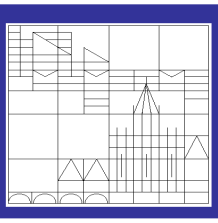
University of Konstanz
Department of Economics



The Impact of Bailouts on Political Turnover and Sovereign Default Risk

Timm M. Prein & Almuth Scholl

Working Paper Series
2018-04

https://ideas.repec.org/s/knz/dpteco.html

The Impact of Bailouts on Political Turnover and Sovereign Default Risk*

Timm M. Prein
University of Konstanz

Almuth Scholl
University of Konstanz

June 8, 2018

Abstract

This paper develops a stochastic dynamic politico-economic model of sovereign debt to analyze the impact of bailouts on sovereign default risk and political turnover. We consider a small open economy in which the government has access to official loans conditional on the implementation of austerity policies. There is a two-party system in which both parties care about the population's welfare but differ in an exogenous utility cost of default. Political turnover is the endogenous outcome of the individual voting behavior. In a quantitative exercise we apply the model to Greece and find that bailout episodes are characterized by an increased risk of political turnover. In the short run, stricter conditionality raises the risk of sovereign default because it reduces the participation rate in bailout programs. In the long run, however, stricter conditionality limits the accumulation of debt which lowers sovereign default risk. We show that the frequency of political turnover is U-shaped in the strength of conditionality.

Keywords: sovereign default risk, political turnover, bailouts, conditionality, austerity

JEL-Codes: E44, E62, F34

*We thank our discussant Carsten Hefeker, seminar participants at the University of Hamburg, University of Konstanz, the meeting of the Committee of International Economics of the German Economic Association 2018 (Trier), and the EEA 2017 (Lisbon) for useful comments. This research is supported by the German Research Foundation under grant SCHO 1442/1-2 The usual disclaimer applies. Please address correspondence to `almuth.scholl@uni-konstanz.de` or to `timm.prein@uni-konstanz.de`.

1 Introduction

Rising government bond spreads in the aftermath of the 2007/08 financial crisis forced the Greek government to turn to the International Monetary Fund, the European Commission, and the European Central Bank requesting financial assistance. The first bailout was granted in May 2010 and two further bailout programs followed in 2012 and 2015. In return, the government committed to implement pre-specified austerity policies. The implementation of the program conditions was accompanied by domestic protests and political unrest. Formerly small and newly founded parties opposing austerity massively gained votes, destabilizing the government and giving rise to doubts on the commitment to repay debt and fulfill conditionality.

The events in Greece raise several important questions: What is the impact of bailout programs on political stability and turnover? How do sovereign default risk, bailouts, and political turnover interact and how are macroeconomic outcomes affected? How does stricter conditionality affect the risk of political turnover and sovereign default in the short run and in the long run?

To address these questions, this paper analyzes the interaction of sovereign default risk, bailouts, and political turnover in a politico-economic model of sovereign debt. The theoretical framework features endogenous default risk, endogenous participation rates in bailout programs as well as endogenous political turnover. We consider a small open economy that is inhabited by infinitely-lived households. The government finances a public good by raising taxes and by issuing external debt. International financial markets are incomplete and debt contracts are subject to default risk. In addition to debt provided by international private creditors, an (unmodeled) international financial institution provides official loans below the market rate and, in return, restricts the set of fiscal policies by imposing a target on the primary surplus. The government decides whether to fulfill its debt obligations or to default. Moreover, taking conditionality as given, the government chooses whether to make use of a bailout program.

There is a two-party system in which both parties care about the population's welfare. Following Chang (2007), the parties differ in an exogenous one-time utility cost of default that can be interpreted as a personal cost of the policymaker due to a loss of reputation. Individuals are not affected by these utility costs, but differ in stochastic idiosyncratic ideological aspects, which are independent from economic policy. Political turnover is the endogenous outcome of the individual voting behavior, which is determined by the economic benefits from having the opponent rather than the incumbent in power as well as stochastic idiosyncratic ideological aspects. The endogenous probability of a political turnover turns out to be a function of the productivity state and the debt policy. Risk-neutral international private creditors charge a risk premium that reflects the endogenous probability of a political turnover as well as the endogenous default risk.

In a quantitative exercise we apply our theoretical framework to the Greek economy. The policy functions suggest that the party with the lower utility cost of default is more likely to come into power when debt levels are high and is more willing to exit a bailout program by declaring a

default. Instead, the party with the higher utility cost of default is more likely to be in power when debt is low and is more willing to make use of official financial assistance. In our model, bailouts provide insurance: For a given level of debt, the existence of a bailout option reduces sovereign default risk. The incumbent benefits from a lower interest spread and is less borrowing constrained which, in general equilibrium, allows to accumulate more debt. In turn, the higher level of debt makes the economy more vulnerable to debt crises and political instability.

To explore the interaction between political turnover and bailouts, we simulate our model and study the macroeconomic dynamics around a bailout event. In the years before the bailout, the sovereign interest spread and the probability of a political turnover are low due to good economic conditions. Because of low credit costs, the government is not borrowing constrained and runs a budget deficit. The debt crisis is triggered by an adverse economic shock that reduces the ability of the government to repay its debt. Due to the strong increase in the sovereign interest spread, the incumbent government decides to enter a bailout program. Conditionality requires the incumbent to implement tax hikes and spending cuts which raise the probability of political turnover. In turn, the risk of a political turnover elevates the sovereign spread. A comparison with the Greek bailout of May 2010 reveals that the model replicates the empirical pattern of output, consumption and the sovereign spread quite well.

To study the short- and long-run impact of conditionality, we vary the target on the primary surplus. For a given level of debt, stricter conditionality makes it more costly for a government to enter or to remain in a bailout program. The greater sovereign default risk is reflected in higher credit costs making the government more borrowing constrained. In consequence, while stricter conditionality increases the probability of default in the short run, it reduces debt and sovereign default risk in the long run. Political turnover is affected by conditionality in two ways. On the one hand, fulfilling the target on the primary surplus forces the incumbent to implement tax hikes and spending cuts which foster the risk of losing power. On the other hand, a tighter fiscal constraint reduces debt and default risk in the economy which decreases political turnover. As a result of these opposing forces, the frequency of political turnover is U-shaped in the strength of conditionality. We show that while conditional bailouts increase the short-run risk of political turnover, in the long run, stricter conditionality reduces political instability if the fiscal constraint is not too tight. These findings highlight the tension that policymakers face when designing bailout packages: While stricter conditionality may improve fiscal sustainability and political stability in the long run, it fosters political uncertainty and sovereign default risk in the short run.

Our paper is related to three different strands of literature. First, our paper builds on the politico-economic literature that analyzes the interaction of political turnover and public debt, see, e.g., Alesina and Tabellini (1990), Persson and Svensson (1989), Aghion and Bolton (1990), and the overview in Persson and Tabellini (2000). While the aforementioned papers mostly consider two-period models, Battaglini and Coate (2008), Song et al. (2012), Müller et al. (2016) and Dovis et al. (2016) develop dynamic politico-economic theories of public debt but abstract from sovereign

default risk. Chang (2007) and Chang (2010) study the interaction between political crises and financial crises and focus on the role of self-fulfilling expectations.

Second, we build on the recent quantitative literature on sovereign debt that allows for default in equilibrium, see, e.g., Aguiar and Gopinath (2006) and Arellano (2008). Hatchondo et al. (2009) and Cuadra and Sapriza (2008) consider exogenous political turnover rates and show that political instability increases debt accumulation and default risk. In a recent contribution, Scholl (2017) builds on the politico-economic literature and introduces the probabilistic voting approach in a quantitative model of sovereign debt to analyze the impact of endogenous electoral outcomes on sovereign default risk. She shows that endogenous election probabilities increase the disparities between the parties' debt and default policies. In a related study, Chatterjee and Eyigungor (2017) analyze the interaction of economic growth, election probabilities, and sovereign risk premia. Novelli (2018) builds on Battaglini and Coate (2008) and introduces legislative bargaining in a quantitative model of sovereign debt and default.

Third, this paper is related to the literature that studies the role of international financial institutions and the macroeconomic impact of bailouts and conditionality. For a discussion of the empirical findings concerning bailout programs and conditionality we refer to the excellent surveys by Bird (2007), and the references therein. Ardagna and Caselli (2014) discuss the politico-economic aspects of the Greek bailouts.[1] Several papers analyze the impact of official loans on sovereign default risk using stochastic dynamic models of sovereign debt, e.g., Aguiar and Gopinath (2006), Boz (2011), Roch and Uhlig (2016), Hatchondo et al. (2017), and Kirsch and Rühmkorf (2017). These studies consider endowment economies and abstract from endogenous fiscal policy and endogenous production. In contrast, Fink and Scholl (2016) and Juessen and Schabert (2013) develop production economies in which fiscal policy and conditionality are explicitly modeled. Fink and Scholl (2016) show that bailouts prevent sovereign defaults in the short run but may come at the cost of a greater default probability in the long run. Pancrazi et al. (2017) focus on the welfare effects of bailouts. All these papers abstract from the role of political uncertainty which is our focus here. Our paper contributes to the literature by studying the dynamic interaction between bailouts and political turnover and the short- and long-run effects of conditionality on political risk.

The remainder of the paper is structured as follows. In Section 2 we consider Greece as a case study and provide narrative evidence on the link between sovereign spreads, bailouts, and political turnover. In Section 3 we describe the theoretical framework. Section 4 presents the quantitative properties of the model and discusses the interaction of political turnover and conditional bailouts. Finally, Section 5 concludes.

[1] In a related paper, Arellano and Bai (2017) study the impact of austerity measures during the Greek debt crises but they abstract from official loans.

2 Empirical Evidence on the Interaction of Bailouts, Political Turnover, and Sovereign Default Risk

2.1 The Greek Sovereign Debt Crisis

Starting in May 2010, Greece has agreed on three economic adjustment programs, often referred to as 'bailout packages', under the supervision of the International Monetary Fund (IMF), the European Central Bank (ECB) and the European Commission (EC) representing the Eurogroup. The programs provided financial assistance of substantial size. The bailout packages of May 2010, March 2012 and August 2015 amounted to 110 billion euro, 164.5 billion euro and 86 billion euro, respectively. The interest rates on the official loans were below the rates charged on the bond markets. The second bailout package came along with a haircut on debt held by private creditors (100 billion euro.).[2] In the context of the bailouts, the share of Greek general government debt owed to official institutions summed up to 71% at the end of 2015. 66% and 5% was held by the countries of the Eurogroup and the IMF, respectively (IMF, 2016).

The official loans were provided conditional on austerity measures to restore fiscal sustainability. The fiscal targets were set in terms of a gradually improving primary surplus in percent of GDP. E.g., for the years 2015, 2016, 2017 and 2018, the third bailout package of August 2015 specified targets on the primary surplus of -0.25%, 0.5%, 1.75% and 3.5% of GDP, respectively. To reach these targets, the bailout programs defined different austerity measures such as tax hikes and public spending cuts. The fiscal conditions of the first program included spending cuts of 7% of GDP, tax hikes resulting in a revenue increase of 4% of GDP, and structural fiscal reforms with respect to pensions, health sector, tax system, tax administration, and public financial management. The second program of March 2012 required public sector wage bill reductions of 1.5% of GDP, tax administration improvements of the same size, and a further 5.5% of GDP reduction in spending measures. The third program again included a set of austerity measures and structural reforms. In addition, all programs required specific financial sector policies, structural reforms, and privatization.[3] A detailed overview of the targets on the primary surplus and the austerity measures is provided in Appendix B.

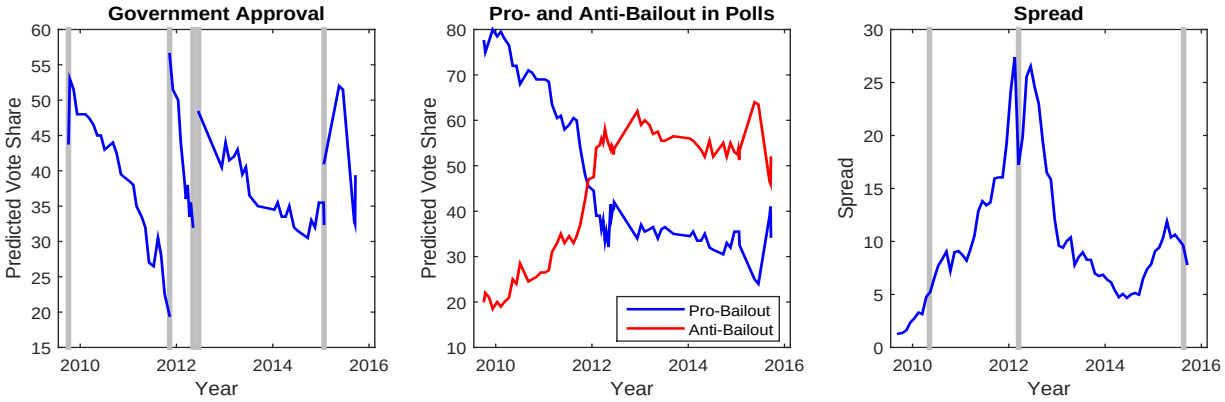
During the time of the bailout programs, Greece faced political instability. George A. Papandreou and his Panhellenic Socialist Movement (PASOK) won the early elections in late 2009, but lost dramatically in the opinion polls after the implementation of the policies from the first bailout package in May 2010 (see Figure 1). Papandreou resigned in November 2011 and was followed by a caretaker cabinet supported by PASOK and the conservative New Democracy (ND), which had refused the first bailout package in parliament.[4] This government finalized the agreement on the

[2]For details on the March/April 2012 debt exchange of 200 billion euro and the December 2012 buyback of exchanged debt, see e.g., Zettelmeyer et al. (2013).

[3]European Commission (2010), European Commission (2012), European Commission (2015), ESM data.

[4]The third supporter, the small right-wing Popular Orthodox Rally (LAOS), left the coalition in

Figure 1: Election Polls and Bond Spreads



Notes: The first two panels are based on *Public Issue* election polls from 2009 to 2015 (see *http://www.publicissue.gr*). Government approval refers to the predicted percentage vote share of the parties which are part of the government. The grey bars mark government turnovers. The second panel shows the predicted percentage vote share of the parties approving (blue) and refusing (red) the memorandum in June 2012, following Vasilopoulou and Halikiopoulou (2013). Changes of positioning as in case of ND in 2011 and DIMAR in 2012 are neglected. The third panel presents the spread between Greek and German 10-year government bonds in %, calculated from OECD data. Grey bars mark the dates of approval of the bailout programs.

second bailout program in March 2012. Continuing the consolidation policy, the coalition parties quickly lost support in the opinion polls, ending with heavy losses in the early elections of May 2012. The anti-bailout Radical Left (SYRIZA) gained from these losses and became the second strength in parliament. While there was a majority of seats for a large number of formerly small and newly founded parties which rejected the bailout policy, no coalition could be formed and early elections in June were announced and a caretaker cabinet took office.

The subsequent election campaigns debated the continuation of the bailout policy, in which ND and SYRIZA represented the pro- and anti-bailout camps, respectively.[5] ND, PASOK and the formerly bailout critical Democratic Left (DIMAR) formed a coalition in June 2012. The bailout policy was continued despite worsening results in the opinion polls and the DIMAR leaving the coalition in June 2013.

In December 2014, president elections failed implying early parliamentary elections in January 2015. In line with the opinion polls, Alexis Tsipras of the anti-bailout SYRIZA became the new prime minister. At the end of the negotiations on the third bailout package, the Greek government fell into arrears with the IMF in June 2015 which was resolved in the following weeks. Despite loss of support in his own party, Tsipras won the early elections in September 2015.

The times of political uncertainty were accompanied by rising bond spreads between Greek and German 10-year government bonds (see Figure 1). Spreads dropped in March 2012 after the

February 2012 in protest against the austerity policy.

[5]Details on the period between 2009 and June 2012 with respect to political campaigns, fragmentation of the party system, and the effects of the bailout policies on voting behavior can be found e.g. in Dinas and Rori (2013) and Karyotis and Rüdig (2015).

agreement on the second bailout program, but increased again at the time of the two parliamentary elections until summer 2012. In fall 2014, bond spreads started rising again, in light of the upcoming negotiations on the third bailout package and the early Parliament elections in January 2015.

2.2 Beyond Narrative Evidence

The narrative evidence on the events in Greece supports the view that there is a dynamic interaction between political uncertainty, sovereign default risk, and conditional bailouts. Similar experiences have been made by several Latin American countries, e.g., Ecuador in the early 2000s, Peru and Venezuela in the 1980s, and Argentina in 2001.

There is an empirical literature that goes beyond the narrative evidence and performs econometric analyses of the link between sovereign default risk and political uncertainty, see Hatchondo and Martinez (2010) for an excellent overview. Citron and Nickelsburg (1987) report that the number of government changes within a period of five years is a significant determinant of default risk. Block and Vaaler (2004) and Vaaler et al. (2005) provide econometric evidence that electoral risk is associated with significant increases in sovereign spreads in developing countries. Similar results for the Brazilian economy can be found in Goretti (2005). Manasse and Roubini (2009) find that the probability of a debt crisis increases if an election takes place. More recently, Herrera et al. (2014) show that politico-economic factors are important predictors of financial crises in emerging market economies.

The link between bailouts and political stability has received less attention in the literature. Bienen and Gersovitz (1985, 1986) study the impact of financial assistance programs of the IMF. They report several cases in which the implementation of austerity policies generated political instability in the short run. However, governments were usually able to prevent a political turnover by rejecting the full implementation of the program conditions. Dreher (2004) and Dreher and Gassebner (2012) report evidence that IMF and World Bank programs affect re-election positively in times of low economic growth but negatively in times of high economic growth.

As conditionality typically implies the implementation of fiscal consolidation measures, there is also a relation to empirical studies on the effects of austerity policies on electoral outcomes. While, e.g., Alesina et al. (2013) and Alesina et al. (1998) do not find political costs from fiscal adjustments, Hübscher and Sattler (2017) report empirical evidence for a strategic timing of fiscal consolidation policies. Governments under electoral risk avoid austerity towards the end of the legislative term. Ponticelli and Voth (2017) provide empirical evidence on the relationship between austerity policies and social unrest. They find a significant increase in political instability in response to expenditure cuts.

3 The Model

3.1 The Environment

We consider a small open economy inhabited by a continuum of infinitely-lived individuals who have identical preferences over private consumption, leisure, and government spending. The government has access to international financial markets where it can issue external debt. International debt contracts are not enforceable and are subject to default risk. There is a two-party system with parties $j = A, B$. Both parties care about the population's welfare. We follow Chang (2007) and assume that the parties differ in an exogenous one-time utility cost of default.[6] This utility cost can be interpreted as a personal cost of the policymaker due to loss of reputation. In the following, suppose that party A faces a higher utility cost of default than party B. As in Scholl (2017), political turnover is the endogenous outcome of the individual voting behavior. We follow the probabilistic approach and assume that the individual voting behavior is determined by the economic benefits from the incumbent's and opponent's policies as well as stochastic idiosyncratic ideological aspects that are unrelated to economic policy and affect preferences additively.

Let the individuals' per-period utility, net of the idiosyncratic ideological aspects, be given as:

$$(1-\alpha)u(c,l) + \alpha v(g),$$

where c and l denote private consumption and labor supply, respectively. The per-period utility function $u : \mathbb{R}^2_+ \to \mathbb{R}$ is continuous, twice differentiable in both arguments, strictly increasing in c, strictly decreasing in l, jointly strictly concave in c and l, and satisfies the Inada conditions. g represents government consumption. The per-period utility function $v : \mathbb{R}_+ \to \mathbb{R}$ is continuous, twice differentiable, strictly increasing in g, strictly concave in g, and satisfies the Inada conditions. $\alpha \in (0,1)$ is a preference parameter.

The individuals' budget constraint reads as:

$$(1+\tau)c = y, \tag{1}$$

where τ is a consumption tax raised by the government. The production of output y is determined by a constant returns to scale production technology $f(l)$, $f : \mathbb{R}_+ \to \mathbb{R}_+$, and is subject to productivity shocks:

$$y = zf(l).$$

Productivity $z \in \mathcal{Z}$ is assumed to have a compact support, $\mathcal{Z} = [\underline{z}, \overline{z}] \subset \mathbb{R}_+$, and to follow a Markov process with transition function $\mu(z', z)$.

The government has access to incomplete international financial markets where it can issue non-contingent one-period bonds. International private creditors are risk-neutral, have perfect information about the stochastic processes in the economy, and borrow at the risk-free interest rate

[6] Exogenous one-time utility costs of default are also considered in, e.g., Roch and Uhlig (2016) and Müller et al. (2016).

r^f. $q_j(b', z)$ denotes the price of an international private debt contract if party j is in power. We follow Boz (2011) and Fink and Scholl (2016) and assume that, in addition to international debt owed to private creditors, the government has access to financial assistance offered by an (unmodeled) official creditor. If the government decides to enter a bailout program, the official creditor replaces a fraction $\lambda \in (0, 1)$ of the existing debt by official loans at price q^*. In this way, the maturity of a fraction of the existing debt gets extended. In return, the incumbent government is required to implement a pre-specified fiscal constraint on the primary surplus.

International private debt contracts as well as official debt contracts are not enforceable and the government has the option to default on all outstanding debt obligations. Note that we explicitly incorporate the possibility of a default on official debt which is in contrast to the literature on sovereign debt in emerging markets that assumes seniority of IMF loans, see, e.g., Boz (2011), Fink and Scholl (2016), Hatchondo et al. (2017). We assume limited enforceable official debt contracts to account for the events in summer 2015 when Greece fell into arrears with the IMF. Moreover, this assumption reflects the ongoing debate on whether Greece will be able to repay its large amount of official debt.[7] In addition to the direct utility cost of default suffered by the incumbent policymakers, we assume that a sovereign default is associated with a temporary exclusion from international financial markets, as in, e.g., Arellano (2008). Moreover, in financial autarky, the country suffers from output losses, which are particularly relevant for the case of Greece since a default is likely to come along with an exit from the European Monetary Union.

Conditional on being in a good credit standing, if the government chooses to fulfill the outstanding debt obligations without making use of official financial assistance, the budget constraint of the incumbent j is given by:

$$g + q_j(b', z)b' = \tau c + b. \tag{2}$$

If the government enters a bailout program and receives official loans of size λb at price q^*, the government budget constraint reads as:

$$g + q^*\lambda b + q_j(b', z)(b' - \lambda b) = \tau c + b. \tag{3}$$

This formulation implies that if the government enters or remains in a bailout program, the maturity of a fraction λ of the existing debt extends by one period. We assume that the price of official loans is given by:

$$q^* = \frac{1}{1 + r^f + k},$$

[7]For a discussion see, e.g., Avgouleas et al. (2018). In its January 2013 report, the IMF considers the need for further fiscal transfers or a substantial haircut on official debt (IMF, 2013). Schumacher and Weder di Mauro (2015) refer to restructuring of official debt by extended grace periods and lowered interest rates in case of Greece and find a potential need for additional measures due to future liquidity problems. Concerning seniority, the empirical analysis of Schlegl et al. (2015) finds bilateral credits to be junior relative to IMF and multilateral credits as well as bonds. Given that the bailout credits provided by Euro area members are essentially bilateral, they conclude that repayment incentives are affected by the composition of official loans.

where k denotes a constant spread between the official lending rate and the risk-free rate. In bad economic times, q^* will be larger than $q_j(b', z)$ such that a bailout program offers a maturity extension as well as an interest rate reduction. In addition to official loans, the government can issue one-period debt from private creditors, $(b' - \lambda b) \leq 0$, where b' denotes total bond holdings. If the government makes use of a bailout program, the official creditors restrict the government's set of fiscal policy choices by imposing a target ζ on the primary surplus as share of output:

$$\frac{\tau c - g}{y} \geq \zeta.$$

If the government defaults on all outstanding debt obligations, the government is excluded from international financial markets and the budget constraint is given by:

$$g = \tau c. \tag{4}$$

The timing is as follows. At the beginning of each period, the incumbent observes the productivity realization z and chooses its optimal policies given the distribution of the stochastic idiosyncratic ideological aspects. At the end of the period, the ideological aspects realize. Individual i evaluates the idiosyncratic ideological aspects against the expected economic benefit of having the opponent instead of the incumbent in power next period. The individual prefers the opponent to come into power, if the expected continuation value of a political turnover is larger than the expected continuation value associated with the incumbent remaining in office. Details of the political turnover process and the distributional specification of the ideological aspects are described in Section 3.2.4.

3.2 Recursive Equilibrium

In equilibrium, the individuals take the policy choices of the incumbent government as given and maximize their expected lifetime utility subject to the budget constraint. The incumbent policymaker j takes the private sector equilibrium as given and maximizes the expected lifetime utility of the population, taking into account the utility cost of default as well as the probability of a political turnover. Conditional on being in a good credit standing, the incumbent chooses whether to fulfill the outstanding debt obligations, whether to enter, continue or to exit a bailout program and whether to default. Risk-neutral foreign creditors incorporate the risk of default as well as the probability of a political turnover when maximizing expected profits. The probability of political turnover is the endogenous outcome of the individual voting behavior. The following subsections describe the maximization problems of the private and the public sector, the zero-profit condition of the foreign creditors, and the details of the political turnover process as well as the distributional specifications of the ideological aspects. The formal definition of the recursive equilibrium is given in Appendix A.

3.2.1 The Private Sector

The private sector takes the public sector policies as given and maximizes the expected discounted life-time utility subject to the budget constraint (1). Since the tax on consumption is uniform, all individuals choose the same amounts of consumption and labor. The optimality condition of the private sector is given by:

$$-\frac{u_l(c,l)}{u_c(c,l)} = \frac{zf_l(l)}{(1+\tau)}, \tag{5}$$

where u_l and u_c are the marginal utility of labor and consumption, respectively, and f_l is the marginal product of labor.

3.2.2 The Public Sector

Conditional on being in a good credit standing, the incumbent j chooses between three different options:

$$V_j(b,z) = \max\{V_j^R(b,z), V_j^{CB}(b,z), V_j^D(z) - \chi_j\}. \tag{6}$$

$V_j^R(b,z)$ is the value function of incumbent j in case of debt repayment without making use of official financial assistance. $V_j^{CB}(b,z)$ denotes the value function when the incumbent enters or continues a conditional bailout program and honors the debt contracts. $V_j^D(z)$ is the value function associated with default on all debt obligations. $\chi_j > 0$ denotes the one-time utility cost that incumbent j faces when declaring default. Let $\beta \in [0,1]$ denote the discount factor, which is common for all individuals in the economy.

The value function associated with debt repayment solves:

$$\begin{aligned} V_j^R(b,z) = \max_{\tau,b'} \{&(1-\alpha)u(c,l) + \alpha v(g) \\ &+\beta\left((1-P_j(b',z))\int_{z'} V_j(b',z')\mu(z',z)dz' + P_j(b',z)\int_{z'} \overline{V}_j(b',z')\mu(z',z)dz'\right)\Big\} \end{aligned} \tag{7}$$

subject to

$$\begin{aligned} g + q_j(b',z)b' &= \tau c + b \\ (1+\tau)c &= zf(l) \\ -\frac{u_l(c,l)}{u_c(c,l)} &= \frac{zf_l(l)}{(1+\tau)}. \end{aligned}$$

$\overline{V}_j(b',z')$ denotes the value function of party j if the opponent is in office next period and is defined in Appendix A. $P_j(b',z)$ denotes the probability of political turnover if party j is the incumbent, conditional on a good credit standing. The turnover probability is the endogenous outcome of the individuals' voting behavior and is shown to be a function of the newly issued external debt b' and the productivity state z in Section 3.2.4. If party j is the incumbent, the borrowing decision at

the beginning of the period affects its probability of remaining in power at the end of the period. In addition, the incumbent's borrowing choice affects the opponent's set of policy choices in case a political turnover takes place because the level of external debt is inherited.

If the incumbent enters or continues a bailout program, it receives official loans of size λb at price q^*. In return, the incumbent faces conditionality that enters as a constraint on the primary surplus. The value function associated with a bailout is given by:

$$\begin{aligned} V_j^{CB}(b,z) = &\max_{\tau,b'} \{(1-\alpha)u(c,l) + \alpha v(g) \\ &+\beta \left((1-P_j(b',z)) \int_{z'} V_j(b',z')\mu(z',z)dz' + P_j(b',z) \int_{z'} \overline{V}_j(b',z')\mu(z',z)dz' \right) \Big\} \end{aligned} \tag{8}$$

subject to

$$\begin{aligned} g + q^*\lambda b + q_j(b',z)(b'-\lambda b) &= \tau c + b \\ (1+\tau)c &= zf(l) \\ -\frac{u_l(c,l)}{u_c(c,l)} &= \frac{zf_l(l)}{(1+\tau)} \\ \frac{\tau c - g}{y} &\geq \zeta \\ b' - \lambda b &\leq 0. \end{aligned}$$

If the incumbent chooses to default, external debt b is not repaid and the economy is excluded from international financial markets and suffers from output losses, $m(z)f(l) \leq zf(l)$. The value function associated with a default on all debt obligations is given by:

$$\begin{aligned} V_j^D(z) = &\max_{\tau} \{(1-\alpha)\, u(c,l) + \alpha v(g) \\ &+\beta \Big[(1-P_j^D(z)) \left(\theta \int_{z'} V_j(0,z')\mu(z',z)dz' + (1-\theta) \int_{z'} V_j^D(z')\mu(z',z)dz' \right) \\ &+P_j^D(z) \left(\theta \int_{z'} \overline{V}_j(0,z')\mu(z',z)dz' + (1-\theta) \int_{z'} \overline{V}_j^D(z')\mu(z',z)dz' \right) \Big] \Big\} \end{aligned} \tag{9}$$

subject to

$$\begin{aligned} g &= \tau c \\ (1+\tau)c &= m(z)f(l) \\ -\frac{u_l(c,l)}{u_c(c,l)} &= \frac{m(z)f_l(l)}{(1+\tau)}. \end{aligned}$$

$P_j^D(z)$ denotes the turnover probability if party j is the incumbent, conditional on a bad credit standing. $\theta \in [0,1]$ is the exogenous probability of re-entering international financial markets. $\overline{V}_j^D$ is the value function of party j if the opponent is in office and the economy is in financial autarky. The definition can be found in Appendix A.

The default policy of incumbent j is described by the following indicator function:

$$d_j(b,z) = \begin{cases} 1 & \text{if } V_j^R(b,z) < V_j^D(z) - \chi_j > V_j^{CB}(b,z) \\ 0 & \text{else.} \end{cases}$$

The set of productivity shocks $z \in \mathcal{Z}$ for which incumbent j chooses to default reads as:

$$\mathcal{D}_j(b) = \{z \in \mathcal{Z} : d_j(b, z) = 1\}. \tag{10}$$

If party j is in office, the default probability is given by:

$$\eta_j(b', z) = \int_{\mathcal{D}_j(b')} \mu(z', z) dz'. \tag{11}$$

The decision of incumbent j whether to enter or to continue a bailout program is described by the following indicator function:

$$h_j(b, z) = \begin{cases} 1 & \text{if } V_j^R(b, z) < V_j^{CB}(b, z) \geq V_j^D(z) - \chi_j \\ 0 & \text{else.} \end{cases}$$

The set of productivity shocks $z \in \mathcal{Z}$ for which incumbent j chooses to make use of official financial assistance reads as:

$$\mathcal{H}_j(b) = \{z \in \mathcal{Z} : h_j(b, z) = 1\}. \tag{12}$$

3.2.3 International Private Creditors

Conditional on being in a good credit standing, the government can borrow from a large number of identical infinitely-lived risk-neutral international private creditors. International private creditors have perfect information about the realization of productivity shocks and the distribution of idiosyncratic ideological aspects. They borrow or lend from international financial markets at the constant risk-free interest rate r^f. International private creditors internalize the risk of a default as well as the probability of political turnover which depends on the current incumbent j. As a result of competitive risk-neutral pricing, the bond price function is given by:

$$q_j(b', z) = (1 - P_j(b', z)) \left(\frac{1 - \eta_j(b', z)}{1 + r^f} \right) + P_j(b', z) \left(\frac{1 - \eta_{-j}(b', z)}{1 + r^f} \right). \tag{13}$$

$\eta_{-j}(b', z)$ denotes the default probability of the opponent $-j$.

3.2.4 Political Turnover

The political turnover probabilities $P_j(b', z)$ and $P_j^D(z)$ are determined endogenously. We follow Scholl (2017) and use the probabilistic voting approach, building on the political economy literature, see, e.g., Persson and Tabellini (2000).

We assume that the two parties differ in the size of the one-time utility cost of default, $\chi_A > \chi_B$. This may be interpreted as different reputational concerns of policymakers, see Chang (2007). Individuals are not affected by these utility costs, but differ in stochastic idiosyncratic ideological aspects, which are independent from economic policy. At the end of each period, individual i evaluates the realization of the idiosyncratic ideological shock against the expected benefit of

having the opponent $-j$ instead of the incumbent j in office next period. The expected benefit follows from the comparison of the expected continuation values associated with both parties' policies.

In the following, suppose that party A is the incumbent. Conditional on a good credit standing, the population's expected economic benefit of having the opponent B instead of the incumbent A in office next period is given by:

$$W(b', z) \equiv \int_{z'} V_B^P(b', z')\mu(z', z)dz' - \int_{z'} V_A^P(b', z')\mu(z', z)dz'.$$

where $V_A^P(b, z)$ denotes the population's value function if party A remains in power. $V_B^P(b, z)$ is the population's value function if a political turnover takes place and the incumbent B makes the policy choices next period. $V_A^P(b, z)$ and $V_B^P(b, z)$ are defined in Appendix A.

Define δ_i to be the idiosyncratic ideological bias of individual i towards party A. The general popularity of party A is denoted by ω. We assume that δ_i and ω follow uniform zero-mean distributions with densities ϕ and Ω, respectively. δ and ω are uncorrelated over time.

If party A is the incumbent, individual i wants the opponent B to come into power if the expected economic benefit of having party B instead of the incumbent A in office next period exceeds the idiosyncratic ideological bias towards party A:

$$W(b', z) > \delta_i + \omega.$$

Given the distributional assumptions on the idiosyncratic ideological bias, δ_i, the total share of the population supporting a political turnover when party A is the incumbent is given by:

$$\pi_A(b', z, \omega) = \frac{1}{2} + \phi W(b', z) - \phi\omega.$$

We assume that a political turnover occurs if the oppositional party is favored by a population share larger than ξ. Given the uniform distribution of ω, it follows that the probability of political turnover from party A to party B is given by:

$$\begin{aligned} P_A(b', z) &\equiv Prob_\omega \left[\pi_A(b', z, \omega) > \xi\right] \\ &= \frac{1}{2} + \Omega\left(\frac{\frac{1}{2} - \xi}{\phi} + W(b', z)\right). \end{aligned} \tag{14}$$

Equation (14) shows that the probability of a political turnover depends on the densities of the popularity shocks Ω and the individuals' ideology ϕ. The higher ϕ, the less ideological are the individuals such that economic policies have a larger effect on the probability of political turnover. The lower Ω, the larger are the popularity shocks and the smaller is the impact of economic aspects on the political turnover probability. The likelihood of a government change is decreasing in the required population share ξ favoring the oppositional party.

Similarly, in a bad credit standing, the political turnover probability if party A is the current incumbent is given by:

$$P_A^D(z) = \frac{1}{2} + \Omega\left(\frac{\frac{1}{2} - \xi}{\phi} + W^D(z)\right), \tag{15}$$

where

$$W^D(z) \equiv \Big[\theta\left(\int_{z'} V_B^P(0,z')\mu(z',z)dz' - \int_{z'} V_A^P(0,z')\mu(z',z)dz'\right) + (1-\theta)\left(\int_{z'} V_B^{P,D}(z)\mu(z',z)dz' - \int_{z'} V_A^{P,D}(z)\mu(z',z)dz'\right)\Big].$$

4 Quantitative Analysis

4.1 Calibration

In our quantitative analysis, we apply our model to Greece, considering the time period from 1998 to 2016. In the following, we specify functional forms and calibrate the parameters to match specific empirical targets. Table 1 summarizes the parameter values. We employ annual series for real GDP, real private consumption, real government consumption, and interest rates, which are taken from the OECD Annual National Accounts. Furthermore, we use annual series for the budget deficit and primary balance from the IMF World Economic Outlook Database. We calculate the interest spread as the difference between the interest rate on Greek and German 10-year bonds.

Following Greenwood et al. (1988), we specify the per-period utility functions as:

$$\begin{aligned} u(c,l) &= \frac{\left(c - \frac{l^{1+\psi}}{1+\psi}\right)^{1-\gamma}}{1-\gamma}, \\ v(g) &= \frac{g^{1-\gamma}}{1-\gamma}, \end{aligned}$$

where $\gamma > 0$ denotes the parameter of relative risk aversion and ψ is the inverse of the intertemporal labor elasticity. We set ψ to 0.455, which is a standard value in the literature (see, e.g., Mendoza (1991), Neumeyer and Perri (2005) and Cuadra et al. (2010)). The coefficient of relative risk aversion γ is chosen to be equal to 2. The public good weight α is set to match the average ratio of government consumption to private consumption of 31.24%. The annual risk-free interest rate of 3.2 percent corresponds to the average interest rate on German 10-year government bonds between 1998 and 2016.

We follow Cuadra et al. (2010) and assume that the production function is linear in labor, $f(l) = l$. Productivity shocks follow an AR(1) process:

$$\log(z') = \rho_z \log(z) + \epsilon,$$

where ϵ is i.i.d. $N(0, \sigma_\epsilon^2)$. We take the empirical autocorrelation of 0.83 as value for the parameter ρ_z and calibrate σ_ϵ to match the standard deviation of the annual Greek GDP between 1998 and 2016.

In our model, entering a bailout program allows a government to replace a fraction λ of existing debt by official debt at interest rate $1/q^* - 1$. We set the spread between the interest rate on

Table 1: Calibration

	Parameter	Value
α	Public good weight	0.77
γ	Relative risk aversion	2.0
ψ	Inverse labor supply elasticity	0.455
r^f	Risk-free rate	0.032
β	Discount factor	0.87
η	Asymmetric output cost	0.94
θ	Redemption probability	0.25
χ_A	Default utility cost, party A	0.06
χ_B	Default utility cost, party B	0.02
λ	Share of official debt	0.71
$1/q^* - 1$	Official interest rate	0.037
ζ	Conditionality constraint	0.0192
ξ	Vote threshold for turnover	0.6940
ϕ	Idiosyncratic ideology	9
ρ_z	Productivity	0.83
σ_ϵ	Standard deviation of ϵ	0.015

official loans and the risk-free rate to 0.5%. This value corresponds to the lower bound of margins and fees demanded by the institutions, see Appendix B. In 2015, 71% of Greek public debt was owed to official creditors (IMF, 2016). We use this value to determine the share of official loans and set λ equal to 0.71. The provision of official loans is accompanied by conditionality in terms of restrictions on the primary surplus. The second and third bailout programs specify target values between -1% and 4.5%. Between 2016 and 2018, the average target value for the primary surplus was 1.92% of GDP (see European Commission, 2015 and Appendix B). Correspondingly, in the conditionality constraint, we set ζ equal to 0.0192 in our benchmark calibration. To study the interaction between conditionality and political turnover, we consider variations of ζ and carefully analyze the impact of conditionality on the variables of interest.

The incentives whether to default or to enter a bailout program are crucially affected by the default costs. In our model, the two parties face default utility costs χ_A and χ_B. In addition, following Arellano (2008), after a default, the government is temporarily excluded from international financial markets and faces an asymmetric output cost:

$$m(z) = \begin{cases} \eta E(z) & \text{if } z > \eta E(z) \\ z & \text{else,} \end{cases}$$

with $\eta \in (0, 1)$. The probability of re-entering international financial markets θ is set to 0.25, which implies an average market exclusion of four years. This value lies within the range of estimates by Gelos et al. (2011). The parameters χ_A, χ_B, η and the discount factor β affect the default risk, the bailout participation rate and the budget balance. We calibrate these four parameters to

match the following four targets. First, our model simulations replicate the empirical mean and volatility of the sovereign spread between 1998 and 2016. Second, we match the empirical bailout participation rate of 36.84%. This rate follows from the fact that between 1998 and 2016 Greece has been in bailout programs in 7 out of 19 years. Third, we match the mean improvement in the budget balance that occurs if a government makes use of official loans. In Greece, after entering the bailout program in 2010, the budget balance improved on average by 1.84% of GDP compared to the period from 1998 to 2009.

In our model, a political turnover takes place if the oppositional party is favored by a population share larger than ξ. We determine this threshold value from the *Public Issue* election polls and consider the average government approval during the three months prior to a political turnover. Between 2010 and 2016, prior to the two political turnovers in November 2011 and January 2015[8] the mean government approval was 30.60%. Accordingly, the threshold ξ is set to 0.6940. We assume the same distributions for the idiosyncratic ideology ϕ and the average popularity Ω. We calibrate Ω to match the turnover frequency in Greece during the bailout episode, which corresponds to two political turnover during the 7 years of bailout participation.

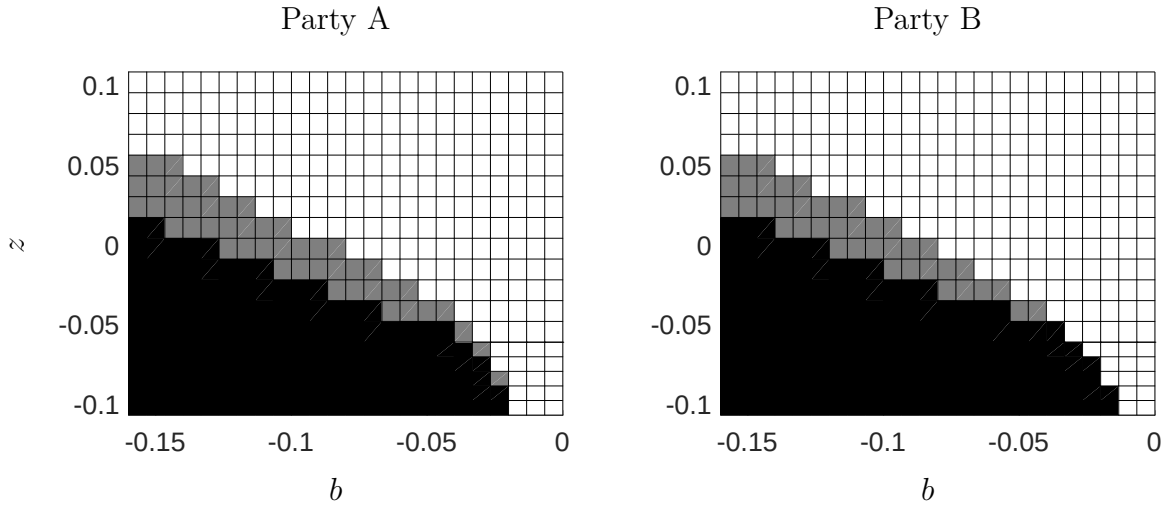
4.2 Policy Functions

We first consider the optimal decisions of the two parties regarding whether to repay without using official loans, or whether to enter/remain in a bailout program, or whether to default on all outstanding debt obligations. The left panel of Figure 2 presents the optimal policies of party A for different productivity realizations z and debt levels b. The right panel displays the policy decisions of party B. In the black areas, the parties choose to default on their debt obligations. The states in which they repay or enter/remain in a conditional bailout program are represented by the white and grey areas, respectively. The panels reveal that default is optimal for low productivity realizations and high debt levels. When indebtedness is low and productivity is high, both parties choose to repay their debt. In the intermediate states the government makes use of a bailout program accepting conditionality as a constraint on its fiscal policy choices. Clearly, party A is more reluctant to default than party B since it faces a higher utility cost of default. Comparing the two panels, it turns out that party B uses official financial assistance at lower debt levels than party A. Moreover, party B exits the bailout programs at lower levels of debt and for less adverse productivity realizations than party A.

Figure 3 plots the bond price functions and the political turnover probabilities as functions of borrowing b' if party A (solid blue lines) or party B (solid red lines) is the incumbent. The left (right) column refers to a productivity realization of 3.6% below (2.9% above) the trend. The figure reveals that bond prices are decreasing in the level of borrowing and increasing in

[8] As described in Section 2, in November 2011, Papandreou resigned and was followed by cabinets supported by PASOK and ND. In January 2015, a government change from PASOK and ND to SYRIZA and ANEL took place.

Figure 2: Default Set, Repayment Set, Bailout Set



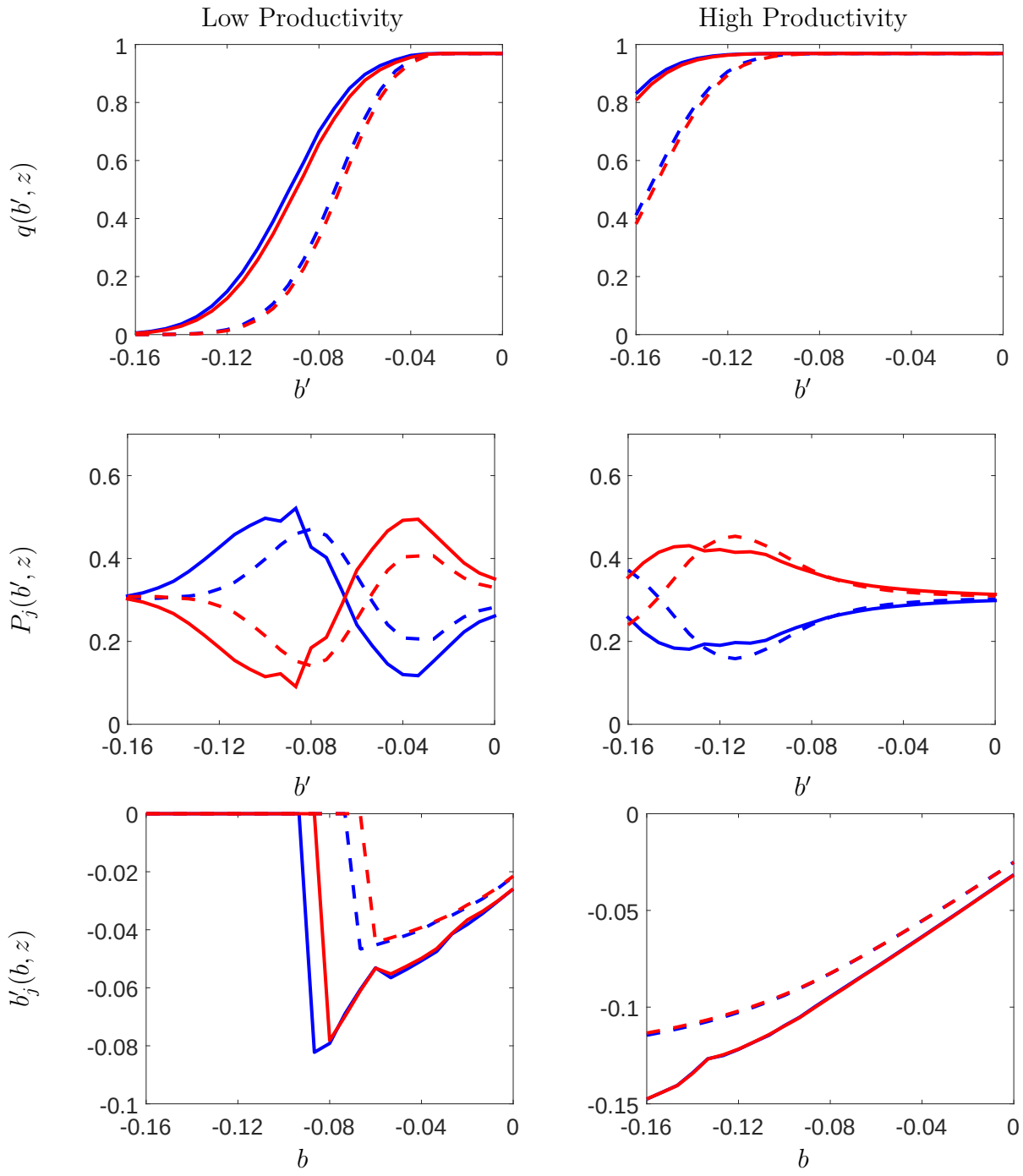
Notes: This figure displays the default set, the repayment set, and the bailout set for the benchmark calibration. The black and the grey areas denote the combinations of productivity z and government debt b for which the incumbent party $j = A, B$ chooses to default or to make use of a bailout program, respectively. In the white area, the incumbent repays its debt without using official loans.

productivity. With low borrowing, both parties never find it optimal to default such that bond prices are equal to the inverse of the risk-free rate. The default probability increases as more debt is issued, which is reflected in the decreasing pattern of the bond price. Moreover, the bond prices increase in productivity, since lower productivity negatively affects the ability to repay debt. Due to a lower default utility cost, party A is more reluctant to default than party B and faces lower credit costs.

For low productivity and high borrowing, both parties face equal turnover probabilities since both are expected to default at these states. The same occurs for low borrowing given high productivity since both parties are likely to repay their debt in these states. Whenever the parties choose the same policies, the turnover probability converges towards 30.60% which reflects the required share of votes for a political turnover of 69.40% in the benchmark specification. For high productivity and high borrowing as well as for low productivity and low borrowing, party B faces a higher turnover probability than party A because it faces higher credit costs such that it has to choose a higher tax rate and lower level of government consumption. In case of an adverse productivity realization, the pattern of the turnover probability changes if borrowing increases. For high debt, party B is likely to default while party A makes use of a conditional bailout. In these states, to party A the costs from conditionality are lower than the default costs. However, conditionality is costly to the households as the constraint on the primary surplus forces the incumbent to reduce public spending and to raise the tax rate. Since they are not affected by the policymaker's utility cost of default, more agents favor a default. In consequence, more individuals prefer the economic policies of party B and the probability of a political turnover from A to B increases.

The lower panels of Figure 3 plot the optimal borrowing decisions of incumbent party A (solid

Figure 3: Bond Prices, Political Turnover and Borrowing: Bailout vs. No Bailout



Notes: In the upper panels, the blue (red) lines represent the bond prices and turnover probabilities of incumbent party A (incumbent party B) for different borrowing choices b'. In the lower panels, the blue (red) lines represent the optimal borrowing policies of incumbent party A (B). Solid (dashed) lines refer to the model with (without) access to bailout programs. In the left column, productivity is 3.6% below the trend. High productivity refers to levels 2.9% above trend. All panels are based on the benchmark calibration.

blue line) and B (solid red line) given a low and high productivity realization. For high levels of debt, both parties find it optimal to default while they find it optimal to repay if debt is low.

The higher default risk of party B raises its borrowing costs and makes party B more borrowing constrained than party A. As shown in Figure 2, for intermediate values of debt, the incumbent government enters a bailout program. The constraint on the primary surplus strongly reduces the issuance of new debt and makes the borrowing function steeper.

How do the policy functions look like if the government does not have access to official financial assistance? The dashed lines in Figure 3 refer to a counterfactual scenario in which no bailout option is available. The pattern of the bond price reveals the insurance character of bailouts: For a given issuance of new debt, the availability of loans below the market rate reduces the default probability. Consequently, international private creditors charge a lower premium compared to the scenario in which no bailouts are available. Without bailouts, the qualitative pattern of the turnover probabilities are similar to the benchmark model. They are, however, quantitatively less pronounced and slightly shifted such that the peak of the turnover probability from A to B occurs at a lower level of borrowing. The optimal borrowing decision reveals that in the economy without bailouts, both parties are more borrowing constrained and optimal borrowing is substantially lower.

4.3 Cyclical Properties

In this section, we analyze whether our model replicates the cyclical properties of the Greek economy. The first three columns of Table 2 summarize the business cycle statistics of the Greek data. In column (1) we consider the time period from 1998 to 2016 and HP-filter the relevant time series with a smoothing parameter of 100. We split the sample in two subsamples: In column (2) we focus on the period between 1998 and 2009 in which Greece did not make use of official loans; in column (3) we consider the years between 2010 and 2016 that were characterized by continuous bailout programs. In columns (4), (5) and (6) we report the cyclical properties of our model simulation. To provide a meaningful comparison with the data, we proceed as follows. Out of a simulation of 1 million years[9] we consider episodes of at least 19 consecutive years in which the country is in a good credit standing and in which party A is initially in office. We refer to them as 'full sample' and report the associated statistics in column (4). Out of the full sample we consider episodes of at least 12 consecutive years in which party A is initially in office and the country is in a good credit standing without making use of official loans. We refer to these episodes as 'normal times', summarize the associated statistics in column (5) and compare them with the empirical counterpart reported in column (2). Finally, out of the full sample we consider episodes of at least 7 consecutive years in which the country makes use of bailout packages. The statistics are reported in column (6) and compared with the data presented in column (3).

In a first step, we evaluate the fit of our model and compare the statistical properties of the Greek economy between 1998 and 2016 (column (1)) with the simulated full sample (column (4)). Overall, the model provides a good description of the cyclical characteristics of the Greek economy.

[9]We cut off the first 100 years to focus on the invariant distribution.

Table 2: Business Cycle Statistics

	Greece			Model Simulation			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	'98-'16	'98-'09	'10-'16	Full Sample	Normal Times	Bailout	No Bailout
$\sigma(y)$	5.14	4.95	4.42	5.14	4.33	2.69	5.12
$\sigma(c)/\sigma(y)$	1.02	1.00	1.13	1.11	1.06	1.05	1.08
$\sigma(g)/\sigma(y)$	0.88	0.91	0.94	1.51	1.37	1.43	1.53
$\sigma(s)$	5.62	1.11	5.28	6.55	0.79	9.56	1.27
$\rho(c,y)$	0.96	0.94	0.99	1.00	1.00	0.99	1.00
$\rho(g,y)$	0.87	0.90	0.76	0.97	0.97	0.88	0.97
$\rho(nx/y,y)$	−0.61	−0.70	−0.38	−0.59	−0.26	−0.50	−0.68
$\rho(s,y)$	−0.54	−0.28	−0.54	−0.59	−0.73	−0.71	−0.75
$E(s)$	4.40	0.95	10.31	4.07	0.71	11.92	1.13
$E(g/c)$	31.24	30.68	32.20	31.53	31.95	30.47	31.36
Mean Budget Balance (% of GDP)	−6.73	−7.41	−5.57	−0.46	−1.13	1.03	−0.11
Mean Improvement Budget Balance	1.84	–	–	2.16	–	–	–
Mean Bailout Probability	36.84	–	–	36.41	–	–	–
Political Turnover Frequency	21.05	16.67	28.57	26.58	25.81	28.78	27.51

Notes: Column (1) to (3) are based on annual OECD and IMF data. Column (1) considers the time period from 1998 to 2016. y, c, g refer to real output, real private consumption and real government consumption, respectively. y, c and g are HP-filtered with a smoothing parameter of 100. s refers to the sovereign interest spread measured as the percentage difference between the interest rates on Greek and German 10-year bonds. Shares and probabilities are given in %. Column (2) reports statistics for the subsample 1998 to 2009 in which Greece did not make use of official loans. Column (3) reports statistics of the subsample 2010 to 2016 that was characterized by continuous bailout programs. The political turnover frequency refers to the percentage share of years in which a government change took place. Elections took place in 2000, 2004, 2007, 2009, May and June 2012, January 2015, and September 2015. Government changes were observed in 2004, 2009, 2011, and January 2015. Columns (4), (5) and (6) are based on a simulation of 1 million years where the first 100 years are omitted. Column (4) considers episodes of at least 19 consecutive years in which the country is in a good credit standing and in which party A is initially in office. Out of the full sample, column (5) considers episodes of at least 12 consecutive years in which party A is initially in office and the country is in a good credit standing without making use of official loans. Out of the full sample, column (6) considers episodes of at least 7 consecutive years in which the country makes use of bailout packages. Column (7) refers to a counterfactual economy in which no bailout option is available. All statistics refer to averages across simulated episodes.

In particular, the targeted statistics such as the volatility of output, the mean of the sovereign spread, the bailout participation rate, the mean ratio of public to private consumption, and the average frequency of political turnover during bailouts are well matched. In line with the data, the sovereign spread is very volatile, however, the model slightly overstates the standard deviation. In line with the data and with the literature, e.g. Arellano (2008) and Cuadra et al. (2010), the sovereign spread is counter-cyclical while fiscal policy is pro-cyclical. Moreover, consumption is more volatile than output. As most other models of sovereign debt and default, the model cannot match the huge budget deficit of the Greek government, but it replicates the improvement in the budget balance after entering the bailout programs.[10]

Next, we study the properties of the economy during bailout episodes and during normal times in which the economy does not use official financial assistance. In the data, the mean and the volatility of the sovereign spread is substantially higher during the bailout period compared to normal times. Our model is able to replicate these facts quite well, see columns (5) and (6). To facilitate this comparison, note that column (6) considers only bailout episodes that last for at least 7 years.[11] As shown in Figure 2, a government only remains in a bailout program if the productivity shocks are moderate. Therefore, in the model, the volatility of output is lower during a bailout episode compared to normal times. This is in line with the data, although the model overstates the reduction in output volatility. In the model, in normal times, the political turnover rate is about 25% which corresponds to an average tenure of 4 years and 3 political turnover in 12 years. For comparison, in Greece, elections took place in 2000, 2004, 2007, and 2009, however, government changes occurred only in 2004 and 2009. The model predicts that the bailout episode is characterized by a higher political turnover rate which reflects the Greek experience.

In column (7) we report the statistical properties of our counterfactual economy in which there is no bailout option. In line with the policy functions shown in Figure 3, in the counterfactual economy, higher sovereign default risk translates into higher credit costs that make the government borrowing constrained. Therefore, the mean budget deficit is smaller compared to the one that occurs in normal times as well as in our full sample in our benchmark economy (column (5) and column (4)). Similar to Fink and Scholl (2016) and Kirsch and Rühmkorf (2017), our analysis shows that the insurance character of bailouts generates lower credit costs which allows the government to accumulate more debt in general equilibrium. In consequence, in the full sample of our benchmark economy, a higher debt level increases the sovereign spread in general equilibrium. In normal times, there is less political turnover in our benchmark than in our counterfactual economy because the government benefits from lower credit costs. In contrast, bailout episodes are characterized by higher political turnover risk. In the full sample of the benchmark economy, the frequency of political turnover is lower than in the counterfactual economy because the country

[10] One way to increase the level of debt is to allow for long-term bonds provided by private creditors, see, e.g., Hatchondo and Martinez (2009). This, however, would substantially increase the complexity of our model given that we allow for official loans and politico-economic aspects.

[11] Our full sample also includes episodes in which financial assistance is used for less than 7 years.

participates in bailout programs only in 36% of the years and the stabilizing impact of low credit costs during normal times dominates.

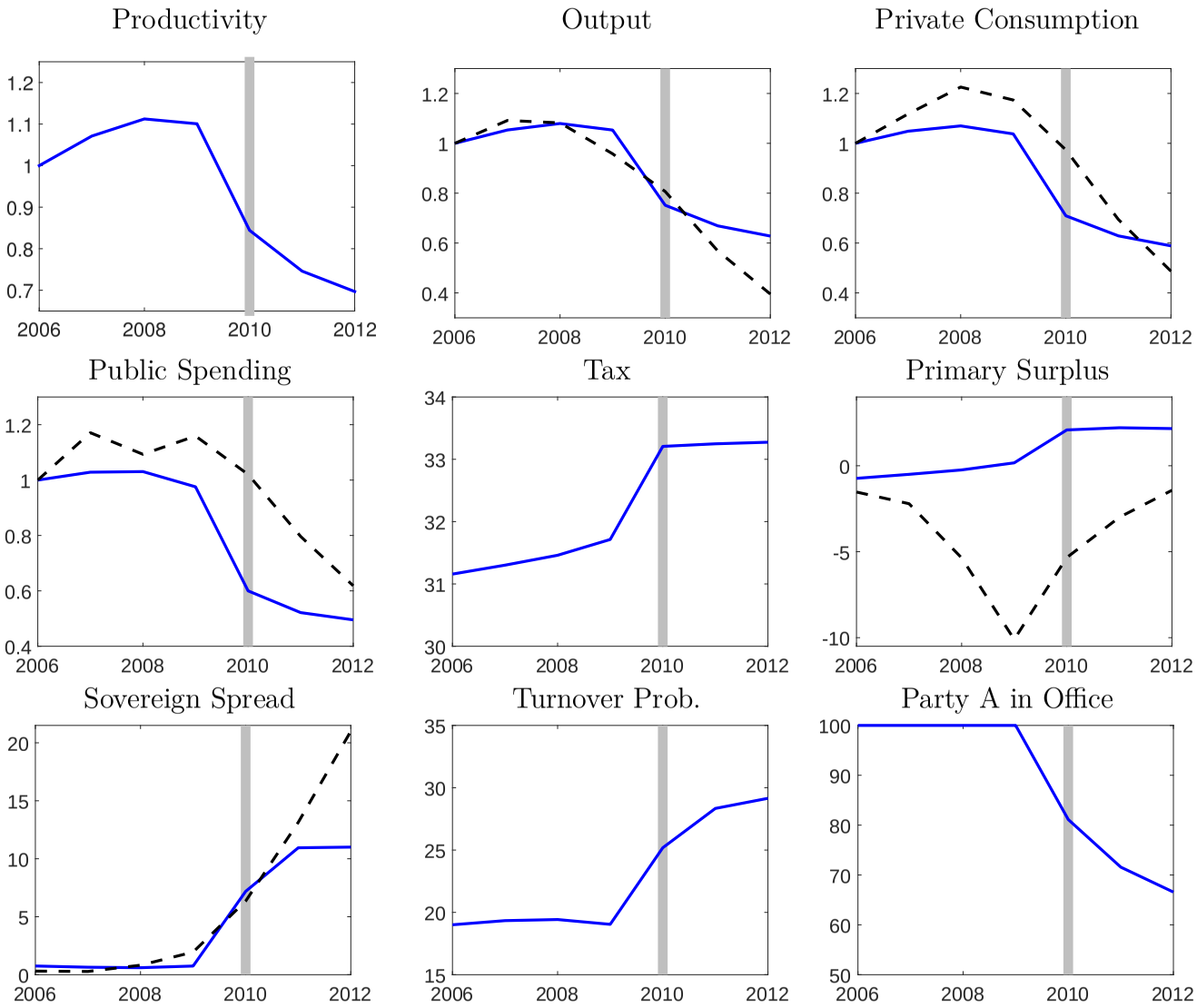
4.4 The Dynamics of Bailouts and Political Turnover

In this section, we study the dynamics of bailouts and political turnover. In an event study, we reproduce the Greek scenario regarding the bailout package of May 2010. To do so, in our model simulation, we consider episodes in which party A has been in office during the four years prior to the bailout program. Moreover, we assume that there is no bailout and no default before $t = 0$. We focus on bailout episodes that last for at least three years.

Figure 4 presents the macroeconomic dynamics around a bailout entry at $t = 0$ and shows average productivity, output, private consumption and public spending. The variables are normalized to 1 in the initial period to facilitate a comparison with the data. The tax rate, the sovereign spread, and the turnover probability are displayed in percent. 'Party A in office' represents the percentage share of cases in which party A is the incumbent. The dashed lines refer to the empirical dynamics observed in Greece between 2006 and 2012.

In the years before the bailout, a rise in productivity increases production and consumption. Because of the good economic conditions the sovereign interest spread is low. The government can keep the tax rate at a moderate level such that the probability of a political turnover is low. Since the government is not borrowing constrained, the primary surplus is negative and the government issues debt. At the time of the start of the bailout program, there is a decline in productivity which reduces the ability of the government to repay, generating a strong increase in the sovereign spread. Conditionality requires the incumbent to fulfill the constraint on the primary surplus such that the tax rate rises and government spending decreases. In consequence, the probability of a political turnover increases and the percentage of cases in which party A is still the incumbent after entering the bailout program drops. The larger likelihood that party B comes into power raises the sovereign spread even further. Overall, the model is able to replicate the Greek pattern of output, private consumption, public spending, and the sovereign spread surprisingly well. However, the model underestimates the increase in the sovereign spread. The model replicates the increase in the primary surplus but fails to match its quantitative size. The empirical pattern of the primary surplus suggests that the targets specified by the European institutions and the IMF were not fulfilled. This is in line with Eichengreen and Panizza (2016) who show that large budget surpluses for longer time periods are very unlikely to be achieved. Therefore, in the next section, we vary the parameterization of the target value for the primary surplus and study how the strength of conditionality affects the variables of interest.

Figure 4: Event Analysis: Bailout



Notes: The blue lines consider bailout episodes out of a model simulation of 1 million years, where the first 100 are cut off. Only episodes are considered in which party A has been in office during the four years prior to the bailout. The bailout lasts for at least three years and there is no bailout and no default before $t = 0$. The dashed lines refer to Greek data from 2006 to 2012. The average values of productivity, output, private consumption, and public spending are shown and normalized to 1 in the initial period, while the averages of the sovereign spread, the tax rate, and the turnover probability are displayed in percent. The primary surplus is given as share of output. 'Party A in office' is the percentage share of cases in which party A is in power.

4.5 The Impact of Conditionality on Sovereign Default Risk and Political Turnover

In this section, we study how conditionality affects sovereign default risk and political turnover. To do so, we vary the target on the primary surplus between -4% and $+8\%$ of GDP. We proceed in three steps. First, we analyze the impact of a tighter fiscal constraint on the policy functions of party A and B. Then, we study how conditionality influences the long-run properties of the simulated model. Finally, we study the transitional dynamics of our model to explore how the tightness of the fiscal constraint affects sovereign default and political turnover risk in the short run and in the long run.

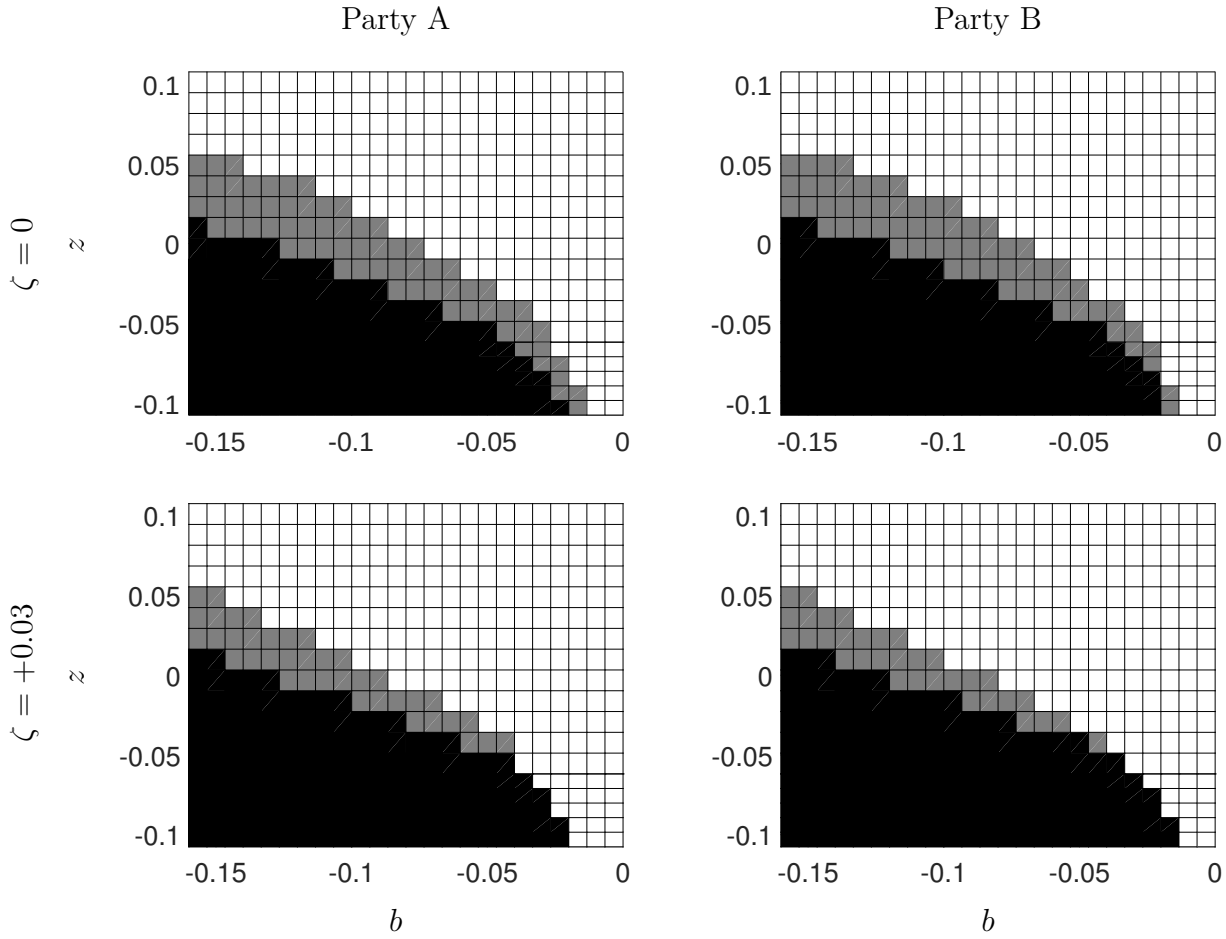
Figure 5 considers $\zeta = 0$ and $\zeta = +0.03$ and presents the decision of incumbent A and B whether to repay outstanding debt without using official loans, or whether to enter/remain in a bailout program, or whether to default. Clearly, stricter conditionality shrinks the bailout set such that default is chosen at lower levels of debt and for higher productivity realizations.

In Figure 6 we consider a low productivity realization (3.6% below trend) and compare the policy functions associated with weak conditionality $\zeta = 0$ (solid lines) and severe conditionality $\zeta = +0.03$ (dashed-dotted lines). The left (right) column refers to the policy functions if party A (B) is the incumbent. As argued before, a stricter fiscal constraint increases the cost of conditionality and the incumbent is more likely to exit the bailout program by choosing default. In consequence, international private creditors charge higher interest rates on private debt. Higher credit costs in combination with a tighter target on the primary surplus make the government more borrowing constrained such that the borrowing function becomes steeper. Moreover, stricter conditionality makes the pattern of the political turnover probability more pronounced, in particular for debt levels that are within the region in which the government chooses a bailout.

In Figure 7 we consider different values of ζ and simulate our model for 1 million years. We consider episodes of at least 19 consecutive years in which the country is in a good credit standing and in which party A is initially in office. This exercise follows our procedure in Section 4.3. We plot the average bailout probability, the mean sovereign spread, the share of cases in which party A is in power, and the average frequency of political turnover for targets on the primary surplus between -4% and $+8\%$ of GDP. In line with Figure 5, the bailout participation rate decreases as conditionality becomes more severe. If the target on the primary surplus is larger than 5% of GDP, the bailout participation rate is below 1% and the outcomes are close to the ones of our counterfactual economy in which no bailout option is available.

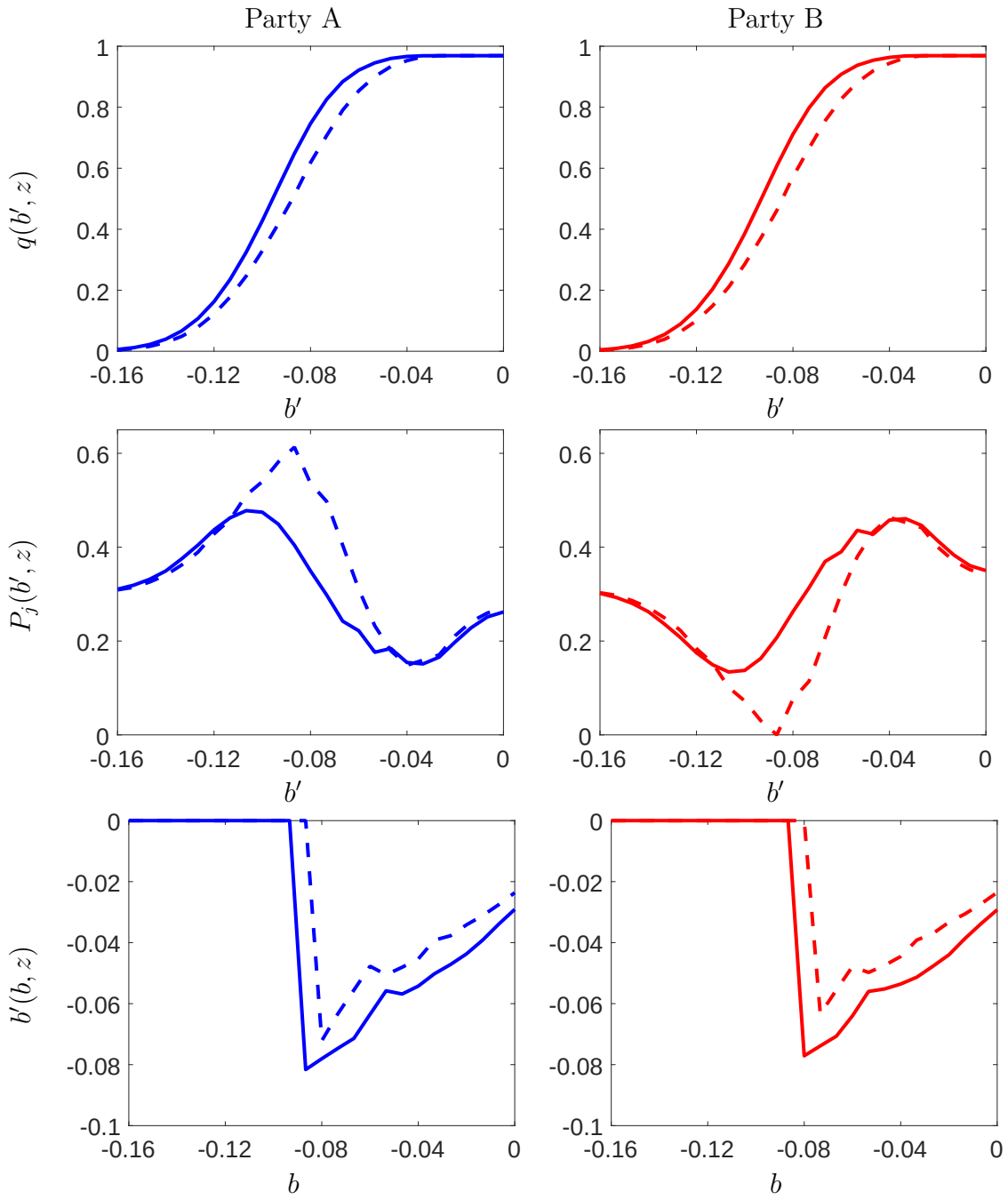
We know from Figure 6 that for a given level of borrowing international private creditors charge a higher premium if conditionality becomes stricter. However, the simulated sovereign spread shown in Figure 7 decreases as the target on the primary surplus increases. This is due to a general equilibrium effect: A tighter fiscal constraint and higher credit costs make the government more borrowing constrained such that less debt is accumulated in equilibrium. Lower debt reduces the

Figure 5: Default Set, Repayment Set, Bailout Set: $\zeta = 0$ vs. $\zeta = +0.03$



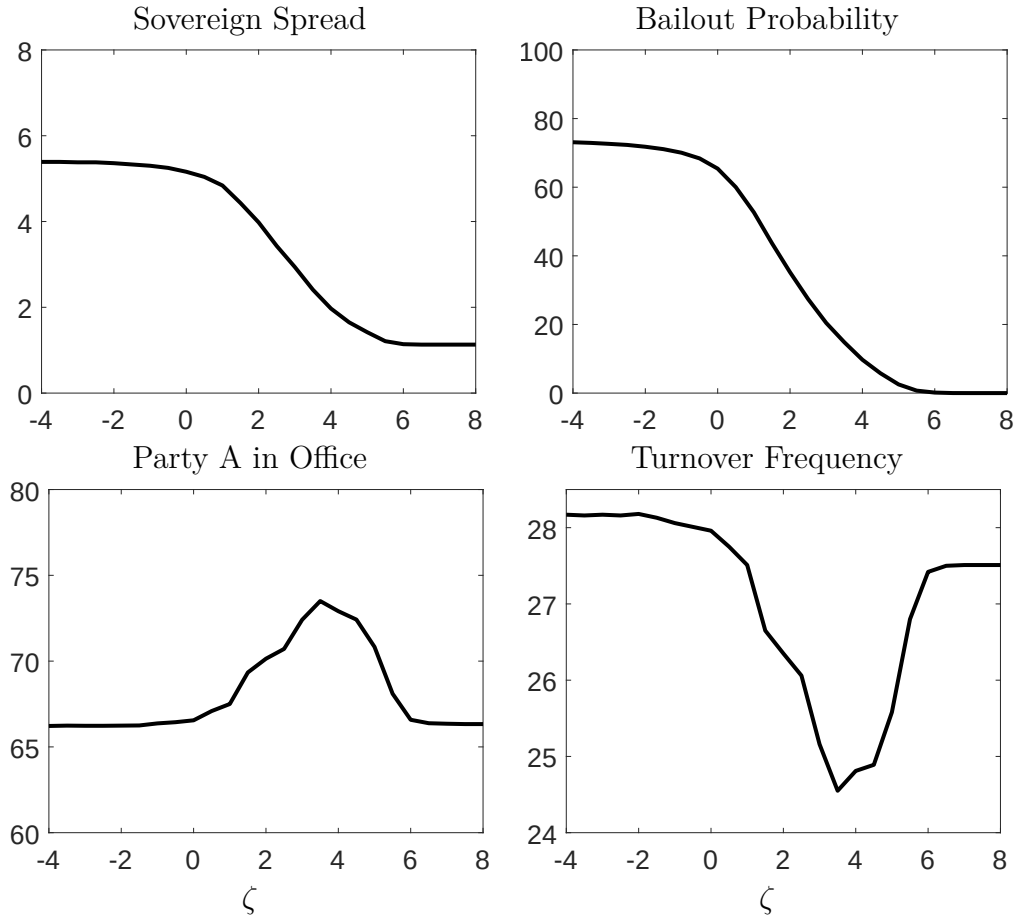
Notes: This figure considers $\zeta = 0$ and $\zeta = +0.03$ and displays the default set, the repayment set, and the bailout set. The black and the grey areas denote the combinations of productivity z and government debt b for which the incumbent party $j = A, B$ chooses to default or to make use of a bailout program, respectively. In the white area, the incumbent repays its debt without using official loans.

Figure 6: Bond Prices, Political Turnover and Optimal Borrowing: The Role of Conditionality



Notes: In the upper panels, the blue (red) lines represent the bond prices and turnover probabilities of incumbent party A (incumbent party B) for different borrowing choices b'. In the lower panels, the blue (red) lines represent the optimal borrowing policies of incumbent party A (B). Solid (dashed) lines refer to weak conditionality $\zeta = 0$ (severe conditionality $\zeta = +0.03$). All panels refer to productivity 3.6% below the trend.

Figure 7: The Impact of Stricter Conditionality



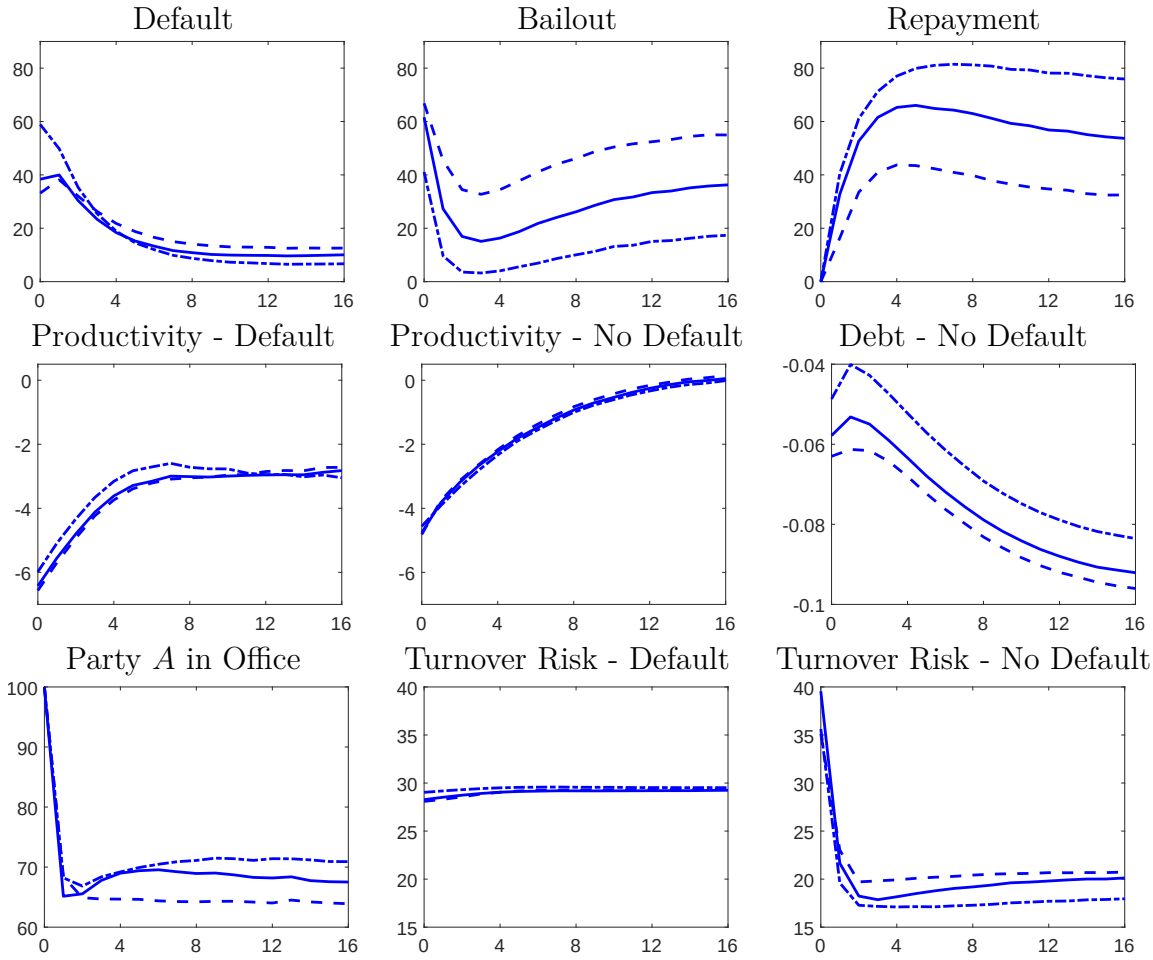
Notes: This figure is based on a simulation of 1 million years where the first 100 years are omitted. Out of the simulation, episodes are considered in which party A is initially in office and the country is in a good credit standing for at least 19 consecutive years. The figure displays the average turnover probability, the mean spread, the share of party A in office, and the average bailout probability for different conditionalities ζ. All variables are denoted in percentage values.

default probability and, hence, the sovereign spread.

Interestingly, the political turnover frequency is U-shaped in ζ which results from two opposing forces. On the one hand, a higher target on the primary surplus reduces debt in the economy. The policy functions in Figure 6 show that for lower levels of debt party A faces a smaller risk of losing office than party B. In consequence, the share of cases in which party A is in power increases as conditionality becomes stricter. On the other hand, a tighter fiscal constraint increases the cost of being in a bailout program. While party A is reluctant to default, party B is more likely to exit a bailout program by defaulting which allows to reduce the tax rate and to raise public spending. In consequence, the probability of a political turnover from party A to party B increases and the cases in which party A is in power decreases. Figure 7 reveals that the second effect dominates if conditionality becomes very severe.

In the following, we study the transitional dynamics of our model to explore how conditionality affects sovereign default risk and political turnover in the short run. As initial situation, we take

Figure 8: The Impact of Conditionality in the Short Run



Notes: As initial situation, this figure considers the average level of debt of the simulated counterfactual economy in which no bailout option is available (-0.06) and party A as incumbent. Out of a simulation of 1 million of different productivity series those are selected for which party A defaults at time $t = 0$ if no bailout is provided. These productivity series are fed into the model in which the government has access to bailout programs. The figure displays the simulated transitional dynamics and shows the percentage of cases in which the incumbent government chooses to default, the percentage of cases in which a bailout program is used, and the percentage of cases in which the incumbent government repays its debt without using official loans (upper panels). The middle panels display the average productivity associated with default and associated with cases in which the government repays and average debt. The lower panels display the percentage of cases in which party A is in power and the average political turnover probability of party A in case of a default/no default. Solid lines refer to $\zeta = 0.015$ while dashed-dotted (dashed lines) refer to $\zeta = 0.03$ ($\zeta = 0.00$).

the average level of debt of our simulated counterfactual economy in which no bailout option is available and suppose that party A is in power. We simulate 1 million of different productivity series and select the ones for which party A defaults at time $t = 0$ if no bailout is provided. We then feed these productivity series in our model in which the government has access to bailout programs. We simulate the model for 16 years and display the transitional dynamics in Figure 8. We show the percentage of cases in which the incumbent government chooses to default, the percentage of cases in which a bailout program is used, and the percentage of cases in which the

incumbent government repays its debt without using official loans. We also report the average productivity associated with default and associated with cases in which the government repays. Moreover, the figure displays the dynamics of debt, the percentage of cases in which party A is in power, and the political turnover probability of party A.

First, consider an intermediate level of conditionality, $\zeta = 1.5$ (solid lines). In the short run, the provision of bailouts reduces sovereign default risk: In about 60% of cases party A uses official assistance to repay its debt rather than to default at time $t = 0$. The cases in which party A still decides to default are characterized by very low productivity realizations. The use of official loans requires the incumbent party to fulfill the constraint on the primary surplus such that the level of debt decreases in the short run. Since at time $t = 0$ productivity is very low, party A faces a high risk of losing office if it uses official loans to repay its debt. After entering the bailout program, party A remains in office in only 65% of the cases. As productivity recovers, the country exits the bailout program and the risk of a political turnover falls. On the transitional path to the invariant distribution, the incumbent government accumulates debt and benefits from reduced credit costs due to the insurance character of bailouts. In the long run, the economy with bailouts is characterized by higher average debt than the counterfactual economy in which no official financial assistance is available.

For stricter conditionality (dashed-dotted lines), at time $t = 0$, party A reduces its participation in bailout programs and defaults for less bad productivity realizations. Yet, stricter conditionality generates a greater debt reduction in the short run. If the target on the primary surplus is raised from 0% (dashed lines) to 1.5% (solid lines), at time $t = 0$, party A's risk of losing office increases more strongly if it repays its debt. The economic mechanism behind this finding is straightforward: Fulfilling stricter conditionality requires a bigger tax hike and a larger reduction in public spending which fosters the probability of a political turnover. The transitional dynamics show that, in the long run, a tighter fiscal constraint makes the government more borrowing constrained and reduces the debt level. In consequence, while stricter conditionality increases the default probability in the short run, it reduces sovereign default risk in the long run. Moreover, in the long run, the lower level of debt reduces political instability, making it more likely that party A remains in office.

4.6 Robustness Analysis

In this section, we perform a robustness analysis with respect to several important parameters. In a first set of robustness checks, we vary the size of the bailout package and the interest rate on official loans. In a second set of robustness checks, we focus on the parties' default utility costs as well as the specification of the distribution of the popularity shocks.

In the left panel of Table 3, we consider different values for the spread k between the interest rate on official loans and the risk-free rate. In the first bailout package in 2010, the margin on the interest rate was initially 300 basis points and was then lowered to 50 basis points, see Table 5

Table 3: Robustness Analysis: The Interest Rate on Official Loans and the Size of Bailouts

	$k = 0$	$k = 0.015$	$k = 0.03$	$\lambda = 0.10$	$\lambda = 0.30$	$\lambda = 0.50$
$E(s)$	4.17	3.76	3.31	1.23	1.60	2.34
Bailout probability	39.97	29.39	20.49	15.18	20.97	27.03
Party A in Office	70.54	69.73	69.31	66.30	66.04	66.16
Turnover frequency	26.02	26.44	26.65	27.60	27.81	27.84

Notes: k determines the spread between the official interest rate and the risk-free rate. λ is the share of official loans. All other parameters are given by the benchmark calibration. Statistics are given in % and calculated from a model simulation of 1 million years where the first 100 years are omitted. Only episodes of at least 19 consecutive years of good credit standing are considered in which party A is in office initially.

in Appendix B. Therefore, in our robustness analysis, we consider spreads up to 3%. In the right panel we vary the size of the bailout package λ. We simulate the model and report the mean spread, the average bailout probability, the average frequency of political turnover, and the share of cases in which party A is in power. The results indicate that a higher interest rate on official loans as well as a smaller bailout package reduce the bailout participation rate and increase the probability of a sovereign default for a given level of debt. In consequence, higher credit costs make the government more borrowing constrained such that in equilibrium a lower debt level reduces the average sovereign spread. k as well as λ have a minor impact on the frequency of political turnover.

Table 4 displays statistics for variations of the distribution Ω of the popularity shocks and party B's utility cost of default χ_B. A higher Ω implies smaller popularity shocks such that the voting outcomes are more affected by economic factors. While the spread and the bailout probability are hardly affected by changes in Ω, party A is substantially more often in power and the political turnover rate is lower if a party's popularity becomes less important. If instead, Ω is very small, the individual voting behavior is mostly affected by stochastic ideological aspects such that party A is in office in 50% of the cases. The turnover probability converges towards 30.60%, which is implied by the vote threshold ξ.

The difference in the default utility costs χ_A and χ_B crucially determines the differences in the optimal policies of the two parties. In Table 4 we keep χ_A constant and vary χ_B. If party B suffers from a lower default utility cost, party B is less reluctant to default. In consequence, party B faces higher credit costs than party A such that the economic benefit of having party A in power is higher. Thus, party A is more often in office and the frequency of political turnover decreases.

5 Conclusions

In this paper, we have analyzed the interaction of sovereign default risk, bailouts, and political turnover in a politico-economic model of sovereign debt. The theoretical framework features endogenous default risk, endogenous participation rates in bailout programs as well as endogenous

Table 4: Robustness Analysis: Popularity and Default Utility Costs

	$\Omega = 10^{-6}$	$\Omega = 6$	$\Omega = 12$	$\chi_B = 0.1$	$\chi_B = 0.3$	$\chi_B = 0.5$
$E(s)$	4.14	4.11	4.05	4.10	4.00	3.79
Bailout probability	36.93	36.58	35.73	36.08	36.22	35.99
Party A in Office	53.16	63.78	74.69	75.98	65.31	56.87
Turnover frequency	30.77	28.88	23.80	23.00	28.42	30.23

Notes: $\Omega = \phi$ refers to the distribution of the popularity shocks. χ_B denotes the utility default cost of party B. All other parameters are given by the benchmark calibration. Statistics are given in % and calculated from a model simulation of 1 million years where the first 100 years are omitted. Only episodes of at least 19 consecutive years of good credit standing are considered in which party A is in office initially.

political turnover.

In a quantitative exercise we have applied our theoretical framework to the Greek economy. It has turned out that our model replicates the Greek experience quite well. In the years before the bailout, the sovereign interest spread and the probability of political turnover are low due to good economic conditions. Low credit costs allow the incumbent government to accumulate debt. The debt crisis is triggered by an adverse economic shock that reduces the ability of the government to repay its debt. Due to the strong increase in the sovereign interest spread, the incumbent government decides to enter a bailout program. However, conditionality requires the implementation of tax hikes and spending cuts which raise the probability of a political turnover. In turn, the risk of a political turnover elevates the sovereign spread.

To study the short- and long-run impact of conditionality, we have varied the tightness of the fiscal constraint. For a given level of debt, stricter conditionality makes it more costly for a government to enter or to remain in a bailout program. The greater sovereign default risk is reflected in higher credit costs making the government more borrowing constrained. In consequence, while stricter conditionality increases the probability of default in the short run, it reduces debt and sovereign default risk in the long run. Political turnover is affected by conditionality in two ways. On the one hand, fulfilling the target on the primary surplus forces the incumbent to implement tax hikes and spending cuts which foster the incumbent's risk of losing power. On the other hand, a tighter fiscal constraint reduces debt and default risk in the economy which decreases political turnover. As a result of these opposing forces, the frequency of political turnover is U-shaped in the strength of conditionality. We have shown that conditional bailouts increase the short-run risk of a political turnover, but in the long run, stricter conditionality reduces political instability if the fiscal constraint is not too tight.

Our findings highlight the tension that policymakers face when designing bailout packages: While stricter conditionality improves fiscal sustainability and political stability in the long run, it fosters political uncertainty and sovereign default risk in the short run. In our theoretical framework we have modeled conditionality as an exogenous constraint. It is a particulary interesting avenue for future research to study conditionality as the endogenous outcome of negotiations between the

incumbent government and official creditors. The analysis of the interaction between negotiations with international creditors and domestic political outcomes is left for future research.

References

Aghion, P. and Bolton, P. (1990). Government Domestic Debt and the Risk of Default: A Political-Economic Model of the Strategic Role of Debt. In Dornbusch, R. and Draghi, M., editors, *Public Debt Management: Theory and History*. Cambdridge University Press, Cambridge.

Aguiar, M. and Gopinath, G. (2006). Defaultable Debt, Interest Rates and the Current Account. *Journal of International Economics*, 69(1):64–83.

Alesina, A., Carloni, D., and Lecce, G. (2013). The Electoral Consequences of Large Fiscal Adjustments. In Alesina, A. and Giavazzi, F., editors, *Fiscal Policy after the Financial Crisis*, pages 531–570. University of Chicago Press.

Alesina, A., Perotti, R., and Tavares, J. (1998). The Political Economy of Fiscal Adjustments. *Brookings Papers on Economic Activity*, (1):197–266.

Alesina, A. and Tabellini, G. (1990). A Positive Theory of Fiscal Deficits and Government Debt. *Review of Economic Studies*, 57(3):403–414.

Ardagna, S. and Caselli, F. (2014). The Political Economy of the Greek Debt Crisis: A Tale of Two Bailouts. *American Economic Journal: Macroeconomics*, 6(4):291–323.

Arellano, C. (2008). Default Risk and Income Fluctuations in Emerging Economies. *American Economic Review*, 98(3):690–712.

Arellano, C. and Bai, Y. (2017). Fiscal Austerity during Debt Crises. *Economic Theory*, 64(4):657–673.

Avgouleas, E., Eichengreen, B., Panizza, U., Maduro, M. P., Portes, R., di Mauro, B., Wyplosz, C., and Zellelmeyer, J. (2018). Independent Report on the Greek Official Debt. *CEPR Policy Insight*, 92.

Battaglini, M. and Coate, S. (2008). A Dynamic Theory of Public Spending, Taxation, and Debt. *American Economic Review*, 98(1):201–236.

Bienen, H. S. and Gersovitz, M. (1985). Economic Stabilization, Conditionality, and Political Stability. *International Organization*, 39(4):729–754.

Bienen, H. S. and Gersovitz, M. (1986). Consumer Subsidy Cuts, Violence, and Political Stability. *Comparative Politics*, 19(1):25–44.

Bird, G. (2007). The IMF: A Bird's Eye View of its Role and Operations. *Journal of Economic Surveys*, 21(4):683–745.

Block, S. A. and Vaaler, P. M. (2004). The Price of Democracy: Sovereign Risk Ratings, Bond Spreads and Political Business Cycles in Developing Countries. *Journal of International Money and Finance*, 23(6):917–946.

Boz, E. (2011). Sovereign Default, Private Sector Creditors, and the IFIs. *Journal of International Economics*, 83(1):70–82.

Chang, R. (2007). Financial Crises and Political Crises. *Journal of Monetary Economics*, 54(8):2409–2420.

Chang, R. (2010). Elections, Capital Flows, and Politico-Economic Equilibria. *American Economic Review*, 100(4):1759–1777.

Chatterjee, S. and Eyigungor, B. (2017). Endogenous Political Turnover and Fluctuations in Sovereign Default Risk. *Working Paper Federal Reserve Bank of Philadelphia*, 17-01.

Citron, J. T. and Nickelsburg, G. (1987). Country Risk and Political Instability. *Journal of Development Economics*, 25(2):385–392.

Cuadra, G., Sanchez, J. M., and Sapriza, H. (2010). Fiscal Policy and Default Risk in Emerging Markets. *Review of Economic Dynamics*, 13(2):452–469.

Cuadra, G. and Sapriza, H. (2008). Sovereign Default, Interest Rates and Political Uncertainty in Emerging Markets. *Journal of International Economics*, 76(1):78–88.

Dinas, E. and Rori, L. (2013). The 2012 Greek Parliamentary Elections: Fear and Loathing in the Polls. *West European Politics*, 36(1):270–282.

Dovis, A., Golosov, M., and Shourideh, A. (2016). Political Economy of Sovereign Debt: A Theory of Cycles of Populism and Austerity. *NBER Working Paper Series*, 21948.

Dreher, A. (2004). The Influence of IMF Programs on the Re-Election of Debtor Governments. *Economics and Politics*, 16(1):53–75.

Dreher, A. and Gassebner, M. (2012). Do IMF and World Bank Programs Induce Government Crises? An Empirical Analysis. *International Organization*, 66(2):329–358.

Eichengreen, B. and Panizza, U. (2016). A Surplus of Ambition: Can Europe Rely on Large Primary Surpluses to Solve its Debt Problem? *Economic Policy*, 31(85):5–49.

European Commission (2010). The Economic Adjustment Programme for Greece. *European Economy, Occasional Papers*, 61.

European Commission (2012). The Second Economic Adjustment Programme for Greece. *European Economy, Occasional Papers*, 94.

European Commission (2015). Memorandum of Understanding between the European Commission acting on behalf of the European Stability Mechanism and the Hellenic Republic and the Bank of Greece.

European Stability Mechanism (2014). ESM Pricing Policy. Luxembourg.

European Stability Mechanism (2016). 2015 Annual Report. Luxembourg.

European Stability Mechanism (2017). 2016 Annual Report. Luxembourg.

Fink, F. and Scholl, A. (2016). A Quantitative Model of Sovereign Debt, Bailouts and Conditionality. *Journal of International Economics*, 98:176–190.

Gelos, R. G., Sahay, R., and Sandleris, G. (2011). Sovereign Borrowing by Developing Countries: What Determines Market Access? *Journal of International Economics*, 83(2):243–254.

Goretti, M. (2005). The Brazilian Currency Turmoil of 2002: A Nonlinear Analysis. *International Journal of Finance & Economics*, 10(4):289–306.

Greenwood, J., Hercowitz, Z., and Huffman, G. W. (1988). Investment, Capacity Utilization, and the Real Business Cycle. *American Economic Review*, 78(3):402–417.

Hatchondo, J. C. and Martinez, L. (2009). Long-Duration Bonds and Sovereign Default. *Journal of International Economics*, 79(1):117–125.

Hatchondo, J. C. and Martinez, L. (2010). The Politics of Sovereign Default. *FRB Richmond Economic Quarterly*, 96(3):291–317.

Hatchondo, J. C., Martinez, L., and Onder, Y. K. (2017). Non-Defaultable Debt and Sovereign Risk. *Journal of International Economics*, 105:217–229.

Hatchondo, J. C., Martinez, L., and Sapriza, H. (2009). Heterogeneous Borrowers in Quantitative Models of Sovereign Default. *International Economic Review*, 50(4):1129–1151.

Hatchondo, J. C., Martinez, L., and Sapriza, H. (2010). Quantitative Properties of Sovereign Default Models: Solution Methods Matter. *Review of Economic Dynamics*, 13(4):919–933.

Hübscher, E. and Sattler, T. (2017). Fiscal Consolidation under Electoral Risk. *European Journal of Political Research*, 56(1):151–168.

Herrera, H., Ordonez, G., and Trebesch, C. (2014). Political Booms, Financial Crises. *NBER Working Paper*, 20346.

IMF (2013). Greece: First and Second Reviews under the Extended Arrangement under the Extended Fund Facility, Request for Waiver of Applicability, Modification of Performance Criteria, and Rephasing of Access. *IMF Country Report*, 13/20.

IMF (2016). Greece: Preliminary Debt Sustainability Analysis - Updated Estimates and Further Considerations. *IMF Country Report*, 16/130.

Juessen, F. and Schabert, A. (2013). Fiscal Policy, Sovereign Default, and Bailouts. *IZA Discussion Paper*, 7805.

Karyotis, G. and Rüdig, W. (2015). Blame and Punishment? The Electoral Politics of Extreme Austerity in Greece. *Political Studies*, 63(1):2–24.

Kirsch, F. and Rühmkorf, R. (2017). Sovereign Borrowing, Financial Assistance, and Debt Repudiation. *Economic Theory*, 64(4):777–804.

Manasse, P. and Roubini, N. (2009). "Rules of Thumb" for Sovereign Debt Crises. *Journal of International Economics*, 78(2):192–205.

Mendoza, E. G. (1991). Real Business Cycles in a Small Open Economy. *American Economic Review*, 81(4):797–818.

Müller, A., Storesletten, K., and Zilibotti, F. (2016). Sovereign Debt and Structural Reforms. *mimeo*. University of Zurich.

Müller, A., Storesletten, K., and Zilibotti, F. (2016). The Political Color of Fiscal Responsibility. *Journal of the European Economic Association*, 14(1):252–302.

Neumeyer, P. A. and Perri, F. (2005). Business Cycles in Emerging Economies: the Role of Interest Rates. *Journal of Monetary Economics*, 52(2):345–380.

Novelli, A. C. (2018). Sovereign Default, Political Instability and Political Fragmentation. *mimeo*. Universidad del Pacifico.

Pancrazi, R., Seoane, H., and Vukotic, M. (2017). Welfare Costs of Sovereign Debt Crisis: The Role of Bailouts. *mimeo*. University of Warwick.

Persson, T. and Svensson, L. (1989). Why a Stubborn Conservative Would Run a Deficit: Policy with Time-Inconsistent Preferences. *Quarterly Journal of Economics*, 104(2):325–345.

Persson, T. and Tabellini, G. (2000). *Political Economics: Explaining Economic Policy*. The MIT Press.

Ponticelli, J. and Voth, H.-J. (2017). Austerity and Anarchy: Budget Cuts and Social Unrest in Europe, 1919-2008. *mimeo*. University of Zurich.

Roch, F. and Uhlig, H. (2016). The Dynamics of Sovereign Debt Crises and Bailouts. *IMF Working Paper*, 16/136.

Schlegl, M., Trebesch, C., and Wright, M. L. J. (2015). Sovereign Debt Repayments: Evidence on Seniority. *VoxEU, August*, 11.

Scholl, A. (2017). The Dynamics of Sovereign Default Risk and Political Turnover. *Journal of International Economics*, 108:37–53.

Schumacher, J. and Weder di Mauro, B. (2015). Greek Debt Sustainability and Official Crisis Lending. *Brookings Papers on Economic Activity*, 2:279–305.

Song, Z., Storesletten, K., and Zilibotti, F. (2012). Rotten Parents and Disciplined Children: A Politico-Economic Theory of Public Expenditure and Debt. *Econometrica*, 80(6):2785–2803.

Vaaler, P. M., Schrage, B. N., and Block, S. A. (2005). Counting the Investor Vote: Political Business Cycle Effects on Sovereign Bond Spreads in Developing Countries. *Journal of International Business Studies*, 36(1):62–88.

Vasilopoulou, S. and Halikiopoulou, D. (2013). In the Shadow of Grexit: The Greek Election of 17 June 2012. *South European Society and Politics*, 18(4):523–542.

Zettelmeyer, J., Trebesch, C., and Gulati, M. (2013). The Greek Debt Restructuring: an Autopsy. *Economic Policy*, 28(75):513–563.

A The Recursive Equilibrium

Definition. *The recursive equilibrium for the small open economy is defined as*

1. *a set of policy functions for private consumption* $c_j(b,z)$, $c_j^R(b,z)$, $c_j^{CB}(b,z)$, $c_j^D(z)$, *and labor supply* $l_j(b,z)$, $l_j^R(b,z)$, $l_j^{CB}(b,z)$ $l_j^D(z)$, $j = A, B$,

2. *a set of policy functions for borrowing* $b'_j(b,z)$, $b'^R_j(b,z)$, $b'^{CB}_j(b,z)$ *government spending* $g_j(b,z)$, $g_j^R(b,z)$, $g_j^{CB}(b,z)$, $g_j^D(z)$, *and the tax policy* $\tau_j(b,z)$, $\tau_j^R(b,z)$, $\tau_j^{CB}(b,z)$, $\tau_j^D(z)$, $j = A, B$,

3. *a bailout set* $\mathcal{H}_j(b)$ *and a default set* $\mathcal{D}_j(b)$, $j = A, B$,

4. *turnover probabilities* $P_j(b',z)$, $P_j^D(z)$, $j = A, B$,

5. *the bond price function charged by international private creditors,* $q_j(b',z)$, $j = A, B$,

6. *a set of value functions* $V_j(b,z)$, $V_j^R(b,z)$, $V_j^{CB}(b,z)$, $V_j^D(z)$, $\overline{V}_j(b,z)$, $\overline{V}_j^R(b,z)$, $\overline{V}_j^{CB}(b,z)$, $\overline{V}_j^D(z)$, $V_j^P(b,z)$, $V_j^{P,D}(z)$, $j = A, B$,

such that

1. *taking as given the public sector policies, private consumption* $c_j(b,z)$, $c_j^R(b,z)$, $c_j^{CB}(b,z)$, $c_j^D(z)$, *and labor supply* $l_j(b,z)$, $l_j^R(b,z)$, $l_j^{CB}(b,z)$ $l_j^D(z)$ *satisfy the optimality condition (5) and the household's budget constraint (1).*

2. *Taking as given the bond price functions* $q_j(b',z)$, q^*, *the private sector equilibrium, the optimal policies of the opponent* $-j$, *and the political turnover probability* $P_j(b',z)$, *the incumbent* j*'s value functions* $V_j(b,z)$, $V_j^R(b,z)$, $V_j^{CB}(b,z)$, $V_j^D(z)$, *the bailout set* $\mathcal{H}_j(b)$, *the default set* $\mathcal{D}_j(b)$ *are given by (6), (7), (8), (9), (10), and (12), respectively. The policy functions* $b'^R_j(b,z)$, $g_j^R(b,z)$, $\tau_j^R(b,z)$ *solve (7).* $b'^{CB}_j(b,z)$, $g_j^{CB}(b,z)$, $\tau_j^{CB}(b,z)$ *solve (8).* $b'_j(b,z)$, $g_j(b,z)$, $\tau_j(b,z)$ *solve (6). In financial autarky,* $g_j^D(z)$ *and* $\tau^D(z)$ *solve (9).*

3. *Bond prices* $q_j(b',z)$ *fulfill equation (13), such that risk-neutral international private creditors earn zero expected profits.*

4. *The turnover probability* $P_A(b',z)$ *fulfills equation (14), and* $P_B(b',z) = 1 - P_A(b',z)$*; the turnover probability* $P_A^D(z)$ *fulfills equation (15), and* $P_B^D(b',z) = 1 - P_A^D(b',z)$.

5. *The value functions of the population* $V_j^P(b,z)$, $V_j^{P,D}(z)$ *are given by*

$$\begin{aligned} V_j^P(b,z) =& (1-\alpha)u(c_j(b,z), l_j(b,z)) + \alpha v(g_j(b,z)) \\ &+ \beta \Bigg((1 - P_j(b'_j(b,z),z)) \int_{z'} V_j^P(b'_j(b,z),z')\mu(z',z)dz' \\ &+ P_j(b'_j(b,z),z) \int_{z'} V_{-j}^P(b'_j(b,z),z')\mu(z',z)dz' \Bigg), \end{aligned}$$

and

$$\begin{aligned}V_j^{P,D}(z) =&(1-\alpha)u(c_j^D(z), l_j(z)) + \alpha v(g_j^D(z)) \\ &+ \beta\left[(1-P_j^D(z))\left(\theta\int_{z'} V_j^P(0,z')\mu(z',z)dz' + (1-\theta)\int_{z'} V_j^{P,D}(z')\mu(z',z)dz'\right)\right. \\ &\left.+P_j^D(z)\left(\theta\int_{z'} V_{-j}^P(0,z')\mu(z',z)dz' + (1-\theta)\int_{z'} V_{-j}^{P,D}(z')\mu(z',z)dz'\right)\right].\end{aligned}$$

6. *Given the policy choices of the opponent $-j$, $\overline{V}_j^R(b,z)$, $\overline{V}_j^{CB}(b,z)$, $\overline{V}_j^D(z)$ and $\overline{V}_j(b,z)$ solve*

$$\begin{aligned}\overline{V}_j^R(b,z) =&(1-\alpha)u(c_{-j}^R(b,z), l_{-j}^R(b,z)) + \alpha v(g_{-j}^R(b,z)) \\ &+ \beta\left((1-P_{-j}(b_{-j}^{\prime R}(b,z),z))\int_{z'}\overline{V}_j(b_{-j}^{\prime R}(b,z),z')\mu(z',z)dz'\right. \\ &\left.+P_{-j}(b_{-j}^{\prime R}(b,z),z)\int_{z'} V_j(b_{-j}^{\prime R}(b,z),z')\mu(z',z)dz'\right),\end{aligned}$$

and

$$\begin{aligned}\overline{V}_j^{CB}(b,z) =&(1-\alpha)u(c_{-j}^{CB}, l_{-j}^{CB}(b,z)) + \alpha v(g_{-j}^{CB}(b,z)) \\ &+ \beta\left((1-P_{-j}(b_{-j}^{\prime CB}(b,z),z))\int_{z'}\overline{V}_j(b_{-j}^{\prime CB}(b,z),z')\mu(z',z)dz'\right. \\ &\left.+P_{-j}(b_{-j}^{\prime CB}(b,z),z)\int_{z'} V_j(b_{-j}^{\prime CB}(b,z),z')\mu(z',z)dz'\right),\end{aligned}$$

and

$$\begin{aligned}\overline{V}_j^D(z) =&(1-\alpha)u(c_{-j}^D(z), l_{-j}^D(z)) + \alpha v(g_{-j}^D(z)) \\ &+ \beta\left[(1-P_{-j}^D(z))\left(\theta\int_{z'}\overline{V}_j(0,z')\mu(z',z)dz' + (1-\theta)\int_{z'}\overline{V}_j^D(z')\mu(z',z)dz'\right)\right. \\ &\left.+P_{-j}^D(z)\left(\theta\int_{z'} V_j(0,z')\mu(z',z)dz' + (1-\theta)\int_{z'} V_j^D(z')\mu(z',z)dz'\right)\right],\end{aligned}$$

with

$$\overline{V}_j(b,z) = \begin{cases}\overline{V}_j^R(b,z) & \text{if } d_{-j}(b,z)=0 \text{ and } h_{-j}(b,z)=0 \\ \overline{V}_j^{CB}(b,z) & \text{if } d_{-j}(b,z)=0 \text{ and } h_{-j}(b,z)=1 \\ \overline{V}_j^D(z) & \text{if } d_{-j}(b,z)=1.\end{cases}$$

B Economic Adjustment Programs for Greece

Greece received bailout packages in 2010, 2012, and 2015. Table 5 lists the initially provided size of financial assistance and the total amount of disbursements. The interest rates differ across official lenders and consist of a base rate (e.g., costs of funding), a margin and occasionally fees. Table 6 provides an overview over the conditions that Greece is required to fulfill.

Table 5: The Economic Adjustment Programs for Greece

	1st Program	2nd Program	3rd Program
	2010	**2012**	**2015**
Initial Amount	€110 billion	€165.4 billion[a]	up to €86 billion
Total Disbursements	€73 billion of which: GLF[b]: €52.9 billion IMF: €20.1 billion	€153.8 billion of which: EFSF: €141.8 billion IMF: €12 billion	€31.7 billion (end 2016, all ESM)
Interest Rate	GLF: Euribor 3M + margin: originally 300, lowered to 50 basis points (bps) IMF: $\sim$ 3.96%	EFSF: guarantee fees cancelled, deferral of some interest payments by 10 years[c], margin: 0 bps[d] IMF: 2.85% to 3.78%	ESM: base rate (funding costs), commitment fees, service fees (upfront, 0.5 bps per year), margin: 5 - 75 bps[e]

[a]The program further included interest rate reductions and maturity extensions on existing official debt as well as the return of profits from the Securities Markets Programme by the ECB.

[b]Greek Loan Facility (summarizes the bilateral credits provided by the Euro area countries in the first bailout program)

[c]Only applied to credits under the Greek Master Financial Assistance Facility Agreement, but not to Private Sector Involvement and bond interest facilities, which represent 25% of the total EFSF credits.

[d]The planned raise in the margin of 200 basis points on credits from the buyback operation in December 2012 was waived in 2016.

[e]E.g. loans: 10 bps, precautionary financial assistance: 35 bps, financial assistance for direct recapitalization of institutions: 75 bps. For details, see European Stability Mechanism (2014).

Sources: European Stability Mechanism (2017), European Stability Mechanism (2016)

Table 6: Overview Conditionality

	1st Program (2010)	2nd Program (2012)	3rd Program (2015)
Public Finances	• Target: general government deficit below 3% of GDP by 2014 • Savings from upfront measures (e.g. cut in public sector wage bill and pension outlays, VAT increase): 2.5% of GDP in 2010 • Savings through 2013 by: expenditure cuts (around 7% of GDP) and revenue increase (around 4% of GDP) • Structural fiscal reforms: pensions, health sector, tax system • Improved management of public finances • Review of debt management strategy (transparency and predictability)	• Target as primary surplus (% of GDP): −1% (2012), 1.75% (2013), 4.5% (by 2014) • Reduced public sector wage bill (savings: 1.5% of GDP by 2015) • Social spending (4% of GDP additional savings given already implemented reforms): pension reform, reduction of public health expenditures, improved targeting of benefit programs • Savings from public administration restructuring • Tax reform: budget-neutral, simplified system, broader tax base, rebalanced tax burden • Improved management of public finances (e.g. spending controls)	• Target as primary surplus (% of GDP): −0.25% (2015), 0.5% (2016), 1.75% (2017), 3.5% (2018 and beyond) • Measures: tax hikes, reduction of public spending; structural measures (in % of GDP: at least 0.75% in 2017, 0.25% in 2018) • Reform of tax codes, income tax, property tax • VAT: simplification, broader tax base • Improved management of public finances and public procurement • Social welfare: pension reform (savings: 0.25% of GDP in 2015, 1% of GDP in 2016), health care reform, implementation of reformed and targeted welfare system
Fiscal Institutions	• Improvements in tax collection • Structural reforms regarding tax compliance and administration	• Improvements in collection of taxes and social security contributions • Revenue administration reform • Dispute resolution system, anti-corruption measures, larger number of auditors, reduction of tax evasion	• Improvements in collection of taxes and social security contributions • Larger capacity of tax administration • Reduction of tax evasion
Privatization	• Review of divesting state assets • Overview of state-ownership	• Privatization of assets (such as state enterprises, concessions, real estate) • Expected total proceeds: EUR 50 billion (at least 19 billion in 2015)	• Asset Development Plan (revenues in EUR: 1.4 bn in 2015, 3.7 bn in 2016, 1.3 bn in 2017) • New Fund (target: EUR 50bn)

Financial Stability	• Extension of existing banking assistance • Independent Financial Stability Fund as safety net for bank equity • Corporate debt restructuring legislation and personal debt restructuring law • Intensified supervision by the Bank of Greece with increased resources	• Financial sector reform • Legislation and financing for bank recapitalization and resolution (estimated EUR 50 billion) • Access to central bank liquidity support • Reform of governance arrangements of Hellenic Financial Stability Fund, Hellenic Deposit & Investment Guarantee Fund and in the Bank of Greece	• Recapitalization of the banking sector and resolution of non-viable banks • Resolution of non-performing loans of the banking sector • Hellenic Financial Stability Fund: independence and reinforced governance structure • No government interventions in bank governance
Structural Reforms	• Labor market reform, increase in private wage flexibility • Strengthening of competition in markets and improved business environment • More transparency, efficiency improvements and reduction of losses of state enterprises • Improved use of EU structural and cohesion funds	• Labor market reform (target: decline in unit labor cost of about 15%); reduction of wage rigidities and non-wage labor costs, adjustment of minimum wage • Reduction of rigidities in service sector and product market • Facilitation of price flexibility, more competition in product markets • Improved business environment • More efficient judicial system	• Labor market reform, reduction of undecleared work, improvements in education and vocational training • Strengthening of competition in markets and improved business environment • Modernization and more competition in the energy market
Public Administration	• Modernization; efficiency improvements and transparency • ELSTAT: independence, improvement of statistical systems • Improved collection of general government data	• Modernization; efficiency improvements • Reform of ELSTAT governance	• Modernization, depoliticization • New Code of Civil Procedure • Anti-corruption measures • ELSTAT: independence, compliance on international stastitical standards

Note: The table provides an overview of the most central conditions listed in the memoranda of the bailout programs, see European Commission (2010), European Commission (2012), European Commission (2015).

C Numerical Algorithm

We solve the model using value function iteration. The algorithm is based on Hatchondo et al. (2010) and uses cubic spline interpolations. The equilibrium is approximated as the equilibrium of the finite-horizon economy. Iterations on the value functions, the bond price functions and the turnover probabilities are executed simulateneously.

From the optimality condition of the private sector (5), optimal labor supply can be written as function of the tax rate τ:

$$l = \left(\frac{z}{1+\tau}\right)^{\frac{1}{\psi}}. \tag{16}$$

Given equation (16) and the budget constraints (1), (2), (3) and (4), optimal private and government consumption can be determined as functions of the decision variables b' and τ.

The model is solved by the following algorithm. We define equidistantly spaced grids for international debt $b \in [\underline{b}, \overline{b}]$ and productivity $z \in [\underline{z}, \overline{z}]$. Given initial guesses for the value functions $V_{j(0)}(b,z)$, $V^R_{j(0)}(b,z)$, $V^{CB}_{j(0)}(b,z)$ and $V^D_{j(0)}(z)$, we find candidate values for $\tau_{j(0)}(b,z)$, $\tau^D_{j(0)}(z)$ and $b'_{j(0)}$ via (6), (7), (8) and (9) for every grid point $(b,z) \in [\underline{b}, \overline{b}] \times [\underline{z}, \overline{z}]$ using a global search procedure. Given these candidate values as initial guesses, optimal values are found with the FORTRAN optimization rountine BCPOL from the IMSL library. Given the initial guess, the default probability $\eta_{j(0)}(b'_{(0)}, z)$ follows from equation (11). The bond price function $q_{j(0)}(b'_0, z)$ and the turnover probabilities $P_{j(0)}(b', z)$ and $P^D_{j(0)}(z)$ are determined via equations (13), (14) and (15), respectively. The computation of expected continuation values is based on Gauss-Hermite quadrature points and weights. Expected continutation values for policies and productivity realizations which do not lie on the grid are evaluated with cubic spline interpolations. The value functions $V^R_{j(0)}(b,z)$, $V^{CB}_{j(0)}(b,z)$ and $V^D_{j(0)}(z)$ are updated given the solutions found at each grid point. We iterate until the value functions converge.

UNIVERSITY OF KONSTANZ
Department of Economics

Universitätsstraße 10
78464 Konstanz
Germany

Phone: +49 (0) 7531-88-3713
Fax: +49 (0) 7531-88-3130

www.wiwi.uni-konstanz.de/econdoc/working-paper-series/