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The impact of bailouts on political turnover and sovereign default risk

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A B S T R A C T

This paper develops a stochastic dynamic politico-economic model of sovereign debt to analyze the impact of bailouts on political turnover and sovereign default risk. 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 application to the Greek economy, we find that bailouts amplify political turnover risk, which, in turn, elevates sovereign interest spreads. While stricter conditionality fosters the probability of political turnover and sovereign default in the short run, it may mitigate political turnover and default risk in the long run. The frequency of political turnover is U-shaped in the strength of conditionality.

Keywords:
Sovereign default risk
Political turnover
Bailouts
Conditionality
Austerity

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 the risk of political 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

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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. Risk-neutral international private creditors charge a premium that reflects the endogenous probability of a political turnover as well as the endogenous default risk.

In equilibrium, the probability of political turnover is a function of the productivity state and the debt policy. Implicitly, the turnover probability is affected by the bailout decision because the provision of official loans is conditional on the implementation of the pre-specified primary surplus target, which restricts the government's borrowing choice. The policy functions suggest that the party with the lower utility cost of default is more likely to come into power when debt is 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. To highlight the interaction between bailouts and political turnover, we provide a comparison with a counterfactual economy in which official loans are not provided. Our analysis reveals that if debt is high, bailouts foster the probability that the party with the lower utility cost of default comes into power, which, in turn, raises sovereign default risk.

In a quantitative exercise we apply our theoretical framework to the Greek economy and explore how the interaction between bailouts and political turnover affects macroeconomic outcomes. To this end, we simulate our model and study the dynamics of a bailout event. In the years before the bailout, our model predicts a low sovereign interest spread and a small probability of political turnover due to good economic conditions. Because of low credit costs, the incumbent 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 the outstanding debt. Due to the increase in the sovereign interest spread, the incumbent government decides to enter a bailout program. Because official loans are conditional on the adoption of austerity policies, the incumbent government implements tax hikes and spending cuts, which raise the probability of losing power. Successively, the risk of political turnover elevates the sovereign interest spread. A comparison with the Greek bailout of May 2010 reveals that the model replicates the empirical pattern of output, consumption, and the sovereign interest spread quite well.

To quantify the impact of political risk on the sovereign interest spread during a bailout, we provide a comparison with a counterfactual economy in which political uncertainty is absent and the incumbent party remains in office forever. Our results suggest that the risk of political turnover increases the sovereign interest spread by 2 percentage points at the time of the entry into a bailout program.

In a policy analysis, we study the role of conditionality and vary the primary surplus target attached to the provision of official loans. We find that the frequency of political turnover is U-shaped in the strength of conditionality, which is driven by two opposing forces. On the one hand, fulfilling the primary surplus target is costly as it 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 in the economy, which decreases the probability that the party with the lower utility cost of default comes into power.

We show that while stricter conditionality raises the short-run risk of political turnover and sovereign default, in the long run, it mitigates sovereign default risk and political turnover 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 fully 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. Our finding that conditionality may increase the incumbent's probability of losing power is related to the recent work of Chatterjee and Eyigungor (2020) who argue that constraints on how much policies can change may generate an "incumbency disadvantage".

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. Scholl (2017) intro-

duces 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 (2019) analyze the interaction of economic growth, election probabilities, and sovereign risk premia.[1] Our paper is related to Andreasen et al. (2019) who highlight that the implementation of austerity policies is subject to political constraints. However, Andreasen et al. (2019) abstract from the role of official loans and conditionality, which is our focus here.

Third, this paper is related to the literature that studies the role of international financial institutions and the macroeconomic impact of bailouts and conditionality.[2] Ardagna and Caselli (2014) discuss the politico-economic aspects of the Greek bailouts.[3] Several papers analyze the impact of official loans on sovereign default risk using stochastic dynamic models of sovereign debt and abstracting from political uncertainty, e.g., Aguiar and Gopinath (2006), Boz (2011), Juessen and Schabert (2013), Kirsch and Rühmkorf (2017), Hatchondo et al. (2017), Pancrazi et al. (2020), and Roch and Uhlig (2018). Fink and Scholl (2016) show that bailouts prevent sovereign defaults in the short run, but may come at the cost of a larger default probability in the long run. Our analysis confirms their finding: The insurance character of bailouts induces the government to borrow more and the higher debt level raises the risk of a sovereign default. Fink and Scholl (2016) stress the opposing forces of conditionality. On the one hand, stricter conditionality reduces the probability that a government enters or remains in a bailout program such that sovereign default risk increases. On the other hand, tighter fiscal constraints lower the level of debt and mitigate sovereign default risk. In our model, similar mechanisms are at work. We contribute to this literature by studying the dynamic interaction between bailout, conditionality and political turnover. Our findings highlight that political turnover elevates the trade-offs of bailouts and conditionality in the short and long run.

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 interest spreads, bailouts, and political turnover. Moreover, we provide empirical evidence on the interplay between political outcomes and sovereign debt for a broader set of countries. In Section 3 we describe the theoretical framework. Section 4 presents the quantitative properties of the model and discusses the interaction between political turnover and conditional bailouts. Finally, Section 5 concludes.

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).[4] 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 % 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.[5] A detailed overview of the targets on the primary surplus and the austerity measures is provided in Appendix A.

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 Fig. 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

[1] In a similar vein, Novelli (2020) builds on Battaglini and Coate (2008) and introduces legislative bargaining in a quantitative model of sovereign debt and default.

[2] For a discussion of the empirical findings concerning bailout programs and conditionality we refer to the excellent survey by Bird (2007), and the references therein.

[3] 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.

[4] 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).

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

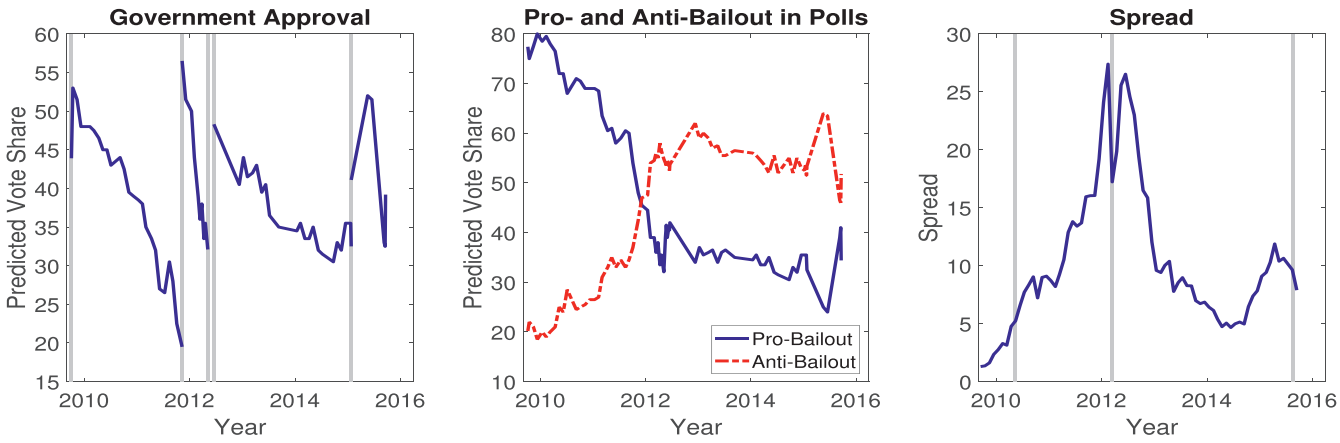

Fig. 1. Election Polls and Bond Spreads in Greece. Notes: The first two panels are based on *Public Issue* election polls from 2009 to 2015 (see http://www.publicissue.gr). Government approval refers to the predicted percentage vote share of the parties which are part of the government. The shaded areas mark government turnovers. The second panel shows the predicted percentage vote share of the parties approving (solid line) and refusing (dash-dotted line) 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. The shaded areas mark the dates of approval of the bailout programs.

the first bailout package in parliament.[6] This government finalized the agreement on the 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 rejecting 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.[7] 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 Fig. 1). Spreads dropped in March 2012 after the 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. Econometric evidence

The narrative evidence on the events in Greece supports the view that there is a dynamic interaction between political outcomes, sovereign default risk, and conditional bailouts. Similar experiences have been made in emerging market economies. For example, in the early 2000s, Argentina went through a major sovereign debt crisis. To prevent a default, the IMF provided financial assistance, but, in return, expected the Argentine government to comply to conditionality and to implement fiscal consolidation policies. The incumbent president Fernando de la Rua imposed austerity measures, but lost political support and resigned in December 2001. The interim president Adolfo Rodriguez Saa immediately declared a sovereign default.[8]

To provide descriptive evidence on the interplay between political outcomes, sovereign default risk, and bailouts in emerging economies, we consider Argentina, Brazil, and Ecuador, and plot a proxy for government popularity (dashed line) together with the sovereign spread (solid line) in Fig. 2.[9] We follow Herrera et al. (2020) and use the sub-indicator "government stability" of the International Country Risk Guide (ICRG) database,[10] which measures the government's ability to

[6] The third supporter, the small right-wing Popular Orthodox Rally (LAOS), left the coalition in February 2012 in protest against the austerity policy.

[7] 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 in, e.g., Dinas and Rori (2013) and Karyotis and Rüdig (2015).

[8] For an overview see Hatchondo et al. (2010).

[9] Here, we follow Scholl (2017) who provides similar plots to highlight the interaction between political outcomes and sovereign default.

[10] The ICRG database is provided by the Political Risk Service group.

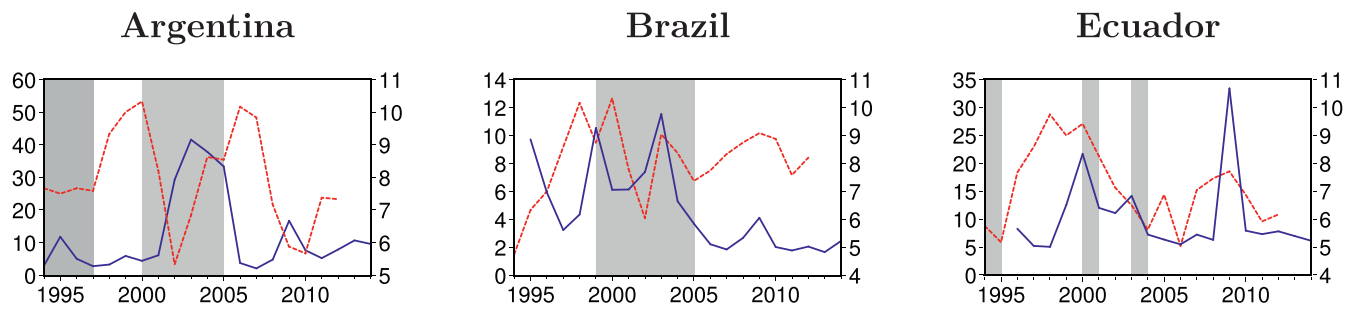

Fig. 2. Political Stability, Sovereign Default Risk, and Bailouts in Emerging Markets. Notes: This figure shows the ICRG sub-indicator "government stability" (dotted line, right axis, index between 0 and 12) together with the country-specific EMBI global spread in % (solid line, left axis). The gray shaded areas highlight the episodes in which the countries used financial assistance from the IMF (Argentina: 3/92 - 3/96, 4/96 - 1/98, 3/00 - 1/03, 1/03 - 8/03, 9/03 - 1/06; Brazil: 12/98 - 9/01, 9/01 - 9/02, 9/02 - 3/05; Ecuador: 5/94 - 12/95, 4/00 - 12/01, 3/03 - 4/04).

carry out its declared programs and its ability to stay in office. The shaded areas highlight financial assistance programs provided by the IMF between 1995 and 2015. Outright defaults occurred in Argentina in January 2002 and in Ecuador in 1999. Fig. 2 suggests that typical emerging market economies such as Argentina, Brazil, and Ecuador face high and volatile interest rates on sovereign debt, which is a well-know fact (Neumeyer and Perri (2005), Arellano (2008)). Importantly, financial assistance is frequently used by emerging market economies and bailouts tend to be associated with declines in government stability.

There is an empirical literature that goes beyond the narrative and descriptive evidence and performs econometric analyses of the link between sovereign default risk and political outcomes, 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. Manasse and Roubini (2009) find that the probability of a debt crisis increases if an election takes place. In a recent contribution, Herrera et al. (2020) consider a large sample of countries and find econometric evidence that government popularity as measured by the ICRG sub-indicator "government stability" is a significant predictor of debt crises in emerging economies. The empirical study of Mian et al. (2014) suggests that political opponents gain power while the position of the incumbent weakens in the aftermath of sovereign debt crises.

To prevent sovereign defaults, international financial institutions provide bailouts in return for conditionality. Typically, governments are required to implement austerity measures, which may generate political risk. While 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. In contrast to the previous literature, Hübscher et al. (2020) conduct survey experiments in a sample of European countries and find that the re-election probabilities of governments decrease substantially when they implement austerity measures. In a related study, Ponticelli and Voth (2020) 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.

The link between IMF or World Bank financial assistance programs and political stability has received less attention in the literature. Bienen and Gersovitz (1985, 1986) report several cases in which the implementation of austerity policies generated political instability in the short run. 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.

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.[11] 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

[11] Exogenous one-time utility costs of default are also considered in, e.g., Roch and Uhlig (2018) and Müller et al. (2019).

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, $\mathcal{Z}=[\underline{z},\bar{z}]\subset\mathbb{R}_+$, and to follow a Markov process with transition function $\mu(z',z)$.

The government has access to incomplete international financial markets and can issue non-contingent one-period bonds b, with $b<0$ denoting debt. International private creditors are risk-neutral, have perfect information about the stochastic processes in the economy, and borrow at the risk-free interest rate 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 return, the incumbent government is required to adopt austerity measures and 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. This assumption reflects the ongoing debate on whether Greece will be able to repay its large amount of official debt. In particular, in its January 2013 report, the IMF expresses the need for further fiscal transfers or a substantial haircut on official debt (IMF, 2013).[12] Moreover, the largest share of official loans is provided by the EU and can be interpreted as bilateral loans, which are junior to IMF loans, according to Schlegl et al. (2019). 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 faces 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:

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

We assume that the price of official loans is given by:

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

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 provides an interest rate reduction for a fraction of the existing debt. 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.[13]

[12] For a further discussion see, e.g., Avgouleas et al. (2018). For the case of Greece, Schumacher and Weder di Mauro (2015) suggest to restructure the official debt by extending grace periods and lowering interest rates. They find a potential need for additional measures due to future liquidity problems.

[13] The constraint $(b'-\lambda b)\leq 0$ rules out that the government borrows from official creditors but saves on private international financial markets.

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:

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

The primary surplus target implies that the borrowing policy of the incumbent government is constrained during a bailout program.[14]

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. 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, accounting for the utility cost of default as well as the probability of 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 and the probability of 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.

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:

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

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:

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

subject to

$$\begin{aligned} g + q_j\big(b',z\big)b' &= \tau c + b \\ (1+\tau)c &= z f(l) \\ -\tfrac{u_l(c,l)}{u_c(c,l)} &= \tfrac{z f_l(l)}{(1+\tau)}. \end{aligned}$$

[14] In a recent contribution, Hatchondo et al. (2020) consider alternative fiscal rules, which impose a limit on borrowing to reduce either the level of debt ("debt-brake rule") or the sovereign spread ("spread-brake rule") below an exogenous threshold. We specify a target on the primary surplus because we can calibrate it using the actual conditions attached to the Greek bailouts in 2010, 2012, and 2015, see Table 6 in Appendix A.

$\overline{V}_j(b', z')$ denotes the value function of party j if the opponent is in office next period and is defined in Section 3.3. $P_j(b', z)$ 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:

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

subject to

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

Note that if the government makes use of a bailout program, the borrowing policy b' is constrained by the primary surplus target. Consequently, the bailout decision affects the probability of political turnover.

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

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

subject to

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

$P_j^D(z)$ 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 Section 3.3.

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:

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

$\eta_{-j}(b',z)$ 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). There is a continuum of individuals who are not affected by these utility costs, but differ in stochastic idiosyncratic ideological biases, which are independent from economic policy. At the end of each period, an individual i evaluates the realization of her idiosyncratic ideological bias against her expected benefit of having the opponent $-j$ rather than the incumbent j in office next period. An individual i is in favor of a political turnover, if her expected continuation value associated with the opponent's policies is larger than her expected continuation value associated with the incumbent's policies and the ideological bias.

Let $V_j^P(b,z)$ denote the value function of the population net of the idiosyncratic ideological biases if party j is in power. $V_j^P(b,z)$ can be derived from the life-time utility of the households associated with the policies of party j:

$$\begin{aligned} V_j^P(b,z) &= (1-\alpha)u(c_j(b,z), l_j(b,z)) + \alpha v(g_j(b,z)) \\ &\quad + \beta\Bigg((1-P_j(b'_j(b,z),z))\int_{z'} V_j^P(b'_j(b,z),z')\mu(z',z)dz' + P_j(b'_j(b,z),z)\int_{z'} V_{-j}^P(b'_j(b,z),z')\mu(z',z)dz'\Bigg), \end{aligned} \tag{14}$$

where $g_j(b,z)$ and $b'_j(b,z)$ denote the optimal policy choices of incumbent j and $c_j(b,z)$ and $l_j(b,z)$ denote the policy functions of private consumption and labor supply if party j is in power. $P_j(b'_j(b,z),z)$ is the probability of a political turnover if incumbent j implements the borrowing policy $b'_j(b,z)$.

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.

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. These distributional assumptions allow us to calculate the probability of a political turnover as a function of the borrowing policy b' and productivity z.

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

$$\begin{aligned} P_A\big(b',z\big) &\equiv Prob_\omega\Big[\pi_A\big(b',z,\omega\big) > \xi\Big] \\ &= \frac{1}{2} + \Omega\left(\frac{\frac{1}{2}-\xi}{\phi} + W\big(b',z\big)\right). \end{aligned} \tag{15}$$

Equation (15) shows that the probability of 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 faced by incumbent A is given by:

$$P_A^D(z) = \frac{1}{2} + \Omega\left(\frac{\frac{1}{2} - \xi}{\phi} + W^D(z)\right), \tag{16}$$

where

$$\begin{aligned} W^D(z) \equiv\ & \theta\left(\int_{z'} V_B^P(0,z')\mu(z',z)dz' - \int_{z'} V_A^P(0,z')\mu(z',z)dz'\right) \\ & +\ (1-\theta)\left(\int_{z'} V_B^{P,D}(z)\mu(z',z)dz' - \int_{z'} V_A^{P,D}(z)\mu(z',z)dz'\right). \end{aligned}$$

and

$$\begin{aligned} V_j^{P,D}(z) =\ & (1-\alpha)u\left(c_j^D(z), l_j{}^D(z)\right) + \alpha v\left(g_j^D(z)\right) \\ & + \beta\left(\left(1 - P_j^D(z)\right)\left[\theta\int_{z'} V_j^P\left(0,z'\right)\mu\left(z',z\right)dz' + (1-\theta)\int_{z'} V_j^{P,D}\left(z'\right)\mu\left(z',z\right)dz'\right]\right. \\ & \left. + P_j^D(z)\left[\theta\int_{z'} V_{-j}^P\left(0,z'\right)\mu\left(z',z\right)dz' + (1-\theta)\int_{z'} V_{-j}^{P,D}\left(z'\right)\mu\left(z',z\right)dz'\right]\right), \qquad j = A, B, \end{aligned} \tag{17}$$

$g_j^D(b,z)$ denotes the optimal policy choice of incumbent j, and $c_j^D(b,z)$ and $l_j^D(b,z)$ denote the policy functions of private consumption and labor supply if incumbent j is in a bad credit standing. $P_j^D(z)$ is the probability of a political turnover if incumbent j is in a bad credit standing.

3.3. Equilibrium definition

The recursive equilibrium for the small open economy is defined as

1. a set of policy functions for private consumption $c_j(b,z)$, $c_j^D(z)$, and labor supply $l_j(b,z)$, $l_j^D(z)$, $j = A, B$,
2. a set of policy functions for borrowing $b_j'(b,z)$, government spending $g_j(b,z)$, $g_j^D(z)$, and the tax policy $\tau_j(b,z)$, $\tau_j^D(z)$, $j = A, B$,
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 $V_j(b,z)$, $V_j^R(b,z)$, $V_j^{CB}(b,z)$, $V_j^D(z)$, $\overline{V}_j(b,z)$, $\overline{V}_j^D(z)$, $V_j^P(b,z)$, $V_j^{P,D}(z)$, $j = A, B$,

such that:

1. Taking as given the public sector policies, private consumption $c_j(b,z)$, $c_j^D(z)$, and labor supply $l_j(b,z)$, $l_j^D(z)$ satisfy the household's budget constraint (1) and the optimality condition (5).
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 $P_j(b',z)$, $P_j^D(z)$, 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 $\mathcal{D}_j(b)$, the policy functions $b_j'(b,z)$, $g_j(b,z)$, $g_j^D(z)$, $\tau_j(b,z)$, $\tau^D(z)$ solve (6), (7), (8), (9), (10), and (12).
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 (15), and $P_B(b',z) = 1 - P_A(b',z)$; the turnover probability $P_A^D(z)$ fulfills equation (16), and $P_B^D(z) = 1 - P_A^D(z)$.
5. The value functions of the population $V_j^P(b,z)$, $V_j^{P,D}(z)$ are given by equations (14) and (17).
6. Given the policy choices of the opponent $-j$, $\overline{V}_j(b,z)$ and $\overline{V}_j^D(z)$ solve

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

and

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

4. Quantitative analysis

4.1. Calibration

In our quantitative analysis, we apply our model to the Greek economy, considering the time period from 1998 to 2016. In the following, we specify the functional forms and calibrate the parameters to match specific empirical targets. Table 1 summarizes the calibration strategy and differentiates between the externally and internally calibrated 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:

$$u(c,l) = \frac{\left(c - \frac{l^{1+\psi}}{1+\psi}\right)^{1-\gamma}}{1-\gamma},$$

$$v(g) = \frac{g^{1-\gamma}}{1-\gamma},$$

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 calibrated internally to match the average ratio of government consumption to private consumption of 31.24%. The annual risk-free interest rate of 3.2% 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 internally to match the standard deviation of the annual Greek GDP between 1998 and 2016.

In our model, entering a bailout program allows the incumbent 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 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 A. 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 A). 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.

Table 1
Calibration to the Greek Economy.

	Parameter	Value	Source/Target
Externally calibrated parameters			
γ	Relative risk aversion	2.0	Standard value
ψ	Inverse labor supply elasticity	0.455	Mendoza (1991), Neumeyer and Perri (2005)
r^f	Risk-free rate	0.032	Mean interest on German 10-year government bonds
θ	Redemption probability	0.25	Gelos et al. (2011)
ρ_z	Productivity	0.83	Autocorrelation of real GDP
λ	Share of official debt	0.71	Share of public debt owed to official creditors in 2015
$1/q^* - 1$	Official interest rate	0.037	Mean spread between official loans and risk free rate
ζ	Conditionality constraint	0.0192	Mean primary surplus target
ξ	Vote threshold for turnover	0.6940	Mean government approval prior to a political turnover
Internally calibrated parameters			
α	Public good weight	0.77	Mean ratio of government to private consumption
β	Discount factor	0.87	Bailout participation rate
η	Asymmetric output cost	0.94	Mean improvement in budget balance after entering bailout
χ_A	Default utility cost, party A	0.6	Mean sovereign spread
χ_B	Default utility cost, party B	0.2	Standard deviation of sovereign spread
ϕ	Idiosyncratic ideology	9	Political turnover frequency during bailouts
σ_ϵ	Standard deviation of ϵ	0.015	Standard deviation of real GDP

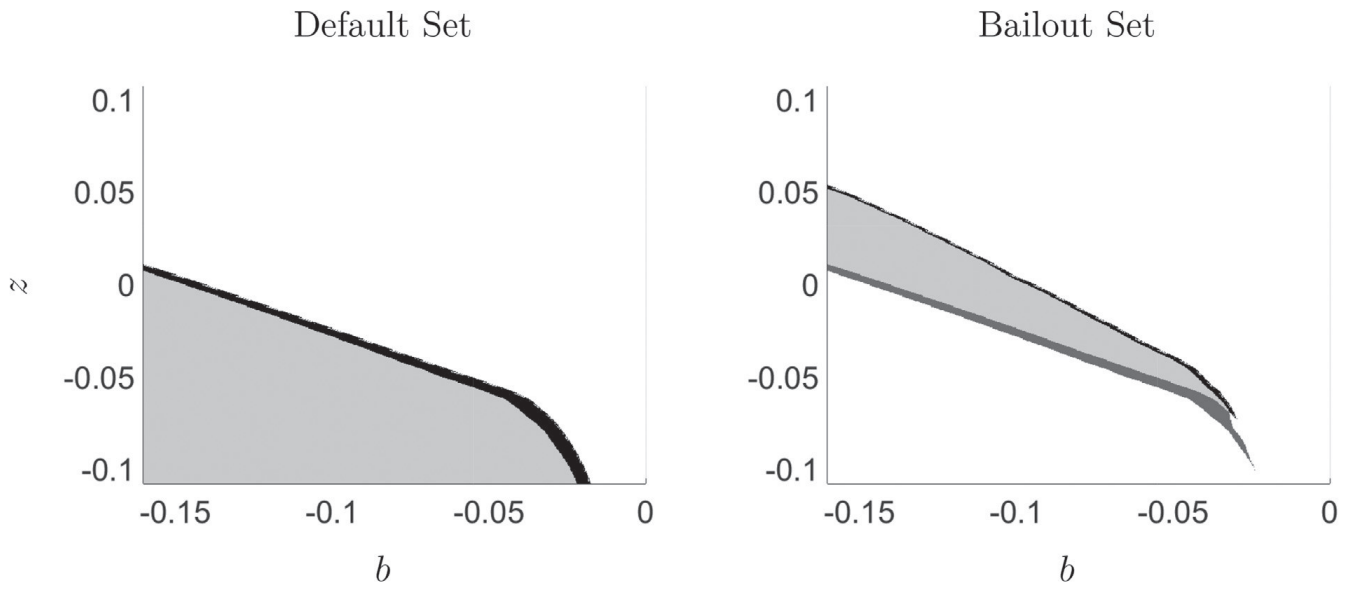

Fig. 3. Default Set and Bailout Set. Notes: This figure displays the default set and the bailout set for the benchmark calibration. The light gray area displays the combinations of productivity z and debt b for which parties A and B both choose to default (left panel) or to make use of a bailout (right panel). The dark gray area (black area) refers to combinations of productivity z and debt b for which only party A (B) chooses to default (left panel) or to make use of a bailout (right panel).

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 externally 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 internally to match the following four targets. First, our model simulations replicate the empirical mean and volatility of the sovereign interest 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,[15] 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 whether to enter/remain in a bailout program or to default on all outstanding debt obligations. Fig. 3 presents the default set and the bailout set. In the left panel the light gray area displays the combinations of productivity z and debt b for which a default is optimal for both parties A and B. In the black area only party B defaults. The light gray area in the right panel refers to combinations of z and b for which both parties choose a bailout. In the dark gray area (black area) only party A (party B) uses financial assistance. Clearly, default is optimal for adverse productivity realizations and high debt levels. In contrast, at intermediate states, the government makes use of a bailout program accepting conditionality as a constraint on its fiscal policy. 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 exits a bailout program by

[15] 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.

defaulting at lower levels of debt and less adverse productivity realizations than party *A*. On the other hand, party *B* enters a bailout at combinations of *b* and *z* for which party *A* finds it optimal to repay debt without financial assistance.

Fig. 4 plots the bond price functions and the political turnover probabilities as functions of borrowing b' if party *A* (solid black lines) or party *B* (solid gray 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 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 higher 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. Whenever the parties choose the same policies, the turnover probability converges to 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 larger turnover probability than party *A* because it faces greater credit costs such that it has to choose a higher tax rate and a lower level of government consumption.[16] 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 policymakers 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 Fig. 4 plot the optimal borrowing decisions of incumbent party *A* (solid black line) and *B* (solid gray 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 Fig. 3, 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 Fig. 4 refer to a counterfactual economy 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.

It turns out that the presence of bailouts intensifies the pattern of the turnover probability. If productivity is low, bailouts make it more likely that party *A* stays in power for low and medium levels of debt, while bailouts increase party *A*'s probability of losing power if debt is high. The underlying mechanism is as follows. The existence of bailout programs provides insurance and reduces credit costs, which increases party *A*'s popularity in regions of debt in which default is not optimal for either party. In contrast, if the government is severely indebted, party *A* is more likely to make use of a bailout program than party *B* who prefers to default instead. Because official loans come at the cost of conditionality requiring tax hikes and spending cuts, more households find a political turnover from party *A* to party *B* beneficial.

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 column of Table 2 summarizes the business cycle statistics of the Greek data. We consider the time period from 1998 to 2016 and HP-filter the relevant time series with a smoothing parameter of 100. In column (2), we report the cyclical properties of our simulated benchmark economy. To provide a meaningful comparison with the data, out of a simulation of 1 million years[17] 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.

Overall, the model provides a good description of the cyclical characteristics of the Greek economy. In particular, the targeted statistics such as the volatility of output, the mean of the sovereign interest spread, the bailout participation rate, and the mean ratio of public to private consumption are well matched. In line with the data, the sovereign interest spread is very volatile, however, the model slightly overstates the standard deviation. As reported in the literature, e.g., Arellano (2008) and Cuadra et al. (2010), the sovereign interest 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

[16] Note that this result is in line with Scholl (2017) who finds a similar pattern for a vote threshold of 50%.

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

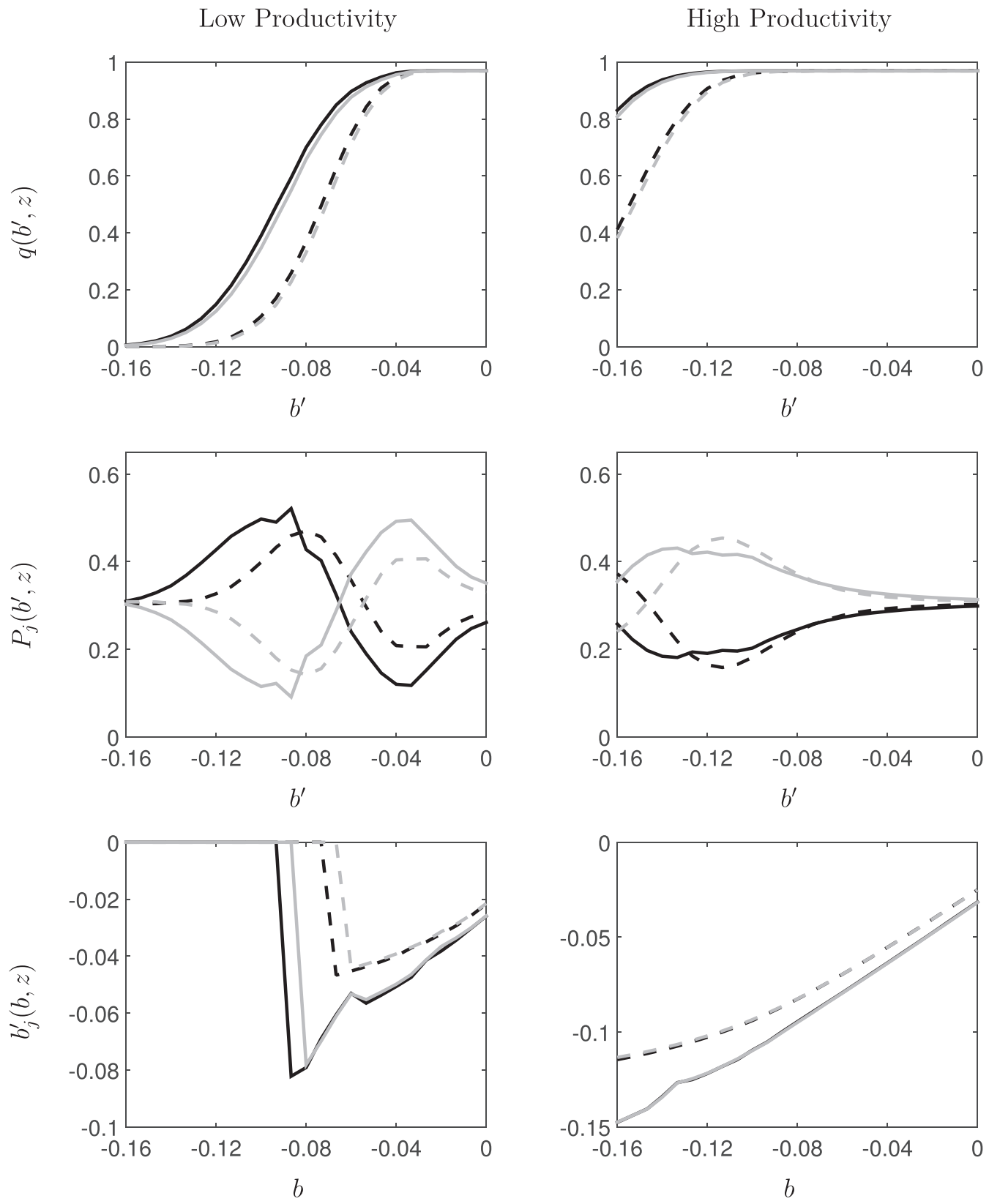

Fig. 4. Bond Prices, Political Turnover and Borrowing: Bailout vs. No Bailout. Notes: In the upper panels, the black (gray) lines represent the bond prices and turnover probabilities of incumbent party A (B) for different borrowing choices b'. In the lower panels, the black (gray) lines represent the 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.

Table 2
Business Cycle Statistics.

	Data	Benchmark	No Bailout	No Political Turnover			
				With Bailout		No Bailout	
				Party *A*	Party *B*	Party *A*	Party *B*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$\boldsymbol{\sigma(y)}$	5.14	5.14	5.12	5.09	5.11	5.14	5.09
$\sigma(c)/\sigma(y)$	1.02	1.11	1.08	1.11	1.11	1.08	1.08
$\sigma(g)/\sigma(y)$	0.88	1.51	1.53	1.48	1.55	1.52	1.51
$\boldsymbol{E(g/c)}$	31.24	31.53	31.36	31.52	31.47	31.35	31.37
$\rho(c,y)$	0.96	1.00	1.00	1.00	1.00	1.00	1.00
$\rho(g,y)$	0.87	0.97	0.97	0.98	0.97	0.97	0.97
$\rho(s,y)$	−0.54	−0.59	−0.75	−0.60	−0.63	−0.75	−0.75
$\boldsymbol{\sigma(s)}$	5.62	6.55	1.27	5.96	5.69	1.08	1.35
$\boldsymbol{E(s)}$	4.40	4.07	1.13	3.74	3.87	0.95	1.20
$E(s)$, if party *A* is in office	–	3.97	1.08	3.74	–	0.95	–
$E(s)$, if party *B* is in office	–	4.33	1.24	–	3.87	–	1.20
Mean budget balance (% of output)	−6.73	−0.46	−0.11	−0.46	−0.41	−0.11	−0.11
Mean budget balance, if party *A* is in office	–	−0.60	−0.16	−0.46	–	−0.11	–
Mean budget balance, if party *B* is in office	–	−0.16	−0.03	–	−0.41	–	−0.11
Mean improvement of budget balance in bailout	1.84	2.16	–	2.14	2.69	–	–
Mean $P(b',z)$, if party *A* is in office	–	20.25	21.17	0.00	–	0.00	–
Mean $P(b',z)$, if party *B* is in office	–	41.35	40.06	–	0.00	–	0.00
Frequency party *A* in office	–	69.43	66.33	100	–	100	–
Political turnover frequency, overall	21.05	26.58	27.51	–	–	–	–
Political turnover frequency, during bailouts	28.57	28.78	–	–	–	–	–
Mean bailout probability	36.84	36.41	–	36.42	34.89	–	–
$E(\lambda b/y)$ during bailouts	126.26	13.68	–	13.82	12.64	–	–
$E(1/q - 1/q^*)$ during bailouts	9.81	8.64	–	8.01	7.93	–	–
Welfare effect of bailouts in consumption equivalents	–	1.22	–	1.12	1.09	–	–

Notes: Column (1) is based on annual OECD and IMF data and considers the time period from 1998 to 2016. y, c, g refer to output, private consumption, and 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 %. Columns (2) to (7) are based on a simulation of 1 million years where the first 100 years are omitted. Column (2) 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. Column (3) refers to a counterfactual economy in which no bailout option is available. Columns (4) and (7) refer to the model without political turnover. All statistics refer to averages across simulated episodes. The targets in our calibration strategy are highlighted in bold.

budget deficit of the Greek government, but it replicates the improvement of the budget balance after entering the bailout programs.[18] We calculate the mean improvement of the budget balance as the difference between the budget balance during bailouts (−1.13% of output) and episodes without financial assistance (1.03% of output).[19] Our calibration strategy targets the average frequency of political turnover during bailout episodes, which amounts to 28%. If we consider the complete time period, the turnover rate drops to 26%.[20]

The model predicts that bailout episodes are characterized by a higher frequency of political turnover, which is in line with the Greek experience. Note, however, that the increase in political turnover is underestimated by the model. In line with the policy functions shown in Fig. 4, party *A* faces a lower sovereign interest spread than party *B*. Consequently, party *A* is less borrowing constrained and issues more debt, which is reflected in larger budget deficits. Because of lower credit costs, party *A* is more often in power and faces a lower probability of losing power than party *B*.

To study the impact of bailouts on sovereign default risk and political turnover, we report the statistical properties of the counterfactual economy in which bailouts are not provided (column (3)). In line with the policy functions shown in Fig. 4, in the counterfactual economy, higher sovereign default risk translates into higher credit costs making the government borrowing constrained. Therefore, the mean budget deficit is smaller than in our benchmark economy. Similar to Fink and Scholl (2016) and Kirsch and Rühmkorf (2017), our analysis shows that the insurance character of bailouts reduces credit costs, which allows the government to accumulate more debt such that the sovereign spread increases in general equilibrium. Whereas in the counterfactual economy without bailouts the sovereign spread is 1.13%, the sovereign spread equals 4.07% if bailouts are available. While bailouts may prevent sovereign defaults in the short run, they substantially raise sovereign default risk in the long run (see also Fink and Scholl (2016)).

[18] 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.

[19] In our simulations, for the calibrated targets during bailouts, we consider bailout episodes of at least 7 consecutive years.

[20] 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.

As seen in Fig. 4, the impact of bailouts on the probability of political turnover depends on the amount of borrowing. The borrowing policy, in turn, is affected by the conditions attached to the provision of official loans, i.e., the constraint on the primary surplus. A comparison of the invariant distributions of the benchmark economy and the counterfactual economy reveals that bailouts decrease party A's and increase party B's probability of losing power. Consequently, in the benchmark economy, party A is more often in power and the overall political turnover rate is lower compared to the counterfactual economy in which bailouts are not available. This result, however, depends on the strength of conditionality. In the benchmark economy, conditionality requires the incumbent government to implement a primary surplus target of 1.92%. In Section 4.5 we will see that weak conditionality, i.e., a lower primary surplus target, allows more borrowing and raises the overall political turnover rate compared to the counterfactual economy in which no bailouts are available.

To assess the welfare effects of bailouts, we compare the lifetime utility of the population in the benchmark economy and the counterfactual economy in which bailouts are not provided. We follow Durdu et al. (2013) and calculate the welfare gain as the equivalent variation in consumption net of disutility of labor Δ, given as

$$\Delta = \left(\frac{V^0(*)}{V^0(\circ)} \right)^{\frac{1}{(1-\sigma)}} - 1,$$

where V^0 denotes the expected lifetime utility of the population, and '$*$' and '$\circ$' refer to the model with access to official financial assistance and the model without bailouts, respectively. For the benchmark calibration, bailouts raise welfare of the households by 1.22%, measured in consumption equivalents. Note that this welfare analysis abstracts from potential losses of official creditors. To assess these costs, we consider the bailout episodes in our simulations and report two additional statistics: first, the amount of financial assistance during a bailout as a percentage share of output, and, second, the difference between the interest rate on private debt and the interest rate on official debt in percentage points. On average, official loans equal 13.68% of output. During bailouts, the interest rate differential amounts to 8.64 percentage points, which is slightly lower than the empirical value of 9.81 percentage points. These findings indicate that high potential losses of official creditors may dampen the overall positive welfare effects.

4.4. The dynamics of bailouts and political turnover

In this section, we study the interaction between bailouts and political turnover. We proceed in two steps. First, we analyze the dynamics of the economy in a bailout episode and compare it to the data. Second, we analyze the role of political turnover risk by studying the properties of a counterfactual economy in which political uncertainty is absent and the incumbent party remains in office forever.

First, we set up an event study that reproduces 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. Fig. 5 presents the macroeconomic dynamics around the 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 interest spread, and the turnover probability are displayed in %. '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. The good economic conditions imply a low sovereign interest spread. The government can keep the tax rate at a moderate level such that the probability of political turnover is small. 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 and raises the sovereign interest 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 political turnover increases and the percentage of cases in which party A is still the incumbent after entering the bailout program drops. Since party B is more often in power and party B is more likely to default, the sovereign interest spread rises even further. Note that the conditionality attached to the bailout generates an "incumbency disadvantage" as in Chatterjee and Eyigungor (2020). In a model of partisan politics, Chatterjee and Eyigungor (2020) show that constraints on changing policies reduce the re-election probability of the incumbent.

Overall, the model matches the Greek pattern of output, private consumption, public spending, and the sovereign interest spread quite well. In particular, the model is in line with the fact that Greece experienced low sovereign interest spreads and positive growth rates of GDP, private consumption, and government consumption prior to the bailout of 2010. Moreover, the model replicates the fact that political turnover rates were low until 2009 and substantially increased after the government entered the bailout program. In line with the data, the model predicts that the sovereign interest spread rises during the bailout. However, quantitatively, the increase is underestimated. The model replicates the improvement in the primary surplus after entering a bailout program, but fails to match its absolute 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. Moreover, as argued by Dovis and Kirpalani (2020), fiscal rules may be difficult to enforce. Therefore, in

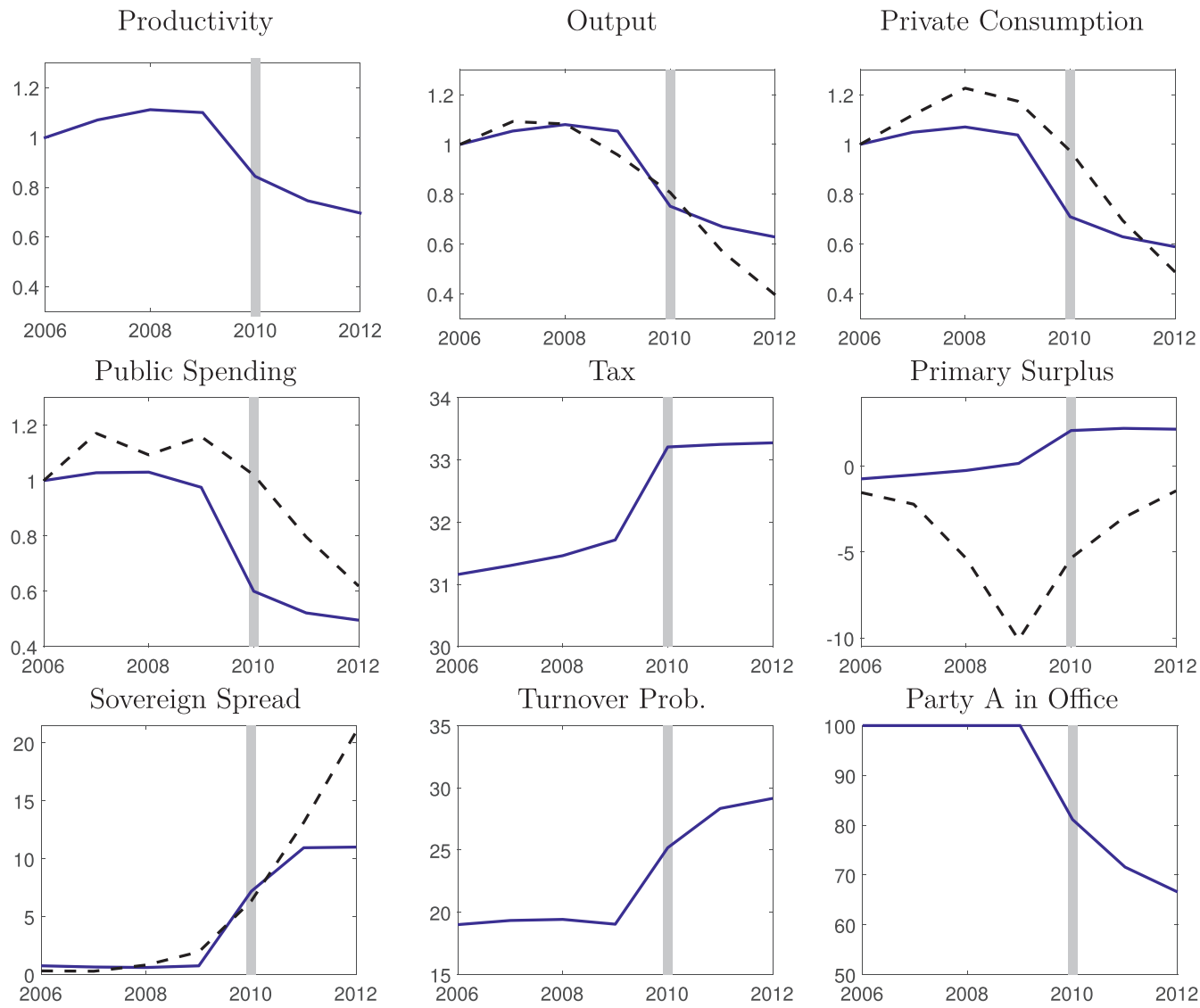

Fig. 5. Event Analysis: Bailout. Notes: The solid lines consider bailout episodes out of a model simulation of 1 million years, where the first 100 are cut off. Only episodes are considered in which party *A* has been in office during the four years prior to the bailout. The bailout lasts for at least 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 interest spread, the tax rate, and the turnover probability are displayed in %. The primary surplus is given as percentage share of output. 'Party *A* in office' is the percentage share of cases in which party *A* is in power.

Section 4.5, we vary the parameterization of the primary surplus target and study how the strength of conditionality affects the variables of interest.

To study the role of political turnover during a bailout episode and to quantify the impact of political risk on the sovereign interest spread, we proceed by considering a counterfactual economy in which the incumbent party remains in power forever with certainty. Fig. 6 considers a productivity realization of 3.6% below the trend and displays the policy functions of the economy without political turnover (dashed lines) in comparison with the policy functions of the benchmark economy (solid lines). The policy functions reveal that for a given b', the absence of political turnover risk reduces party *A*'s credit costs. Party *B*, however, defaults at lower levels of debt and faces a higher sovereign interest rate compared to the benchmark economy.

In columns (4) and (5) of Table 2 we report the cyclical properties of the invariant distribution if party *A* or party *B* is in power forever. In line with the policy functions, without political turnover risk, party *A* faces on average a lower sovereign interest spread than party *B*. Moreover, the average sovereign interest spread is lower compared to the benchmark economy in which parties face the risk of losing power.[21] Note that the impact of endogenous political turnover on the business cycle

[21] In the absence of political turnover risk, the average sovereign interest spread of party *B* is lower than in the benchmark economy because with endogenous political turnover party *B* comes into power in bad economic times in which credit costs are high.

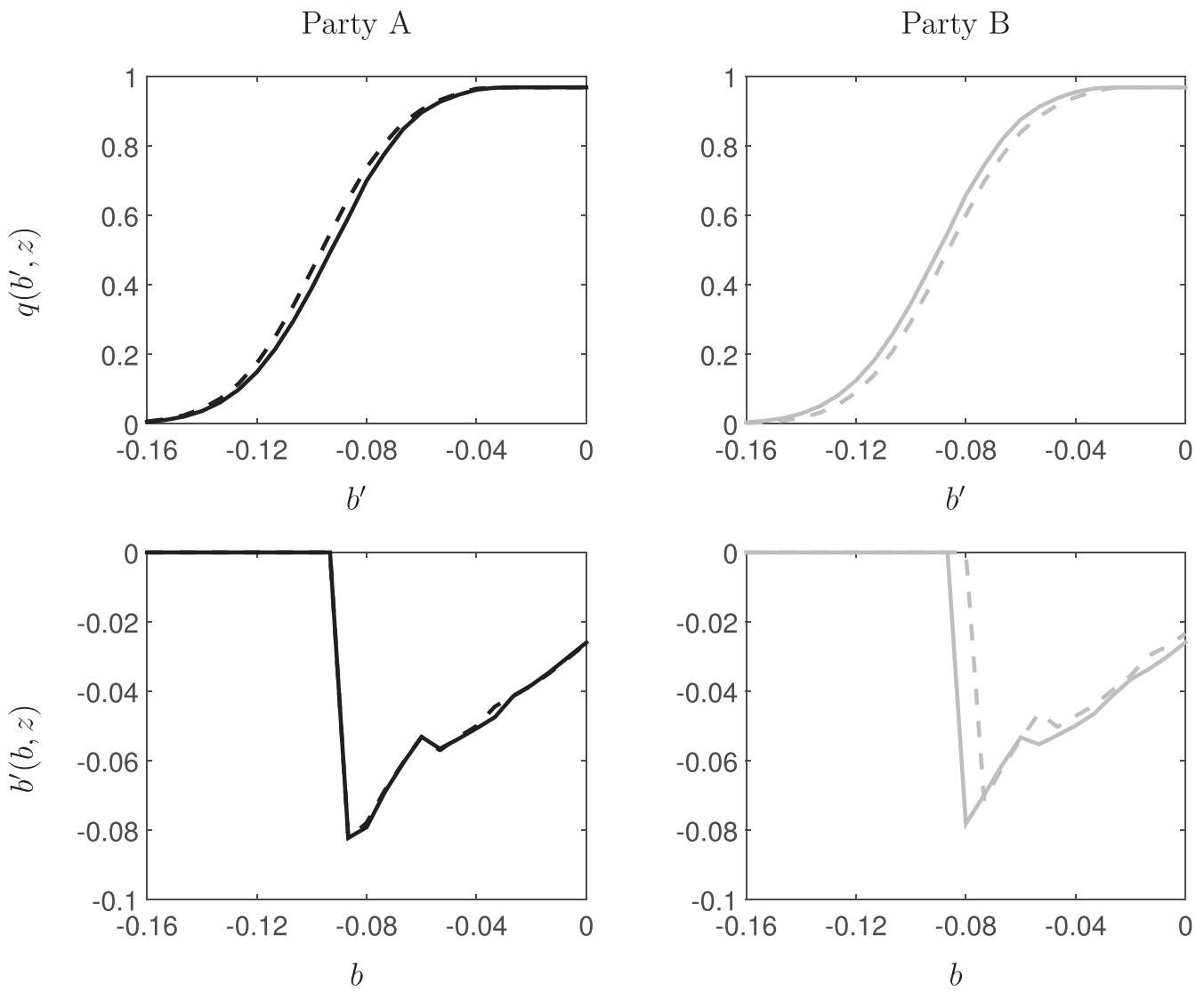

Fig. 6. Bond Prices and Optimal Borrowing: The Role of Political Turnover. Notes: In the upper panels, the black (gray) lines represent the bond prices of incumbent party A (B) for different borrowing choices b'. In the lower panels, the black (gray) lines represent the optimal borrowing policies of incumbent party A (B). Solid (dashed) lines refer to the benchmark model (the model without political turnover). All panels refer to productivity 3.6% below the trend.

statistics is minor. This is not surprising since the cyclical properties are based on time periods in which the country is in a good credit standing. In this model, political turnover becomes crucial during debt crises and bailout episodes.

To quantify the impact of political turnover on the sovereign interest spread during a bailout, we consider the following scenario. As initial situation, we take the average level of debt of our benchmark economy and assume that party A is in power. We simulate 100,000 different productivity series and select the ones for which party A makes use of a bailout at time $t = 0$ and continuously stays in power for the subsequent 10 years. We then feed these productivity series into the counterfactual economy in which party A does not face political turnover risk and stays in power forever. We simulate the two economies and display the dynamics in Fig. 7. For the benchmark economy (solid lines) and the counterfactual economy (dashed lines) we show the percentage of cases in which party A remains in the bailout program and the percentage of cases in which party A chooses to default. We also report the sovereign interest spread and the political turnover probability of party A.

In a first step, we focus on the counterfactual economy in which party A does not face any political risk and stays in power forever. In this economy, the sovereign spread is solely determined by the default risk associated with party A. Clearly, the sovereign spread decreases during the bailout because conditionality requires the government to run a primary surplus and to reduce debt. This finding is in line with Fink and Scholl (2016) who study the role of bailouts and conditionality in the absence of political risk. In a second step, we consider the benchmark economy, which allows for political turnover risk. In this economy, the sovereign spread is not only determined by the default risk associated with party A, but also by the probability of a political turnover and the default risk associated with party B. Note, however, that in Fig. 7 political turnovers do not take place since we consider only those simulations in which party A remains in office. As in the counterfactual economy, the sovereign spread decreases during the bailout. However, entering a bailout increases party A's

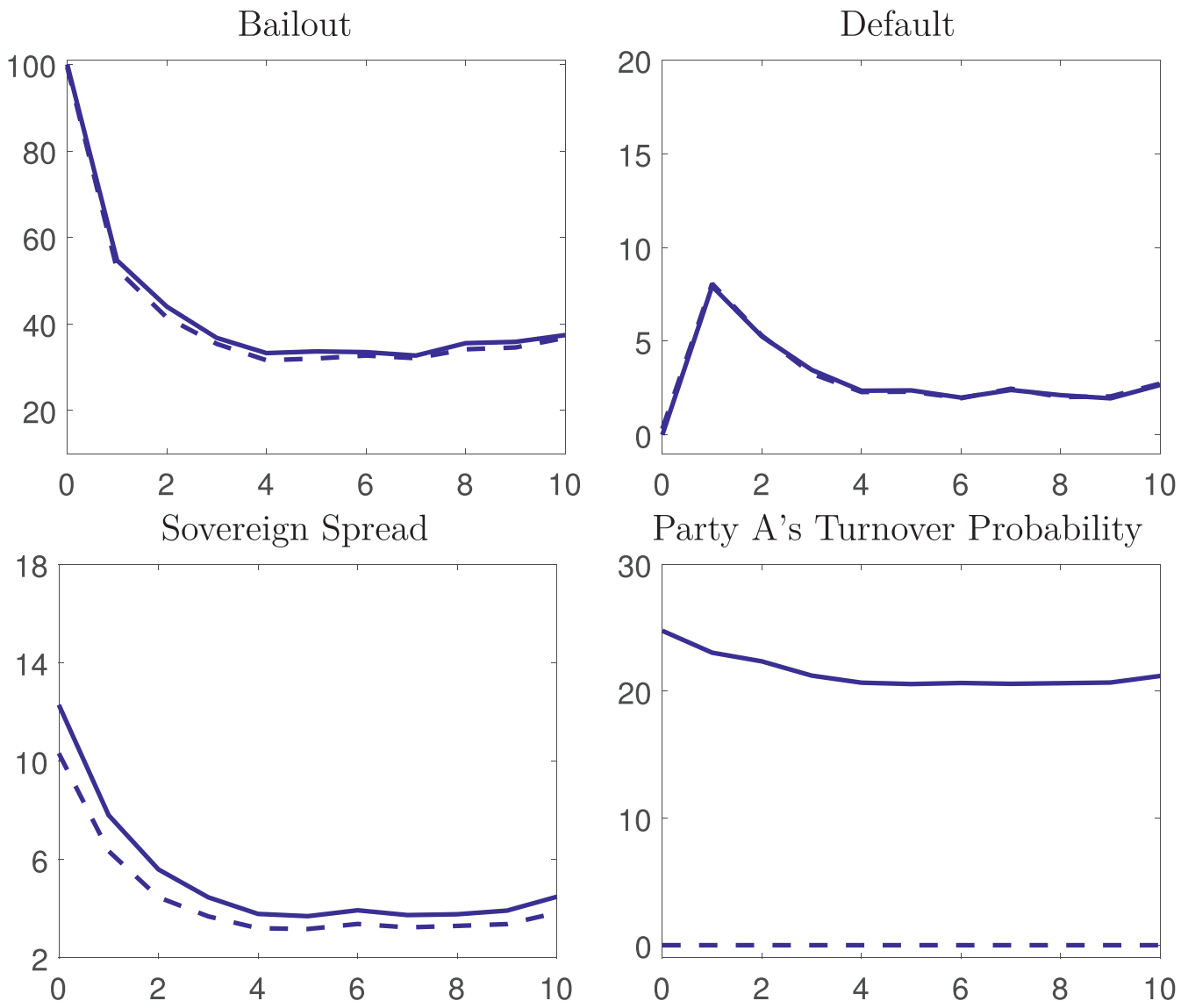

Fig. 7. Political Turnover and Bailouts. Notes: As initial situation, this figure considers the average level of debt of the simulated benchmark economy and party *A* as incumbent. Out of a simulation of 100,000 different productivity series those are selected for which party *A* chooses a bailout at time $t = 0$ and continuously stays in power for the subsequent 10 years. These productivity series are fed into a counterfactual economy in which there is no political turnover and party *A* stays in office forever. The figure shows the percentage of cases in which party *A* remains in the bailout program, the percentage of cases in which party *A* chooses to default, the sovereign interest spread in %, and party *A*'s probability of losing power in %. Solid (dashed) lines refer to the benchmark economy (counterfactual economy without political turnover risk).

probability of losing power, which is reflected in an increase in the sovereign spread. Compared to the counterfactual economy without political uncertainty, the risk of a political turnover from party *A* to party *B* elevates the sovereign interest spread by 1.97 percentage points at date $t = 0$.

4.5. The impact of conditionality on sovereign default risk and political turnover

In this section, we study how the strength of 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 sovereign default risk and political turnover in the long run. Finally, we analyze how the tightness of the fiscal constraint affects the bailout decision and political turnover risk in the short run.

Fig. 8 considers $\zeta = 0$ and $\zeta = +0.03$ and presents the bailout set. The light gray area displays the combinations of productivity z and debt b for which a bailout is optimal for both parties *A* and *B*. In the dark gray area (black area) only party *A* (*B*) uses financial assistance. Clearly, stricter conditionality shrinks the bailout set, implying that default is chosen at lower levels of debt and for higher productivity realizations (white area below the bailout set).

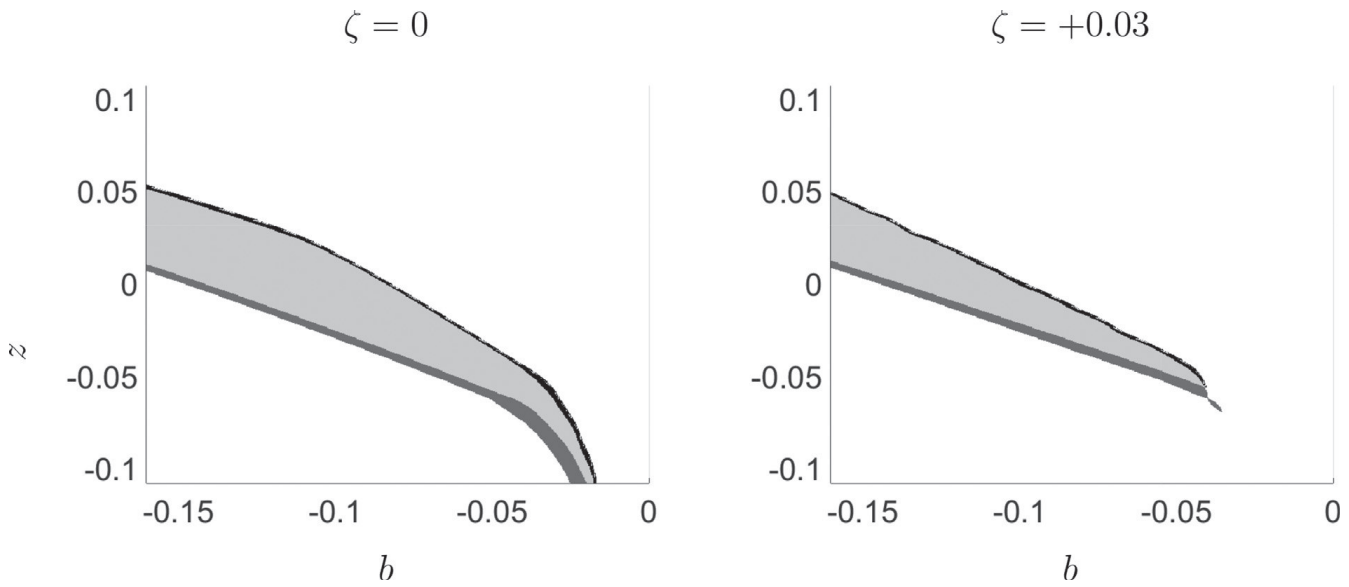

Fig. 8. Bailout Set: $\zeta = 0$ vs. $\zeta = +0.03$. Notes: This figure considers $\zeta = 0$ and $\zeta = +0.03$ and shows the bailout set. The light gray area displays the combinations of productivity z and debt b for which both parties A and B make use of a bailout. The dark gray area (black area) refers to combinations of productivity z and debt b for which only party A (B) uses a bailout.

In Fig. 9 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 lines). The left (right) column refers to the policy functions if party A (B) is the incumbent. 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 sovereign 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 Fig. 10 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 interest spread, the share of cases in which party A is in power, the average frequency of political turnover, the amount of official debt as % of output, and the welfare measure for primary surplus targets between -4% and $+8\%$ of output. In line with Fig. 8, 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 Fig. 9 that for a given level of borrowing international private creditors charge a higher premium if conditionality becomes stricter. However, the simulated sovereign interest spread shown in Fig. 10 decreases as the primary surplus target 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. A lower level of debt reduces the default probability and, hence, the sovereign interest 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 Fig. 9 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 because it 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 number of cases in which party A is in power decreases. Fig. 10 reveals that the second effect dominates if conditionality becomes very severe.

The lower right panel of Fig. 10 shows the welfare gain of the households for different degrees of conditionality. Conditional bailouts generate welfare gains of up to 1.67%, measured in consumption equivalents. Stricter conditionality decreases the welfare gain since the government reduces its bailout participation. The lower left panel considers the costs of the international financial institution and shows the average amount of official debt in % of output during bailouts. Financial assistance follows a U-shaped pattern in the strength of conditionality. On the one hand, a tighter constraint on the primary surplus reduces debt and lowers the required amount of official loans. On the other hand, severe conditionality makes financial assistance less attractive and the government only enters a bailout program if debt is high and a large amount of official loans is required.

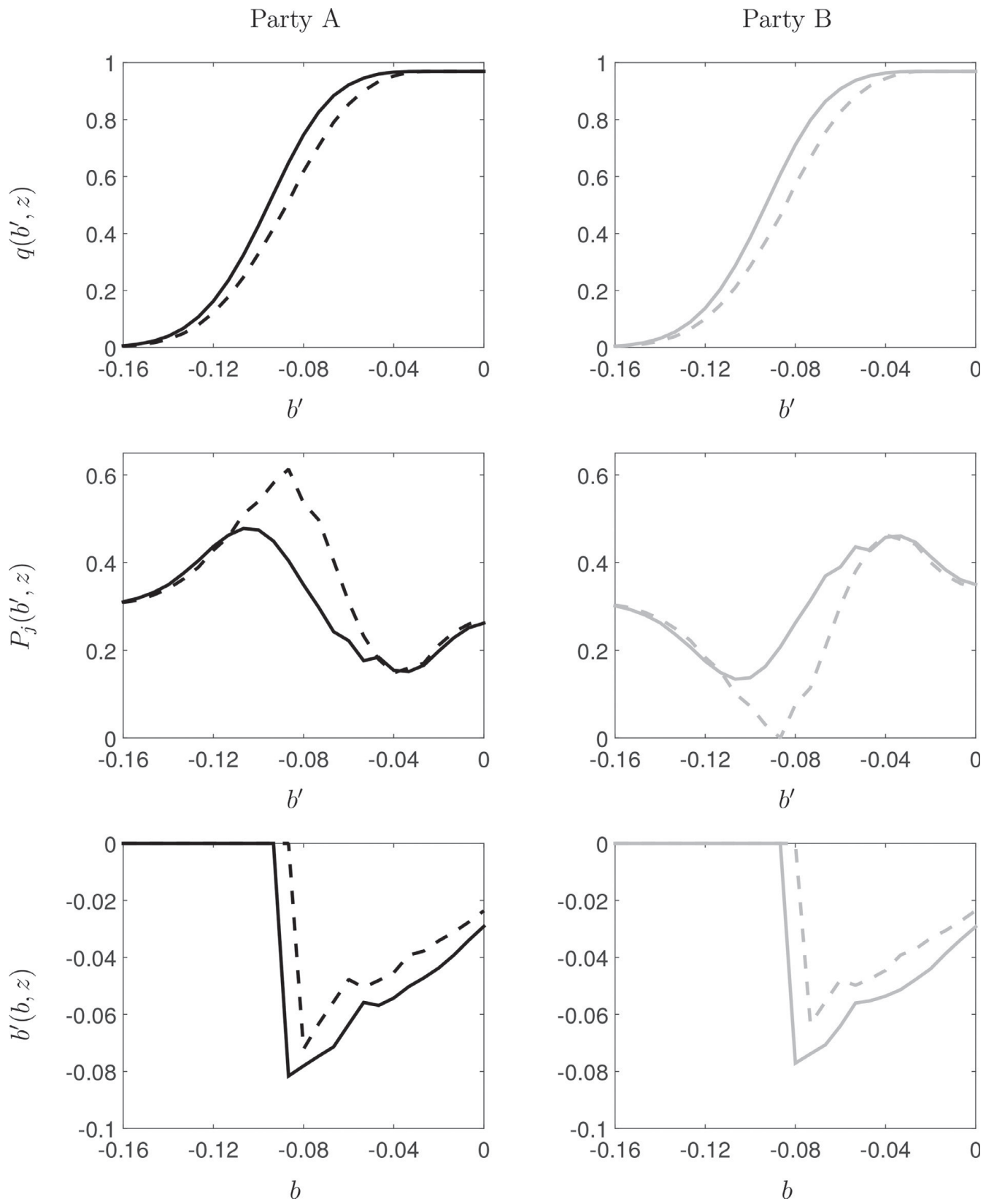

Fig. 9. Bond Prices, Political Turnover and Optimal Borrowing: The Role of Conditionality. Notes: In the upper panels, the black (gray) lines represent the bond prices and turnover probabilities of incumbent party A (B) for different borrowing choices b'. In the lower panels, the black (gray) lines represent 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.

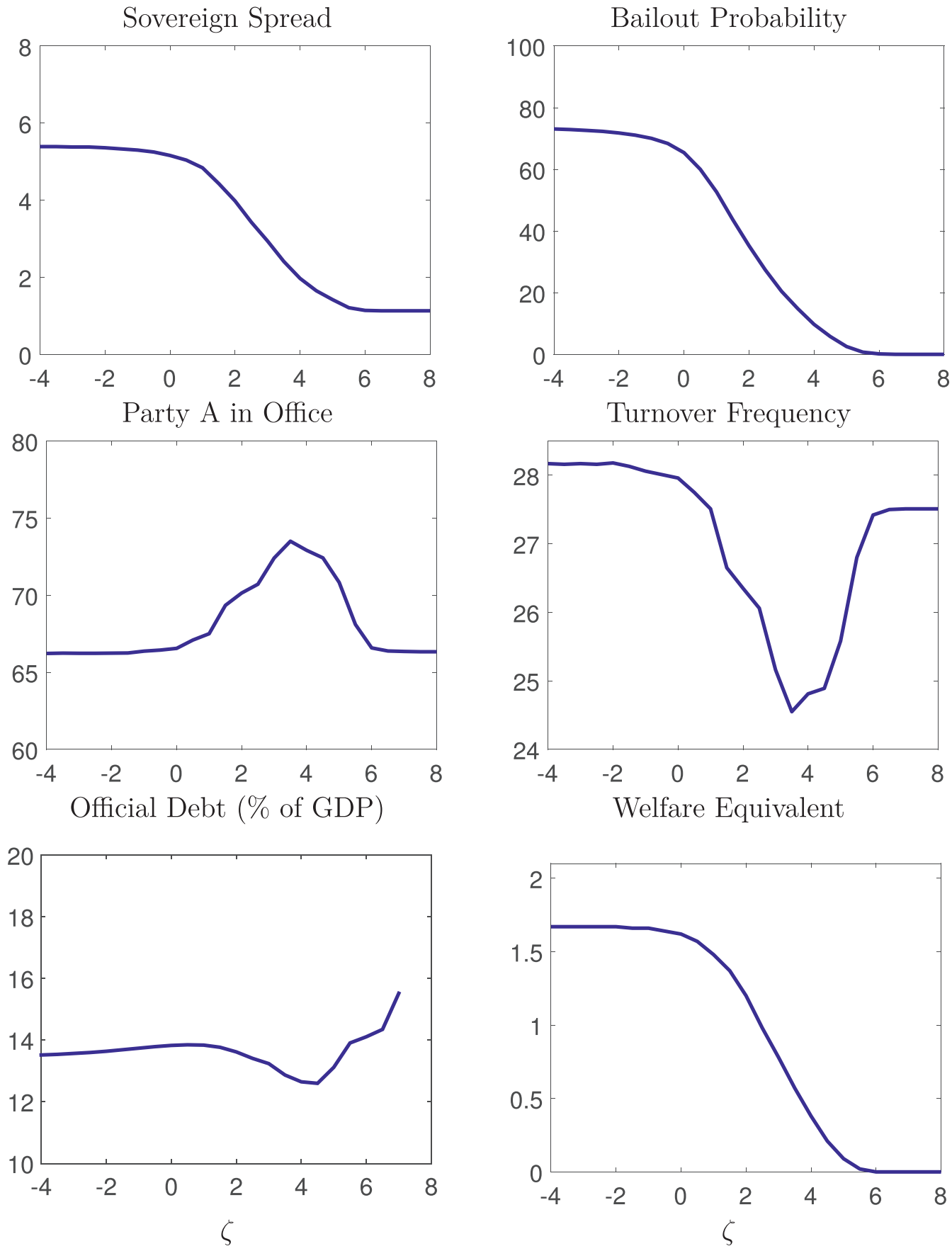

Fig. 10. The Impact of Conditionality. Notes: This figure is based on a simulation of 1 million years where the first 100 years are omitted. Out of the simulation, episodes are considered in which party *A* is initially in office and the country is in a good credit standing for at least 19 consecutive years. The figure displays the average turnover probability, the mean sovereign interest spread, the share of party *A* in office, the average bailout probability, the official debt as share of output during bailouts, and the equivalent variation in consumption relative to the model without bailouts for different degrees of conditionality ζ. All variables are denoted in percentage values.

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.

The previous analysis has focused on the invariant distribution of the economy and has highlighted the long-run impact of conditionality. To study how stricter conditionality affects sovereign default risk and political turnover in the short run, we consider the following scenario. As initial situation, we take the average level of debt of our benchmark economy and assume that party A is in power. We simulate 100,000 different productivity series and select the ones for which party A makes use of a bailout at time $t = 0$. We then feed these productivity series into the model assuming weak conditionality ($\zeta = 0$) and severe conditionality ($\zeta = +0.03$). We simulate the model for 10 years and display the dynamics in Fig. 11. For the economy with weak conditionality (solid lines) and the economy with severe conditionality (dashed lines) we show the pattern of debt and the percentage of cases in which party A is in power. We differentiate the cases in which party A and party B are in power and report the percentage of cases in which the parties make use of bailout programs, and the percentage of cases in which they default. We also report the sovereign interest spread and the political turnover probability faced by party A and party B when in power.

Stricter conditionality implies that party A is required to implement higher tax hikes and larger spending cuts at date $t = 0$. Since party B is more willing to default rather than meeting the costly conditions, party A faces an increased risk of losing office at $t = 0$. Stricter conditionality amplifies the probability of a political turnover from A to B. The increased probability that party B gains power raises the sovereign interest spread faced by party A at date $t = 0$. However, a tighter restriction on the primary surplus reduces the level of debt, which, in turn, has mitigating effects on political turnover and sovereign default risk in the medium and long run. Fig. 11 highlights that while stricter conditionality fosters a political turnover from party A to party B and raises the probability of sovereign default in the short run, it reduces political and sovereign risks in the long run.

Our findings are in a similar spirit as Fink and Scholl (2016) who stress the opposing forces of conditionality. On the one hand, stricter conditionality reduces the probability that a government enters or remains in a bailout program such that sovereign default risk increases. On the other hand, tighter fiscal constraints lower the level of debt and mitigate sovereign default risk. Our analysis suggests that political turnover crucially affects the interaction between conditionality and sovereign default risk because it fosters the trade-off between the short run and the long run.

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 in Appendix A. 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 sovereign interest 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 interest 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 faces a lower default utility cost, party B is less reluctant

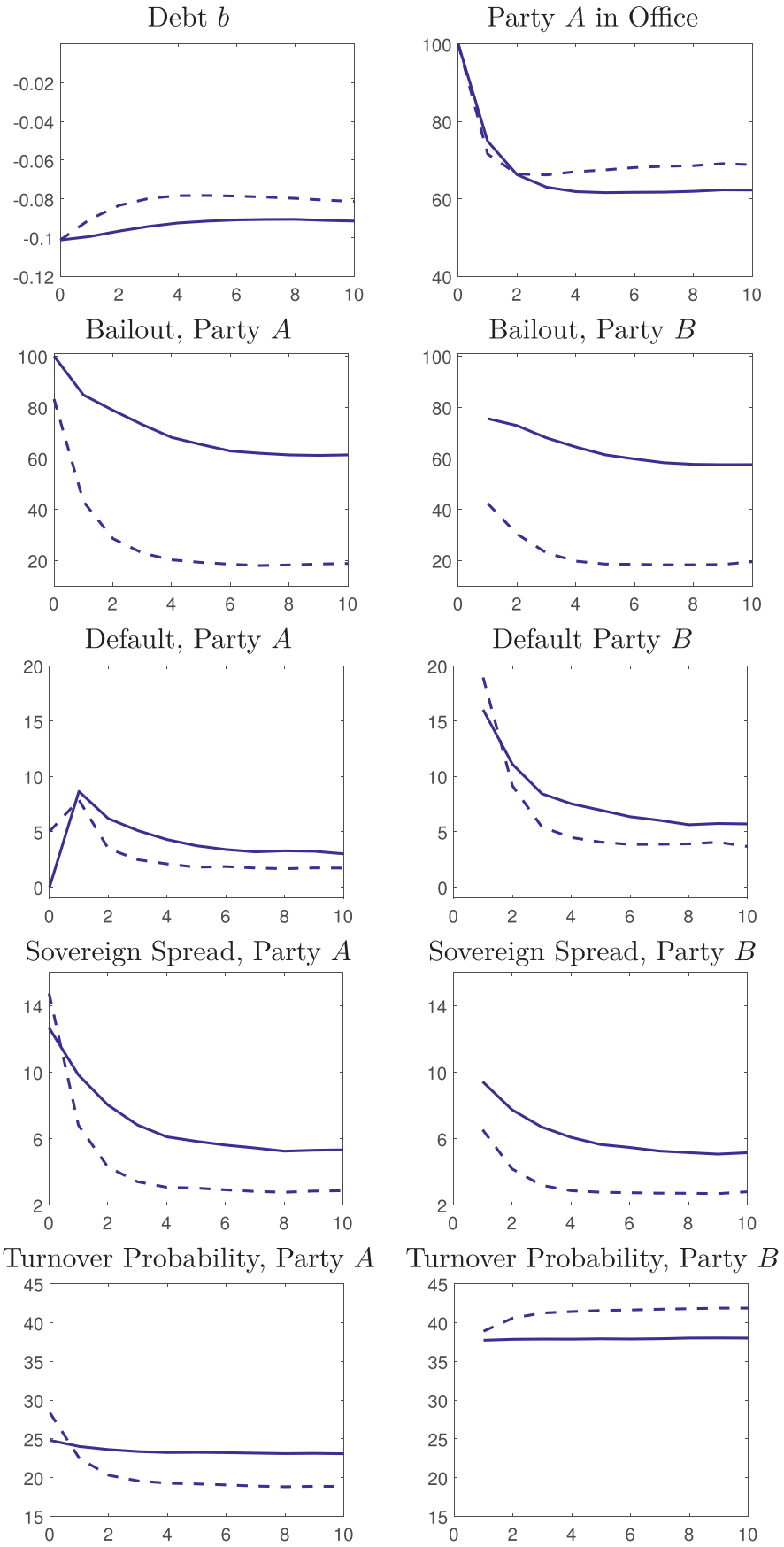

Fig. 11. Political Turnover and Conditionality. Notes: As initial situation, this figure considers the average level of debt of the simulated benchmark economy and party A as incumbent. Out of a simulation of 100,000 productivity series those are selected for which party A chooses a bailout at time $t = 0$. These productivity series are fed into an economy with weak conditionality ($\zeta = 0.00$, solid lines) and an economy with strict conditionality ($\zeta = 0.03$, dashed lines). The figure shows the dynamics of debt b, the percentage of cases, in which party A is in power, the percentage of cases in which party A and party B choose a bailout, the percentage of cases in which party A and party B default, the sovereign spread that party A and B face and the parties' probability of losing power.

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.

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 political turnover.

In a quantitative exercise we have applied our theoretical framework to the Greek economy. Our findings suggest that if debt is high, bailouts foster the probability that the party with the lower utility cost of default comes into power, which, in turn, raises sovereign default risk. 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 the outstanding 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 raises the probability of political turnover. In turn, the risk of political turnover elevates the sovereign interest spread by 2 percentage points at the time of the entry into a bailout program.

We have studied the role of conditionality and have highlighted that the frequency of political turnover is U-shaped in the tightness of the primary surplus target. Importantly, stricter conditionality increases the probability of political turnover and sovereign default in the short run, but it may mitigate political turnover and default risk in the long run. 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.

One can think of several interesting extensions of our theoretical framework. In our analysis, we have focused on short-term debt to keep the model tractable. However, recent contributions have highlighted the importance of debt maturity in the context of sovereign debt crises, e.g., Arellano and Ramanarayanan (2012) and Hatchondo and Sosa-Padilla (2016). In an application to the euro zone crisis, Bocola and Dovis (2019) explore the likelihood of self-fulfilling rollover crises in an economy in which the government can issue debt of multiple maturities. Dvorkin et al. (2020) and Mihalache (2020) focus on the role of maturity extensions in sovereign debt restructurings. Asonuma et al. (2018) show that haircuts are larger for short-term debt than for long-term debt. Incorporating endogenous maturity choices in our politico-economic setup seems to be a promising extension to improve our understanding of the interaction between debt restructuring and political turnover.

In our theoretical framework we have modeled conditionality as an exogenous constraint. In practice, conditionality is the outcome of negotiations between the government and the official creditors. It is a particularly interesting avenue for future research to study conditionality as the outcome of a bargaining process in an economy with endogenous political outcomes.

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Appendix A. 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 of the conditions that Greece was required to fulfill.

Table 5
The Economic Adjustment Programs for Greece.

	1st program 2010	2nd program 2012	3rd program 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: ~ 3.96%	EFSF: guarantee fees canceled, 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	• Target as primary surplus (% of GDP): −1% (2012), 1.75% (2013), 4.5% (by 2014)	• Target as primary surplus (% of GDP): −0.25% (2015), 0.5% (2016), 1.75% (2017), 3.5% (2018 and beyond)
	• Savings from upfront measures (e.g. cut in public sector wage bill and pension outlays, VAT increase): 2.5% of GDP in 2010	• Reduced public sector wage bill (savings: 1.5% of GDP by 2015)	• Measures: tax hikes, reduction of public spending; structural measures (in % of GDP: at least 0.75% in 2017, 0.25% in 2018)
	• Savings through 2013 by: expenditure cuts (around 7% of GDP) and revenue increase (around 4% of GDP)	• Social spending (4% of GDP additional savings given already implemented reforms): pension reform, reduction of public health expenditures, improved targeting of benefit programs	• Reform of tax codes, income tax, property tax
	• Structural fiscal reforms: pensions, health sector, tax system	• Savings from public administration restructuring	• VAT: simplification, broader tax base
	• Improved management of public finances	• Tax reform: budget-neutral, simplified system, broader tax base, rebalanced tax burden	• Improved management of public finances and public procurement
	• Review of debt management strategy (transparency and predictability)	• Improved management of public finances (e.g. spending controls)	• 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	• Improvements in collection of taxes and social security contributions	• Improvements in collection of taxes and social security contributions
	• Structural reforms regarding tax compliance and administration	• Revenue administration reform	• Larger capacity of tax administration
		• Dispute resolution system, anti-corruption measures, larger number of auditors, reduction of tax evasion	• Reduction of tax evasion
Privatization	• Review of divesting state assets	• Privatization of assets (such as state enterprises, concessions, real estate)	• Asset Development Plan (revenues in EUR: 1.4 bn in 2015, 3.7 bn in 2016, 1.3 bn in 2017)
	• Overview of state-ownership	• Expected total proceeds: EUR 50 billion (at least 19 billion in 2015)	• New Fund (target: EUR 50bn)

(*continued on next page*)

Table 6 (*continued*)

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

Notes: 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).

Appendix B. Numerical Algorithm

We solve the model using value function iteration. The algorithm is based on Hatchondo et al. (2010) and uses spline interpolations of the value functions. 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 simultaneously.

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

$$l = \left(\frac{z}{1+\tau}\right)^{\frac{1}{\psi}}. \tag{18}$$

Given equation (18) 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 $b \in [\underline{b}, \bar{b}]$ and productivity $z \in [\underline{z}, \bar{z}]$. 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 $(b,z) \in [\underline{b}, \bar{b}] \times [\underline{z}, \bar{z}]$ using a global search procedure. Given these candidate values as initial guesses, optimal values are found with the FORTRAN optimization routine 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), (15) and (16), respectively. The computation of expected continuation values is based on Gauss-Hermite quadrature points and weights. Expected continuation 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.

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