumption over time, adjusted for that the real interest rate may differ from the consumer's time preference so there may be consumption tilting.

3.2.2 Government Consumption

Public consumption is assumed to be spent on domestically produced products only. Minimizing the total costs of government consumption gives the following public demand for good j:

$$G(j) = \left(\frac{P_H(j)}{P_H}\right)^{-\epsilon} G (3.7)$$

ϵ is the elasticity of substitution between domestically produced goods, and is equal to that of the consumers. G is aggregate public consumption.

3.2.3 Firms

Production for firm j is given by:

$$Y(j) = N(j) (3.8)$$

I.e. production is linear in labour supply. The demand for firm j is given by

$$Y(j) = \left(\frac{P_H(j)}{P_H}\right)^{-\epsilon} \left[(1-\alpha)\frac{PC}{P_H} + \alpha \int_0^1 \frac{\varepsilon_i P_i^i C^i}{P_H} di + G\right] (3.9)$$

α is a measure of home bias in consumption, ε_i is the bilateral nominal exchange rate with country i, P_i^i is an index of domestic prices in country i, and P_H is an index of domestic prices associated with domestic consumption of domestically produced goods. (3.9) can be rewritten to:

$$Y(j) = \left(\frac{P_H(j)}{P_H}\right)^{-\epsilon} Y (3.10)$$

Where $Y = \left[\int_0^1 Y(j)^{\frac{\epsilon-1}{\epsilon}} dj\right]^{\frac{\epsilon}{\epsilon-1}}$ is aggregate domestic production.

The objective function of the firm is:

$$\sum_{s=0}^{\infty} (\theta_p)^s Q_{t,t+s} \left[\frac{P_H(j)_t}{P_{t+s}} Y(j)_{t+s} - \frac{W_{t+s} Y(j)_{t+s}}{P_{t+s}}\right] (3.11)$$

Using Calvo-type sticky prices, 1- θ_p is the probability that the firm will be able to adjust its prices each period. The model so far follows the standard derivation of New-Keynesian models. (3.11) can, together with (3.4) be used to derive the New-Keynesian Philips curve:

$$\pi_{H,t} = \beta E_t \pi_{H,t+1} + \lambda(mc_t + \ln \mu) (3.12)$$

mc is the log of the real wage, w-p_H, and μ is the steady state markup over marginal cost. $\lambda \equiv \frac{(1-\beta\theta_p)(1-\theta_p)}{\theta_p}$ is a battery of parameters. π_H is the rate of inflation in P_H.

3.2.4 Preliminary summary

Appendix 4 shows that the demand side of this model can be expressed as the following IS-curve:

$$y_t = E_t y_{t+1} - (r_t - E_t(\pi_{t+1}) - \rho) - E_t(g_{t+1} - g_t) (3.13)$$

As before, lowercase letters indicates logarithms of level variables. An important exception is g≡-ln(1-G/Y).

On the supply side, appendix 5 explains how (3.12) can be rewritten to

$$\pi_{H,t} = \beta E_t \pi_{H,t+1} + \lambda\big((1+\varphi) y_t - g_t + \ln \mu \mu_w\big) (3.14)$$

μ_w is the steady state markup in the domestic labour market.

The outcome of step 4 of the model will be determined by the IS- and PC-curves. The next part will deal with step 3; the central banks response.

3.2.5 The Central Bank

First, define the gap variable with respect to output as:

$$y^g \equiv y - y^n (3.15)$$

y^n is the level of output that would occur in the absence of sticky prices.

The central bank's optimization problem is assumed to be given by the constitution or a similar legal device. The loss function of the central bank takes the form of quadratic deviations from the desired output and inflation targets:

$$U_{CB} = E_0 \sum_{t=0}^{\infty} \beta^t \left(\frac{1}{2} \pi_{H,t}^2 + \frac{\gamma}{2} y_t^{g\,2} \right) (3.16)$$

Here $\gamma \geq 0$ is a parameter that determines the weight the central bank places on the output gap relative to inflation. Again, it should be pointed out that the inflation component of the loss function is domestic producer price inflation, and not consumer price inflation.

The side constraints will be the demand (3.13) and supply (3.14) equations, but in addition there are constraints that limit the movement of the nominal exchange rate. The exchange rate constraints are inequalities that determine the upper and lower permissible values for the nominal exchange rate. These inequalities are included to allow for the possibility that the central bank may have been instructed to maintain some nominal target for the exchange rate. With a floating exchange rate regime, the nominal exchange rate will always be within these limits. With a fixed exchange rate, the limits will always be binding. A final possibility is that there is a narrow gap between the upper and lower nominal exchange rate limit, where it is not certain that the limits are binding.

The model will at first study two corner solutions. The first is where the exchange rate is independently floating, and the second case is where the exchange rate is completely pegged. Later on it will be discussed how the model will work for countries with intermediary exchange rate regimes. Appendix 6 shows in detail how the central bank's optimization problem is set up

With these side constraints, using the domestic price inflation in the central bank's loss function has the benefit of enabling the model to be solved for firstly a purebred inflation

targeting regime, and secondly an exchange rate peg regime. Including the consumer price inflation would cause the central bank to would also to respond to exchange rate changes, even when the exchange rate constraints are not binding.

Case 1: Floating exchange rates

Appendix 6 shows that in the case of floating exchange rates, the central bank sets the interest rate to achieve the following trade-off between output and inflation

$$\pi_{H,t} = \frac{-\gamma y_{\mathrm{t}}^{g}}{\lambda(1+\varphi)} \quad (3.17)$$

The central bank's reaction function is derived from (3.17) in appendix 6. The central bank will change the interest rate in response to increased government spending according to the following:

$$\frac{\partial r_{\mathrm{t}}}{\partial G_{\mathrm{t}}} = \frac{1}{Y_{\mathrm{t}} - G_{\mathrm{t}}} \frac{\gamma + \lambda^2(1+\varphi)\varphi}{\gamma + \lambda^2(1+\varphi)^2} > 0 (3.18)$$

This implies that the central bank will respond to increased government spending by increasing the interest rate. This is as expected; increased government spending will stimulate the economy, thus increasing both inflation and production. So, in an attempt to cool down the economy and reach the desired trade-off between production and inflation, the central bank increases the interest rate. Increasing the interest rate has several effects; it makes it more beneficial to postpone consumption for consumers, and it causes appreciation of the exchange rate thus lowering the demand for domestic products. Both effects will reduce the demand.

Case 2: Fixed exchange rates

Following Gali and Monacelli (2005), complete financial markets and absence of risk premia implies that uncovered interest parity must hold:

$$r_t - r_t^* = E_t[\Delta e_{t+1}] (3.19)$$

Uncovered interest parity claims that the expected payoff from holding an asset denominated in the local currency for one period should be equal to buying foreign currency now, holding the asset denominated in the foreign currency for one period, and finally converting the asset into domestic currency.

The argument above implies that if there is a difference between the interest rate at home and abroad the exchange rate should be expected to change. The currency with a higher interest rate should expect a depreciation of a magnitude that would exactly cancel out the gain from investing at the higher interest rate. The mechanism is the opposite for countries with a lower interest rate.

Assuming the exchange rate initially at its par value, with a credible fixed exchange rate regime the domestic interest rate is effectively pinned down to equal the foreign interest rate:

$$r_t = r_t^* (3.20)$$

This is as expected; the central bank has a passive role in economies that follows has a fixed exchange rate regime.

If the model had been richer and included money as well, it would be natural to see some reaction from the central bank even if the exchange rate is pegged. Increased government spending would ceteris paribus increase the activity in the economy and hence increase demand for money. For a given money supply, the domestic interest rate would increase. Thus, in order to maintain (3.20) the central bank would have to increase the money supply. However, including money in the model would in not increase the qualitative results from the model, given that money growth would be assumed to be unobservable for consumers. Drazen (2001a) provides a discussion of such an assumption.

3.2.6 Government budget constraint

The government budget constraint is

$$\mathrm{P_{H,t}G_t} = \mathrm{T} + B_t - \frac{1}{Q_{t-1,t}} B_{t-1} (3.21)$$

This states that government expenditures should equal the sum of tax income, and the change in government debt. Here *B* denotes government debt.

Section 3.1 introduced the concept of competence. Formally, the competence level of the politician j, ψ_t^j, is defined by a moving average process where

$$\psi_t^j = \varsigma_t^j + \varsigma_{t-1}^j (3.22)$$

Each ς has a zero mean, finite variance distribution function F(ς) and a density function f(ς)where f(0)>0, and j is the identifier of the politician. As Shi and Svennson (2006), it is assumed that voters cannot observe ψ contemporaneously. However, they can observe the competence level of the previous period directly.

The "government production", of which voters receive utility, is defined as:

$$\widetilde{\mathrm{G}}_\mathrm{t} = \mathrm{G}_\mathrm{t} + \frac{\psi_t^j}{P_{H,t}} = \frac{T_t + B_t - \frac{1}{Q_{t-1,t}} B_{t-1} + \psi_t^j}{P_{H,t}} (3.23)$$

The discussion in 3.1 explains why it is appropriate to distinguish between government production and consumption. The implication of including competence in the model as it is done in (3.23) is that the competence shocks are "nominal", and are scaled according to the domestic production price index. This solution has the advantage of being analytically simple. However, if one moves many periods ahead in an economy with a positive inflation the shocks will eventually vanish. With the given setup with fixed nominal taxes, this problem is relevant for not just the competence part of the model. The model thus seems most appropriately set up for analyzing a few periods ahead only.

3.2.7 Politicians

Politicians are assumed to have the following utility function:

$$U^{politician} = E_0 \sum_{t=0}^{\infty} \beta_t \Xi_\mathrm{t} (3.24)$$

Ξ_t is a positive constant if the politician is in office in period t, and zero otherwise. (3.24) is a very simple utility function – it assumes that politicians' only source of utility is to be in office. Contrary to e.g. Shi and Svennson (2006), they do not get any utility from consumption or from government output.

There is a trade-off between augmenting the politicians' utility function and specifying in detail how the inobservant consumers form their expectations. The solution adopted here is to use a fairly restrictive utility function of the politicians, which removes the need for

adjusting the IS and PC-curves to take into account how some consumers will e.g. underestimate public consumption in an election year. The alternative of adopting a richer utility function of the politicians would necessitate further assumptions on the behaviour of the inobservant consumers, and an adjustment of the IS and PC curves.

Shi and Svennson (2006) incorporate politicians which derive utility both from the rents of remaining in office, but also from consumption and government expenditures. Even so, they find that budget cycles is the equilibrium solution. Thus, there should not be much lost by keeping (3.24) in such a simple form.

There are two politicians, a and b, where a is the incumbent. To get elected, one must receive over half of the votes. As the main interest of this thesis is the interaction between voters, politicians and the independent central bank, it abstracts from partisan politics. Hence, there are no ideological differences between the two types of politicians.

3.3 Budget Cycles

This section will discuss the final part of the model; the actions by the politicians. The structure is as follows: First, the steady state is described in the case where there are no elections in section 3.3.1. It has been shown that the reaction by the central bank will be dependent on the exchange rate regime. Therefore, this section proceeds by solving the model for three types of exchange rate regimes; independently floating exchange rates 3.3.2, pegged exchange rates 3.3.3 and finally an intermediary exchange rate regime 3.3.4. Finally, the effect of corruption and information will be discussed in section 3.3.5.

3.3.1 Case I: Steady state without elections.

As the incumbent politician in a country without elections derive utility from remaining in office only, there is no reason for politicians to take up any debt or spend less than the government tax income, i.e: $B_t = 0 \, \forall t$. This is though a weak argument, as the politicians really do not have an incentive to do anything at all. Regardless, setting T=G is the intuitive solution, and as soon as the competence shock occurs government production will be determined. This competence shock will affect the amount of public services provided only, and not the domestic price level or production.

3.3.2 Case II: Elections and floating exchange rates

Now, the incumbent politician will desire to get re-elected. Assume there is an off-election year at time t+1. As all variables are observable by the voters in hindsight, there is no incentive for the politicians to manipulate the voters. Note that $E_{t+1}[\psi_{t+3}|\psi_{t+1}] = E_{t+1}[\psi_{t+3}] = 0$. Moreover, the government will run a surplus to pay down any debt it is holding:

$$\widetilde{\mathrm{G}}_{\mathrm{t+1}} = \frac{\mathrm{T} - \frac{1}{Q_{t,t+1}} B_t + \psi_{t+1}^a}{P_{H,t+1}} (3.25)$$

Note that (3.25) relies on a weak argument, as the politicians are indifferent on whether to repay debt or not. The argument implies that the debt level in the election period will be zero, and will allow a simpler notation. However, the arguments could easily be augmented to the case where to debt at the start of the election period was not zero, not affecting the qualitative conclusions. Given (3.25), the budget constraint in the election period is therefore:

$$\widetilde{\mathrm{G}}_{\mathrm{t}} = \frac{\mathrm{T} + B_t + \psi_t^a}{P_{H,t}} (3.26)$$

The expected outcome of electing the opponent (which has an expected competence level of zero) is:

$$E_t\left[\tilde{G}_{t+1}^b\right] = \frac{\mathrm{T} - E_t B_t}{P_{H,t}} (3.27)$$

The expected value next period of reelecting the incumbent is

$$E_t\left[\tilde{G}_{t+1}^a\right] = \frac{\mathrm{T} - E_t B_t + E_t \psi_{t+1}^a}{P_{H,t+1}} = \frac{\mathrm{T} - E_t B_t + E_t \varsigma_t^a}{P_{H,t+1}} (3.28)$$

Note that the expected value of the competence shock in t+1 is zero.

The utility function of the consumers is now augmented to the following:

$$E_0 \sum_{t=0}^{\infty} \beta^t \left(lnC_t + \widetilde{\mathrm{G}}_t - \frac{{N_t}^{1+\varphi}}{1+\varphi} + \theta^i z_t - \left|\theta_2^i\right| \mathrm{V_t} - \beta \left|\theta_3^i\right| \mathrm{Z_{t+1}} \left(\mathrm{B_t} - \widehat{\mathrm{B}}_\mathrm{t}\right) \right) (3.29)$$

Shi and Svennson (2006) assume there is a constant fraction of the population that is "uninformed" – i.e. unable to observe the contemporaneous debt level. As the uninformed part of the population cannot observe the contemporaneous public debt level or the amount of government purchases G_t directly, they form some estimate of it. As already discussed, all voters can observe the competence of the incumbent indirectly, but that requires calculating and hence disutility. So, the utility function of the consumers is augmented by adding two parts, shown in (3.29). $\mathrm{V_t}$ is a binary variable being a positive constant if the consumer calculates the contemporaneous debt level of the politicians, and zero otherwise. It is multiplied by the absolute value of the parameter θ_2^i, hence consumers have varying levels of disutility of computing the debt level. The parameters θ_2^i and θ_3^i are equal to θ^i, except that they each have their own distribution amongst the population (I.e. a single consumer may have different values of the three heterogeneity parameters). The function $\mathrm{Z_{t+1}}(\mathrm{B_t} - \widehat{\mathrm{B}}_\mathrm{t})$ captures that consumers will dislike to be fooled. If a consumer has kept on to his belief of the current debt level through the election year, and he finds the next year that the government debt level was larger than what he expected, he will be disgruntled. The function $\mathrm{Z_{t+1}}(\mathrm{B_t} - \widehat{\mathrm{B}}_\mathrm{t})$ thus captures the disutility associated with this disgruntledness, and is further multiplied by the absolute value of the heterogeneity factor θ_3^i to capture that getting duped will cause a varying degree of disutility. The disutility takes place next period, hence the $\mathrm{Z_{t+1}}(\mathrm{B_t} - \widehat{\mathrm{B}}_\mathrm{t})$ is discounted by β.

So, each consumer will have to choose between incurring some disutility now or later; i.e. investigate the debt level now or expect to get deceived and find out how badly later. From this it is intuitive to see that consumers will choose to investigate the actual debt level at differing levels of expected divergence between actual debt level and the belief. The population as a whole can thus be divided in two; one uninformed and one informed part. The uninformed part of the population, $1 - \vartheta$, will be decreasing with increased divergence between the expected and actual debt level, i.e. that

$$\vartheta = \vartheta\left(B_t - \hat{B}_t\right) \quad (3.30)$$

$$\frac{\partial \vartheta}{\partial (B_t - \hat{B}_t)} > 0 \text{ for } B_t > \hat{B}_t \quad (3.31)$$

Furthermore, $\vartheta(0) = 0$. I.e for debt levels equal to the expected level the entire electorate is uninformed. The proportion of inobservant voters in the case of $B_t < \hat{B}_t$ is not important as

this would mean deliberately disappointing the voters. However, it would be natural to assume that $\vartheta(.)$ is convex.

Using the IS (3.13) and PC- curves (3.14), and substituting in for g_t using the government budget constraint (3.23), it can be solved for the current debt level:

$$B_t = \mathrm{Y_t P_{H,t}}\Big[1 - \exp\frac{1}{\varphi}\Big(\frac{\beta E_t \pi_{H,t+1}}{\lambda} + (1+\varphi)E_t y_{t+1} - (1+\varphi)(r_t - E_t(\pi_{t+1}) - \rho) - (1+\varphi)E_t g_{t+1} + (1+\varphi)\,ln\,\mu\mu_w - \frac{\pi_{H,t}}{\lambda}\Big)\Big] - \mathrm{T} + \left(1 + \frac{1}{\mathrm{Q_{t-1,t}}}\right)\mathrm{B_{t-1}} (3.32)$$

Observant voters use (3.32) to calculate the contemporaneous debt level. Note that $\mathrm{B_{t-1}} = 0$ per assumption.

Assume the estimated debt level is $\hat{B}$. From here on, $\hat{B}$ is treated as observable for the incumbent politician. This approach is equal to that in Shi and Svennson (2006), and could be supported by the argument that the incumbent politician has the ministry of finance at its disposal, which could easily calculate the general public's expectations. As the uninformed voters know the politicians equilibrium strategy, they can use this to form an estimate of the incumbent's competence level

$$\hat{\varsigma}_t^a = B_t - \hat{B}_t + \varsigma_t^a (3.33)$$

Voter i will vote for the incumbent if

$$E_t \varsigma_t^a - \theta^i \geq 0 (3.34)$$

Recall that there are two politicians, where the opponent has an expected competence of zero. Thus, the probability of the incumbent receiving 50% of the votes is given by

$$\begin{aligned}\Pr\Big[\vartheta(\mathrm{B_t})\Big(\varsigma_t^a + \frac{1}{2}\Big) + \Big(1 - \vartheta\big(B_t - \hat{B}_t\big)\Big)\Big(B_t - \hat{B}_t + \varsigma_t^a + \frac{1}{2}\Big) \geq \frac{1}{2}\Big] \\ = \Pr\big[(1 - \vartheta\big(B_t - \hat{B}_t\big)(\hat{B}_t - B_t) \leq \varsigma_t^a\big] \\ = 1 - F\Big[\Big(1 - \vartheta\big(B_t - \hat{B}_t\big)\Big)(\hat{B}_t - B_t)\Big] (3.35)\end{aligned}$$

Again, F is a zero mean density function with F'(0)>0. At the beginning of time t, the incumbent politician will choose B as to maximize his expected utility over the following two years. Period t is an election period, and period t+1 is not. The politician will receive

rents the in year t, as he is already in office, but will only receive rents in year t+1 if he is re-elected.

The politician's optimization problem must take the central banks response into account. As shown earlier, with floating exchange rates the central bank will set the interest rate to achieve the trade-off in (3.17). It turns out that it is hardly necessary to set up the politician's maximization problem in the case of floating exchange rates. The central bank will react to increased government spending by adjusting the interest rate according to (3.18)

Given the assumption on the visibility of the the interest rate, consumers will use the central banks response to learn the current government debt level, and hence the competence of the incumbent. This implies that it is futile to manipulate the electorate, thus there will be no budget cycles in the case of floating exchange rates. This leads to proposition 1:

Proposition 1: Budget cycles will never be an equilibrium strategy if the exchange rate is allowed to float freely.

Again, the fundamental assumption that supports proposition 1 is that in the case of floating exchange rates, it is costless to calculate the contemporaneous debt level using the interest rate. It should be noted that expectations of the next period are treated as given. At least for the observant part of the electorate, lowered government spending will decrease the expected government spending next period. Moreover, other variables may be subject to change as well, such as increased expected production and inflation. All such changes will have an effect on the interest rate the central bank decides on. Finally, the model abstracts from shocks that may affect the economy. Describing the central banks reaction function taking these points into account is beyond the scope of this setup. However, the general point remains that the central bank will in fact react to increased government spending by adjusting the interest rate. The validity of the assumption on the treatment of the interest rate is discussed further in section 5.

The result from proposition 1 is quite strong, and is in agreement with Clark and Hallerberg (2000) in the case of an independent central bank and floating exchange rates. However, the underlying mechanism behind the findings is vastly different. In Clark and Hallerberg (2000), the model predicts that increased government spending will merely crowd out exports leaving total production unaffected. In the model in this paper however, increased

government spending would indeed affect production, but it would not benefit the re-election probabilities of the incumbent.

The result from proposition 1 could also be reviewed in a New-Keynesian context. Clarida et al (1999) describes optimal monetary policy in a closed economy setting, where they show how the central bank should respond to demand and supply shocks. The general point, which is valid also in the open economy case, is simply that the central bank indeed will respond to shocks that affect the economy – government spending shocks as well. Thus, the question is: how can budget cycles be an equilibrium strategy when the central bank will try to fend off the effects of the government spending shock? Proposition 1 answer clearly: It is not the equilibrium strategy at all.

3.3.3 Case III: Elections and fixed exchange rates

If the exchange rate is pegged, the model implies that:

$$\frac{\partial r_t}{\partial B_t} = \frac{\partial r_t}{\partial g_t} = 0 (3.36)$$

Due to uncovered interest parity, monetary policy is kept occupied maintaining the exchange rate peg. It will therefore not react at all to government spending.

The politician's optimization problem can now be formulated (omitting periods t+3 and onwards, as they do not contain the relevant decision variables):

$$U^{Politician} = E_t \left\{ \Xi_t + (\beta \Xi_{t+1} + \beta^2 \Xi_{t+2}) \left(1 - F \left[\left(1 - \vartheta \left(B_t - \hat{B}_t \right) \right) (\hat{B}_t - B_t) \right] \right) \right\} (3.37)$$

The first order condition is:

$$\frac{\partial U}{\partial B_t} = -\frac{\partial \vartheta}{\partial B_t} \left(B_t - \hat{B}_t \right) + (1 - \vartheta) = 0 (3.38)$$

Increased spending thus has to effects: Firstly, it manipulates the uninformed part of the electorate, thereby increasing the probability of getting re-elected. Secondly, increased spending reduces the uninformed part of the population, thus reducing the probability of getting re-elected.

Increased government spending will have some real economic effects on both production and inflation. Furthermore, even though taxes are assumed to be fixed, the consumers' budget constraint will be affected by increased government spending. The effect will come through the increased price level, increased production and thus increased wages and profits. However, as per the assumption of "costly inference" based on the price and production aggregates, the uninformed part of the population will not know the actual debt level.

The first order condition (3.38), together with the assumption in (3.31) implies that the equilibrium debt level is $B_t \geq 0$. I.e, with the given assumptions it cannot be ruled out that $B_t = 0$ will be the equilibrium solution. However, this is treated as more of a fine point, and the discussion will in the following ignore this possibility even though it would be interesting to explore which requirements on $\vartheta(.)$ that would rule out $B_t = 0$.

The discussion can be summarized in proposition 2:

Proposition 2: With a fixed exchange rate regime, there will be an equilibrium deficit in election years.

As proposition 2 displays a stark contrast to proposition 1, an explanation is in place. Imagine a small country that that has pegged its exchange rate that of to a large country. Due to its size, the economic policies of the small country have no effect on the large country. Thus, the central bank of the large country will not respond at all to the policies undertaken by the small country.

As this small country has no independent monetary policy, the setup now reverts to something that looks like a standard game of budget cycles. As long as there is an unobservant part of the electorate that it is possible to manipulate, budget cycles will be the equilibrium policy.

It is vital to point out that in this example it is irrelevant if the large country has a floating exchange rate. The important part is that the small country has fixed its exchange rate to that of the large country, and that the large country's interest rate does not respond to the actions by the small country.

A fine point is that it is crucial for the model outcome that the central bank does not at all respond to varying levels of competence for the incumbent politician. In other words; the

inflationary pressure of government spending is equal irrespective of the competence level of the incumbent politician.

3.3.4 Case IV: Intermediary exchange rate regimes

It is possible that a country has a gap between the upper and lower nominal exchange rate limit i.e. the currency is allowed to float somewhat. Assuming the exchange rate initially is somewhere between the limits, the central bank will respond to increased government spending by increasing the interest rate according to

$$\frac{\partial r_{\mathrm{t}}}{\partial G_{\mathrm{t}}} = \frac{1}{Y_{\mathrm{t}} - G_{\mathrm{t}}} \frac{\gamma + \lambda^2(1+\varphi)\varphi}{\gamma + \lambda^2(1+\varphi)^2} > 0 (3.39)$$

This is exactly the same response as in the floating exchange rate case. Similarly, the voters will, by observing the interest rate, understand how much government consumption increases so the reelection probability will be unchanged.

However, increasing the interest rate will cause an appreciation. Using UIP and inserting for the lower limit of the exchange rate yields the following:

$$r_t^{\text{upper limit}} = r_t^* + \mathrm{E_t} e_{t+1} - \underline{e}_t (3.40)$$

When the interest rate reaches $r_t^{\text{upper limit}}$, it cannot be increased any further as that would require a appreciation above the limit (note that a decrease of e is an appreciation). So, if the government were to increase expenditures further, the central bank would not respond.

With an intermediary exchange rate regime, the government would then first have to pick up the slack, by increasing government spending to the point where the exchange rate reaches its limit and thus removing the ability of the central bank of increasing the interest rate further. Up to that point, the reelection probability will remain unchanged. However, from here on the game is equal to that of the fixed exchange rate regime case, in that only a share of the voters will be able to observe the actual government expenditures. So, the politicians will then continue to increase spending according to (36)

It then follows that the budget cycle will be larger in the intermediary exchange rate regime case compared to that of the fixed exchange rate regime case. From this discussion proposition 3 can be formulated:

Proposition 3: If the exchange rate limits are close enough, there will be an equilibrium budget cycle in election years. The cycle will also be larger compared to that in the fixed exchange rate regime case.

A weakness of the model is that there are no limits to how much government expenditures are allowed to increase in election years. A question that should be answered is how close is *"close enough"*? Unfortunately, this model does not provide a good answer. As long as there exists a limit to the exchange rate, it is possible to reach it. Thus, *"close enough"* is any finite number. Augmenting the model by adding e.g. fiscal conservative voters and politicians that derive utility from consumption of public goods are examples of factors that would help the model provide a more realistic prediction.

3.3.5 Information and corruption

Shi and Svennson (2006) found that the magnitude of the cycles would depend on i: the rents that the politicians received from being in office, and ii: the proportion of the inobservant part of the electorate.

Similar results can be reproduced with the setup in this paper. The derivative of (3.30) determines how deviation from the expected debt level will increase the informed part of the population.

$$\frac{\partial \vartheta}{\partial (B_t - \hat{B}_t)} > 0 \text{ for } B_t > \hat{B}_t (3.41)$$

As the inobservant part of the electorate is an endogenous variable in this model, it is the size of (3.41) that is important in determining the magnitude of the cycles. If there is very limited access to free media in a country, (3.41) will be close to zero. Hence, few voters will be able to learn to what extent manipulation is going on, thus will the cycles be relatively large. Alternatively, with very good access to free media (3.41) could be very large. Here, almost any attempt to manipulate voters will be understood by the electorate and hence the budget cycles will be very small. From these arguments proposition 4 can be formulated:

Propostition 4: Conditional on the exchange rate regime allowing for budget cycles, increased access to information will decrease the magnitude of the budget cycles.

Finally, there is the topic of corruption. Shi and Svennson (2006) stated that increased rents from staying in office will increase the magnitude of the budget cycles. The link to corruption is not as clear cut in this thesis. However, the budget cycles in themselves should be accepted as a type of corruption. Political corruption, as defined by Transparency International, is *"the abuse of entrusted power by political leaders for private gain, with the objective of increasing power or wealth" (Transparency 2004:11).* Now, turn to the first order condition in (36).

$$\frac{\partial U}{\partial B_t} = -\frac{\partial \vartheta}{\partial B_t}\left(\mathrm{B_t} - \hat{B}_t\right) + \left(1 - \vartheta\left(\mathrm{B_t} - \hat{B}_t\right)\right) = 0 (3.42)$$

(3.42) states that the gain from manipulation comes from exceeding the expectations of the voters. With a high general level of corruption in a country, voters will expect a higher deficit compared to a country with a lower level of corruption. Thus, the incumbent in the highly corrupt country will generate a high deficit. With a lower general level of corruption, and hence a lower expected deficit level, the incumbent politician need not run a very large deficit to exceed the inobservant part of the electorates expectations. From this discussion, proposition 5 can be formulated:

Proposition 5: Conditional on the exchange rate regime allowing for budget cycles, will a higher expected deficit in election years leads to an even higher realized deficit in election years.

Even though it might be thought of as a "chicken or egg" discussion, based on proposition 5 the budget cycles should be expected to be larger in countries with a higher general level of corruption.

It should be pointed out that that proposition 5 does not depend on the rents associated with remaining in office as opposed to the findings in Shi and Svennson (2006). However, if the politicians' utility function had been augmented to include consumption, the rents associated with remaining in office would play a part in determining the magnitude of the budget cycles.

3.4 Simulation

In order to simulate the model, the function that determines the inobservant part of the electorate must be specified. A simple function that satisfies the requirements is of the following form:

$$\vartheta\left(B_t - \hat{B}_t\right) = 1 - \exp\left[\frac{1}{\iota}\left(\hat{B}_t - B_t\right)\right],\ \iota > 0 \quad (3.43)$$

Using the first order condition in the case of fixed exchange rate regimes, it can easily be verified that the solution to the politician's maximisation problem in an election year is given by:

$$B_t = \hat{B}_t + \iota \quad (3.44)$$

I.e. the politicians will always spend ι more than the estimate by voters in election years.

The IS- and PC-curves may need some adjustment, to take into account that the inobservant and observant part of the electorate has different expectations of next period. The difference between the two types of voters is that the uninformed voters underestimate spending in this period. Sticking to the assumption that the government will repay its debt in the year between elections, this means that the uninformed voters will overestimate government consumption and hence production next period. Also, the expected inflation will be too high. Furthermore, the PC-curve should be adjusted, as this has been derived in part from the consumers' optimisation problem.

Taking the aforementioned points fully into account will essentially require remodelling the entire setup. The benefit of such an adjustment will depend on the parameter ι. If ι is small, there will hardly be any difference between the expectations of the two types of consumers. Note that assuming ι is small does not imply that the budget cycles themselves are small as that also depends on the expected debt level. The solution adopted here is thus to keep the IS and PC curves as they are, and leave ι to be a small, positive number

In the model setup it is assumed that taxes and debts are nominal. Thus, the variable g=-ln(1-G/Y) actually contains the prevailing price level, as the government budget constraint can be rewritten to:

$$G_t = \frac{1}{P_{H,t}}\left[T + B_t - \frac{1}{Q_{t-1,t}}B_{t-1}\right] \quad (3.45)$$

This complicates the simulation of the model, and makes it difficult to isolate the analytical expressions for production and inflation. A simple solution is to assume that taxes and debt are scaled according to the current price level; hence $P_{H,t}$ drops out of the budget restriction altogether. For the debt level, this solution implies that the debt is issued through inflation indexed bonds.

Parameter values are taken from Gali and Monacelli (2005), shown in table 3.1.

φ	μ	μ_w	ϵ	θ_p	B	α
3	1.2	1.2	6	0.75	0.99	0.4

Table 3.1

Some additional parameter values are chosen, shown in table 3.2. The implication of the numerical value of the estimated debt level is that the magnitude of the cycles is similar to the shocks that are used in Leith and Wren-Lewis (2005) (the typical "1%" shock).

$\widehat{B}$	ι	T	π_F
0.01	0.00001	0.25	0

Table 3.2

The "fixed exchange rate"-version of the model is simulated, thus keeping the interest rate fixed.

Values of expected inflation, production and government consumption the period after the last simulated period are chosen through linear programming, by minimising the sum of squared changes of inflation and production over all periods. These values turn out to be domestic inflation of about $\pi_{H,t} \sim 5\%$ and production $y_t \sim 0$ (I.e. Y=1). Note that the results are fairly sensitive to the endpoint parameter values that are chosen. 11 periods are simulated from t=0 to t=10.

A peculiarity of this model, given the values of $\widehat{B}$ relative to ι, is that the budget cycles are not shocks; they are on the contrary expected events. Thus, the simulation should not be limited to the election year and onwards, but should also include the run-up to the election. The election is therefore held in period 5, so the effects on the economy in the years before the election can be shown as well.

The assumption that all government debt is repaid the year after the election is arbitrary, and probably unrealistic. Thus, two cases are simulated; one where all debt is repaid the year after the election, and one where a share of 0.3 of the debt is repaid every year after the election. The ratio of 0.3 is probably also in the high end, and is no less arbitrary.

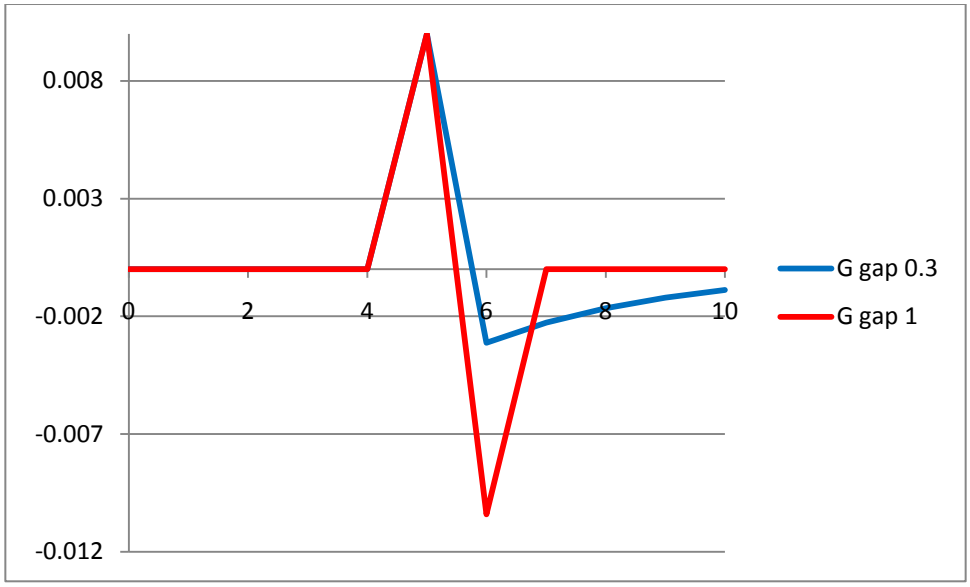

Figure 3.1 Government consumption subtracted steady state value, for repayment ratios of 1 and 0.3. The Y-axis is over "gapped" government consumption, and the X-axis is over time. The election is held at t=5.

Figure 3.1 shows the evolution of government consumption in the two cases. Both curves are identical up to and including t=5. Thereafter G drops to about -0.0104 below its steady state value in the case where all debt is repaid and to about -0.03 in the second case. G remains at its steady state value thereafter in the case where the debt is repaid, in climbs asymptotically to its steady state value in the case where the repayment ratio is 0.3.

Figure 3.2 show the output gap for the two repayment ratios. Aside from the peak, it is most interesting to note that output drops below its steady state value in the year before the election. Also, in the full repayment case, output does not simply revert to its steady state

value after the election but climbs to a higher value in t=7, for thereafter to decline steadily towards its steady state value.

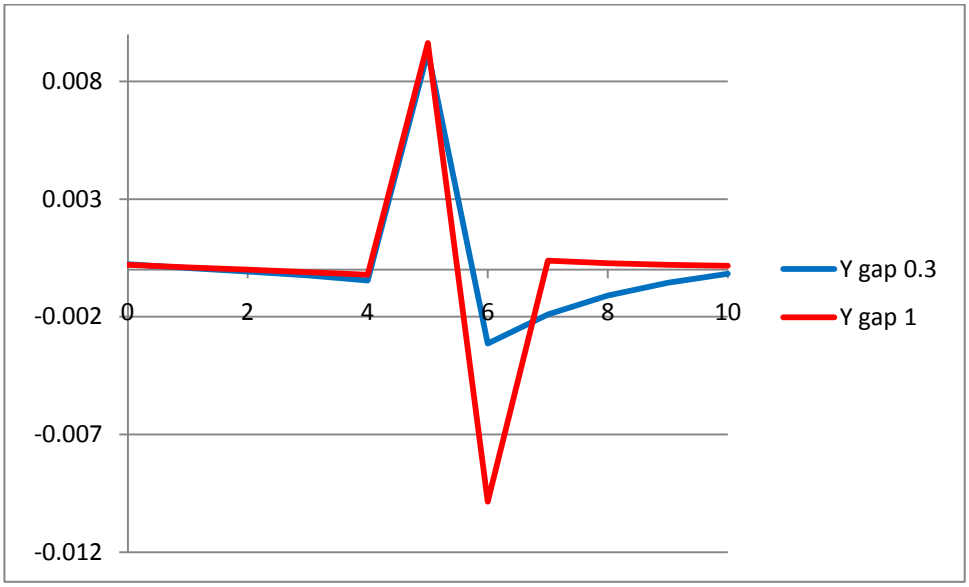

Figure 3.2 Output less steady state value, for the two repayment ratios. The Y-axis is over the output gap, and the X-axis is over time. The election is held at t=5.

Figure 3.3 shows the evolution of domestic price inflation, less its steady state value (note that consumer price inflation is equal to domestic price inflation in this case, multiplied by $(1-\alpha)$, due to fixed exchange rate and zero foreign price inflation). Here it is also evident that the effects of the budget cycle are seen both before and after the election. Inflation increases, and lies above its steady state value in the years before the election. An explanation for this is that firms wishes to ensure that they have set prices high enough to benefit from the demand surge in the election year. Naturally, inflation drops significantly in t=6. From t=7 and onwards however, inflation is higher than its steady state value in the full repayment case, consistent with a corresponding positive output gap.

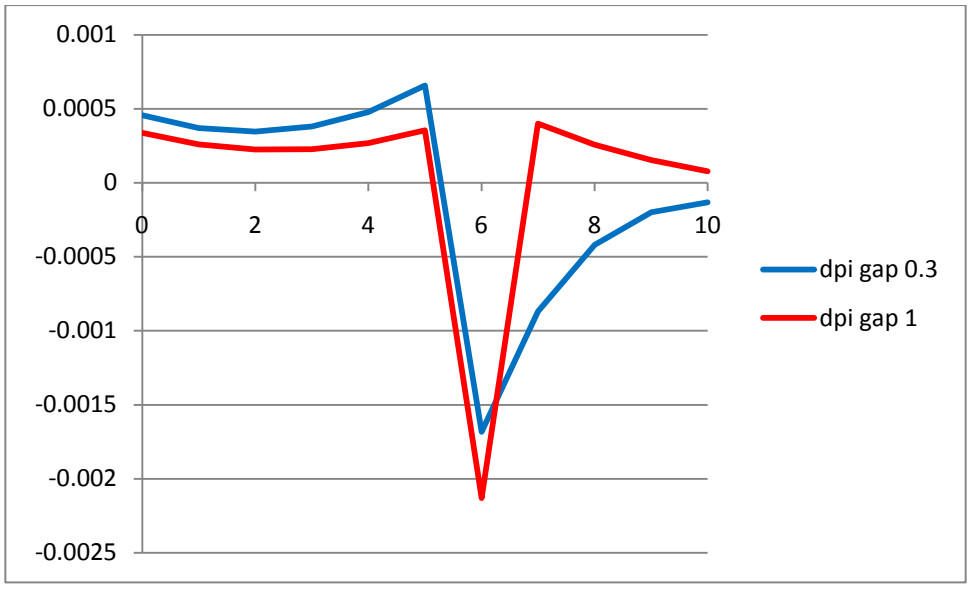

Figure 3.3 Domestic price inflation (DPI) less steady state value, for the two repayment ratios. The Y-axis is over gapped domestic price inflation (dpi), and the X-axis is over time. The election is held at t=5.

Shortly, the thesis proceeds to the empirical section. When performing the empirical analysis, the variable that is used to search for budget cycles is G/Y, government consumption as a share of production. Figure 3.4 plots the simulated evolution of this variable.

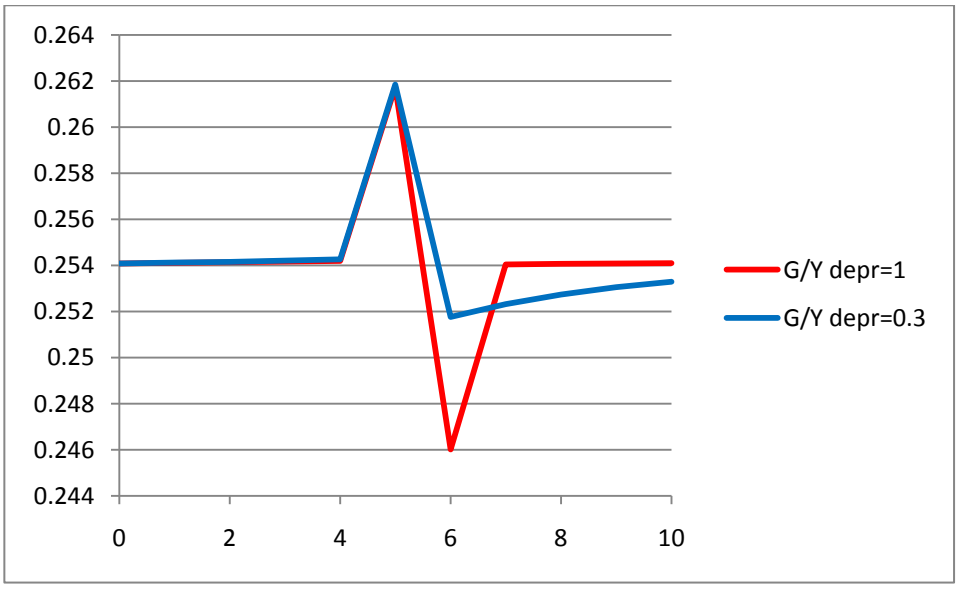

Figure 3.4 Government consumption as a share of output for the two repayment ratios. The Y-axis is over G/Y, and the X-axis is over time. The election is held at t=5.

3.5 Model Conclusion

Section 3 has developed a model over political budget cycles in a small, open economy. Including the central bank has some quite non-trivial consequences. First, budget cycles will never be an equilibrium policy if the exchange rate is allowed to float freely. The mechanism that ensures this is that the interest rate, which is a highly visible economic variable for consumers, conveys information on the public fiscal policies. Manipulation is therefore not possible in this case.

The opposite conclusion prevails when the exchange rate is pegged. In this case the central bank will not respond to fiscal policies, and will therefore not provide voters with any new information. Manipulation will thus be an equilibrium policy. Budget cycles will also prevail with intermediary exchange rate regimes, and the cycles are predicted to be larger to that of the fixed exchange rate regime case.

Also, it is shown that both an increased share of inobservant voters and an increased expected deficit in election years will cause the actual deficit to increase.

Simulation of the small open economy in the case of a fixed exchange rate has given some insight in the evolution of production and inflation in the presence of political budget cycles. In particular, it is shown that these variables are affected by the budget cycles both before and after the election, as well as the actual election year. Further, the simulation has shown that the political budget cycle is not a shock, but an anticipated feature of the elections. This conclusion rests on some of the assumed parameter values.

4. Empirical testing

4.1 Descriptive statistics

The data set is an unbalanced panel over 141 countries, covering the years 1990 to 2009. Countries have only been omitted where there were either no data available, or that the country was not relevant in that no elections were held. 1990 was chosen as the first year due to the assumption of that the central bank is independent; thus hopefully avoiding to include years where this assumption is not met. Table 4.1 displays summary statistics of the variables in the data set.

Variable	Obs	Mean	Std. Dev.	Min	Max
Country	2707	70.94	40.63	1	141
Year	2707	1 999.33	5.65	1990	2009
G/Y	2707	15.58	6.37	1.40	69.54
y	2707	23.51	2.26	18.96	30.09
Corruption	1702	-0.48	0.24	-0.99	-0.04
CBI	1183	0.28	0.27	-0.60	0.78
Election	2662	0.22	0.41	0	1
Info	1401	0.26	0.32	0	1.82
FX-regime	2234	2.24	0.83	1	3
El. Schedule	1933	2.70	0.53	1	3
AFM	377	637.84	860.12	0.21	4383.92

Table 4.1

The data set consists of 2 707 observations. However, many variables contain missing values as e.g. the variable AFM with only 377 observations. I was unfortunately not able to find more data to reduce the amount of missing observations.

The variable of interest is G/Y; government consumption as a percentage of GDP. The variable is multiplied by 100, and table 4.1 shows great heterogeneity in the sample with range from 1.4 to 69.54. This variable was obtained through the World Development Indicators dataset (WDI). Also collected from the WDI-dataset was production, y; log of GDP in 2000 USD. This variable will be transformed later on to obtain a measure of the output gap.

The variable Corruption measures the overall level of corruption in a country. The source of this variable is Transparency International, where data is collected from their 2001 survey. Following Shi & Svennson (2006), only observations from 2001 are used, assuming that the level of corruption is fairly persistent over time. The data from the Transparency International survey has been scaled by diving by 10, and is multiplied by -1. Thus, the values of Corruption lie between -1 to 0, and a higher value of Corruption indicates higher overall level of corruption.

In order to test the propositions from section 3, some measure of the exchange rate regime must be obtained. The variable FX-regime measures the de facto exchange rate regime in a country in a given year. The variable can take three values, 1, 2 and 3, which corresponds to a floating, intermediary or fixed exchange rate regime. There are two sources for this variable, Levy-Yeyati and Sturzenegger (2005b) and the International Monetary Fund. Appendix 7 provides some additional details regarding this variable.

Measuring central bank independence is in general difficult, as what this thesis focuses on is de facto central bank independence. There have been various attempts at measuring this through proxies, e.g. by classifying the laws that govern the autonomy of the central bank, or to measure the turnover rate of central bank governors. A combination of these measures were used in generating the variable CBI, where a higher level of CBI indicates a higher level of central bank independence. Several sources were used in generating this variable, and appendix 7 gives some additional details.

The variable Election it takes the value 1 if there was an election in that country in the given year, and is zero otherwise. The source is the Database on Political Institutions (DPI). From this source the variable SYSTEM is used, which identifies whether a country has parliamentary, assembly-elected president or presidential system. Also, two binary election variables were collected, LEGELEC and EXELEC, which had the value one if there was a legislative or executive election, respectively. Thus, the Election variable has the value one if one of the two conditions are met:

- The country has a presidential system and there is an executive election that given year,
- The country has either a parliamentary or an assembly elected president, and there is a legislative election that given year.

If neither of these conditions were met, the election variable has the value zero. In total, 582 elections are observed. This approach contrasts e.g. Hagen (2010), who used parliamentary elections only. The approach taken in this thesis is similar to the approach in Shi and Svennson (2006).

In order to control for the impact of the availability of information on PBC, the methodology from Shi and Svennson (2006) is followed. The variable Info is generated, which is a measure of the joint effect of availability of information and free media. A higher value of Info indicates more information available to the public. The sources of the Info variable were Freedom House and the International Telecommunication Union. Appendix 7 provides some details in how this variable was calculated.

A recurring subject in the empirical literature on budget cycles is the possible endogeneity in timing of elections. To control for this, the variable El. Schedule is collected from the Institutions and Elections Project (IAEP). This variable can take the following values:

1. if there is no formal election schedule,
2. if there are exact, fixed intervals between elections, and
3. if there are formal rules governing the intervals between elections, but the timing is to some degree left to the discretion of the political system.

Unfortunately, the IAEP dataset only include observations up until 2005, and does not contain information on all the countries in the data set.

The model as laid out in section 3 assumes that consumers can participate in capital markets. With 141 countries in the data set, this may be a too strong assumption. Thus, the variable AFM, an acronym for Access to Financial Markets, is included as well. AFM measures access to various financial institutions and financial instruments per 1000 inhabitants. The source of the variable is International Monetary Fund – Financial Access Survey, and some additional details can be found in appendix 7.

4.2 Properties of the data and transformations

4.2.1 General model

The general model of interest has the following form:

$$\left(\frac{G}{Y}\right)_{i,t} = \beta_1 \left(\frac{G}{Y}\right)_{i,t-1} + \beta_2 Election_{\mathrm{i,t}} + \beta_3 y^g{}_{i,t} + v_{it} \quad (4.1)$$

The error term will in general consist of several parts, as shown in 4.2.

$$v_{it} = \alpha_i + \gamma_t + \varepsilon_{i,t} + \sum_{j=2}^{p} \rho_j \left(\frac{G}{Y}\right)_{i,t-j} \quad (4.2)$$

α_i is a country specific effect which is invariant over time, and $\varepsilon_{i,t}$ is an error term. γ_t are shocks that affect all countries equally each year. $\sum_{j=2}^{p} \rho_j \left(\frac{G}{Y}\right)_{i,t-j}$ capture that there might be autocorrelation of order p.

Entorf (1997) shows that the general spurious regression result holds for panel data, using a fixed effects estimator, when N is finite and T approaches infinity. The problem arises due to non-stationarity of the error term. Including the lagged dependent variable in the specification, as shown in (4.1), might not be sufficient to avoid this problem as there is no reason to ex ante believe that the parameter β_1 is equal across all countries. Thus, there may not be a single parameter value for β_1 that renders all series stationary. Furthermore, one of the estimators that could potentially be used, the System-GMM estimator, requires that $\beta_1 < 1$ (Roodman 2009). The only variable in (4.1) that could have a unit root is G/Y – hence it is important to ensure that this series is stationary.

Performing unit root tests on panel data is not straightforward. Most of the available tests are only available for strictly balanced panels, and the alternative hypotheses are in other cases not relevant for the purposes in this thesis (e.g. that one of the individual countries time series is stationary). Appendix 8 explains in detail the stationarity properties of G/Y using various tests. In general the null of a unit root of G/Y cannot be rejected.

There are several possible ways of solving the problem of non stationarity. Seeing how the research question deals with the short term movements in G/Y, the solution adopted in this thesis is to primarily rely on HP-filtering G/Y. This ensures that G/Y is stationary. Appendix 9 explains the HP-filter in detail, and also discusses the justification for using the filter approach. Applying the HP-filter alters the serial correlation properties of the series, and could also change the correlation between the filtered series and other variables. It is therefore important to take serial correlation into account in the analysis, and also ensure that

any results are not driven by the HP-filter itself. To test for this, regressions on the first differenced G/Y is used as a robustness test. Appendix 8 discusses the stationarity properties of FD G/Y.

The control variable y^g, the output gap, is calculated by applying the HP-filter to a time series of log of GDP in constant 2000 USD. The standard value of $\lambda^{HP} = 6.25$ is used when the filter is applied.

Table 4.2 displays the properties of the two HP-filtered series of G/Y and y.

Variable	Obs	Mean	Std. Dev.	Min	Max
hp G/Y	2707	$8.82 * 10^{-10}$	1.3474	-15.743	14.4912
y^g	2707	$-1.25 * 10^{-11}$	0.02829	-0.4075	0.19751

Table 4.2

4.2.2 Endogeneity

It is probably not reasonable to assume that the election dummies are strictly exogenous, as incumbent politicians can influence the election date in most countries. Brender and Drazen (2005) note that the sign of the correlation between the error in the previous period and the election dummies is not clear. One possibility is that the election dummies are correlated with the error in the previous period. For instance, elections are more likely to be held if the previous error is low This implies that GPD is high – i.e. strategic set election date as examined in Alesina et al (1993). They did not find evidence of this type of strategic use of election dates in their sample of 18 OECD-economies, with the exception of Japan.

Another possibility is that an election is more likely if the previous error is high – i.e. that the election is held as a response to a recession (Brender and Drazen (2005)). It is even possible that the election dummies should even be treated as endogenous, if the lag between e.g. a negative macro shock to an election is held is small. Brender and Drazen explored the possibility of endogeneity of the election dates, and found that the qualitative results are the same regardless of how the dates are treated (2005). Shi and Svennson (2006) found significant budget cycles for both predetermined and endogenous elections, except for developed countries.

y^g, the output gap, is probably not strictly exogenous either, as it is possibly correlated with the previous and/or contemporaneous error. In Hagen (2010), where the left hand side variable is the primary surplus in percent of GDP, the estimated size of the budget cycle is slightly higher when taking the lack of strict exogeneity of the election dummy and the GDP-gap into account.

The dataset at hand divides the election schedule in three possible categories. Brender and Drazen discuss the subject of election schedules, and warns first of that the de jure election schedule might not be corresponding to the de facto election schedule. Second, the distinction between a "flexible" and "fixed" election schedule is a simplification, as they note: *"…almost all countries have some provision for elections at a date earlier than the end of the legally mandated term of office for the executive or the legislature, whether the elections actually occur at the legally determined date is an empirical question*" (2005:1282).

The consensus from the aforementioned papers is then that ignoring the potential lack of strict exogeneity in the election dummies and the output gap will not affect the results significantly. Section 4.3 provides a brief discussion on the subject, where the sample is split according to election schedule. From this, it can be seen if there appears to be fundamental differences between the two types of election schedule regimes.

4.2.3 Estimators

Dynamic panel estimation calls for some carefulness when choosing which estimator to use. However, the effects of the HP-filtering process should be taken into account. Note that from table 4.2, the mean of hp G/Y is very close to zero. In fact, all the country specific series have a similar near-zero mean (the largest country mean in absolute value is $5.4 * 10^{-6}$). As a consequence, the country-specific fixed effect in (4.2) can be ignored. Thus, (4.1) can be rewritten to the following:

$$\left(\text{hp}\ \frac{G}{Y}\right)_{i,t} = \beta_1 \left(\text{hp}\ \frac{G}{Y}\right)_{i,t-1} + \beta_2 Election_{\text{i,t}} + \beta_3 y^g{}_{i,t} + \gamma_t + \varepsilon_{i,t} + \sum_{j=2}^{p} \rho_j \left(\frac{G}{Y}\right)_{i,t-j} \quad (4.3)$$

As (4.3) does not contain a country specific fixed effect, it can be estimated by OLS. However, it is important to be aware of the serial correlation properties of hp G/Y. In the presence of serial correlation, OLS is still consistent although it may not be the most

efficient estimator. However, the estimated standard errors will be biased, and should be corrected. Section 4.2.4 elaborates on this. It should also be pointed out that using a Random Effects estimator will not be more efficient than OLS, as there is virtually no between country variation.

As it should be tested that any results are not driven by the HP-filter itself, there is a need for a second estimation strategy. Taking into account the stationarity properties of the series G/Y, a natural starting point is the differenced version of (4.1). Running OLS on a first-differenced version of (4.1) will lead to an inconsistent estimator, due to correlation between the lagged, differenced dependent variable and the differenced error. The bias does not decrease with an increased T (Verbeek 2008).

There have been proposed several estimators based on FD-OLS that aim to remove the bias related to the lagged dependent variable. In general, the solution offered by these estimators is to instrument the lagged dependent variable with deeper lags of the dependent variable. The simplest of these estimators is the one proposed by Anderson-Hsiao (1982) (AH), where the dependent variable lagged two periods is used to instrument the lagged dependent variable[3]. A more refined GMM-estimator is proposed by Arellano and Bond (1991) (AB), where further lags of the dependent variable are used to instrument the lagged dependent variable. Necessary conditions for the consistency of these estimators are that the instruments are valid, hence no autocorrelation in the error term, and that the data set is large enough.

However, it is questionable if any of these estimators are superior to FD-OLS, given the properties of G/Y. The AH-estimator is shown to potentially have large biases when the underlying series is close to having a unit root (Arellano and Bover (1995)). As shown in appendix 9, this is likely to be the case here. The AB-estimator does not appear to be an attractive option either, as Verbeek notes that *"..if the true coefficient on the lagged dependent variable is close to unity, lagged levels as employed in the Arellano-Bond procedure are poor instruments for first differences"* (2008:388).

[3] An alternative is to use the differenced dependent variable lagged two periods as instrument for the lagged dependent variable. Arellano (1989) shows that using the differenced instrument causes the model to suffer from large variance.

As a final note, the system-GMM estimator proposed by Arellano and Bover (1995) and Blundell and Bond (1998) is not appropriate, as it exploits stationarity assumptions could well be violated in this case (as β_1 appears to be close to unity).

However, the consequences of the bias of FD-OLS need not be too bad as there is a low correlation between the lagged dependent variable and other explanatory variables. Thus, the bias may not contaminate the coefficient estimates of the interesting variables very much. So, this is the estimator that is used as a robustness test in section 4.3.5.

If it is assumed that G/Y itself is stationary there are many estimators to choose from, such as SYS-GMM, FE-estimator or corrected least square dummy variable (Bruno 2005a, 2005b). These estimators have been tried, and do in general yield results that are qualitatively equal to that of FD-OLS and the results obtained using HP-filtered series. Thus, the results from these estimators are not included in this thesis.

4.2.4 Robust standard errors

From the discussion so far, it is clear that there are the challenges of heteroscedasticity and autocorrelation that should be countered.

The usual assumption of that $E[u_{it}|\boldsymbol{X}] = E[u_{it}] = 0$, where **X** is a vector of all explanatory variables and u_{it} is the error term, still holds even in the presence of both heteroscedasticity and autocorrelation. However, it is also common to assume that $Var[u_{it}|\boldsymbol{X}] = Var[u_{it}] = \sigma_u^2 \boldsymbol{I}$ where **I** is the identity matrix, i.e. that the variance of the error term is constant conditional on all explanatory variables. This assumption is not appropriate for this case, and the consequence is that the "standard" standard errors are misleading.

One possible strategy to overcome this problem is to re-specify the model. However, the HP-filtering process has made this approach difficult. Due to possible autocorrelation up to a high order, including the appropriate lags in the specification will cause the loss of many observations. Further, the heteroscedasticity imposed by the end-point bias of the HP-filter would still require a solution.

It is more convenient to use standard errors that rely on more realistic assumptions. By assuming that $E[u_{it}|u_{jt}] = 0$ for all $i \neq j$, i.e. that the errors of different countries are

uncorrelated, standard errors that are robust to both heteroscedasticity and autocorrelation can be computed. The approach is an extension of the heteroscedasticity robust standard errors proposed by Huber (1967) and Newey and West (1987). These standard errors are called cluster robust standard errors, as they allow for correlation between error terms within a cluster. In this setting a cluster is a country, so to be able to calculate the cluster robust standard errors it is only required to assume that there is no correlation in errors between countries. As year-dummies are included in the analysis, this is not a restrictive requirement.

Unfortunately, the cluster robust errors rely on asymptotics, meaning that N or T should be sufficiently large. This might not be the case here, so it will be prudent to show some carefulness when interpreting the results.

4.2.5 Subsamples

The model in section 3 relies on two vital assumptions. The first is that the central bank is independent. The second assumption relates to the treatment of the interest rate in the model, and as a minimum, this assumption implies that the consumers should have access to financial markets. The implication for the empirical analysis is that there is a trade-off between sample size on the one hand, and a sample consistent with the model assumptions on the other hand.

The solution that is adopted in this thesis is that regressions are run in three different samples. The first sample consists of the entire data set of 141 countries. The second sample, denoted subsample 1, controls for that the central bank is independent, using the variable CBI. Preferably, there should be a dummy variable in the data set, taking the value 1 if the central bank is independent, and zero in all other cases. What is available is the variable CBI, varying from -0.59 to 0.78, where a higher value indicates a more independent central bank. So, in need for setting a limit for when the central bank is independent, the regression is run conditional on CBI>0[4]. 68 countries have observations that meet the condition of CBI>0.

[4] Many different values of CBI have been tested, and it turns out that the results are not at all sensitive to the value of CBI that is chosen. This is unsurprising, given the open definition of central

The third sample, denoted subsample 2, controls for both central bank independence and the assumption of access to financial markets. The assumption of participation in capital markets share the same difficulties as with central bank independence, as some number of AFM must be chosen as the cut off value. Specifically, the value of AFM was set fairly low, 500. However, seeing that only 19 countries meet both conditions, the sample is extended somewhat. As there are many OECD-economies where there are missing observations for one or both of CBI and AFM, all OECD-economies are also included. This is based on the assumption that with the given time period, from 1990 and onwards, both CBI-independence and access in financial markets were in place. This third sample is covers 38 countries, with an average T of 15.

Table 4.3 sums up the three samples that will be used.

Sample name	Selection Criterion	Countries	Av. T
All	None	141	19.2
Subsample 1	CBI>0	68	15.4
Subsample 2	Both CBI>0 and AFM>500, or OECD	38	15

Table 4.3

4.3 Results

Equation (4.3) is amended to the following:

$$\left(\text{hp}\,\frac{G}{Y}\right)_{i,t} = \alpha_0 + \beta_1\left(\text{hp}\,\frac{G}{Y}\right)_{i,t-1} + \beta_2 Election|\text{Fix}_{i,t} + \beta_3 Election|\text{Else}_{i,t} + \beta_4 Election|\text{Float}_{i,t} + \beta_5 y^g{}_{i,t} + v_{it} \quad (4.4)$$

Here α_0, which is is the intercept, has been inserted, even though it would be consistent to leave α_0 out. However, as T-1 year dummies are included in the specification as well (not shown), the intercept can be interpreted as the time effect the year without the year dummy. The elections are split in three, according to the exchange rate regimes. The variables Election|Fix, Election|Else and Election|Float have properties equal to Election, except that

bank independence used in the model (i.e. that only instrument independence is needed for the model assumption of independence to be ok).

they will equal one only if the country that given year is classified as having a fixed, intermediate or floating exchange rate regime, respectively.

The propositions from section 3 can now be translated to testable hypotheses. These are:

> **Proposition 1:** The coefficient on elections held in countries with floating exchange rate, β_4, should be zero.
> **Proposition 2:** The coefficient on elections held in countries with a fixed exchange rate, β_2 should be positive
> **Proposition 3:** The coefficient on elections held in countries with an intermediary exchange rate regime, β_3 should be positive, and larger than the coefficient on countries with a fixed exchange rate.

For proposition 4 it is necessary to add further regressors to (4.4). Using the methodology from Shi and Svennson (2006), and taking into account that the effect of information and corruption is conditional on that the exchange rate regime allows for budget cycles, interactions between the three election variables in (4.3) and the information variable Info are added (not shown).

> **Proposition 4:** The coefficient on the interaction variables Election|Fix * Info and Election|Else * Info should be negative. The coefficient on the interaction Election|Float * Info should be zero.

When testing proposition 5 a similar methodology is used, except that Info is replaced by Corruption.

> **Proposition 5:** The coefficient on the interaction variables Election|Fix * Corruption and Election|Else * Corruption should be positive. The coefficient on the interaction variable Election|Float * Corruption should be zero.

When testing propositions 4 and 5 the coefficients on the election variables should have signs in accordance with propositions 1 through 3.

The strategy for testing these hypotheses is as follows: First, section 4.3.1 tests propositions 1, 2 and 3. Thereafter, section 4.3.2 will test proposition 4, and section 4.3.3 tests proposition 5. Section 4.3.4 will briefly discuss the endogeneity of the election variable. Section 4.3.5 will thereafter extend the analysis to include the years adjacent to the election year.

The results presented in section 4.3.1 to 4.3.4 all relies on the HP-filter. As a robustness test, all specifications have been run using FD-OLS. As the results from FD-OLS are

quantitatively very similar to the results found with the HP-filtered series, the robustness test results are relegated to appendix 10.

4.3.1 Proposition 1, 2 and 3 – Exchange rate regimes

Proposals 1 and 2 from section 3 can now be tested[5]: firstly that budget cycles are never to be present in countries with a floating exchange rate regime, and secondly that political budget cycles will only be present in countries where the exchange rate constraints are binding.

If proposal 1 is true, the coefficient on Election|Float should be zero. This can clearly not be rejected. In all three samples, the estimated coefficient on Election|Float is insignificant and close to zero.

Dep. Var:	hp G/Y	hp G/Y	hp G/Y
Regression	1	2	3
Estimator	OLS	OLS	OLS
Lagged hp G/Y	-0.043	-0.047	-0.013
	(0.04)	(0.09)	(0.04)
Election|Fix	0.183***	0.130*	0.099**
	(0.06)	(0.07)	(0.04)
Election|Else	0.350**	0.168***	0.144
	(0.15)	(0.06)	(0.11)
Election|Float	0.066	0.013	0.021
	(0.08)	(0.05)	(0.03)
y^g	-4.558**	-1.689	-9.012***
	(1.82)	(2.06)	(2.81)
Year dummies	Yes	Yes	Yes
Obs	2539	1002	569
Countries	141	68	38
Std. Errors	Cluster R	Cluster R	Cluster R
Sample	All	Subsample 1	Subsample 2

* 10% significance ** 5% significance *** 1% significance
Coeff / (Std. Error)
Table 4.4

[5] All regressions have been tested using the FE-estimator and the Corrected Least Square Dummy Variable estimator by Bruno (2005a 2005b) as well, and in no case do the results qualitatively differ from that of OLS. Small divergences arise when running regressions on subsamples, as only parts of some of the countries' series are used. Thus, for these countries, the mean of the chosen sample may not be zero.

If proposal 2 is true, the coefficient on Election|Fix should be significantly larger than zero. This is also the case, as the coefficient on Election|Fix is significantly positive in all three samples.

If proposal 3 is true, the coefficient on Election|Else should be greater than zero, but also greater than the coefficient on Election|Fix. In all three samples, the estimated coefficient is positive, and the estimated coefficient is also larger than the estimated coefficient on Election|Fix. The confidence intervals are however overlapping.

It is interesting to note that the estimated coefficients on Election|Fix and Election|Else are decreasing with reduced sample size. This can be explained by that the smaller samples consist of fewer countries with poor institutional constraints on politicians. Thus, the budget cycle will be lower and in the remaining countries, and with less variation between countries.

The estimated coefficients on the election variables are similar to those found in Brender and Drazen (2005). They estimate the increase in G/Y to 0.085 percentage points in election years in their full sample, and to 0.747 percentage points in a sample of so-called "New Democracies". Shi and Svennson (2006) found that the primary surplus as a share of GDP was reduced by 0.69 percentage points in election years. Rerunning the regression in column (1) from table 4.4 using only one pooled election dummy variable, yields an estimated coefficient of 0.197 (results not shown).

It is not usual in the empirical PBC literature to add more intuition on the interpretation of the coefficients. However, the coefficients can, ceteris paribus, be translated to the actual increase in spending in a given country. Using the estimated coefficient on Election|Fix in column (3) and the data on GDP, the estimated increase in government expenditures in an election year is e.g. 1.99 billion USD in Germany, and 0.13 billion USD in Ireland[6]. Note that these figures are obtained using the Subsample 2 results, which are in general lower compared to the full data set or subsample 1.

It should be kept in mind that the results in table 4.4 are the partial derivatives with respect to the cyclical component of G/Y. Thus, any effect on the trend component is not included.

[6] These numbers were calculated using 2009 figures on GDP in 2000 USD. The estimated coefficient on Election|Fix is simply multiplied by the value of GDP that given year. The equivalent number for Norway is 0.20 billion USD, except that Norway is not classified to have a fixed exchange rate for 2009.

If a part of the expenditure surge in an election year is permanent, the HP-filter will underestimate the budget cycle. This is because with permanent increases in expenditures, some of the increase will be captured by the trend component of the HP-filter. Hence, when interpreting the results from these regressions it is important to keep in mind that there could be traces of the political budget cycle in the trend component as well.

It has been performed studies, as that of Hagen (2010) on a sample consisting OECD-economies. Regressions on OECD-economies yield results that are close to a replication of the results from regressions on Subsample 2, and are therefore not shown.

4.3.2 Proposition 4 - Information

Table 4.5 shows the results from the tests of proposition 4. First of all, two countries did not have any observations of the Info variable, and were dropped. Secondly, there were many years where there were not recorded observations of the Info variable. In all, 1260 observations were dropped due to missing observations of Info. The effect of this is in best case that the precision of the estimates is reduced. In worst case, it might introduce selection bias. Also, there is positive correlation between the interactions between the interaction variables and the three other election variables (the correlation coefficient is about 0.9 for all three pairs of election variables). This multicollinearity may lead to *"unreliable estimates with high standard errors and of unexpected sign and magnitude"* (Verbeek 2008:43)

The signs of the coefficients are however as expected. The estimated coefficients on Election|Fix and Election|Else are still positive in all three subsamples. However, it is apparent the general level of significance has been reduced. Also, it is interesting to see that the estimated coefficient on Election|Float has now increased in columns (1) and (2), compared to the results in table 4.4. This could be explained by collinearity. Alternatively, it could be that there is a budget cycle in some countries with a floating exchange rate. The estimated coefficient on Election|Float in column (3) is still close to zero.

The interaction variables in column (1) all have the expected signs, and are significantly negative in the fixed exchange rate case. The coefficient on the interaction in countries with a floating exchange rate is also fairly low. In columns (2) and (3) the sign varies, and none of the coefficients are significant. In all, proposition 4 cannot be rejected.

Dep. Var:	hp G/Y	hp G/Y	hp G/Y
Regression	1	2	3
Estimator	OLS	OLS	OLS
Lagged hp G/Y	0.012	-0.051	0.013
	(0.04)	(0.11)	(0.05)
Election|Fix	0.415***	0.462	0.38
	(0.13)	(0.28)	(0.27)
Election|Else	0.351	0.115	0.098
	(0.44)	(0.14)	(0.31)
Election|Float	0.222	0.743	-0.043
	(0.18)	(2.86)	(0.07)
Election|Fix * Info	-0.521**	-0.605	-0.504
	(0.21)	(0.42)	(0.33)
Election|Else * Info	-0.256	0.128	0.056
	(0.49)	(0.27)	(0.42)
Election|Float * Info	-0.047	-0.065	0.02
	(0.14)	(0.11)	(0.06)
y^g	-4.118	0.113	-5.389
	(2.77)	(0.14)	(4.23)
Year dummies	Yes	Yes	Yes
Obs	1279	442	214
Countries	139	55	30
Std. Errors	Cluster R	Cluster R	Cluster R
Sample	All	Subsample 1	Subsample 2

* 10% significance ** 5% significance *** 1% significance
Coeff/(Std. Error)
Table 4.5

4.3.3 Proposition 5 – Corruption

The result from the tests of proposition 5 is shown in table 4.6. Observations are dropped for 55 countries where corruption data is not available, leaving a great potential for selection

bias. A further weakness is that the proxy that is used for the expected deficit in election years is not entirely convincing, and is also time invariant.

Dep. Var:	hp G/Y	hp G/Y	hp G/Y
Regression	1	2	3
Estimator	OLS	OLS	OLS
Lagged hp G/Y	-0.061	-0.166**	-0.014
	(0.07)	(0.08)	(0.04)
Election|Fix	0.202*	0.333	0.293
	(0.11)	(0.20)	(0.18)
Election|Else	0.318	0.211	0.535**
	(0.35)	(0.13)	(0.26)
Election|Float	0.157	0.062	-0.024
	(0.24)	(0.15)	(0.12)
Election|Fix * Corrupt	0.157	0.355	0.262
	(0.16)	(0.28)	(0.24)
Election|Else * Corrupt	0.003	0.055	0.629*
	(0.48)	(0.25)	(0.32)
Election|Float * Corrupt	0.11	0.045	-0.067
	(0.29)	(0.18)	(0.17)
y^g	-4.992*	-1.672	-9.265***
	(2.85)	(2.47)	(2.90)
Year dummies	Yes	Yes	Yes
Obs	1604	889	565
Countries			37
Std. Errors	Cluster R	Cluster R	Cluster R
Sample	All	Subsample 1	Subsample 2

* 10% significance ** 5% significance *** 1% significance
Coeff/(Std. Error)
Table 4.6

The results are in general consistent with proposition 5. First, the sign and estimated sizes of the election variables are similar to those found i section 4.3.1, except that the coefficient on Election|Float has increased somewhat in column (1). Second, all but one of the coefficients on the interactions between the Corruption and the election variables have the expected sign. Few of the variables are significant, but this is expected given the collinearity of the

variables. Also, the objection pointed out with reference to table 4.4 applies here: there are traces of a budget cycle in countries with a floating exchange rate in column (1) and (2), although not significantly so.

Maintaining an exchange rate peg requires institutional discipline, as there may well be times when a country with a fixed exchange rate is forced to pursue monetary policies unfit for the domestic economy. A country with less strong institutions may choose devaluation instead of maintaining high interest rates in times of stress. Skånland (2004) provides anecdotal evidence in favour of such an interpretation, based on the experiences of Norway in the late 1980's and early 1990's. So, less disciplined institutions could make it easier for an incumbent to undertake a manipulative fiscal policy, and countries with a fixed exchange rate could have stronger institutions in general compared to countries with an intermediary exchange rate regime. The results in table 4.6 could thus alternatively be interpreted as a test of institutional constraints in general. Given this interpretation, the results support the idea that institutional constraints in general reduce the PBC.

4.3.4 Endogeneity

A recurring subject in the empirical political budget cycle literature is the potential endogeneity of elections due to a discretionary timing schedule. Although it by and large have been concluded that a flexible election schedule does not have a large impact on the budget cycles, it should be tested whether this is the case also with this data set. In table 4.7 all observed elections that can be sorted as being subject to either a fixed or a flexible schedule have been counted, and split according to the exchange rate regime.

	All observations			Subsample 2	
	Exact	Inexact		Exact	Inexact
Fix	26	144	Fix	4	49
Else	28	51	Else	6	4
float	23	95	Float	7	37

Table 4.7

Note that it is far more common to have a flexible election schedule compared to a fixed. This has the unfortunate consequence that testing the model implications on subsample 2 using only the exogenous elections is unlikely to yield any reliable results. Also, there are only four observations of elections with intermediary exchange rate regimes and flexible election schedule among the subsample 2 countries. In addition to the elections above, there

were 6 elections held in countries where the executive is not required at all to hold elections. These 6 elections were left out of the regressions in this section.

First, it should be pointed out that there are in all 1933 observations of the election schedule. As the data set covers in all 2707 observations, there are 774 missing observations of the election schedule. In terms of a selection bias, a first guess would be that countries with missing observations are likely to have a stronger budget cycle compared to the countries with missing observations. However, the table below displays some details of GDP per capita in current USD in 2000(note that there were two countries with missing data this year) (Aten et al (2009)):

GDPPC	Mean	std. Dev	min	Max
Schedule Observed	8572.85	9076.79	570.26	34607.52
Schedule Missing	11224.84	14133.55	352.83	54108.91

Table 4.8

Table 4.8 displays that the group of countries with missing observations is fairly heterogeneous. So, it may not be so obvious what direction any selection bias will have.

In order to investigate the consequences of the endogeneity regressions are run subsamples, shown in table 4.9 The first subsample contains observations where the election schedule is fixed (column 1), and the second subsample is where the schedule is flexible (column 2). At a second pass, only observations from subsample 2 are included, and are split in two subsamples in accordance with the election scheduling (columns 3 and 4).

In the first regression including exact election schedule observations only, shown in column 1, the coefficient estimates are quite imprecise. The estimated coefficients on both Election|Fix and Election|Else are as expected, but the robust standard errors are so large that not much interesting can be said of the true value of the coefficients. The estimated coefficient on Elecion|Float is even negative.

The results from the regressions on the subsample with the inexact election schedule, shown in column 2 take a more familiar form. The coefficient on Election|Fix is positive and

significant, and the estimated coefficient on Election|Else is positive, although it has a large estimated standard error.

Limiting the sample to only subsample 2 countries result in, using the subsample of a fixed election schedule, in a significantly negative estimated coefficient on Election|Fix. The estimated coefficient on Election|Else is also negative, although this is not significant.

Dep. Var:	hp G/Y	hp G/Y	hp G/Y	Hp G/Y
Regression	1	2	3	4
Estimator	OLS	OLS	OLS	OLS
Lagged hp G/Y	-0.05	-0.044	0.130*	0.023
	(0.06)	(0.06)	(0.06)	(0.05)
Election|Fix	0.151	0.304***	-0.313**	0.155***
	(0.12)	(0.08)	(0.10)	(0.03)
Election|Else	0.166	0.328	-0.049	0.083
	(0.14)	(0.28)	(0.11)	(0.17)
Election|Float	-0.177	0.136	0.015	0.007
	(0.23)	(0.11)	(0.11)	(0.03)
y^g	-5.718	-4.617*	-1.247	-7.427**
	(3.80)	(2.42)	(5.67)	(3.39)
Year dummies	Yes	Yes	Yes	Yes
Obs	415	1344	68	328
Countries	36	107	6	27
Std. Errors	Cluster R	Cluster R	Cluster R	Cluster R
Sample	Exact Election Schedule	Inexact Election Schedule	Exact Election Schedule & Subsample 2	Inexact Election Schedule & Subsample 2

* 10% significance ** 5% significance *** 1% significance

Table 4.9

There are three explanations for these strange results.[7] The first is that there are very few actual observations of elections in this subsample, where e.g. the four elections observed in countries with a fixed exchange rate consists of three elections in Norway (1993, 1997 and

[7] Removing the year-dummies from this regression yields similar results.

2001) and one in Korea (2002). The second explanation is that the HP-filter actually contributes to the negative estimate of the coefficients on Election|Fix and Election|Else. As will be shown in Appendix 10, repeating the regression on the differenced series removes the significance of the coefficient on Election|Fix, though it is still estimated to be negative. Finally, the standard errors rely on asymptotics, whereas the sample used in column 3 is fairly small.

Running a regression on subsample 2 observations that have a flexible election schedule again produce coefficient estimates consistent with propositions 1 through 3; positive point estimates on the coefficients on Election|Fix and Election|Else, while the coefficient on Election|Float is close to zero. The coefficient on Election|Fix is significantly greater than zero.

The objective of this exercise is to investigate if it matters for the political budget cycles whether there is a fixed or flexible election schedule. As discussed earlier, what appears to be the consensus is that there are no fundamental differences between the two types of election schedules. So far there is no reason to object to that, even though the results are not very convincing[8].

4.3.5 Dynamic structure

Having gained some insights into the nature of political budget cycles in election years, this section investigates the year preceding and following an election year as well as the actual election year. Similar approaches have had limited success (Hagen 2010), possibly due to the inaccuracy associated with not taking into account the effect of different exchange rate regimes. In order to do this, the data set is split into two subsamples. The first of these are countries where the model assumptions hold. However, as there are many missing observations of the AFM-variable, only central bank independence is used. Section 4.3 showed that values of CBI>0 gave results consistent with the model proposals. However, a regression on countries with values of CBI lower than zero still gives results qualitatively equal to those in section 4.3 (Not shown). Thus it seems that the model from section 3 fits all countries with observed values of CBI, a total of 72 countries and 1 183 observations. So,

[8] All regressions have been re-run while omitting the output gap variable, as this variable could be endogenous and therefore bias the results. Omitting it could, on the other hand impose an omitted variable bias. The qualitative results remain unchanged to those shown in sections 4.3.1 to 4.3.3, although the general level of significance was reduced.

observations with observed values of CBI will be the first subgroup. The second subgroup will then be those observations without any observed levels of CBI. $_{t-1}$

Dep. Var:	HP G/Y	HP G/Y	FD G/Y	FD G/Y
Regression	1	2	3	4
Estimator	OLS	OLS	OLS	OLS
Dep. Var_{t-1}	-0.103	0.029	-0.098	-0.034
	(0.09)	(0.04)	(0.11)	(0.06)
Election|Fix $_{t+1}$	-0.002	0.081	0.169	0.280**
	(0.10)	(0.10)	(0.14)	(0.14)
Election|Fix $_{t}$	0.181**	0.269***	0.331**	0.543***
	(0.09)	(0.10)	(0.15)	(0.16)
Election|Fix $_{t-1}$	0.243**	0.277**	0.349**	0.554***
	(0.10)	(0.12)	(0.14)	(0.16)
Election|Else $_{t+1}$	-0.058	-0.034	0.097	0.073
	(0.07)	(0.20)	(0.10)	(0.30)
Election|Else $_{t}$	0.113	0.511*	0.185	0.693*
	(0.09)	(0.28)	(0.12)	(0.40)
Election|Else $_{t-1}$	-0.015	0.124	0.13	0.272
	(0.15)	(0.10)	(0.12)	(0.21)
Election|Float $_{t+1}$	0.07	-0.121	0.013	-0.08
	(0.07)	(0.15)	(0.07)	(0.26)
Election|Float $_{t}$	0.058	0.171	0.012	0.143
	(0.06)	(0.23)	(0.08)	(0.40)
Election|Float $_{t-1}$	0.078	0.139	0.03	0.115
	(0.06)	(0.22)	(0.08)	(0.32)
y_t^g	-0.889	-7.206***	0.404	-9.686***
	(1.95)	(2.35)	(2.57)	(3.49)
Year dummies	Yes	Yes	Yes	Yes
Obs	1063	1314	1005	1230
Countries	72	93	71	92
Std. Errors	Cluster R	Cluster R	Cluster R	Cluster R
Sample	CBI observed	CBI Unobserved	CBI observed	CBI Unobserved

* 10% significance ** 5% significance *** 1% significance

All explanatory variables are first differenced in (3) and (4).

Table 4.10

Running a separate regression on subsample 2 yields very similar results as on subsample 1, except that the general magnitude of the cycle is lower. Thus, only results from the two subsamples of observed and unobserved CBI are shown.

Table 4.10 shows the results from regressions on both HP-filtered and differenced series, for both subgroups. Future, contemporaneous and lagged election variables are included.

The sign and significance of the contemporaneous election variables are similar to what has already been found, but there is clear signs of that there is more going on than what has been found in the election years.

Figure 4.2 show the estimated coefficients for the HP-filtered series, and figure 4.3 the estimated coefficients for the FD series. The estimated effect on the dependent variable is measured on the vertical axis, and time is on the horizontal axis. -1 indicates the year before an election, 0 the actual election year, and 1 the year after an election.

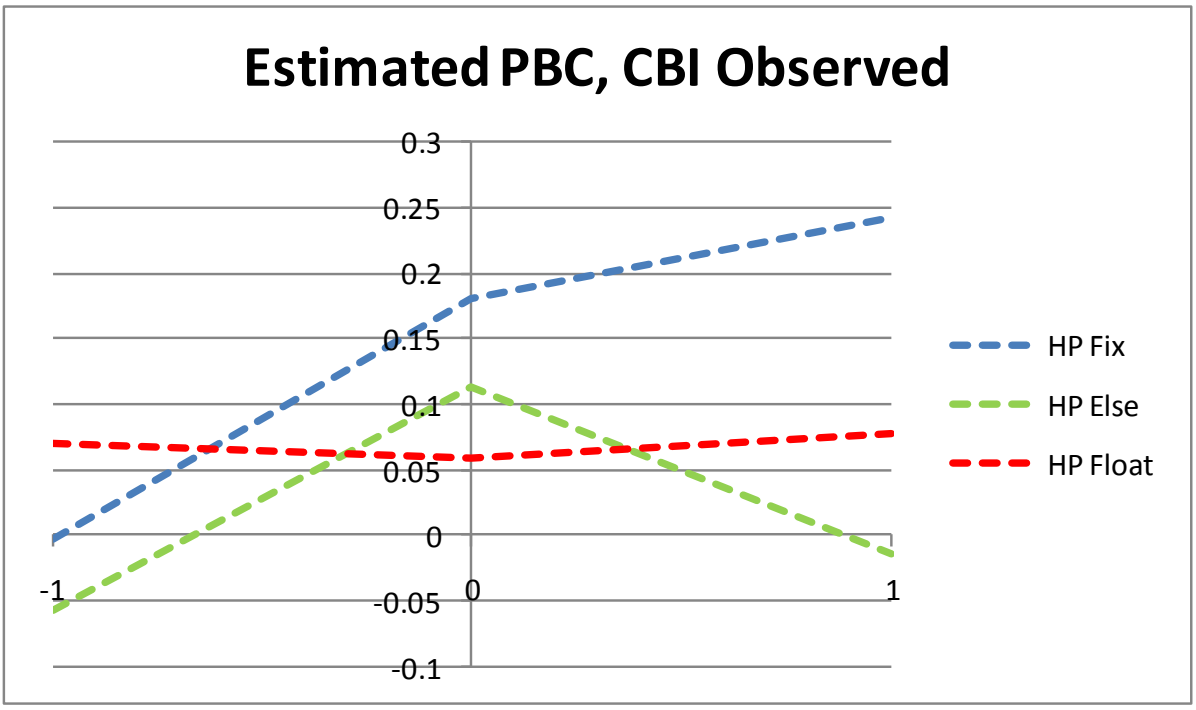

Figure 4.2: The estimated coefficients on the election variables obtained from the HP-Filtered series. The Y-axis displays the estimated effect on the dependent variable. The X-axis shows time, where -1 is the year before an election, 0 is the election year and 1 is the year after an election.

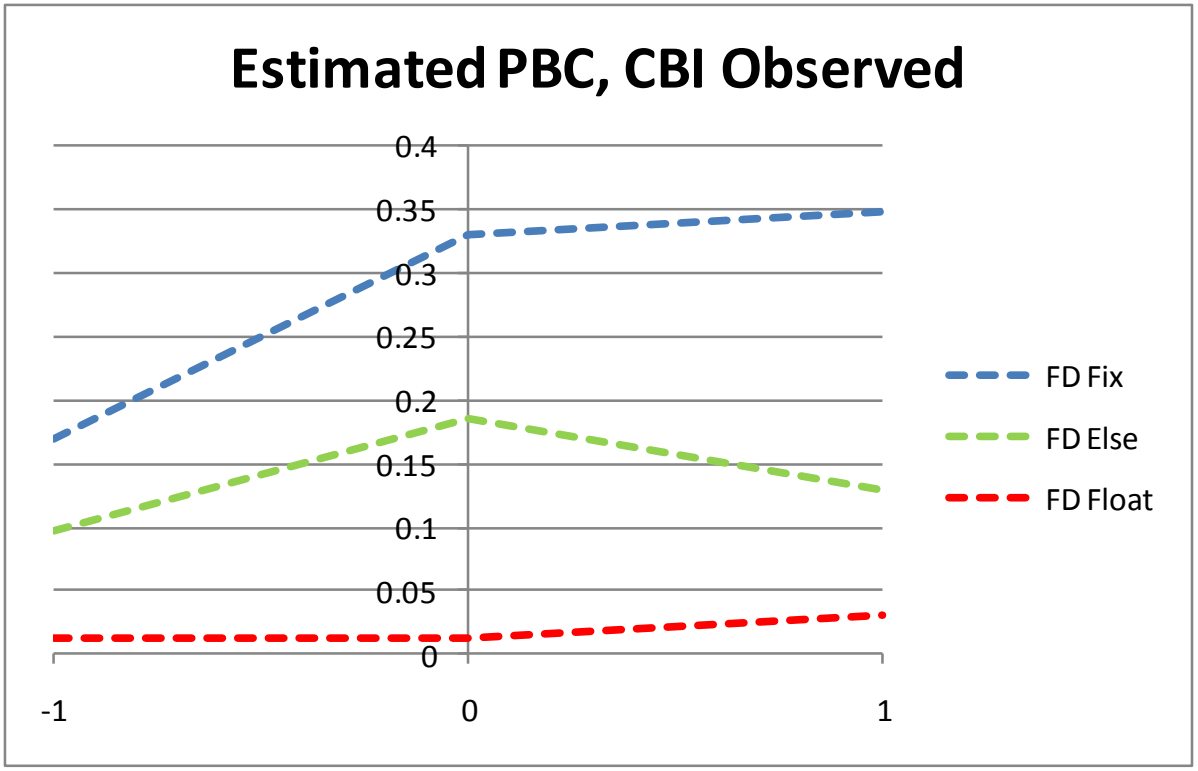

Figure 4.3: The estimated coefficients on the election variables obtained from the FD-series. See Figure 4.2 for further details.

One distinct feature of both figures is that the Election|Float-curve is near flat, and close to zero. A second feature is that the Election|Fix-curves are positive before, during and after an election. The HP and FD results are pretty much in agreement over this, except that the FD results indicate stronger cycles than the HP-results. This is not surprising, as some of the increase in spending should be permanent and therefore be picked up by the trend component of the HP-filter. The Election|Else curves indicate that the increase in spending is decreasing the year after an election.

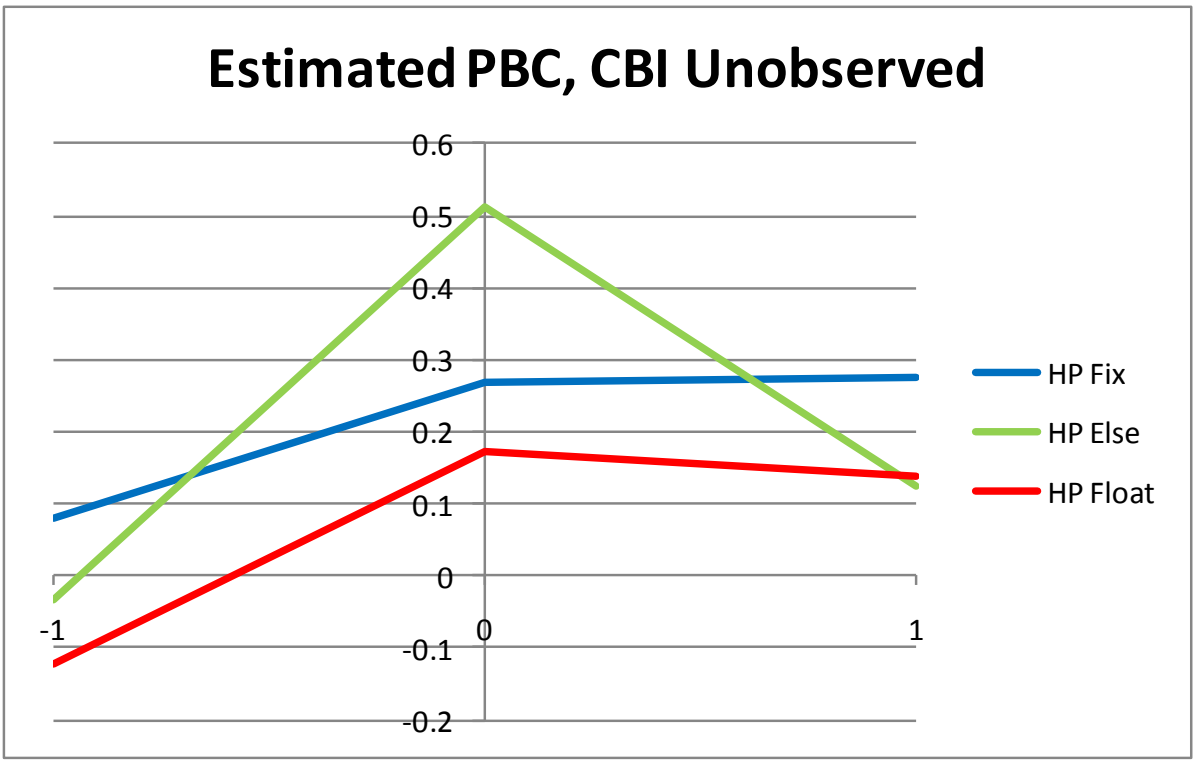

Figure 4.4: The estimated coefficients on the election variables obtained from the HP-Filtered series. See Figure 4.2 for further details.

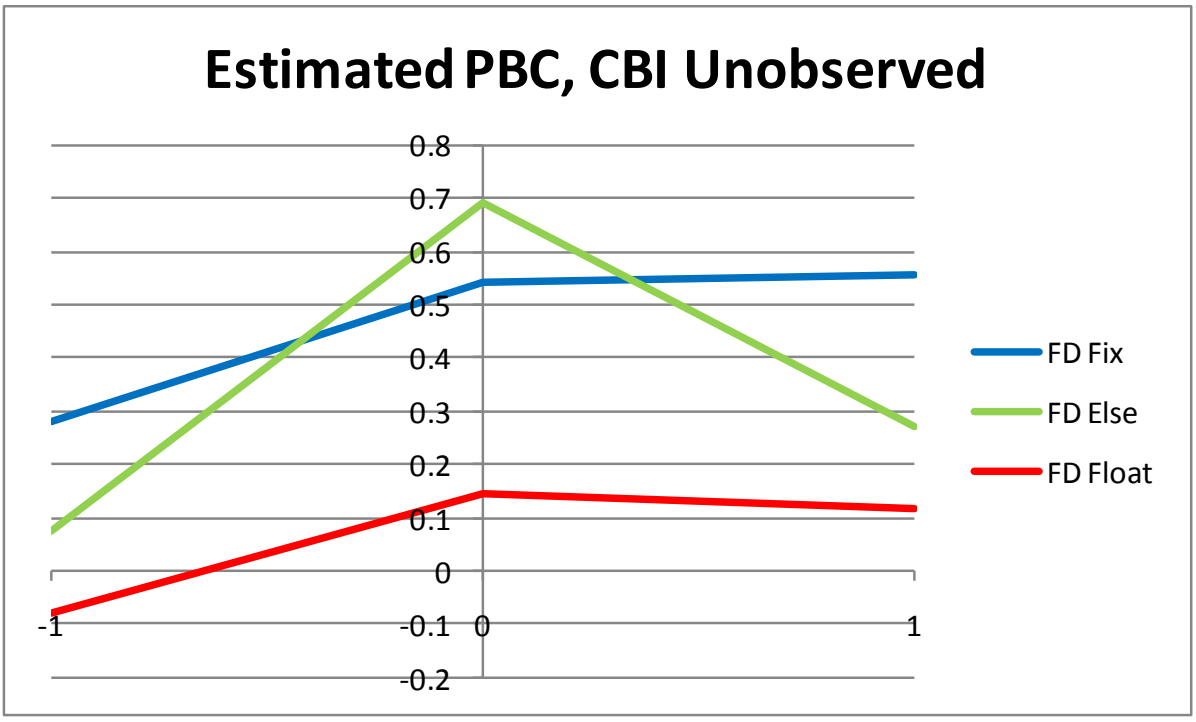

Figure 4.5: The estimated coefficients on the election variables obtained from the FD-series. See Figure 4.2 for further details.

Figure 4.4 and 4.5 plots the estimated coefficients for the various election variables from the HP-filtered and FD series, respectively. Both figures essentially tell the same story, except that, again, the FD results lie above HP-results.

There are a few differences compared to the countries with observed CBI. First, looking at the Election|Float curves, there is a trace of a budget cycle in these countries. Although it is not significant, this can indicate two things. First, that the model propositions are relevant for a larger sample of countries than only those with observed values of CBI. Second, the trace of the budget cycle in these countries adds to the trustworthiness of the model from section 3. If the propositions were relevant for countries which definitely do not have an independent central bank, it would be unlikely that the mechanisms described by the model were correct.

The patterns of the Election|Fix curves are similar to those found earlier, in that there appears to be an increase in spending before, during and after elections. The Election|Else curves appear to have a more marked peak in the actual election year, where the curve lies above that of Election|Fix.

The curves where CBI is observed lie in general below those where CBI is unobserved. This is hardly surprising, as e.g. access to information and corruption level should be better in countries with observed CBI. However, the patterns of the Election|Fix and Election|Else curves are surprisingly similar. There appears to be more of a peak in the budget cycle in countries with an intermediary exchange rate regime. However, there are still signs of increased spending also the year after an election in these countries. The Election|Fix curves show sign of a persistent increase in government expenditures.

Assumed the output gap is unaffected by increased government spending, the additive effect from the year before an election to the year after an election can be calculated. It is done by adding together the election coefficients from the FD regression, but taking into account the change in the lagged dependent variable. Figure 4.8 and 4.9 displays the resulting cumulative effects, for the CBI observed and CBI unobserved subsamples.

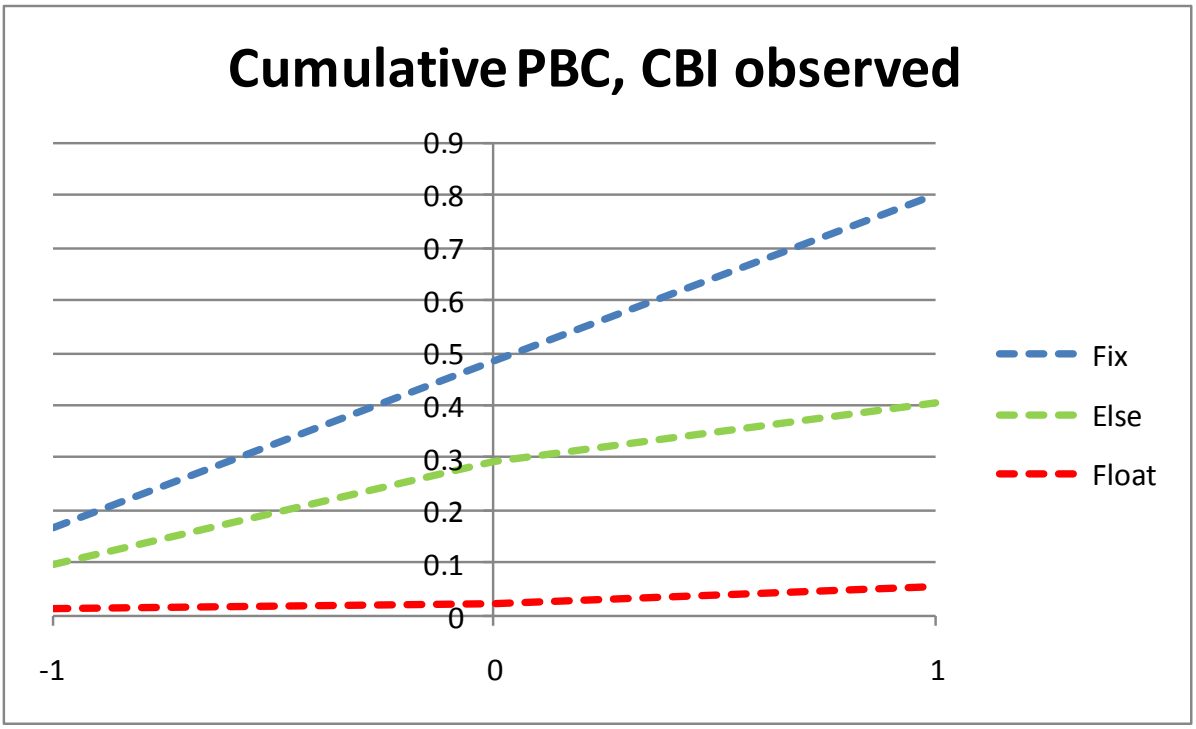

Figure 4.8: The estimated cumulative effect of elections, obtained using the FD-series. Y-axis displays the cumulative effect on G/Y at each point in time. The X-axis displays time, where -1 is the year before an election, 0 is the election year and 1 is the year after an election.

Both figure 4.8 and 4.9 shows that there is a near linear increase in G/Y in countries with a fixed exchange rate. The total effect of an election on G/Y over these three years is a net increase in .8 and 1.35 percentage points, respectively. The curves for countries with an intermediary exchange rate regime is kinked in the election year in both figures, and remain below that of the fixed exchange rate regimes throughout.

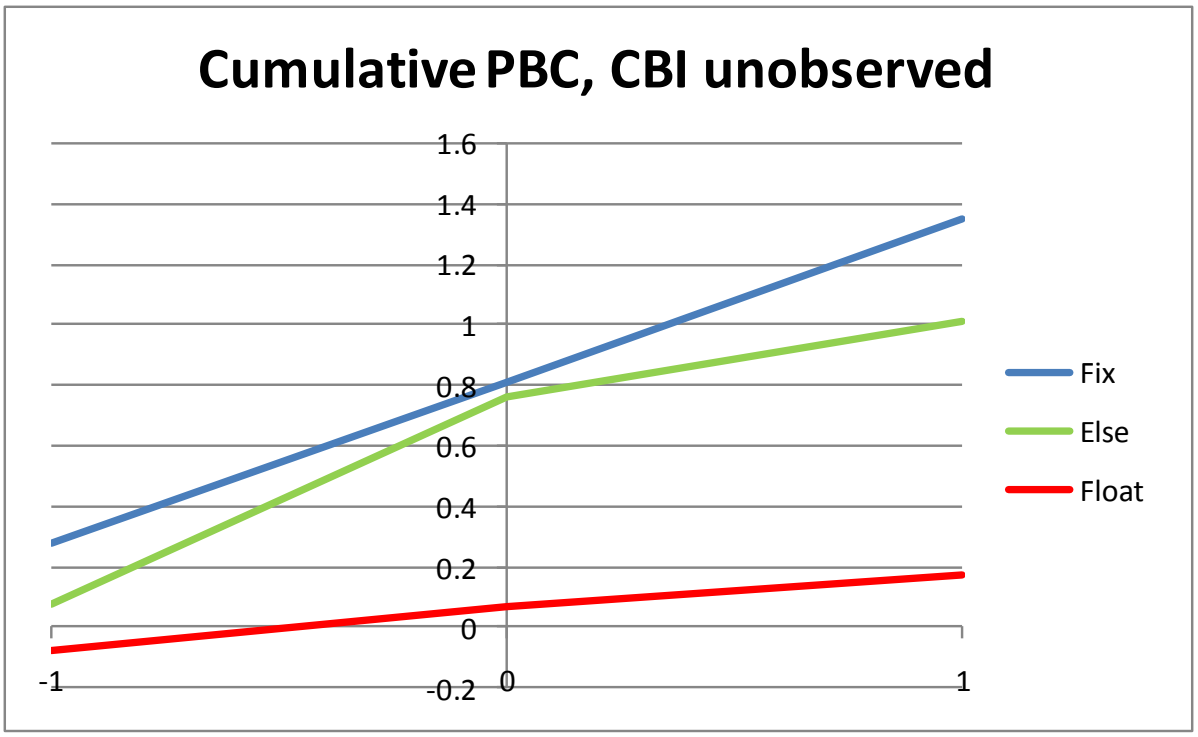

Figure 4.9: The estimated cumulative effect of elections. See figure 4.8 for details.

This section has expanded the analysis to include the effects of elections on adjacent years. The main, qualitative finding is that the PBC, i.e. the increase in spending, is not restricted to the election year. In general there has been found that spending increases before, during and after elections. Propositions 1, 2 and 3 still appear to be valid as an increase in spending is not found in countries with a floating exchange rate. Also, there seems to be a trace of a budget cycles in countries with unobserved CBI and a floating exchange rate.

It is also found that there appears to be further differences between the PBC in countries with different exchange rate regimes than what can be explained by propositions 1-3. These findings should be taken with some care as the confidence intervals are overlapping. However, the increase in spending appears to be more centred on the election year in countries with an intermediary exchange rate regime. The increase in spending appears to be more persistent, in particular the year after the election, in countries with a fixed exchange rate.

5. Discussion

5.1 The model and its assumptions

The empirical section has merely tested the proposals that were generated by the model; the model in itself has not been tested. The assumption on the visibility of the interest rate is an innovation of this thesis that has not, to my knowledge, been explored in earlier work. It is also crucial for the model results. Section 3 has provided some arguments for why the assumption is justifiable. However, propositions similar to those found in this thesis could be reached without relying on the assumption of the visibility of the interest rate.

As an example of this, assume voters vote for the incumbent if they are content and vote for the opponent if they are not, i.e. similar to the Nordhaus (1975) approach. The wealthier voters are, and the more public services they receive, the more content they are. Assume still that the reactions by the central bank are as described in section 3. So, in a flexible exchange rate regime case, an increase in government spending will be followed by an increase of the interest rate. The increased government spending makes voters more content. The increased interest rate will on the other hand have an opposite effect; it will reduce the present value of the future income of consumers, and will increase the present value of their debt (Of course, consumers could be net creditors, in that case this argument might not hold). Thus, consumers might even be less content after the increase in government spending. Such an explanation could be thought of as an updated version of the Clark and Hallerberg (2000) model, which utilizes slightly more realistic view on the mechanisms that govern macroeconomics compared to the Mundell-Fleming framework.

Within such a framework, proposition 1 – 3 could be replicated, with a possible exception of that the budget cycles are larger in the case of intermediary exchange rate regimes. However, building a microfounded, internally consistent model with these ideas is likely to be challenging. Therefore, it could be argued that this explanation requires a greater leap of faith than accepting the assumptions from section 3.

A second possibility could be to leave the politicians with a bit more honour. Assume inference through the interest rate is equally difficult as inference through inflation or production. Furthermore, expand the model in section 3 to include traded and non-traded goods, and also costs of shifting factors of production from one type of goods to the other.

Finally, assume politicians actually care about their policies, and possibly share the same utility function as consumers in addition to the rent from remaining in office. So, assume a country has a floating exchange rate. An expansionary fiscal policy will be followed by an increase of the interest rate, and the currency will appreciate. Demand for traded goods will decline and factors of production will shift, thereby incurring readjustment costs. With a fixed exchange rate on the other hand, the country will avoid these readjustment costs, making the cost of manipulation smaller for the politician. Thus, propositions 1 to 3 could possibly be reached within such a framework, although probably with an exception of the relative magnitude of the cycles with fixed vs intermediary exchange rate regimes. Also, the conclusion of that there will never be budget cycles with floating exchange rate might be too strong.

It is possible that more than one of these suggested mechanisms is appropriate. As this thesis does not allow for picking a "winner", it can be concluded there is great potential for refinement in this first attempt to create a unified, micro-founded model of political budget cycles and macroeconomics. However, a lesson that can be drawn from this thesis is that it is demanding to maintain the assumption of rational voters as the model of PBC becomes richer, and the assumptions may at some point seem less believable than the alternative of dropping the assumption of rationality. Thus, the validity of the assumption of rationality could well be investigated in future research.

5.2 The propositions and the empirical results

As for the empirical analysis, it is about time to reach a verdict; are the proposals supported by the data?

5.2.1 Proposition 1, 2 and 3 – The effect of the exchange rate regime

Proposition 1 definitely have support in the data. There is little or no trace of a budget cycles in countries with floating exchange rate regime, and in particular not in countries where the model assumptions a more likely to hold.

Proposition 2 also definitely has support in the data, as a significant political budget cycle is found in countries with a fixed exchange rate in all subsamples.

However, it is not so easy to determine if proposition 3 is supported. Significant budget cycles were found in countries with an intermediary exchange rate regime, but it has not been established that the cycles are larger compared to those with a fixed exchange rate. As discussed in section 3, the point about the relative magnitude of the cycles may well stem from the simple setup of the model, and would thus disappear had the model been more richly specified.

Section 4.3.5 showed that proposition 1 may not have support in regressions on countries with unobserved values of CBI, although it is not rejected. As the model has applicability only in cases where the vital assumptions of the model are met, it is noteworthy that it has not been found a minimum value of CBI, where the model propositions are rejected for CBI-values below this level. It may be that none of the observations of CBI is as low is this minimum level. As a consequence, it could be the model setup is relevant for a larger set of countries than those included in the CBI-sample. This is realistic given the wide definition of central bank independence that was used in the model.

5.2.2 Proposition 4 and 5 – Information and corruption

Propositions 4 and 5 also have support in the data, although with varying significance. However, the tests of these propositions rest on the use of proxies. Info should be a good measure of access to information. There is a greater rift between the expected debt level and Corruption, as this variable also measures other factors that could influence on the budget cycles. As discussed in section 3, such factors could e.g. be pecuniary rents enjoyed by the incumbent, or alternatively institutional constraints on politicians in general. It is therefore not surprising that the test of proposition 5 yielded such strong results. Even so, as argued earlier, a more rich model in section 3 would probably also show how the rents associated with remaining in power would affect the budget cycles. It is then important to be aware of the fact that this thesis has tested the impact of corruption in general on the budget cycles, and not precisely proposition 5.

5.2.3 The dynamics of the political budget cycles and fiscal sustainability

Section 4.3.5 explores the dynamics of the PBC. The main finding is that the increase in spending is not restricted to the actual election year. Also, the increase in spending appears

to be different in countries with different exchange rate regimes, and the difference goes beyond what propositions 1-3 can explain.

The findings raise some questions. First, why does spending increase both before and after the election? One possible reason for this could be that government spending is sluggish; hence it is necessary to increase spending well in advance of an election in order to have high spending in the actual election year. This could possibly also explain why it in some series is found positive expenditures in also in the year following an election. Alternatively, it could be that it is not controlled for the time of the year the election have taken place, nor is it controlled for that the fiscal year may not match the calendar year. Any of these factors could explain why it is observed increased spending in the years before and/or after an election. However, it is doubtful whether these factors can fully explain the phenomenon, as the budget cycles appears to be varying between the different exchange rate regimes. Thus, this question remains unanswered.

A second question that is raised by the findings in section 4.3.5 is related to fiscal sustainability, namely how is the increase in spending financed? One possibility is that taxes are increased simultaneously, which implies that the increase sustainable. As this thesis does not investigate tax revenues, it cannot be concluded if this is the case. However, as earlier work has found a decline in tax revenues in election years, it is doubtful if this is the case (Brender and Drazen (2005)). A second possibility is that the increase in spending is financed through debt. However, if this is the case it is surprising that spending does not appear to decrease in any of the years investigated. Thus, the increase in spending might not be sustainable in the long run, as debt is continually rolled over and never repaid. Alternatively, it could be that the decrease in spending is found in years other than those examined. Again, this thesis does unfortunately not allow for coming to a conclusion on this.

5.2.4 The findings compared to previous research

Comparing the empirical results in this paper with previous work, it is clear that taking the exchange rate regime into account is of great importance. Hagen (2010) tested for whether fiscal policies were expansionary the year before an election, and concluded that the expansionary fiscal policy occurs in the election year only. This thesis has shown that there are expansionary policies taking place before, during and after elections. Thus, taking the exchange rate regime into account increases the precision of estimates. Further, it is of

particular importance when EU-member countries are in the data set, due to the effect of the EMU.

The findings in this thesis bear some resemblance to the discussion related to the consequences of the Euro on fiscal discipline. Hallet and Lewis (2005) studied fiscal discipline for the Euromembers in three periods; 1960-1991 (The pre-Maastrich phase), 1992-1997 (Run-up to monetary union) and finally 1998-2002 (The stability-pact phase). The paper found that there was increased fiscal discipline in the run-up to the monetary union, and proposes that this can explained by the credible threat of exclusion from the EMU. The paper finds however that fiscal discipline deteriorates after 1998, and the authors conclude that that *"by 2005, there is less discipline than before the Maastricht process started"* (Hallett and Lewis 2005:17). The article proposes that the threat of imposing fines on members violating the Stability and Growth Pact is unsatisfactory. However, the findings of deteriorating fiscal discipline as the individual countries monetary authorities are becoming more constraint due to participation in the monetary union are indeed consistent with the findings of this thesis.

6. Conclusion

6.1 Research Question

This thesis has aimed to answer the question “How does an independent central bank affect political budget cycles”. To answer this question, a model has been presented that draws on both political economy and New-Keynesian macroeconomics. The model produces five simple proposals. In short, the independent central bank can be a crucial determinant for the presence of political budget cycles. However, the effect depends on the exchange rate regime; with a floating exchange rate, there will never be budget cycles, but if there are limits to the allowed movement of the exchange rate there will be equilibrium budget cycles.

The paper then proceeds to testing the model proposals, using a data set over 141 countries for the years 1990 to 2009. In both countries with an independent central bank and highly developed democracies the model proposals have great support.

The increased precision of estimates that arises when taking into account the effect of different exchange rate regimes has allows for exploring the political budget cycles before and after the election year. This analysis has shown that political budget cycles are not restricted to the election year. Also, the analysis has indicated that the exchange rate regime matters for the dynamics of the cycles.

6.2 Further Research

There are a number of interesting possibilities for augmenting the model laid out in section 3. Some of the possibilities are

1. Allow for a semi-independent central bank, possibly similar to what was done in Drazen (2001b). It would then be interesting to solve the model for various exchange rate regimes.
2. Explore the findings of section 4.3.5, and try to answer how increased spending both before and after an election can be explained.
3. Solve the model without the restrictive assumptions of a fixed lump-sum tax and no risk premia in the capital market.

It would also be interesting to gather a better data set. In particular, more fiscal variables, such as tax revenue, government debt and primary surplus should be gathered. This would

allow for investigating the sustainability of the PBC. Also, using quarterly data would possibly allow for exploring the dynamics of the budget cycles with increased precision.

Along different lines is to investigate the benefits of central bank independence. There has been performed a lot of research on the effects of central bank independence, however none of these articles has to my knowledge included the effect of the exchange rate regime. It follows from this thesis that the gains from central bank independence will depend on the exchange rate regime; this thesis has discussed budget cycles, but there may be more to it. For instance, given an independent central bank, will inflation develop differently in countries with different exchange rate regime? And could the perspectives offered in this thesis explain the some of the development of public debt? This thesis has given some evidence in favour of that a floating exchange rate regime will result in a more sustainable fiscal policy – however this could well be investigated further.

6.3 Policy Implications

The most fundamental lesson from this thesis is that joining a monetary union or imposing limits on exchange rate movements will give politicians the incentive inflate budgets in election years. This is most definitely a cost that needs to be considered against the pros and cons of various exchange rate arrangements.

For countries that have already committed themselves to limiting the exchange rate movements, such as the Euro member countries, one could consider other measures to reduce the manipulative fiscal policies. Increased transparency of fiscal policies, "expert boards" approving the budget, or perhaps increased fiscal federalism in the Eurozone are measures that could reduce the cycles.

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Appendix 1: List of variables and parameters used in section 3

B - Public debt

$\hat{B}$ - Voters' estimate of public debt

C - $\frac{C_H^{1-\alpha} C_F^{\alpha}}{(1-\alpha)^{\alpha}\alpha^{\alpha}}$ Consumers' consumption

C^* - Aggregate foreign consumption

C_F - $\left(\int_0^1 C_i^{\frac{\eta-1}{\eta}} di\right)^{\frac{\eta}{\eta-1}}$ Aggregate of goods produced abroad

C_H - $\left(\int_0^1 C_H(j)^{\frac{\epsilon-1}{\epsilon}} dj\right)^{\frac{\epsilon}{\epsilon-1}}$ Bundle of domestically produced consumption goods

$C_H(j)$ - Good j within bundle of domestically produced consumption goods

$C_i(j)$ - Consumption of good j in country i

C_i - Bundle of goods produced within country i

C^{i} - Consumption in country i

c^* - $\ln C^*$

c - $\ln \mathrm{C}$

D - Nominal value of consumer's portfolio

e - $\ln \varepsilon$

$\overline{\mathrm{e}}$ - Upper limit of e

$\underline{\mathrm{e}}$ - Lower limit of e

$G(j)$ - Home country's public consumption of good j

G -$\left(\int_0^1 G_j(j)^{\frac{\epsilon-1}{\epsilon}} dj\right)^{\frac{\epsilon}{\epsilon-1}}$ Amount of goods purchased and consumed by the public sector

$\widetilde{G}$ - Public services produced

g^* - $\int_0^1 g^i di$, where $g^i = -\ln\left(1 - \frac{G^i}{Y^i}\right)$ and i is the country identifier.

g - -ln(1-G/Y)

N - Labour supplied by consumers

$N(j)$ - domestic labour employed by firm j

P - Aggregate consumer price index associated with C, $P = P_H^{1-\alpha} P_F^{\alpha}$

P_H - Aggregate consumer price index associated with C_H

P_i - domestic price index in country i, in home country's currency

P_i^i - domestic price index in country i, in country i's currency

$P_i^i(j)$ - Price of country i's good j in country i's currency

P^* - World price level (both consumer and output prices)

p_H - ln P_h

p_i - ln P_i

p_H - ln P_H

p^* - ln P^*

$Q_{t,t+1}$ - Discount factor measuring current (t) value of payoff at time t+1

R_t - $1/E_tQ_{t+1}$

r^* - Aggregate foreign interest rate

r - ln R

S_i - Bilateral terms of trade with country i, given by $S_i = P_i/P_H$

S - Effective terms of trade, given by $S = P_F/P_H$

T - Lump sum taxes. Indefinitely fixed in the model.

V - Binary variable taking a positive value if the voter calculates the current debt level, and zero otherwise

W - Nominal wage charged by consumer

w - ln W

X_i - Bilateral real exchange rate, given by $X_i = \varepsilon_i P_i/P$

Y - Domestic production

$Y(j)$ - Domestic production of good j

y - ln Y

y^g - $y - y^n$

y^n - Steady state domestic output level

Z - Loss of utility if the consumer realises he has underestimated the debt level the last period

z_t - binary variable, taking values according to political candidate in office

$1 - \alpha$ - Weight on domestically produced goods in consumption

β - consumer's discount factor for utility

γ - Parameter determining the weight the central bank assigns to inflation relative to output.

ε_i - Bilateral nominal exchange rate with country i

ε - Effective nominal exchange rate

$\bar{\varepsilon}$ - Upper permissible limit of ε, which the central bank is instructed to maintain

$\underline{\varepsilon}$ - Lower permissible limit of ε, which the central bank is instructed to maintain

ϵ - elasticity of substitution between domestically produced goods

η - elasticity of substitution between bundles of goods produced in foreign economies

$1-\vartheta$ - share of voters that do not know the contemporaneous competence level of the incumbent politicians (See text for further discussion)

ι - Parameter determining to what extent politicians will spend more than expected by voters

λ - $\frac{(1-\beta\theta_p)(1-\theta_p)}{\theta_p}$

μ - Steady state markup in goods market

μ^w - Steady state markup in labour market

Ξ - Rents enjoyed by politicians from being in office one period

Π -Profit from ownership in firms

π - Rate of inflation in P

π_H - Rate of inflation in P_H

ς^j - Competence shock to candidate j

φ - labour supply parameter

θ_p - Probability of firm not being able to adjust prices each period

θ^k - Consumer k's preference parameter over political candidates

χ - Log of effective real exchange rate, ln X

ψ^j - Competence level of candidate j

Appendix 2: The consumers' budget constraint

Following Leith and Wren-Lewis (2005), price indices are given by

$$P_H = \left(\int_0^1 P_H(j)^{1-\epsilon}\, dj \right)^{\frac{1}{1-\epsilon}} \text{(A2.1)}$$

$$P_i = \left(\int_0^1 P_i(j)^{1-\epsilon}\, dj \right)^{\frac{1}{1-\epsilon}} \text{(A2.2)}$$

Moreover:

$$\int_0^1 P_H(j) C_H(j) dj = P_H C_H \text{ (A2.3)}$$

$$\int_0^1 P_i(j) C_i(j) dj = P_i C_i \text{ (A2.4)}$$

Optimisation of consumption across imported goods gives

$$C_i = \left(\frac{P_i}{P_F} \right)^{-\eta} C_F \text{(A2.5)}$$

Foreign prices are defined as

$$P_F = \left(\int_0^1 {P_i}^{1-\eta} di \right)^{\frac{1}{1-\eta}} \text{(A2.6)}$$

Equations (A2.5) and (A2.6) imply that

$$P_F C_F = \int_0^1 P_i C_i di \text{ (A2.7)}$$

Optimisation of consumption between foreign and domestically produced goods gives:

$$P_H C_H = (1-\alpha) PC \text{(A2.8)}$$

$$P_F C_F = \alpha PC \text{(A2.9)}$$

Thus, the consumer's budget constraint can be rewritten to

$$P_t C_t + E_t\left(Q_{t,t+1} D_{t+1}\right) = \Pi_t + D_t + W_t N_t - T \quad \text{(A2.10)}$$

Appendix 3: Prices and exchange rates

Bilateral terms of trade is given by:

$$S_i = \frac{P_i}{P_H} \text{(A3.1)}$$

Effective terms of trade is given by:

$$S = \frac{P_F}{P_H} = exp \int_0^1 (p_i - p_H)\, di \text{(A3.2)}$$

As P=$P_H^{1-\alpha} P_F^{\alpha}$, (A3.2) can be rewritten to

$$P = S^{\alpha} P_H \text{(A3.3)}$$

Or alternatively in logs, where s= p_F-p_H:

$$p = \alpha s + p_H = \alpha p_F + (1-\alpha) p_H \text{(A3.4)}$$

First differencing (A3.4) gives domestic CPI:

$$\pi = \alpha \pi_F + (1-\alpha)\pi_H \text{(A3.5)}$$

Assuming law of one price holds for all individual goods at all times, the following must hold:

$$P_i(j) = \varepsilon_i P_i^i(j) \text{(A3.6)}$$

Here $P_i^i(j)$ is the price of country i's good j expressed in terms of of country i's currency. Aggregating (A3.6) across all goods gives:

$$P_i = \varepsilon_i \left[\int_0^1 P_i^i(j)^{1-\epsilon} dj \right]^{\frac{1}{1-\epsilon}} = \varepsilon_i P_i^i \text{(A3.7)}$$

Recalling the price index of imported goods defined in appendix 2 , and inserting from (16):

$$P_F = \left(\int_0^1 P_i^{1-\eta} di\right)^{\frac{1}{1-\eta}} = \left(\int_0^1 \left(\varepsilon_i P_i^i\right)^{1-\eta} di\right)^{\frac{1}{1-\eta}} \text{(A3.8)}$$

(A3.8) can be log-linearized to:

$$p_f = \int_0^1 \left(e_i + p_i^i\right) di = e + p^* \text{(A3.9)}$$

Here e is the log of the nominal effective exchange rate, p_i^i if the logged price index of country I, and p^* is the world price index.

The effective terms of trade given in (A3.2) can now be used together with (A3.9) to be rewritten in log-form:

$$s = p_F - p_H = e + p^* - p_H \text{(A3.10)}$$

The bilateral real exchange rate is defined as:

$$\mathrm{X}_i = \frac{\varepsilon_i P_i}{P} \text{(A3.11)}$$

Taking logs of (A3.11), integrating over all countries and inserting from (20) and (14) gives:

$$\chi_t = \int_0^1 (e_i + p^i - p) di = e + p^* - p = s + p_H - p = (1-\alpha)s \text{ (A3.12)}$$

Appendix 4: The IS-Curve

Goods market clearing requires that for each good, the following must hold:

$$Y(j) = C_H(j) + \int_0^1 C_H^i(j)di + G(j) \text{ (A4.1)}$$

I.e. that production of good j, $Y(j)$, equals the sum of domestic consumption of the good $C_H(j)$, the sum of foreign consumers' demand for the good $\int_0^1 C_H^i(j)di$, and the domestic government's demand for the good G(j).

Following Leith and Wren-Lewis (2005), symmetrical preferences abroad implies that:

$$C_H^i(j) = \alpha\left(\frac{P_H(j)}{P_H}\right)^{-\epsilon}\left(\frac{P_H}{\varepsilon_i P^i}\right)^{-1} C^i \text{(A4.2)}$$

Here C^i is aggregate consumer consumption in country i. Substituting in (A4.1) from (A4.2) gives:

$$Y(j) = \left(\frac{P_H(j)}{P_H}\right)^{-\epsilon}\left[(1-\alpha)\left(\frac{PC}{P_H}\right) + \alpha\int_0^1 \frac{\varepsilon_i P^i C^i}{P_H}di + G\right] \text{(A4.3)}$$

Aggregate output is defined as

$$Y = \left[\int_0^1 Y(j)^{\frac{\epsilon-1}{\epsilon}}dj\right]^{\frac{\epsilon}{\epsilon-1}} \text{(A4.4)}$$

(A4.4) can be rewritten to:

$$Y = (1-\alpha)\frac{PC}{P_H} + \alpha\int_0^1 \frac{\varepsilon_i P^i C^i}{P_H}di + G = S^\alpha\left[(1-\alpha)C + \alpha\int_0^1 \frac{\varepsilon_i P^*}{P}C_i di\right] + G$$
$$= CS^\alpha + G \text{(A4.5)}$$

Defining g=-ln(1-G/Y), taking logs of (A4.5) gives:

$$c + \alpha s = y - g \text{(A4.6)}$$

As (A4.6) holds for all countries, world output is given by

$$y^* = \int_0^1 c^i + g^i + \alpha s^i di = \int_0^1 c^i + g^i di = c^* + g^* \text{(A4.7)}$$

Above, the fact that the all effective exchange rates sum to zero is used.

Solving (A4.7) for c, and inserting for c_t and c_{t+1} in (6) gives:

$$y_t = E_t y_{t+1} - (r_t - E_t(\pi_{t+1}) - \rho) - E_t(g_{t+1} - g_t) \text{(A4.8)}$$

Here it is used that the expected change in effective terms of trade is zero.

Appendix 5: The Philips-Curve

From (33) in Leith & Wren-Lewis (2005), if all wages are renegotiated each period the following must hold:

$$\frac{W}{P} = \mu_w N^{\varphi} C \text{(A5.1)}$$

Log-linearising and inserting for c in (A5.1)gives:

$$w = \ln \mu_w + \varphi n + c_t + p_t = \ln \mu_w + \varphi n_t + y_t - g_t - \alpha s_t + p_t \text{(A5.2)}$$

Thus, the Philips Curve (3.12) can be rewritten to:

$$\pi_{H,t} = \beta E_t \pi_{H,t+1} + \lambda(\ln \mu_w + \varphi n + y_t - g_t - \alpha s + p - p_h + \ln \mu) \text{(A5.3)}$$

Recall that $\alpha s = p - p_h$ and n = y, (A5.3) can then be simplified to:

$$\pi_{H,t} = \beta E_t \pi_{H,t+1} + \lambda\big((1+\varphi) y_t - g_t + \ln \mu \mu_w\big) \text{(A5.4)}$$

Appendix 6: The central bank's response

The loss function the central bank wishes to minimize is the squared deviations from the target levels for inflation and production. Note that the loss function contains domestic inflation instead of CPI, as if it were to contain CPI the central bank would also have to respond to exchange rate changes. Therefore, to make a purebred "floating exchange rate case" the solution adopted in this thesis is use domestic inflation. Moreover, the problem will be solved for a discretionary monetary policy, taking expectations for the next period as given.

The complete optimization problem has the following form:

$$Min\ L_{CB}: E_0 \sum_{t=0}^{\infty} \beta^t \left(\frac{1}{2}\pi_{H_t}^2 + \frac{\gamma}{2}(y - y^n)^2\right) \text{(A6.1)}$$

Subject to:

$$y_t = E_t y_{t+1} - (r_t - E_t(\pi_{t+1}) - \rho) - E_t(g_{t+1} - g_t) \text{(A6.2)}$$

$$\pi_{H,t} = \beta E_t \pi_{H,t+1} + \lambda\big((1+\varphi)y_t - g_t + \ln \mu\mu_w\big) \text{ (A6.3)}$$

$$\varepsilon_t \geq \underline{\varepsilon} \ (A6.4)$$

$$\varepsilon_t \leq \overline{\varepsilon} \ (A6.5)$$

(A6.2) and (A6.3) are the supply and demand equations, which are standard side constraints. (A6.4) and (A6.5) are the constraints that govern the exchange rate. ε_t is the nominal exchange rate at time t, and $\underline{\varepsilon}$ and $\overline{\varepsilon}$ are the lower and upper nominal exchange rate limit. Thus, the requirement of (A6.4) and (A6.5) is that the nominal exchange rate must stay in between the nominal limits.

So, the central banks optimization problem can be formulated as follows:

$$E_0 \sum_{t=0}^{\infty} \beta^t \left(\frac{1}{2}\pi_{H,t}^2 + \frac{\gamma}{2} y^{g2}\right) + \upsilon_t\left(-y_t + E_t y_{t+1} - (r_t - E_t(\pi_{t+1}) - \rho) - E_t(g_{t+1} - g_t)\right)$$
$$+ \sigma_t\left(-\pi_{H,t} + \beta E_t \pi_{H,t+1} + \lambda((1+\varphi)y_t - g_t + \ln \mu_t \mu_w)\right) + \overline{\epsilon}_t(\overline{\varepsilon}_t - \varepsilon_t)$$
$$+ \underline{\epsilon}_t\left(\underline{\varepsilon}_t - \varepsilon_t\right) \text{ (A6.6)}$$

One way to solve the problem is to differentiate (A6.6) and then write out all Kuhn-Tucker conditions. Fortunately, that is not necessary. The interest of this appendix is to solve the problem for the corner solution of floating exchange rates. In that case, (A6.4) and (A6.5) will neither be binding. Thus, $\overline{\epsilon}_t = \underline{\epsilon}_t = 0$. The remaining Kuhn-Tucker conditions are given by the following (which are simply "ordinary" first order conditions, abstracting from the exchange rate constraints):

$$\frac{\partial U_{CB}}{\partial r_0} = -\upsilon_0 = 0 \text{ (A6.7)}$$

$$\frac{\partial U_{CB}}{\partial y_0} = \gamma(y_0 - y^n) - \upsilon_t + \sigma_t \lambda(1+\varphi) = 0 \text{(A6.8)}$$

$$\frac{\partial U_{CB}}{\partial \pi_{H,0}} = \pi_{H,0} - \sigma_0 = 0 \text{ (A6.9)}$$

Using the focs an expression can be obtained for the desired tradeoff between inflation and

$$\pi_{H,0} = \frac{\gamma(y^n - y_0)}{\lambda(1+\varphi)} \text{ (A6.10)}$$

Inserting for production and inflation in the expression above, the central bank's reaction curve can be developed:

$$r_t = \frac{\lambda(1+\varphi)}{\gamma + \lambda^2(1+\varphi)^2}\left(\beta E_t \pi_{\mathrm{H},t+1} + \lambda \ln \mu \mu_w\right) - (1 + \lambda^2(1+\varphi)^2\gamma^{-1})y^n$$
$$+ \frac{3 + \gamma\lambda^{-2}(1+\varphi)^{-2} + \gamma^{-1}\lambda^2(1+\varphi)^2}{\gamma\lambda^2(1+\varphi)^2}(E_t y_{t+1} + E_t \pi_{t+1} + \rho - E_t g_{t+1})$$
$$+ g_t\left(\frac{\gamma + \lambda^2(1+\varphi)\varphi}{\gamma + \lambda^2(1+\varphi)^2}\right) \text{ (A6.11)}$$

(A6.11) can be more generally by written as

$$r_t = r\left(g_t, E\left[E_t \pi_{\mathrm{H},t+1}, y_{t+1}, g_{t+1}, \pi_{t+1}\right]\right) \text{ (A6.12)}$$

I.e. the interest rate can be expressed as a function of government spending in this period and the expectations of the next period.

The interesting bit is to note that:

$$\frac{\partial r_0}{\partial G_0} = \frac{1}{Y_0 - G_0}\left[\frac{\gamma + \lambda^2(1+\varphi)\varphi}{\gamma + \lambda^2(1+\varphi)^2}\right] > 0 \ (A6.13)$$

This implies that the central bank will increase the interest rate in response to increased government spending. Note that (A6.13) assumes the expectations of next periods variables are fixed, i.e. that neither of them will change in response to increased government spending this period. Section 3 discusses this assumption further.

Appendix 7: Data Set and Variables

A7.1 FX-regime

To identify the type of exchange rate regime in a country, a three-way classification system was used that corresponds to the one found in Levy-Yeyati and Sturzenegger (2005b). Classification systems of greater detail were not used, as this thesis intends to run regressions on smaller subsamples. This limits the number of parameters that can be estimated with precision, as there will then be relatively few observed elections for each observed exchange rate regime. The variable FX3 can take on three possible values:

1. if a country has a floating exchange rate a given year
2. if a country has an intermediary exchange rate regime
3. if a country has a fixed exchange rate.

For observations up to and including 2004, the source is Levy-Yeyati and Sturzenegger (2005b). The classification are based on de-facto exchange rate regimes, as opposed to *de jure* regimes, and is calculated on the basis of data on exchange rates and international reserves. Levy-Yeyati and Sturzenegger (2005a) provides a thorough discussion of the methodology used to classify the exchange rate regimes.

For classifications after 2004 the source is IMF. IMF provides *de facto* classifications up to and including 2008. The classification system used by IMF is far more detailed compared to the simple three-way classification. However, splicing the two series is probably not very controversial, as the definitions used by the IMF fits well within the three-way classification. The following IMF-categories were classified as having a fixed exchange rate:

- Exchange arrangement with no separate legal tender
- Currency board arrangement
- Other conventional fixed peg arrangement
- Eurocountries

The following IMF-categories were assigned as having an intermediary exchange rate:

- Pegged exchange rate within horizontal bands
- Crawling peg
- Crawling band
- Managed floating with no pre-determined path for the exchange rate

Finally, observations in the IMF-category "independently floating" were naturally classified as having a floating exchange rate. Classifications are used without any adjustments except the 2008 observation for Guinea, which is classified as having a fixed exchange rate as the country is a member of the West African Monetary Union (IMF (2011)). Also, the 2008 observation for Bolivia was assigned to the intermediary category, as the country was listed in several of the categories. For 2005 there were several classifications available, but as annual observations are needed only, the observations labelled "July 2005" were not used.

Unfortunately, the data set over exchange rate regimes consist of some gaps. Some individual observations from the three-way classification are missing from the Levy-Yeyati and Sturzenegger dataset, although some of them are given the value of "inconclusive" in their five-way classification system. Also, IMF has not published any classifications for 2007. However: taking into account that there must be some stability to the game between politicians and the central bank, the gaps of some of the missing observations were filled in, using the following methodology: If for a given country there are observations the year before and after a missing observation, and these observations both are classified with the same exchange rate regime, the gap is filled with the same classification as that before and after the gap. In all 112 observations were filled in using this methodology.

A7.2 CBI – Central Bank Independence

In order to control for that the assumption of having an independent central bank is fulfilled data from Crowe and Meade (2007) is used. This data set actually consists of two merged dataset, the first of which was presented in Cukierman, Nebb and Neyapti (1992). This was a study of central bank independence which was based on a sample over the years 1980-1989. Crowe and Meade (2007) repeated the study using a sample from 2003, and this paper also provides a thorough discussion of the measures that are used. The variable in question, *CWN*, varies from zero to one where a higher number indicates higher central bank independence. However, as the aforementioned is a measure of *de jure* central bank independence, Cukierman, Nebb and Neyapti (1992) find that the turnover rate of central bank governors per year, *TI*, works better as a proxy for *de facto* central bank independence in developing countries compared to the *de jure* measure.

Lacking anything that appears to be a very good measure of central bank independence, a new variable is constructed: *CBI_two_obs=CWN-TI*. However, there is the problem that

there at most are only two observations of this variable per country: CWN is based on first a 1989-1990 sample, and thereafter a 2003 sample. The turnover data is based on data from a 1989-1990 sample and a sample from 1995 to 2004. Acimoglu et al (2008) assigns dates to major central bank reforms in various countries. So, a new variable is generated, *CBI*:

- For a given country, the observation from 1990 and up to the year of major central bank reform, each year the country is given the value of 1990 observation of *CBI_two_obs*
- From the year of major reform and onwards, the 2003 observation of *CBI_two_obs* is used
- If Acemoglu (2008) does not provide a shift year, 2003 used as the year of major reform

Exceptions to this rule were Brazil (2000), Chile (1990), Australia (1996) and New Zealand (1990). To these exceptions the year of major reform was set to the year in parenthesis, based on the discussion in Acemoglu (2008). Another exception was Macedonia, which was classified as having all of its values of CBI as missing due to as the country was neither in the Cukierman, Nebb and Neyapti sample and was not included in the Acemoglu (2008) discussion.

A7.3 Info

In order to control for the impact of the availability of information on PBC, the methodology from Shi and Svennson (2006) is followed, where it is the joint effect of availability of information and free media that is used as a proxy for the share of informed voters. The variable *freedom_house* is collected from the Freedom House organisation, which measures press freedom and can vary from 0 to 100 where a lower value indicate a more free press. Also, the variable *radios_per1000* was gathered from the International Telecommunication Union, measuring radio sets per 1000 inhabitants. This variable was unfortunately only available for the years up to 2006, and there were many missing values.

So, a new variable is generated, *info*, which was calculated as i*nfo = radios_per1000/1000*((100-freedom_house)/100).* Thus, an increased value of *info* implies greater availability of information.

A7.4 AFM – Access to Financial Markets

Data is gathered from the Financial Access Survey administered by the IMF - Financial Access Survey. As the dataset contains many missing values, the following variables:

- Overall Borrowers per 1000 adults
- Borrowers from commercial banks per 1000 adults
- Borrowers from other depository corporations per 1000 adults
- Depositors with commercial banks per 1000 adults
- Depositors with other depository corporations per 1000 adults
- Depositors/Clients per 1000 adults

Thereafter a new variable is generated, *AFM*, which is calculated as the average of all six variables above each year for each country.

Appendix 8: Unit roots and stationarity

The only variable of concern with respect to unit roots is the dependent variable, G/Y. As discussed in the main text, it is not straightforward to test for unit roots with panel data.

If it is assumed that all countries share the same autocorrelation coefficient, the Durbin-Watson based test proposed in Bhargava et al (1982) can be used. This test can unfortunately only be used on static models, and test the properties of the residuals from a WG-estimator. They tabulate critical values that allows for testing both the null of serial correlation as well as the null of a unit root.

Estimating (4.1) with an FE estimator, and omitting the lagged dependent variable, produces a panel Durbin-Watson statistic of 0.586[9]. Bhargava et al (1982) only tabulates critical values of up to T=10, however it seems clear that the null of a unit root should not be rejected (Critical lower value for the DW-statistic when testing the null of a unit root is with N=150, T=10 and 15 explanatory variables is 0.93). Repeating the procedure, but by first differencing (4.1), yields a DW-statistic of 1.957. This is so high that even the null of positive serial correlation can be rejected (Upper critical DW-stat for testing for positive serial correlation with N=150, T=10 and 15 explanatory variables is 1.9375), although T is somewhat larger and there are more explanatory variables than 15.

However, it is possible that the countries have different levels of serial correlation. Augmented Dickey-Fuller tests are therefore run on all time series. The Augmented Dickey-Fuller test estimates the following equation (country denominators are dropped to simplify notation):

$$\left(\frac{G}{Y}\right)_t - \left(\frac{G}{Y}\right)_{t-1} = a + \theta\left(\frac{G}{Y}\right)_{t-1} + \sum_{s=1}^{p} \beta_s \left[\left(\frac{G}{Y}\right)_{t-s} - \left(\frac{G}{Y}\right)_{t-s-1}\right] + e_t \quad \text{(A8.1)}$$

The null hypothesis of the test is that the G/Y has a unit root, i.e. that $\theta = 0$. (A8.1) could also be modified to include a trend. In order to remove serial correlation from the error term, further lags of the differenced G/Y are included up to lag p. In order to determine p, the sequential T test proposed by Ng and Perron (1994), by first running estimating (A8.1) using

[9] The Panel Durbin-Watson statistic was calculated using the *xtdw*-command implemented in Stata by Nunziata (2002)

p=int[12(T+1)/100)^.25] as proposed by Schwert(1989), and then removing one lag if the p-value of the coefficient of p is greater than 0.1. The procedure then continues until the coefficient of the greatest lag is larger than 0.1, or all lags are removed. A discussion of the procedure is found in the Stata User Guide (2009)

The table below displays the results. For over two thirds of the individual series the null of a unit root cannot be rejected at the 10% level, regardless of whether a trend is included or not.

Results ADF on G/Y	Trend	w/o Trend
Reject at 10%	32	35
Reject at 5%	27	25
Reject at 1%	18	20
Total number of series	141	141

Table A8.1

Thus, it seems that the potential problems with unit roots should be taken seriously.

It might be that the series G/Y is non-stationary for some of the series. Another alternative is that it in fact is stationary, but that the ADF-test does not have sufficient power to reject the null of a unit root; recall that there are on average only about 18 observations for each of the series.

ADF tests are run on all the first differenced series of G/Y, without a trend. The results are given in the table below:

Results: ADF on FD G/Y	
Reject at 10%	116
Reject at 5%	103
Reject at 1%	80
Total Number of Series	140

Table A8.2

The number of rejections is greatly improved, although there are 24 series where the null of a unit root cannot be rejected at 10% significance level (one of the series was dropped because it because it became too short after first differencing). As a reference, the results from a similar ADF test on the HP-filtered series G/Y is given in table A8.3:

Results ADF on HP G/Y

Reject at 10%	131
Reject at 5%	126
Reject at 1%	102
Total number of series	141

Table A8.3

The series HP G/Y is stationary, however there are still 10 series where the ADF-test does not manage to reject the null of a unit root. Although this is not a formal test, and the ADF test statistics may be biased due to the high order serial correlation of the series HP G/Y, the similarities between the results from the ADF tests on HP G/Y and FD G/Y are indicative of that first differencing the series G/Y renders the series stationary.

Appendix 9: Hodrick-Prescott filter

There are several possible strategies in order to ensure a series is stationary. One of them is to apply a filter, as the one proposed by Hodrick and Prescott (1981). The HP-filter sees each time series as the sum of two components; one cyclical component and one growth component. The filter is based on the assumption that the growth component is fairly smooth over time. The modest requirement to the cyclical component is that its average should be close to zero over time. To calculate the two components of the filter, the procedure is to choose values for all growth components that minimise the following equation:

$$\underset{g_t}{Min} : \sum_{t=1}^{T} \left(\frac{G}{Y}\right)^2_{HP,t} + \lambda^{HP} \sum_{t=1}^{T} [(g_t - g_{t-1}) - (g_{t-1} - g_{t-2})]^2 \quad \text{(A9.1)}$$

Here $\left(\frac{G}{Y}\right)_{HP,t}$ is the cyclical component, g is the growth component, and the sum of these is the actual observation. λ^{HP} is a key parameter in this context; it determines the "cost" of changing the direction of the trend. If λ^{HP} is set sufficiently high, the filter will merely produce a linear time trend.

A rather important question to answer is if the conceptual framework that the HP-filter rests on fits the purposes in this paper. There are clearly some long-term trends that affect government consumption as a percentage of GDP. For instance, in developed countries the Thatcherism of the 1980's should lead to a decrease in G/Y. A developing country should perhaps exhibit an increasing level of G/Y as the country is becoming industrialized. These are examples of trends that affect G/Y and that last for several years. The cyclical component on the other hand will be subject to shocks that affect both government consumption and production. Among these high-frequency movements are the phenomenon of my interest, namely those movements that are caused by sudden changes in government expenditure. Therefore, the conceptual framework of the HP-filter fits the purposes of this thesis very well.

However, Hodrick and Prescott (1981) demonstrate that the serial correlation properties of the series change, and in their case a rather informal approach demonstrates autocorrelation of order one to order ten. As the HP-filter has been in use for quite some time there are well established parameter values for various series. For annual series the standard approach,

which is used throughout in this thesis, is to set $\lambda^{HP} = 6.25$. This value is based on some assumptions that hardly can be imagined to hold, but is nevertheless the standard value when applying the HP-filter.

King and Rebelo (1993) discuss the consequences of HP-filtering. Among these were that the cyclical component will have a lower variance compared to the original series, but also that the correlation between different series might change when the filter is applied. This second point calls for caution when interpreting the results, as there is a possibility that findings could be generated by the filter itself. However, King and Rebelo (1993) also show that he cyclical component has the appealing property that it is stationary, even if the original series is integrated of order one or higher.

Cogley and Nason (1995) show that the HP-filter is applied to persistent series, it might even generate cycles that are not present in the underlying data. This is thus a piece of critique that should be taken into account when working with the filtered series.

As a final note, the HP-filter is known to impose an end point bias to the series. Again, it should therefore be controlled for that the results are not driven by the filter itself.

Appendix 10: Robustness Test

As discussed in section 4.2, there is a possibility that results are driven by the HP-filter. Appendix 8 provides some evidence that the first differences series of G/Y does not have a unit root, so this section proceeds by using this differenced series. This approach also has the benefit of that it will provide coefficient estimates that can be easily interpreted. With filtered series, the coefficients translate to the effect on the cyclical component of the series. With differenced series the coefficients can be interpreted as the estimated effect of elections on G/Y.

Proposition 1, 2 and 3 – The effect of the exchange rate regime

Splitting up the election variable in three according to the type of exchange rate regime results in estimates very similar to those found in section 4.3.1. Quantitatively, the only noteworthy difference is that the estimated coefficient on Election|Fix is smaller and insignificant in all columns (2) and (2). The coefficient on Election|Float is near zero and insignificant throughout.

Dep. Var:	FD G/Y	FD G/Y	FD G/Y
Regression	1	2	3
Estimator	OLS	OLS	OLS
L. FD G/Y	-0.064	0.013	0.041
	(0.05)	(0.06)	(0.05)
FD Election|Fix	0.084	0.048	0.087*
	(0.06)	(0.06)	(0.05)
FD Election|Else	0.373**	0.206***	0.094
	(0.17)	(0.07)	(0.13)
FD Election|Float	0.046	-0.026	0.03
	(0.08)	(0.05)	(0.04)
FD y^g	-6.674***	-1.969	-10.068***
	(2.47)	(2.48)	(3.28)
Year dummies	Yes	Yes	Yes
Obs	2396	955	545
Countries	141	67	38
Std. Errors	Cluster R	Cluster R	Cluster R
Sample	All	Subsample 1	Subsample 2

* 10% significance ** 5% significance *** 1% significance Coeff / (Std.Error)

Table A10.1

Proposition 4 - Information

Table A10.2 shows the test of proposition 4. (1) is obtained using the entire data set, and the results are in line with what is found earlier: Proposition 4 cannot be rejected, although there is trace of a budget cycle in countries with a floating exchange rate. (2) and (3), which is based on subsamples 1 and 2 respectively, show similar results although the estimated coefficient on Election|Float is smaller than in (1). The results are in general insignificant which is not surprising given the low number of observations. The significance of the estimated coefficients hardly changes when using heteroscedasticity-robust standard errors, as opposed to cluster robust errors (not shown).

Dep. Var:	FD G/Y	FD G/Y	FD G/Y
Regression	1	2	3
Estimator	OLS	OLS	OLS
L. FD G/Y	-0.031	0.018	0.141*
	(0.05)	(0.08)	(0.07)
FD Election|Fix	0.224	0.323	0.32
	(0.17)	(0.25)	(0.29)
FD Election|Else	0.465	0.156	0.297
	(0.62)	(0.24)	(0.18)
FD Election|Float	0.229	-0.177	0.01
	(0.22)	(0.16)	(0.21)
FD Election|Fix * Info	-0.36	-0.56	-0.48
	(0.27)	(0.41)	(0.36)
FD Election|Else * Info	-0.728	-0.187	-0.597**
	(0.80)	(0.33)	(0.25)
FD Election|Float * Info	-0.078	0.155	-0.022
	(0.19)	(0.15)	(0.18)
FD y^g	-7.496*	1.918	-3.802
	(4.38)	(4.81)	(4.74)
Year dummies	Yes	Yes	Yes
Obs	1102	375	181
Countries	139	53	29
Std. Errors	Cluster R	Cluster R	Cluster R
Sample	All	Subsample 1	Subsample 2

* 10% significance ** 5% significance *** 1% significance Coeff. / (Std. Error)

Table A10.2

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All but one of the coefficients interactions between the election dummies and Info have the expected sign, but only one of the estimated coefficients is significantly less than zero.

Proposition 5 – Corruption

Table A10.3 shows the results of the test of proposition 5, along similar lines as in table A10.2 The results are in very similar to those found in section 4.3.3, and in none of the samples can proposition 5 be rejected. All of the estimated coefficients on the election variables and the interaction have the expected signs. The exception is the coefficients associated with a floating exchange rate regime, which in general are small and insignificant.

Dep. Var:	FD G/Y	FD G/Y	FD G/Y
Regression	1	2	3
Estimator	OLS	OLS	OLS
L. FD G/Y	-0.085	-0.037	0.043
	(0.07)	(0.08)	(0.05)
FD Election|Fix	0.137	0.175	0.460**
	(0.11)	(0.19)	(0.22)
FD Election|Else	0.536	0.374***	0.544
	(0.39)	(0.13)	(0.39)
FD Election|Float	0.106	-0.055	0.017
	(0.24)	(0.18)	(0.20)
FD Election|Fix * Corrupt	0.172	0.228	0.500*
	(0.17)	(0.28)	(0.30)
FD Election|Else * Corrupt	0.407	0.333	0.743
	(0.56)	(0.26)	(0.46)
FD Election|Float * Corrupt	0.055	-0.078	-0.021
	(0.32)	(0.24)	(0.26)
FD y^g	-7.152	-2.972	-10.423***
	(4.47)	(2.96)	(3.37)
Year dummies	Yes	Yes	Yes
Obs	1517	848	541
Countries	86	59	37
Std. Errors	Cluster R	Cluster R	Cluster R
Sample	All	Subsample 1	Subsample 2

* 10% significance ** 5% significance *** 1% significance Coeff. / (Std. Error)

Table A10.3

Endogeneity

Table A10.4 displays the results from tests of propositions 1 through 3, when splitting the sample in countries with a fixed and flexible election schedule. (1) and (2) the subsamples are chosen from the entire data set, whereas (3) and (4) uses subsample 2 observations only. The results are qualitatively very similar to those found earlier, with a possible exception of that the negative coefficient on Election|Fix in column (3) not significant.

Dep. Var:	FD G/Y	FD G/Y	FD G/Y	FD G/Y
Regression	1	2	3	4
Estimator	OLS	OLS	OLS	OLS
L. FD G/Y	-0.09	-0.063	0.102	0.075
	(0.10)	(0.06)	(0.05)	(0.08)
FD Election|Fix	0.193	0.140*	-0.176	0.111**
	(0.15)	(0.08)	(0.16)	(0.04)
FD Election|Else	0.063	0.476	-0.15	-0.136
	(0.12)	(0.38)	(0.11)	(0.22)
FD Election|Float	-0.278	0.149	0.069	0.017
	(0.24)	(0.10)	(0.15)	(0.05)
FD y^g	-7.752*	-6.047*	-2.321	-10.226*
	(4.22)	(3.63)	(6.72)	(5.20)
Year dummies	Yes	Yes	Yes	Yes
Obs	396	1252	65	309
Countries	35	104	6	27
Std. Errors	Cluster R	Cluster R	Cluster R	Cluster R
Sample	Exact Election Schedule	Inexact Election Schedule	Subsample 2 & Exact Election Schedule	Subsample 2 & Inxact Election Schedule

* 10% significance ** 5% significance *** 1% significance Coeff / (Std. Error)

Table A10.3

Although only results from FD-OLS and the results from regressions on the HP-filtered series are reported in this thesis, many other estimators have been tested. These trials included using a more sophisticated filter by Christiano and Fitzgerald (2003), and various estimators which assumes that G/Y is stationary (or alternatively, that $^{G_t}/_{Y_t} - \beta_1 \, ^{G_{t-1}}/_{Y_{t-1}}$ is stationary). Also, instrumenting the lagged dependent variable of FD-OLS have been tried through various estimators (Anderson-Hsiao (1982) and Arellano-Bond (1991)). None of

these approaches add anything to the analysis, as the results in general are the same as what has been shown so far. Thus, no further robustness tests are included in this thesis.

Based on the results in this appendix, it can be concluded that the results that were found in section 4.3.1 to 4.3.4 were not at all driven by the HP-filter.