Fiscal Policy: Financing and Indebtedness*

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Abstract

We conduct a large-scale information randomized controlled trial to study fiscal policy impacts. Surveying approximately 9,000 households across five eurozone countries with varying debt-to-GDP ratios enables a clean cross-country comparison. The key finding is that the fiscal multiplier depends jointly on the financing method and the country's debt burden: multipliers are smaller in high-debt countries when debt-financed but remain similar across countries when tax-financed. Finally, we develop a New Keynesian model featuring fiscal discipline, which reproduces the empirical patterns observed in the survey and highlights their underlying economic mechanisms.

Keywords: survey RCT, fiscal multiplier, financing method, debt-to-GDP ratio
JEL codes: C83, D84, E62, H60

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"Global public debt could increase to 100 percent of global gross domestic product by the end of the decade if current trends continue."

— IMF Fiscal Monitor, May 2025

1 Introduction

Global public debt has soared to unprecedented levels since World War II, raising urgent questions about whether fiscal stimulus remains effective when governments' fiscal capacity is constrained. Yet, while much research has examined the aggregate effects of government stimulus, little attention has been paid to how these effects depend on the method of financing, taxes versus debt, and a country's existing debt burden.

To address this gap, we conduct a large-scale informational randomized controlled trial (RCT) in the five largest eurozone countries, which span a wide range of debt-to-GDP ratios. This design enables a uniquely clean and consistent comparison of fiscal policy effectiveness across financing methods and governments' fiscal capacity, which is infeasible with observational data. We show that the interaction between financing method and a country's debt burden is crucial for determining fiscal multipliers. Our results offer new policy guidance for governments confronting limited fiscal capacity and considering new borrowing.

To implement this design, we conduct a new large-scale survey of a representative sample of about 9,000 households across the five largest eurozone economies: Germany, France, Italy, Spain, and the Netherlands, with similar sample sizes in each country.

Our survey design leverages four key features. First, these countries span a wide range of debt-to-GDP ratios, from 56% to 139%. Second, they operate under a common monetary policy set by the European Central Bank. Third, we field a harmonized survey instrument across all countries. Fourth, the treatment groups receive a standardized hypothetical fiscal shock. Together, these features enable credible causal inference on how fiscal policy

effectiveness varies with fiscal capacity across countries.

During the information treatment stage, all participants were provided with information about their country's average debt-to-GDP ratio. Participants were then randomly assigned to one of three groups, resulting in balanced samples across groups by size and key demographic and financial characteristics. The control group received no fiscal policy information, while the two treatment groups were each told to consider a hypothetical 5% of GDP increase in government spending. The distinction between the two treatment groups was the financing method: one was told the spending would be funded through additional public debt, and the other through higher income taxes.

By holding the stimulus size constant and varying only the financing method between two treatment groups, our design allows us to cleanly identify how different financing methods shape households' macroeconomic expectations. Further, holding the fiscal scenario constant across countries yields a clean comparison across nations operating under different fiscal capacities.

We elicit expectations about inflation, GDP growth, interest rates, and personal consumption both before and after the intervention, providing a direct measure of how individuals revise their beliefs in response to the fiscal shock.

We begin by comparing the effects of debt- and tax-financed stimulus, and a puzzle emerges: while debt- and tax-financed spending have similar effects at the one-year horizon, debt-financed spending leads to larger upward revisions in GDP expectations over five years. This five-year divergence is linked to differences in expected consumption. Specifically, tax-financed fiscal expansions lead to stronger crowding out of expected household spending, both durables and non-durables, than debt-financed expansions.

Next, a key finding of our study is that the effectiveness of fiscal stimulus depends not only on the method of financing, but also, critically, on a country's debt burden. Specifically, we introduce an interaction term between the treatment dummy variables and the country's debt-to-GDP ratio in the regression specification. We find a negative

slope coefficient for debt-financed stimulus: it is significantly less effective in countries with higher debt, such as Italy and Spain, than in those with lower debt, such as the Netherlands. By contrast, the effectiveness of tax-financed policy is largely invariant to a country's debt burden. Intuitively, households take into account a country's debt burden when fiscal stimulus is debt-financed, but not when it is tax-financed. Taken together, our findings highlight the important interaction between a government's fiscal capacity and its financing method in determining the fiscal multiplier.

Consequently, debt-financed fiscal stimulus is less effective than tax-financed stimulus in high-debt countries, while the opposite holds in low-debt countries. This pattern appears at both the one-year and five-year horizons.

We then return to the puzzle and use these results to explain its underlying mechanism. Conceptually, what matters is the debt level at which the response lines for debt- and tax-financed stimulus intersect. At the sample average debt-to-GDP ratio of 94%, the two financing methods yield similar effects at the one-year horizon, while debt-financed stimulus is more effective than tax-financed stimulus at the five-year horizon. This result helps explain why, when pooling all countries, differences in fiscal multipliers for different financing methods appear inconsistent at different horizons. Importantly, this inconsistency does not fundamentally stem from the distinction between the short run and long run, but rather arises from the interaction between a country's debt level and the way stimulus is financed.

To formalize the mechanisms underlying our empirical findings, we develop a New Keynesian model featuring novel fiscal discipline. Fiscal discipline is motivated by restrictions on fiscal deficits and public debt imposed by the European Union (EU), as well as by our survey evidence showing that respondents in high-debt countries are more concerned about excessive government debt and expect higher future tax burdens. A further non-standard element of our model is proportional income taxation, which reflects the structure of our survey design and breaks Ricardian equivalence.

We model fiscal discipline through a tax rule that governs how taxes respond to past debt. Under debt financing, the strength of this response depends on fiscal capacity, measured by the distance between the long-term debt target and the steady-state debt level. When steady-state debt is higher, limited fiscal capacity forces the government to raise taxes earlier and by a larger amount, which dampens the stimulative effect of spending and results in a smaller fiscal multiplier. Conversely, when the steady-state debt level is lower, the government has greater fiscal capacity and can therefore postpone taxation, resulting in a larger fiscal multiplier.

When the government finances its spending through contemporaneous tax revenues, it does not need to be concerned about its fiscal capacity. In this case, government spending does not directly contribute to debt accumulation but affects debt dynamics indirectly through its general-equilibrium effects on output, inflation, and the interest rate.

Our model delivers a central prediction that mirrors our survey insight: under debt financing, the fiscal multiplier declines as public debt rises, whereas under tax financing it remains broadly stable. Put differently, borrowing-funded fiscal expansions are most powerful when debt levels are low, but they lose traction as debt builds up and eventually become less effective than tax-financed stimulus in high-debt economies.

The remainder of the paper, following a brief literature review, is organized as follows: Section 2 details the survey design and provides summary statistics. Section 3 examines the average information treatment effects of fiscal shocks on macroeconomic expectations, while Section 4 further explores how cross-country differences in public debt levels shape fiscal multipliers. Section 5 formalizes empirical findings in a New Keynesian model, and Section 6 concludes.

Literature Our paper contributes to the growing literature that uses information RCT to study how macroeconomic policies shape individual beliefs and expectations (see Haaland et al. (2023) for a review). Among them, several recent studies have examined the effects

of fiscal information. Roth et al. (2022) show that informing people about the actual debt-to-GDP ratio lowers support for government spending. Bianchi et al. (2025) document cross-country patterns in fiscal beliefs and show that debt information alters expectations about fiscal policy. Coibion et al. (2021) find that information on current debt has little impact, whereas news about rising future debt raises households' inflation expectations. Grigoli and Sandri (2024) extend these analyses to the U.S., U.K., and Brazil. Andrade et al. (2025) show that fiscal news increases inflation expectations among households who view fiscal space as limited. Guo et al. (2025) studies the effects of fiscal uncertainty on macroeconomic outlooks. D'Acunto et al. (2022) and Bachmann et al. (2024) study how tax change announcements in Germany affect households' inflation expectations and consumption decisions. Different from the literature, our paper centers on how financing methods interact with countries' debt levels to shape macroeconomic expectations.

Our paper also contributes to the literature studying the state-dependence of fiscal multipliers. A large body of empirical and theoretical research suggests that the fiscal multiplier at the zero lower bound can be larger than in normal times (e.g., Christiano et al., 2011; Woodford, 2011; Woodford and Xie, 2019). More recent studies find an endogenous state-dependent fiscal multiplier due to the presence of downward nominal wage rigidity (e.g., Shen and Yang, 2018; Barnichon et al., 2022; Jo and Zubairy, 2025). We add a new dimension of state dependence: fiscal multipliers vary with both the method of financing and the prevailing fiscal stance. In this sense, our paper relates to an earlier literature from the 1990s showing that deficit-financed fiscal policy can be contractionary when debt is high (e.g., Blanchard, 1990; Sutherland, 1997; Perotti, 1999). Further, Wu and Xie (2025) show that the financing method affects the fiscal multiplier due to credit constraints in a two-agent New Keynesian model. Empirically, Huidrom et al. (2020) find that fiscal multipliers tend to be smaller with weaker fiscal positions, while Pinardon-Touati (2021) shows that the debt-financed fiscal multiplier is lower when public debt strongly crowds out private borrowing. While the literature typically studies financing and debt separately,

we focus on their interaction.

Our paper also contributes to the growing literature on fiscal capacity in advanced economies. Bianchi and Melosi (2019) introduce state-dependent monetary and fiscal policy targets in a New Keynesian model. Mehrotra and Sergeyev (2021) study debt sustainability in a low interest rate environment and propose a state-dependent fiscal limit. More recent work examines the determinants of fiscal capacity (e.g., Elenev et al., 2025; Mian et al., 2025; Jiang et al., 2025). Whereas these studies examine the determinants of fiscal capacity, we document how fiscal capacity shapes the fiscal multiplier.

2 Survey Design

This section details the design and implementation of our cross-country survey experiment. We field an RCT in the five largest euro area economies: Germany, France, Italy, Spain, and the Netherlands. We highlight several distinct features. First, we leverage substantial differences in debt-to-GDP ratios across countries, which range from 56% to 139%. Second, all countries share a common monetary policy. Third, we administer a harmonized survey design in each country. Finally, treatment groups receive a standardized hypothetical fiscal shock. Together, these features provide clean identification that exploits cross-country variation in fiscal capacity to compare the effectiveness of fiscal policy.

2.1 Questionnaire

The questionnaire was administered using Qualtrics, a leading platform for global online surveys. The survey design was identical across all five countries, with only minor adaptations for country-specific references. In each country, the questionnaire was translated into the local language and thoroughly reviewed by native-speaking economists. Respondents could complete the survey in either the local language or in English, with the platform automatically defaulting to the language detected from the participant's web browser.

The survey comprised four main sections: pre-treatment beliefs, information treatment, post-treatment beliefs, and background information. The full questionnaire is provided in Appendix A; to avoid redundancy, we include only one version as a representative example.

First, we ask about households' past spending and then immediately follow up with their expectations for future spending. Next, we elicit expectations about key macroeconomic aggregates in their country, specifically inflation, GDP growth, and interest rates, over both 1-year and 5-year horizons. These questions provide a snapshot of participants' economic outlook before any additional information is introduced. An attention-check question is embedded before moving on to the next section.

After eliciting these baseline beliefs, the survey introduces the information treatment. All participants are first presented with factual information on fiscal capacity, specifically the average debt-to-GDP ratio in their country over the past decade. Participants are then randomly assigned to a control group or one of two treatment groups. Those in a treatment group are presented with a hypothetical fiscal shock, framed as a government spending increase. The two treatments differ only in the financing method: one uses additional borrowing and the other uses higher taxes. The control group does not receive any additional information. Details of these treatments are provided in Section 2.2.

Following the information treatment, participants are again asked about their expectations for inflation, GDP growth, interest rates, and personal spending. In this round, we expand the spending questions: whereas the pre-treatment module covers non-durables only, the post-treatment module includes both non-durable and durable goods. We also field a set of questions designed to shed light on the underlying mechanisms, which we use in the model section. Finally, respondents provide demographic information, including age, country of residence, household income and savings, home ownership, education, and gender.

Table 1: DEBT-TO-GDP RATIOS

Country	Debt-to-GDP Ratio (%)
Italy	138.82
Spain	106.77
France	103.19
Germany	67.11
Netherlands	55.59

Notes: Average debt-to-GDP ratios by country (percent), 2014–2023. Raw data: https://www.imf.org/external/datamapper/d@FPP.

2.2 Treatments

This section provides a detailed description of the experimental treatments, which form the core identification strategy of our survey design. All participants, including those in the control group, first received factual information about their country's average debt-to-GDP ratio over the past decade, as reported in Table 1.

They were then randomly assigned to one of three groups: a control group, a debt-financed treatment group, and a tax-financed treatment group. The control group received no further information beyond the factual national debt-to-GDP ratio. Respondents in treatment groups were asked to consider a hypothetical fiscal shock involving an increase in government spending over the next 12 months:

> *Consider the following scenario. Suppose the government decides to implement a new spending plan. Under this plan, the government will increase its spending over the next 12 months by an additional amount equal to 5% of the country's GDP, beyond what was originally planned... This change is temporary and occurs despite no changes in the government's assessment of economic conditions.*

The wording of the treatment ensures that the intervention is perceived as an exogenous, one-time fiscal shock: "new," "additional," "beyond what was originally planned," and "temporary and occurring despite no changes in the government's assessment of economic conditions."

Participants in the first treatment group (T1) were informed that the government spending increase would be entirely financed by additional government borrowing:

> *The government announces that this increase in spending will be financed by additional government borrowing... Moreover, taxes do not change in response to the increase in spending.*

Participants in the second treatment group (T2) were informed that the increase would be covered by higher income taxes rather than government debt:

> *The government announces that this increase in spending will be financed by increasing income taxes, without putting additional burdens on government debt.*

By holding the stimulus size constant and varying only the financing method, our randomization isolates the causal impact of financing method on expectations, independent of other macroeconomic factors.

2.3 Two Waves

The survey was administered in two waves by Qualtrics: November 2024 and February 2025. The second wave was designed both to double the sample size and to collect supplemental information. Specifically, Wave 1 collected participants' 12-month projections for household consumption. Preliminary findings from Wave 1 indicated that average treatment effects differed more between the two financing methods at longer horizons. Based on this insight, Wave 2 included new questions eliciting 5-year consumption expectations for both non-durable and durable goods to explore the consumption component of output. To gain further insight into the underlying mechanisms, we also included another mechanism question in Wave 2, which provides empirical motivation for our theoretical model. Minor variations in question phrasing occurred between waves, but these adjustments do not materially affect the results.

2.4 Summary Statistics

To obtain a sample representative of the general population, we set demographic quotas to align with key age and gender distributions: 30% aged 18–34, 32% aged 35–54, and 38% aged 55+, and a gender split of 48% male and 52% female.

To ensure data quality, we implement two data-cleaning steps. Qualtrics systematically excludes respondents who complete the survey in less than half the median completion time, which is approximately 10 minutes. We then further remove those who spend fewer than 3 seconds on the treatment information screen. Following these quality-control procedures, our final sample consists of 8,873 respondents: 3,881 from the first wave and 4,992 from the second.

Overall, the samples are well-balanced across control and treatment groups. Sample sizes are roughly equal across the three groups, with approximately 3,000 respondents in each. More importantly, we find no statistically significant differences in age, gender, education, income, savings, homeownership, average monthly spending, or household size. All p-values for tests of demographic balance exceed 0.05, most by a considerable margin, indicating successful randomization (see Table B.1 for summary statistics by treatment status). For external validation, our sample demographic distributions are similar to those reported by Coibion et al. (2024), who surveyed households across six eurozone economies.

Next, we examine demographic breakdowns by country (France, Germany, Italy, Spain, and the Netherlands); see Table B.2 for details. The sample size is similar across all countries (ranging from about 1,600 to 1,850 respondents per country). Spain, the Netherlands, and France have higher percentages of college graduates, while Germany and Italy have lower rates. Ranking countries by household income in our sample yields the following order: the Netherlands, Germany, France, Italy, and Spain. Homeownership rates are highest in Italy and Spain, followed by the Netherlands and France, and lowest in Germany.

The average household size is largest in Spain and Italy, followed by the Netherlands and France, with the lowest in Germany. All these patterns are consistent with cross-country demographic differences in Europe, as reflected in published statistics.

Pre-treatment expectations about macroeconomic variables are broadly similar across countries. Across all countries, average 1-year inflation expectations are about 3.4%, rising to 4.7% over a 5-year horizon. Expected GDP growth is approximately 2.1% for the next year and 2.4% over five years. Respondents anticipate an increase in household spending of about 4.7% over the next year and by 11.6% over five years. Long-term interest rates are anticipated to rise by 2–3 percentage points over the next year. Overall, these figures indicate that respondents expect moderate but positive growth and inflation in their country over both the short and medium term. For more details, see Table B.3.

3 Debt vs. Tax Financing

In this section, we investigate how an information treatment about a fiscal shock shapes households' expectations for key macroeconomic variables: output, consumption, inflation, and interest rates. We pay particular attention to how these responses differ by the financing method, tax versus debt. This section pools all five countries together, whereas Section 4 further investigates how these effects vary across countries, especially with respect to differences in indebtedness.

Specifically, our regression specification is as follows:

$$\mathbb{E}_i^{post} Y - \mathbb{E}_i^{pre} Y = \alpha_0 + \sum_{j=1,2} \alpha_j \times \mathbb{I}_{i \in T_j} + \gamma X_i + \epsilon_i, \tag{3.1}$$

where $\mathbb{E}_i^{pre}$ and $\mathbb{E}_i^{post}$ denote individual i's expectation before and after the information treatment, respectively, and Y is the outcome variable. $\mathbb{I}_{i \in T_j}$ is an indicator variable, and $\mathbb{I}_{i \in T_j} = 1$ when i is assigned to treatment $j \in \{1, 2\}$. α_j measures the average treatment

Table 2: AVERAGE TREATMENT EFFECTS: GDP

	1-year		5-year	
	(1)	(2)	(3)	(4)
Constant (α_0)	0.021	-0.137	0.239***	0.654***
	(0.029)	(0.182)	(0.030)	(0.187)
T1: debt (α_1)	0.099**	0.099**	0.132***	0.139***
	(0.041)	(0.042)	(0.043)	(0.044)
T2: tax (α_2)	0.100**	0.097**	0.073*	0.071
	(0.042)	(0.043)	(0.043)	(0.044)
Demographics	No	Yes	No	Yes
N	8872	8872	8873	8873
R^2	0.001	0.010	0.001	0.013

Notes: This table reports the estimation results of equation (3.1). The dependent variables are changes in 1-year (Columns 1-2) and 5-year (Columns 3-4) GDP growth expectations. T1 and T2 are treatment indicators for respondents who received information about debt-financed or tax-financed fiscal stimulus, respectively. Odd columns do not include control variables. Even columns include the respondent's age, gender, education, income, savings, housing status, and country of residence as control variables. Huber-robust regressions are employed. Standard errors are reported in parentheses. $***$, $**$, $*$ denote statistical significance at 1, 5, and 10 percent levels, respectively.

effect for group j. X_i represents a collection of control variables, including age, gender, education, income, savings, housing status, and country of residence. To systematically remove outliers and influential observations, we employ Huber-robust regressions (Huber, 1964), following the literature (Coibion et al., 2022, 2024).

3.1 GDP

We begin our analysis with GDP, the headline measure of aggregate economic activity. Table 2 reports the average treatment effects (ATE) on households' expectations of GDP growth following the information treatment. Specifications (1) and (2) present results for the expected growth rate over the next year, while specifications (3) and (4) examine a longer horizon, five years. Demographic controls are included in columns (2) and (4). Standard errors are reported in parentheses.

First, we find that fiscal stimulus raises expectations of GDP growth. This result holds across both treatments: T1 (debt-financed fiscal stimulus) and T2 (tax-financed

fiscal stimulus), and at both short and long horizons. The estimated effects are mostly statistically significant and remain similar regardless of whether demographic controls are included.

Second, when comparing financing methods, we observe that over the five-year horizon, debt-financed fiscal policy (T1) is more stimulative than tax-financed policy (T2), as reflected in larger coefficients. By contrast, this distinction disappears at the one-year horizon, where both treatments yield comparable effects.

These findings suggest that the financing method matters. Interestingly, a puzzle arises: why does the financing method matter over five years but not over one? We will delve deeper into the mechanisms underlying this pattern, both empirically in Section 4 and theoretically in Section 5.

3.2 Consumption

Table 3: AVERAGE TREATMENT EFFECTS: SPENDING

	Nondurable		**Auto**		**Furnishings**	
	(1)	(2)	(3)	(4)	(5)	(6)
Constant (α_0)	-1.193***	0.071	1.952***	2.372***	2.134***	2.321***
	(0.192)	(1.175)	(0.018)	(0.107)	(0.018)	(0.104)
T1: debt (α_1)	-0.344	-0.390	-0.064**	-0.040	-0.079***	-0.039
	(0.282)	(0.281)	(0.027)	(0.026)	(0.026)	(0.025)
T2: tax (α_2)	-0.500*	-0.579**	-0.070***	-0.052**	-0.089***	-0.048*
	(0.283)	(0.283)	(0.027)	(0.026)	(0.026)	(0.025)
Demographics	No	Yes	No	Yes	No	Yes
N	4992	4992	4992	4992	4992	4992
R^2	0.001	0.011	0.002	0.087	0.003	0.134

Notes: This table reports the estimation results of equation (3.1). The dependent variables are changes in expected nondurable consumption growth rates (Columns 1-2), and categorical indicators for expected auto (Columns 3–4) and furnishings (Columns 5–6) spending, coded as: more likely = 3, no change = 2, less likely = 1. T1 and T2 are treatment indicators for respondents who received information about debt-financed or tax-financed fiscal stimulus, respectively. Control variables include the respondent's age, gender, education, income, savings, housing status, and country of residence. Huber-robust regressions are employed in Columns (1)-(2); OLS regressions are employed in Columns (3)-(6). Standard errors are reported in parentheses. $***$, $**$, $*$ denote statistical significance at 1, 5, and 10 percent levels, respectively.

The previous section highlights a difference between the two financing methods at the five-year horizon. In this section, we zoom in on the consumption component and examine whether differences in consumption responses help explain this difference in overall GDP effects.

Table 3 reports how the treatments affect different types of consumption expectations over the five-year horizon. Columns (1)–(2) present results for non-durable consumption, while columns (3)–(6) focus on durable items: auto (cars, trucks, and motorcycles) and furnishings (furniture and appliances).[1] Even-numbered columns add demographic controls.[2]

We find that T2 (tax-financing) leads to a larger decline in expected consumption than T1 (debt financing), and this pattern holds across all categories, both durable and non-durable. Putting together, when fiscal expansions are tax-financed, households scale back spending due to a lower disposable income, which helps account for the weaker GDP response in Table 2.

3.3 Nominal Variables

After assessing real activities, Table 4 reports the average treatment effects on nominal variables. Columns (1) - (4) report changes in inflation expectations, which were elicited at both the 1-year and 5-year horizons. Columns (5) and (6) report expectations on long-term interest rates, only at the 1-year horizon. As before, even-numbered columns include demographic controls.

We find no evidence that either debt- or tax-financed fiscal stimulus alters agents' inflation expectations at any horizon. This null result is consistent with Wu et al. (2024) and Andrade et al. (2025), who find only small or insignificant effects of fiscal policy on

[1] For durables, the questions are phrased as "more or less likely to make a purchase of the following items."

[2] The sample size for this table is about half that of the other tables, since consumption questions at the five-year horizon were only included in the second survey wave, as a supplement to help interpret the long-run GDP findings in Table 2.

Table 4: AVERAGE TREATMENT EFFECTS: INFLATION AND INTEREST RATE

	inflation: 1-year		**inflation: 5-year**		**interest: 1-year**	
	(1)	(2)	(3)	(4)	(5)	(6)
Constant (α_0)	1.038***	1.582***	0.755***	0.804*	0.086**	1.053***
	(0.072)	(0.438)	(0.069)	(0.452)	(0.036)	(0.240)
T1: debt (α_1)	0.046	0.055	-0.049	-0.054	0.060	0.076
	(0.103)	(0.102)	(0.099)	(0.105)	(0.051)	(0.056)
T2: tax (α_2)	-0.088	-0.060	-0.129	-0.147	-0.010	0.013
	(0.104)	(0.103)	(0.100)	(0.106)	(0.052)	(0.056)
Demographics	No	Yes	No	Yes	No	Yes
N	8873	8873	8873	8873	8873	8873
R^2	0.000	0.008	0.000	0.011	0.000	0.012

Notes: This table reports the estimation results of equation (3.1). The dependent variables are changes in 1-year inflation expectations (Columns 1-2), 5-year inflation expectations (Columns 3-4), and 1-year interest rate expectations (Columns 5-6). T1 and T2 are treatment indicators for respondents who received information about debt-financed or tax-financed fiscal stimulus, respectively. Odd columns do not include control variables. Even columns include the respondent's age, gender, education, income, savings, housing status, and country of residence as control variables. Huber-robust regressions are employed. Standard errors are reported in parentheses. $***$, $**$, $*$ denote statistical significance at 1, 5, and 10 percent levels, respectively.

inflation in observational data and on inflation expectations in survey data, respectively. Similarly, we observe no treatment effect on expectations of long-term interest rates.

4 Interaction of Financing and Indebtedness

This section tackles the central question: Do cross-country differences in public debt levels fundamentally shape the transmission and effectiveness of fiscal policy? As demonstrated in Section 3, the impact of fiscal stimulus varies by financing method; however, this difference emerges only at the five-year horizon, not at the one-year horizon, raising a puzzle. This section provides the underlying driver of this puzzle: the effectiveness of fiscal stimulus hinges not only on how it is financed but—crucially—on its interaction with a country's debt burden. This result has major implications for fiscal policy, especially for high-debt economies.

Table 5: REGRESSION ESTIMATES: FINANCING-INDEBTEDNESS INTERACTION

	1-year		5-year	
	(1)	(2)	(3)	(4)
Constant (α_0)	0.156	-0.020	0.332***	0.863***
	(0.101)	(0.226)	(0.103)	(0.233)
T1: debt (α_1)	0.386***	0.390***	0.411***	0.424***
	(0.143)	(0.143)	(0.146)	(0.148)
T2: tax (α_2)	0.257*	0.246*	0.071	0.070
	(0.144)	(0.144)	(0.147)	(0.149)
Debt-to-GDP (β_0)	-0.137	-0.107	-0.096	-0.209
	(0.100)	(0.150)	(0.102)	(0.155)
T1 $\times$ Debt-to-GDP (β_1)	-0.294**	-0.300**	-0.290**	-0.296**
	(0.143)	(0.143)	(0.146)	(0.147)
T2 $\times$ Debt-to-GDP (β_2)	-0.160	-0.153	0.002	0.002
	(0.144)	(0.144)	(0.147)	(0.148)
Demographics	No	Yes	No	Yes
N	8872	8872	8873	8873
R^2	0.004	0.010	0.003	0.013

Notes: This table reports the estimation results of equation (4.1). The dependent variables are changes in 1-year (Columns 1-2) and 5-year (Columns 3-4) GDP growth expectations. T1 and T2 are treatment indicators for respondents who received information about debt-financed or tax-financed fiscal stimulus, respectively. Odd columns do not include control variables. Even columns include the respondent's age, gender, education, income, savings, housing status, and country of residence as control variables. Huber-robust regressions are employed. Standard errors are reported in parentheses. $***$, $**$, $*$ denote statistical significance at 1, 5, and 10 percent levels, respectively.

4.1 Regression with Interaction

We start with a regression that explicitly captures the debt-to-GDP ratio and its interactions with the two treatments in the following regression:

$$\mathbb{E}_i^{post} Y - \mathbb{E}_i^{pre} Y = \alpha_0 + \beta_0 D_i + \sum_{j=1,2} \left(\alpha_j + \beta_j D_i\right) \times \mathbb{I}_{i \in T_j} + \gamma X_i + \epsilon_i, \tag{4.1}$$

where $D_i = D_l$ is the average debt-to-GDP ratio of country l (the country in which individual i resides).[3] The average treatment effect for treatment j in country l is captured by $\alpha_j + \beta_j D_l$.

[3] See Table 1 for details.

Table 5 reports results from regression(4.1) on GDP growth expectations. Columns (1)–(2) present estimates for the 1-year horizon, and columns (3)–(4) show those for the 5-year horizon. Demographic controls are included in specifications (2) and (4).

Two treatments differ in both the intercept α_j and slope β_j coefficients. First, the slope on the interaction between T1 and the debt-to-GDP ratio, β_1, is statistically significantly negative. This indicates that debt-financed fiscal stimulus is less effective in countries with a higher level of debt. By contrast, for T2, the slope β_2 is close to zero and statistically insignificant. This contrast is intuitive: when a country finances its fiscal policy by issuing more debt, households take into consideration the country's indebtedness, whereas they do not factor it in when the fiscal policy is financed by taxation. We conduct a t-test for the null hypothesis $\beta_1 = \beta_2$, and reject the null at the 5% level at five years. Second, the intercepts are also different between T1 and T2. These together explain why in Table 2, T1 and T2 have different average treatment effects.

4.2 Overall Average Treatment Effects

While Table 5 quantifies how the regression intercepts and slopes differ across financing methods, Figure 1 provides a more interpretable summary by translating these coefficients into how the resulting average treatment effects vary with the debt-to-GDP ratio.

The left panel plots the 1-year expectations and the right panel the 5-year expectations. Blue (orange) indicates T1 (T2) where fiscal policy is financed by debt (taxes). The lines show predictions from our main regression specification; specifically, we plot $\alpha_j + \beta_j D$ following the terminology of (4.1) and the estimates reported in Table 5. For reference, we add circles and diamonds to depict the average treatment effects estimated from country-level regressions. Dashed black vertical bars mark the average debt-to-GDP ratios of the five countries in our sample (about 94.3%).

Figure 1 presents results consistent with Table 5: the blue solid lines are downward sloping, indicating that debt-financed fiscal expansion is less stimulative in countries with

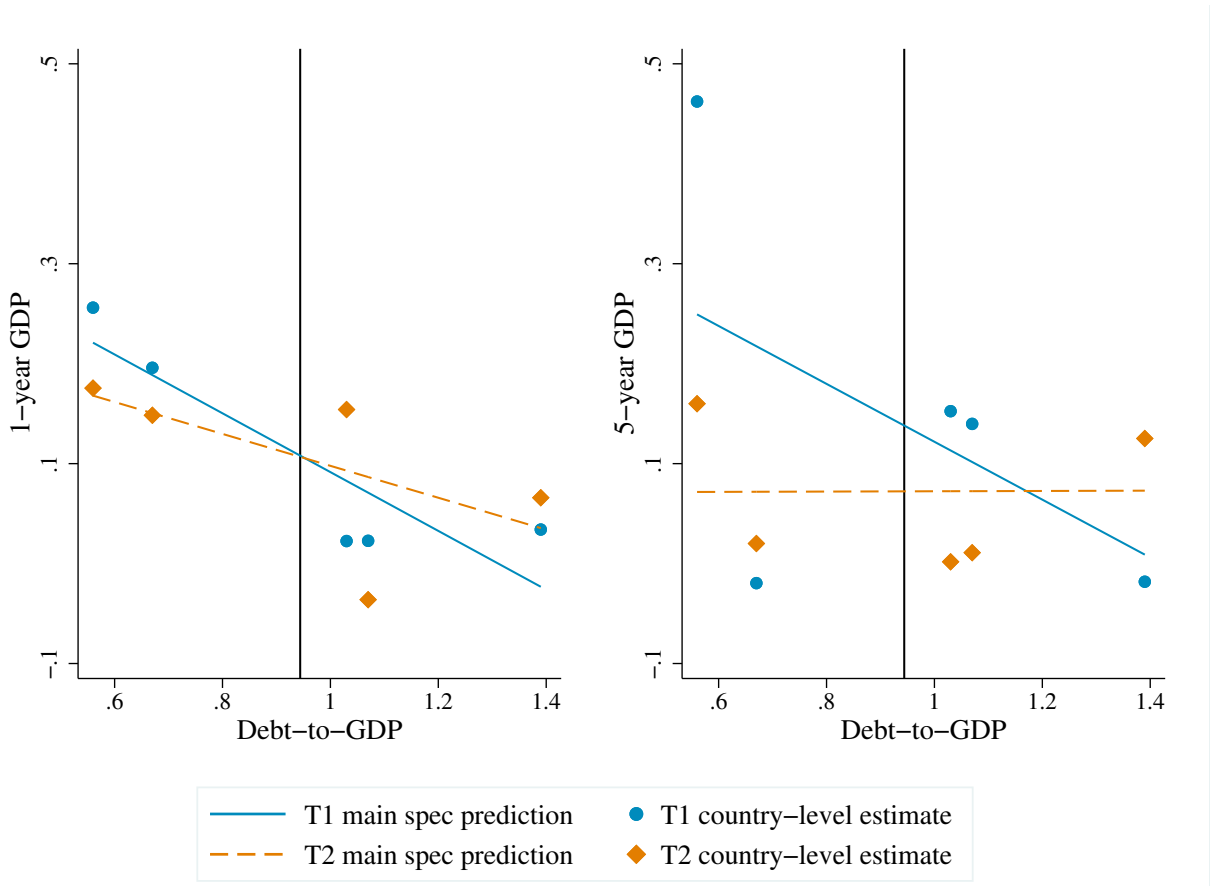


Figure 1: AVERAGE TREATMENT EFFECTS: BY DEBT-TO-GDP RATIO

Notes: This figure plots the predicted impact of fiscal policy on GDP growth expectations as a function of the debt-to-GDP ratio, $\hat{\alpha}_j + \hat{\beta}_j D$, using estimates reported in Table 5. The left and right panels plot the 1-year and 5-year expectations, respectively. Blue (orange) indicates T1 (T2) where fiscal policy is financed by debt (taxes). Circles (diamonds) depict the average treatment effects of T1 (T2) estimated from country-level regressions.

higher debt-to-GDP ratios. In contrast, the orange lines are essentially flat, showing that tax-financed fiscal policy is not sensitive to the debt level.

Consequently, in high-debt countries such as Italy and Spain, debt-financed stimulus is less effective than tax-financed stimulus. By contrast, in low-debt countries such as the Netherlands, the ranking reverses: borrowing-funded fiscal expansions are more powerful. This pattern holds at both the 1-year and 5-year horizons.

Next, we use these results to reconcile the puzzle documented in Section 3. For 1-year expectations, the two treatments yield the same average treatment effect when the debt-

to-GDP ratio is 94%, where the blue and orange lines intersect. Notably, this intersection occurs at a debt-to-GDP ratio very close to the sample average. This explains why, at the 1-year horizon, Table 2 shows little difference between debt- and tax-financed stimulus. The absence of a difference at this horizon does not mean that financing methods are irrelevant; rather, it is masked by the important interaction between financing methods and fiscal capacity. By contrast, for 5-year expectations, debt-financed stimulus is more stimulative than tax-financed stimulus at the average debt-to-GDP ratio, consistent with the difference observed in Table 2. This pattern clarifies why, when pooling all countries, apparent inconsistencies in fiscal multipliers across horizons do not reflect a fundamental difference between the short run and the long run. Instead, these inconsistencies reflect the interaction between debt levels and financing methods.

Overall, these results demonstrate that the effectiveness of fiscal stimulus as well as the difference between financing methods depend crucially on cross-country variation in public debt. This insight has important policy implications: they imply that countries with high debt levels cannot rely on debt-financed stimulus as effectively as low-debt countries, a key insight for designing fiscal policy under constrained fiscal capacity.

5 A New Keynesian Model with Fiscal Discipline

Empirical results in Section 4 suggest that the effectiveness of fiscal policy depends critically on the interaction between a country's debt level and its financing method. To formalize the mechanisms behind this novel finding, we develop a New Keynesian model with fiscal discipline. Section 5.1 motivates this concept, and Section 5.2.1 incorporates it into the model. Additionally, our framework features a proportional income tax, consistent with the framing of the survey questions.[4] Section 5.2.3 shows how this tax enters the Phillips curve as a cost-push shock and thereby breaks Ricardian equivalence. The rest of

[4]The literature has studied the effects of proportional income taxation in New Keynesian models (e.g., Erceg and Lindé, 2014; Fu et al., 2025).

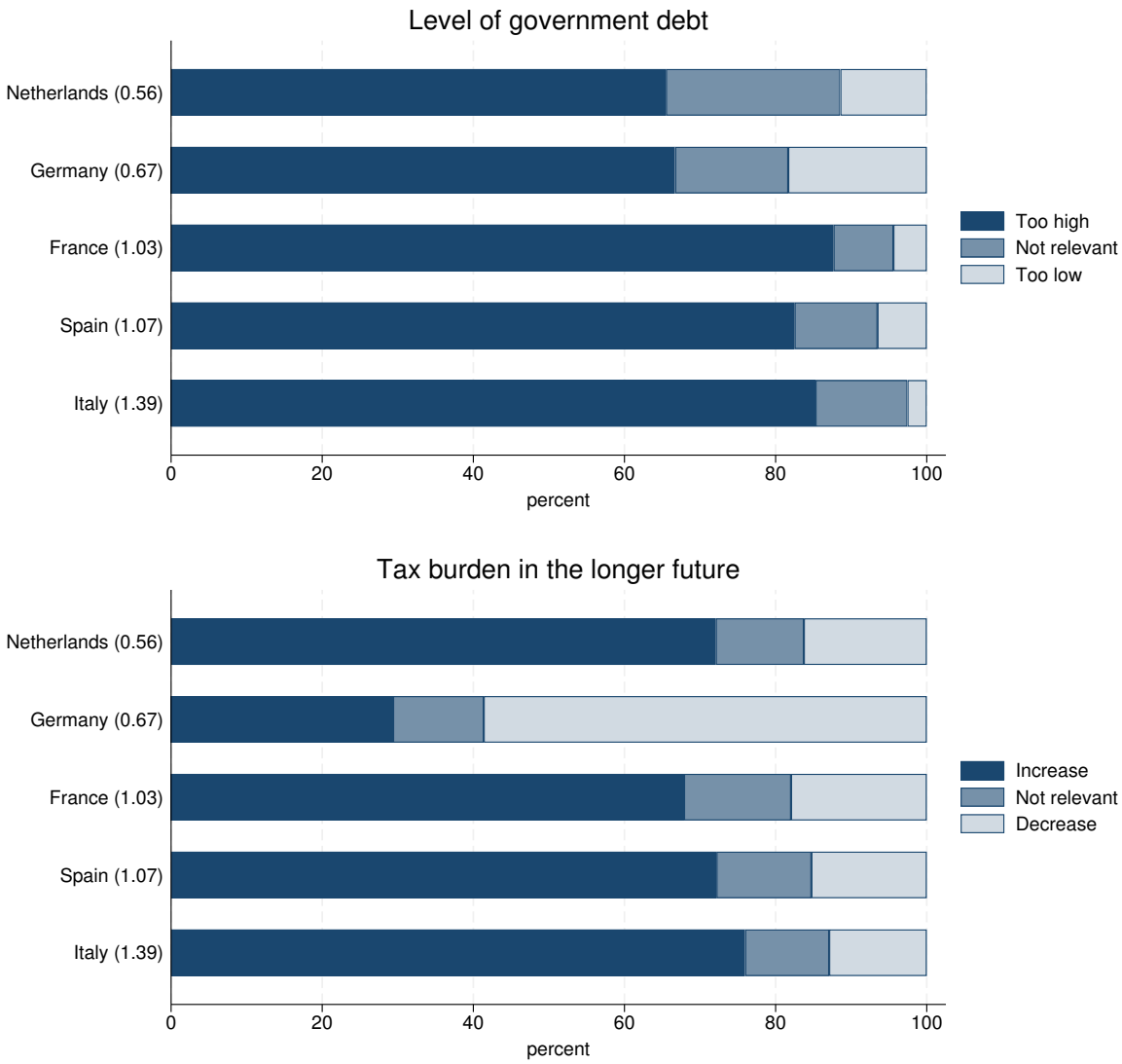


Figure 2: PUBLIC PERCEPTIONS

Notes: The figure plots respondents' perception of government debt and future taxes. The top panel reports the share of respondents indicating whether they think "the level of government debt" is "too high", "too low", or is "irrelevant," represented by different shades of blue. The bottom panel reports the share of respondents indicating whether they think "tax burden in the longer future" will "increase", "decrease", or is "irrelevant." Countries are ordered by their steady-state debt-to-GDP ratios from top to bottom.

the model follows the standard New Keynesian structure, including an active monetary policy.

5.1 Fiscal Discipline in Europe

Many countries have formal mechanisms to promote fiscal discipline. In the United States, Congress imposes a debt ceiling that limits federal borrowing. Especially relevant in our European context, the Stability and Growth Pact (SGP) is a collective agreement among the 27 European Union (EU) member states to constrain fiscal deficits and public debt. The SGP establishes reference values of 3% of GDP for deficits and 60% of GDP for debt.[5] Countries above the debt reference value are expected to reduce the excess toward the target.

Our survey responses align with the EU's fiscal discipline framework. In the top panel of Figure 2, respondents evaluate whether the level of government debt is "too high", "too low", or "irrelevant"; the scale is shown using different shades of blue. On the vertical axis, countries are ordered from lowest to highest steady-state debt-to-GDP ratios, measured as 10-year averages and shown in parentheses. We find that respondents in higher-debt countries are more likely to report that government debt is too high.

In the bottom panel, respondents indicate whether they believe the long-run tax burden will "increase", "decrease", or be "irrelevant." We find that countries with higher current debt-to-GDP ratios have a larger share of respondents expecting higher future taxes. Taken together, these patterns motivate our modeling of fiscal discipline.

5.2 Model

Building on the institutional and survey evidence above, we formalize fiscal discipline within a New Keynesian framework.

[5] See Protocol No. 12 on the excessive deficit procedure: https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A12008M%2FPRO%2F12.

5.2.1 Fiscal Policy under Fiscal Discipline

The government faces the following intertemporal budget constraint:

$$B_{t-1}I_{t-1} + P_tG_t = \mathcal{T}_tP_tY_t + B_t. \tag{5.1}$$

where B_{t-1} denotes the nominal stock of one-period risk-free government bonds issued at the end of period $t-1$, and I_{t-1} is the associated gross nominal interest rate from period $t-1$ to t. P_t is the aggregate price level, G_t is real government spending, $\mathcal{T}_t$ is the proportional income tax rate, and Y_t is aggregate output. The left-hand side of (5.1) combines the nominal liability carried over from period $t-1$ and current government spending, both of which must be financed through proportional income taxes or new bond issuance.

At the core of our model is fiscal discipline: the requirement that taxes adjust to stabilize public debt. This formulation is motivated by both the EU's fiscal framework and by the survey evidence discussed in Section 5.1. We implement this discipline through a tax rule that maps the income tax rate to debt and government spending:

$$\hat{\tau}_t = \alpha\hat{b}_{t-1} + \eta\Lambda\hat{g}_t. \tag{5.2}$$

We use hatted lowercase variables to denote log-deviations from the steady state unless otherwise noted. $\hat{\tau}_t$ is the income tax rate, $\hat{b}_t$ is the debt-to-GDP ratio, and $\hat{g}_t$ is government spending relative to the steady-state output.[6] $\Lambda \equiv 1/(1-\bar{\mathcal{T}})$ is a normalization constant, where variables with a bar represent their steady-state values.

The response coefficient α, which governs how strongly the government respects its

[6]They are defined as $\hat{\tau}_t \equiv -\log\left(\frac{1-\mathcal{T}_t}{1-\bar{\mathcal{T}}}\right)$, $\hat{b}_t \equiv \log\left(\frac{B_t/(P_tY_t)}{\bar{B}/(\bar{P}\bar{Y})}\right)$, and $\hat{g}_t \equiv (G_t - \bar{G})/\bar{Y}$.

existing debt obligations, is defined as

$$\alpha \equiv \bar{\alpha} - (1-\eta)\chi \bar{b}^*, \tag{5.3}$$

where $\bar{\alpha}$ denotes the value of α when $\eta = 1$, and χ is a normalization constant. Larger values of α correspond to a stronger tax response to debt.

$\bar{b}^*$ measures fiscal capacity, and is defined as

$$\bar{b}^* \equiv \ln b^* - \ln \bar{b}. \tag{5.4}$$

This expression captures the gap between the long-term debt target b^* and the steady-state debt-to-GDP ratio $\bar{b}$. A larger gap indicates greater fiscal capacity. In our Euro-area sample, this gap is typically negative, reflecting debt levels above the target.

The parameter $\eta \in [0, 1]$, which appears in both (5.2) and (5.3), captures the share of government spending financed by contemporaneous taxes. When $\eta = 0$, government spending is fully financed by debt, and the income tax does not depend on government spending per (5.2). In (5.3), however, the response coefficient α depends on fiscal capacity. When fiscal capacity is low, limited capacity constrains additional borrowing and requires the government to raise more taxes. When fiscal capacity is higher, the government can postpone taxation and borrow more, implying a weaker tax response to debt.

When $\eta = 1$, government spending is fully financed by contemporaneous taxation. To show this formally, we log-linearize (5.1) and combine it with (5.2), which yields the following debt evolution path:

$$\begin{aligned}\hat{b}_t = \beta^{-1}\Big\{\Big[1 - \beta\bar{b}^{-1}(1-\bar{\mathcal{T}})\alpha\Big]\hat{b}_{t-1} - (\hat{y}_t - \hat{y}_{t-1}) - \hat{\pi}_t + \hat{i}_{t-1}\Big\} - \bar{b}^{-1}\phi\hat{y}_t \\ + \bar{b}^{-1}[1 - (1-\bar{\mathcal{T}})\eta\Lambda]\hat{g}_t.\end{aligned} \tag{5.5}$$

where $\phi \equiv \bar{G}/\bar{Y}$ denotes the steady-state government spending–to–GDP ratio. Derivations

are provided in Appendix C.1.

Finally, (5.5) shows that when $\eta = 1$, coefficient on $\hat{g}_t$ equals zero, so government spending does not directly contribute to debt accumulation. Combined with Equation (5.2), which shows that taxes respond to government spending, this implies full tax financing.

5.2.2 Aggregate Demand: The IS Curve

An infinitely-lived representative household maximizes the following objective function:

$$\mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \left[u(C_t) - v(H_t) \right], \tag{5.6}$$

where C_t is consumption and H_t is labor supply. Its budget constraint at time t is

$$P_t C_t + B_t = (1 - \mathcal{T}_t) W_t H_t + (1 - \mathcal{T}_t) \Phi_t + B_{t-1} I_{t-1},$$

where W_t is the nominal wage rate and Φ_t is the nominal lump-sum dividends transferred from firms. For simplicity, we assume that dividends are taxed at the same proportional rate as labor income.[7]

The first-order conditions of the household's optimization problem yield an Euler equation and a labor supply condition:

$$u_c(C_t) = \beta \mathbb{E}_t \left[I_t \frac{u_c(C_{t+1})}{\Pi_{t+1}} \right], \tag{5.7}$$

$$\frac{v_h(H_t)}{u_c(C_t)} = (1 - \mathcal{T}_t) w_t, \tag{5.8}$$

where $\Pi_t \equiv P_t / P_{t-1}$ is the gross inflation rate and $w_t \equiv W_t / P_t$ is the real wage. Equation (5.8) shows that the proportional income tax drives a wedge between the marginal rate of substitution and the real wage. A higher tax rate increases this wedge, implying

[7] Because households own the firms, total household income is $W_t H_t + \Phi_t = P_t Y_t$, which corresponds to the income term in (5.1).

that the household needs a higher real wage to supply the same amount of labor.

Output Y_t is consumed either by the household consumption, C_t, or by the government purchases, G_t. Thus, the goods-market clearing condition is

$$C_t + G_t = Y_t. \tag{5.9}$$

Log-linearizing (5.7) and (5.9), we obtain the IS curve:

$$\hat{y}_t - \hat{g}_t = \mathbb{E}_t\left[\hat{y}_{t+1} - \hat{g}_{t+1}\right] - \frac{1}{\sigma_y}\left[\hat{i}_t - \mathbb{E}_t\hat{\pi}_{t+1}\right], \tag{5.10}$$

where $\sigma_y \equiv -u_{cc}(\bar{C})\bar{Y}/u_c(\bar{C})$ is the inverse of the intertemporal elasticity of substitution with respect to output. Derivations of (5.10) can be found in Appendix C.2.

5.2.3 Aggregate Supply: The Phillips Curve

The supply side of the economy deviates from the standard New Keynesian model with government expenditure à la Woodford (2011) by introducing a proportional income tax. Production has two stages: a continuum of intermediate firms indexed by $j \in [0,1]$ produces differentiated goods and sells them to the representative final-good firm. The final-good firm aggregates the intermediate goods into the final consumption composite, which is sold to the household and the government.

The final-good firm produces consumption composite Y_t using intermediate inputs $Y_t(j)$ with a CES aggregator:

$$Y_t = \left(\int_0^1 Y_t(j)^{\frac{\epsilon-1}{\epsilon}} dj\right)^{\frac{\epsilon}{\epsilon-1}},$$

where ϵ is the elasticity of substitution across differentiated intermediate goods. The static cost-minimization problem of the final-good firm yields the demand function for each

intermediate variety:

$$Y_t(j) = \left(\frac{P_t(j)}{P_t}\right)^{-\epsilon} Y_t, \tag{5.11}$$

and the aggregate price index satisfies

$$P_t = \left[\int_0^1 P_t(j)^{1-\epsilon} dj\right]^{\frac{1}{1-\epsilon}}. \tag{5.12}$$

Each intermediate-goods firm produces a differentiated good but follows the same production technology:

$$Y_t(j) = H_t(j),$$

where $H_t(j)$ is the labor input. For simplicity, we abstract from productivity shocks.

Following Calvo (1983), each intermediate-goods firm can reset its price with probability $1 - \lambda$ in any given period. The optimal pricing problem of firms yields the following New Keynesian Phillips curve:[8]

$$\hat{\pi}_t = \beta \mathbb{E}_t \hat{\pi}_{t+1} + \psi \widehat{mc}_t, \tag{5.13}$$

where $\widehat{mc}_t$ denotes the economy's average real marginal cost. $\psi \equiv (1-\lambda)(1-\beta\lambda)/\lambda$ measures the sensitivity of inflation to marginal cost.

While the form of the Phillips curve (5.13) is standard, it can be rewritten in terms of output, which now includes an additional tax term arising from the proportional tax:

$$\hat{\pi}_t = \beta \mathbb{E}_t \hat{\pi}_{t+1} + \kappa(\hat{y}_t - \Gamma \hat{g}_t) + \psi \hat{\tau}_t, \tag{5.14}$$

where $\kappa \equiv \psi(\sigma_y + \sigma_h)$ is the slope of the Phillips curve, $\Gamma = \sigma_y/(\sigma_y + \sigma_h)$ is the fiscal multiplier in a flexible-price equilibrium with no change in tax rates, and $\sigma_h \equiv v_{hh}(\bar{H})\bar{H}/v_h(\bar{H}) > 0$ is the inverse of the Frisch elasticity of household labor supply.

[8] See, e.g., Galí (2015), Chap. 3.

Derivations of (5.14) can be found in Appendix C.3.

Equation (5.14) shows that a change in the income tax behaves like a cost-push shock. The intuition is that a higher tax rate compels firms to raise real wages in order to attract labor, thereby increasing real marginal costs. Meanwhile, when government spending increases, it puts downward pressure on real marginal cost due to the wealth effect on labor supply.

5.2.4 Monetary Policy and Equilibrium

Monetary policy follows a standard Taylor rule:

$$\hat{i}_t = \phi_\pi \hat{\pi}_t + \phi_y \hat{y}_t. \tag{5.15}$$

Per Leeper (1991) terminology, we assume an active monetary policy ($\phi_\pi > 1$) and a debt-stabilizing fiscal policy.[9]

We assume government spending follows an exogenous AR(1) process:

$$\hat{g}_t = \rho_g \hat{g}_{t-1} + \epsilon_t,$$

where ϵ_t is an i.i.d. shock. Given the exogenous process $\{\hat{g}_t\}$, the equilibrium is fully characterized by equations (5.2), (5.5), (5.10), (5.14), (5.15), and the log-linearized version of (5.9). Together, they form a system of six equations with six endogenous variables $\{\hat{y}_t, \hat{\pi}_t, \hat{i}_t, \hat{b}_t, \hat{\tau}_t, \hat{c}_t\}$. For calibration details, see Appendix C.4.

5.3 Impulse Responses

This section analyzes how key macroeconomic aggregates respond to a government spending shock under different financing methods and levels of fiscal capacity. We first

[9] Formally, $\frac{\bar{\mathcal{T}}-\phi}{1-\bar{\mathcal{T}}} < \alpha < \frac{\bar{\mathcal{T}}-\phi}{1-\bar{\mathcal{T}}} \frac{1+\beta}{1-\beta}$.

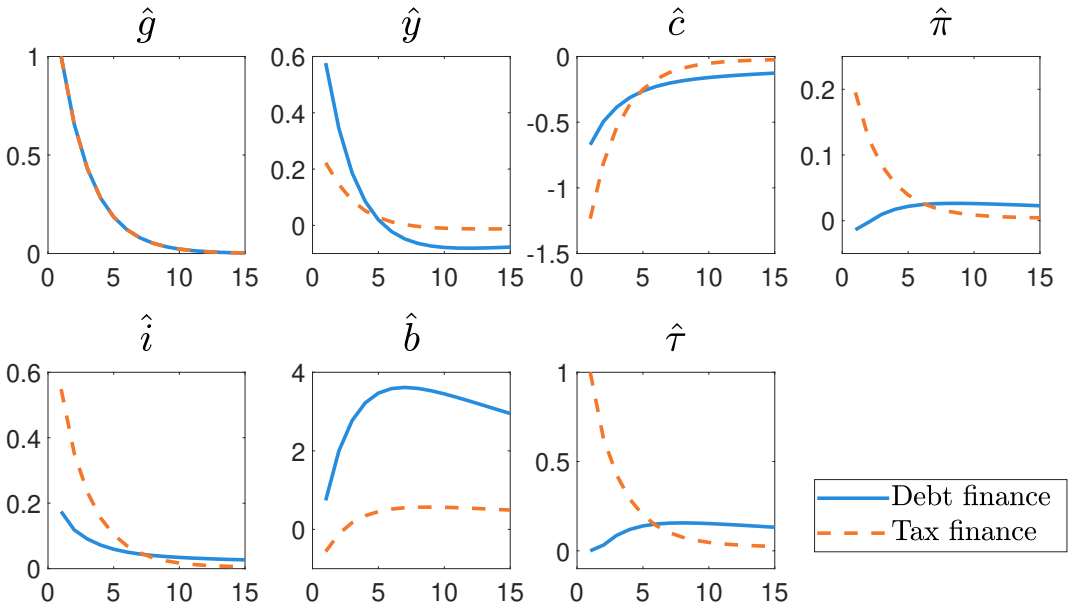


Figure 3: IMPULSE RESPONSES: DEBT VS. TAX FINANCING

Notes: This figure plots the impulse responses to a one-percentage-point shock in government spending. All numbers are expressed in percentage points. x-axis represents time in years.

compare tax- versus debt-financed stimulus, and then contrast high versus low fiscal capacity.

Following the standard calibration of government spending shocks in the literature, we set $\rho_g = 0.66$ at the annual frequency, which corresponds to a quarterly persistence of 0.9. Figure 3 plots the impulse responses to a one-percentage-point shock in government spending when $\bar{b} = b^* = 0.6$. The solid blue lines correspond to debt financing ($\eta = 0$), while the dashed orange lines correspond to tax financing ($\eta = 1$).

Under tax financing, the income tax rate rises immediately to fund the additional spending. The higher tax rate raises inflation through the supply-side channel, which in turn pushes up the nominal interest rate. Although government spending directly stimulates aggregate demand, the higher nominal interest rate dampens this effect. Decomposing the output response, government spending crowds out private consumption, so consumption falls and output increases only modestly. Debt initially declines because higher output and inflation lower the debt-to-GDP ratio, but it eventually begins to rise again as output

growth slows and the higher interest burden accumulates. Over time, debt converges back to its steady state.

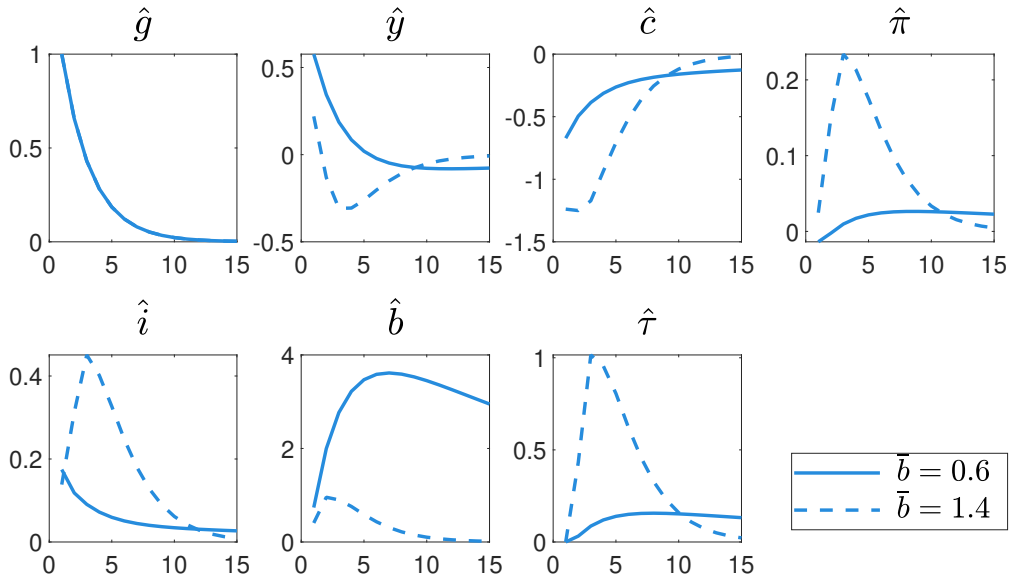
Compared to tax financing, debt financing does not lead to an immediate change in taxes. Instead, the government borrows to finance its spending, which raises the debt level, measured by $\hat{b}_t + \hat{y}_t$. The debt-to-GDP ratio $\hat{b}_t$, however, increases only slightly initially because strong output growth offsets the rise in debt. The persistent deficit associated with the spending increase, slower output growth, and accumulated interest payments lead to a hump-shaped response in the debt-to-GDP ratio. As the deficit remains elevated, the government gradually raises taxes, and debt eventually converges back to its original steady state.

These fiscal dynamics have implications for the real side of the economy. The delayed tax hikes under debt financing allow for stronger initial output responses compared to tax financing and a smaller drop in private consumption. However, output subsequently declines more quickly as tax rates begin to rise.

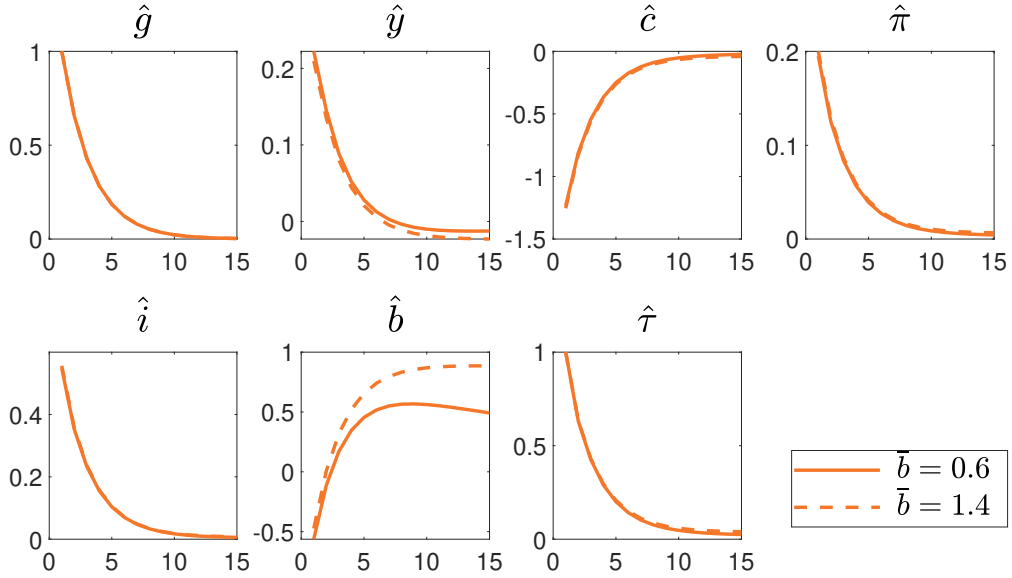
Next, we investigate the role of fiscal capacity by varying the steady-state debt-to-GDP ratio $\bar{b}$. We set $\bar{b} = 0.6$ for high fiscal capacity and $\bar{b} = 1.4$ for low fiscal capacity, which span the lower and upper ends of the debt-to-GDP distribution in the five euro-area countries in our survey sample. Figure 4 plots the impulse responses to the same government spending shock. Panel (a) shows debt financing, and Panel (b) shows tax financing. Solid lines denote high fiscal capacity, while dashed lines denote low fiscal capacity.

Panel (a) shows that fiscal capacity matters under debt financing: lower fiscal capacity limits the government's ability to postpone taxation and smooth taxes over time. As a result, the output response is smaller and the debt-to-GDP ratio returns to its steady state more quickly.

By contrast, Panel (b) shows that when the spending shock is financed through contemporaneous taxes, fiscal capacity has little effect on the dynamics of aggregate variables. The only noticeable difference appears in the debt path: because tax adjustments follow



(a) DEBT FINANCE



(b) TAX FINANCE

Figure 4: IMPULSE RESPONSES: DIFFERENT DEBT LEVELS

Notes: This figure plots the impulse responses to a one-percentage-point shock in government spending with different steady-state debt-to-GDP ratios, assuming the same shock persistence as in Figure 3. All numbers are expressed in percentage points. x-axis represents time in years.

similar paths under high and low fiscal capacity, a higher steady-state debt-to-GDP ratio results in greater debt accumulation and a slower return to its steady state.

5.4 Financing–Fiscal Capacity Interaction

While Section 5.3 focuses on impulse responses, this section examines how fiscal capacity shapes the fiscal multiplier under different financing methods. This analysis reproduces the key empirical finding from Section 4: the effectiveness of debt-financed stimulus declines with a country's debt burden, whereas tax-financed stimulus is largely unaffected.

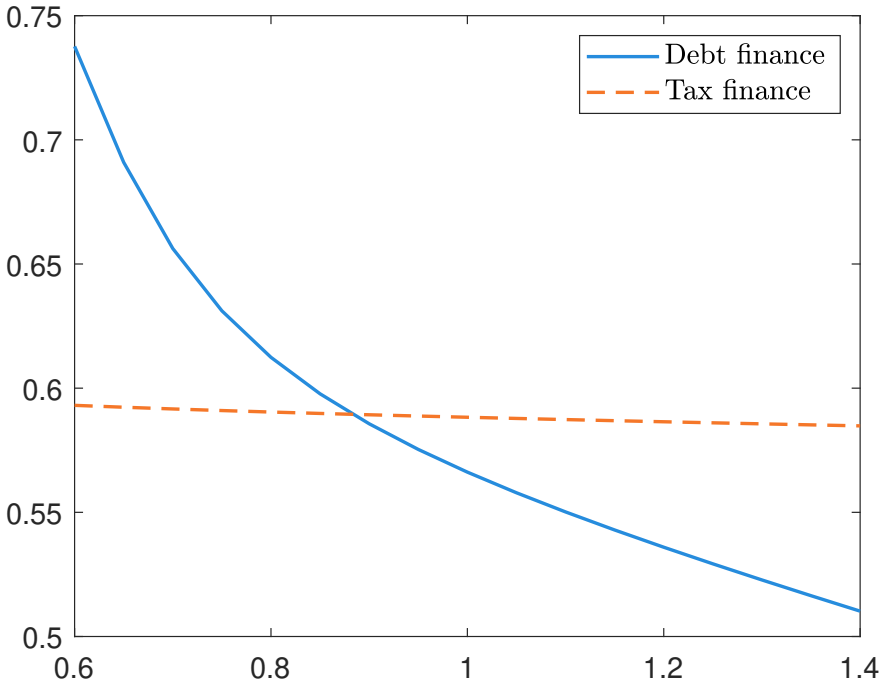


Figure 5: OUTPUT RESPONSES: BY DEBT-TO-GDP RATIO

Notes: This figure plots the initial output response to a one-time shock in government spending, with a shock size of one percentage point. The x-axis represents the annualized debt-to-GDP ratio. The y-axis is reported in levels.

To mimic the survey question, we consider a one-time shock to the government spending by setting $\rho_g = 0$. We focus on the steady-state debt-to-GDP ratios between 60% and 140%. Figure 5 plots the impact output responses to a government spending shock under debt financing ($\eta = 0$) in the blue solid line and tax financing ($\eta = 1$) in the orange dashed line, across countries with different debt levels.

The fiscal multiplier declines with the debt-to-GDP ratio under debt financing, whereas it remains largely insensitive to debt levels under tax financing. This pattern is consistent

with our main empirical finding in Section 4. The mechanism is straightforward. Under debt financing, the government's borrowing ability is limited by its fiscal capacity. When the current debt level is substantially above the long-run target, the government's ability to borrow and postpone taxation is weakened. It therefore must raise taxes more quickly to finance its spending, which dampens the fiscal multiplier. In contrast, under tax financing, taxation adjusts immediately and does not depend on the level of outstanding debt, leaving the multiplier largely stable across debt levels.

6 Conclusion

Our study shows that the effectiveness of fiscal stimulus depends on both how it is financed and a country's fiscal capacity. Using a large-scale information RCT across five eurozone countries with widely differing debt burdens, we document the importance of the interaction between fiscal capacity and the method of financing. When fiscal expansions are debt-financed, higher public debt weakens their stimulative effect, whereas under tax financing, households do not condition their expectations on the existing debt level.

To interpret these findings, we develop a New Keynesian model with fiscal discipline embedded through a tax rule. A central ingredient is fiscal capacity, modeled as the gap between a long-term debt target and the steady-state debt level. Under debt financing, limited fiscal capacity forces earlier and larger tax adjustments when current debt is high, dampening output responses and lowering the multiplier. When debt is low, greater fiscal capacity allows the government to postpone taxation and borrow more, producing a larger output response. Under tax financing, by contrast, spending is funded contemporaneously and the multiplier remains stable across debt levels. The model therefore reproduces the core empirical patterns and provides their underlying mechanisms.

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Appendices

A Survey Questionnaire

Note: *In each country, the survey was fielded in either English or the local language. For illustration, we reproduce below the English version of the questionnaire corresponding to France. Respondents in each country saw the analogous version for their own country.*

In the survey, we ask about your perceptions of the current economic situation and your personal outlook.

No special knowledge is required, and there are no right or wrong answers to the survey. It is important for us that you state your own opinion, not others' opinions, so please do not consult with others or look for external sources of information. Any answer is correct as long as it truly reflects your opinion!

We care about the quality of our data. In order for us to get the most accurate measures of your knowledge and opinions, it is important that you thoughtfully provide your best answers to each question in this survey. **Do you commit to thoughtfully provide your best answers to each question in this survey?**

- Yes
- No

Section 1: pre-treatment beliefs

Q1.1. How many people – including children and yourself – normally live with you as members of this household? By household we mean everyone who usually lives at your main place of residence (including yourself) and that shares a common budget (that is, excluding flatmates and lodgers).

Questions on this page asks about **average monthly** spending.

Q1.2. During the **past 12 months**, how much did your household spend on non-durable goods and services **on average each month**? Only count goods and services that will be consumed within a few years. For example, food and beverages (including grocery and restaurants), clothing, transportation and fuel, communication, travel and recreation, toiletry and cosmetics, and cleaning products.

€_____ [RANGE: 0 to 99999]

Q1.3. [Wave 1] What is your best guess about your **monthly average** household spending over the **next 12 months**? Again, please only count spending on non-durable goods and services.

€_____ [RANGE: 0 to 99999]

Q1.3. [Wave 2] How much do you think your household spending on non-durable goods and services will change **over the next 12 months** compared to the past year?

Instruction: Please provide your answers in percentage terms. A **positive** number represents an increase in consumption, a **negative** number represents a decrease in consumption, and **0** means no change.

_____ percent [Range: -100 - 100]

Q1.4. How about your spending **over the next 5 years**? Please provide your answers in **annual average rates**.

_____ percent [Range: -100 - 100]

Q1.5. [Wave 1] We would like to ask you about the rate of inflation/deflation.

Inflation is the percentage rise in overall prices in the economy, most commonly measured by the Consumer Price Index and deflation corresponds to when prices are falling.

In this question, you will be asked about the probability of something happening. The percent chance must be a number between 0 and 100 and the sum of your answers must add up to 100.

What do you think is the percent chance that, over the next 12 months…

	Percentage Chance
the rate of inflation will be 12% or more	_____
the rate of inflation will be between 8% and 12%	_____
the rate of inflation will be between 4% and 8%	_____
the rate of inflation will be between 2% and 4%	_____
the rate of inflation will be between 0% and 2%	_____
the rate of deflation will be between 0% and 2%	_____
the rate of deflation will be between 2% and 4%	_____
the rate of deflation will be between 4% and 8%	_____
the rate of deflation will be between 8% and 12%	_____
the rate of deflation will be 12% or more	_____
% Total [TOTAL ANSWERS FROM ABOVE – MUST SUM TO 100%]	_____

Q1.5. [Wave 2] We would like to ask you about the rate of inflation/deflation. Inflation is the percentage rise in overall prices in the economy, most commonly measured by the Consumer Price Index and deflation corresponds to when prices are falling.

What do you expect the inflation rate to be over the next 12 months?

Instruction: A **positive** number means inflation, a **negative** number represents deflation, and **0** means neither inflation nor deflation.

_____ percent per year [RANGE: -50 - 50 allow for up to ONE decimal points]

Q1.6. What do you expect the **annual average rate** of inflation or deflation to be over the next 5 years?

_____ percent per year [RANGE: -50 - 50 allow for up to ONE decimal points]

Q1.7. The European Central Bank (ECB) is the central bank for the euro area. The euro is the common currency used by 20 of the European Union's member countries, including France. The ECB sets interest rates and conducts monetary policy to maintain price stability across the euro area.

What is your best guess about the **annual inflation rate** in the Euro area that the ECB tries to achieve on average over longer time periods?

_____percent per year [RANGE: -50 - 50 allow for up to ONE decimal points]

Q1.8. [Wave 1] Over the next 12 months, how do you expect the level of interest rate on the 10-year France government bond to move?

Q1.8. [Wave 2] Over the next 12 months, how do you expect the level of mortgage rates to move?

Instruction: A **positive** number represents an increase in interest rate, a **negative** number represents a decrease in interest rate, and **0** means no change.

_____ percentage points

In the next few questions, we ask you to give your best guess about the rate at which GDP will grow in France. GDP is the current value in euro of all final goods and services that are produced within France.

Instruction: A **positive** growth rate indicates that the economy **grows**, while a **negative** growth rate indicates that the economy **shrinks**.

Q1.9A. [Wave 1] Please give your best guess about the **lowest** growth rate (your prediction for the most **pessimistic** scenario for France's growth rate over the next 12 months). [Range: – 50 - 50]

Q1.9B. [Wave 1] Please give your best guess about the **highest** growth rate (your prediction for the most **optimistic** scenario for France's growth rate over the next 12 months). [Range: – 50 - 50]

Q1.9C. [Wave 1] What do you think is the **percentage chance** that the growth rate of GDP in France over the next 12 months will be greater than (Q9A + Q9B)/2 %?

Q1.9. [Wave 2] Please give your best guess about the growth rate of GDP in France over the next 12 months.

Over the next 12 month, GDP will grow by _____ percent [Range: -50 - 50]

Q1.10. What about the **average annual** GDP growth rate in France over the **next 5 years**? Please provide your best estimate.

Over the next 5 years, GDP will grow by an annual rate of _____ percent [Range: -50 - 50]

Q1.11. How much do you trust the government to adequately manage the following?

Slider from 1 to 5 (1 = "no trust at all"; 5 = "completely trust")

- Spending
- Taxation
- Government debt

Q1.12. This is a question to check whether you are paying attention and reading the questions carefully. Please select both “strongly disagree” and “strongly agree” to continue. Otherwise, you will leave the survey.

- Strongly agree
- Agree
- Neither strongly agree or disagree
- Disagree
- Strongly disagree

Section 2: information treatment

On the next screen, we provide you with information about fiscal policy and government budget in France. We would like to ask you to review this information carefully. Please note that this information will be shown only once, and you will not be able to go back to it.

"The debt-to-GDP ratio is the ratio between a country's government debt and its GDP. Government debt is the total amount of money a government owes, typically composed of government bonds and loans. The average **debt-to-GDP ratio in France during the past decade is 103%**."

T0: Control group

[No additional information]

T1: government spending increases by 5% financed by debt

"Consider the following scenario. Suppose the government decides to implement a new spending plan. Under this plan, the government will **increase its spending** over the next 12 months by **an additional amount equal to 5% of the country's GDP**, beyond what was originally planned.

The government announces that this increase in spending will be **financed by additional government borrowing**. This change is temporary and occurs despite no changes in the government's assessment of economic conditions. Moreover, taxes do not change in response to the increase in spending."

T2: government spending increases by 5% financed by taxation

"Consider the following scenario. Suppose the government decides to implement a new spending plan. Under this plan, government will **increase its spending** over the next 12 months by **an additional amount equal to 5% of the country's GDP**, beyond what was originally planned.

The government announces that this increase in spending will be **financed by increasing income taxes**, without putting additional burdens on government debt. This change is temporary and occurs despite no changes in the government's assessment of economic conditions."

Q2.1 The message was about (choose one):

- Fiscal policy
- Monetary policy
- Population growth
- Inflation rate
- Other [open text]

Q2.2 To what extent do you agree with the following statements?

There is too much government debt in France.

[Slider bar of 5 scales]

1. Too little
2.
3. Just right
4.
5. Too much

Q2.3 [Wave 2] I am confident in the government's ability to navigate the next recession.

1. Strong disagree
2. Disagree
3. Neither agree nor disagree
4. Agree
5. Strongly agree

Section 3: post-treatment beliefs

You are almost done with the survey. In the next few questions, we would like to ask your forecasts about several economic indicators again. **Please provide your answers based on the information provided.**

Q3.1 How much do you think consumer prices will change in France? Please provide an answer in percentage terms. [Range: -50 - 50]

- Over the next 12 months: _____ percent
- Over the next 5 years (annual average): _____ percent

Q3.2 What do you think the GDP growth rate in France will be … [Range: -50 - 50]

- Over the next 12 months: _____ percent
- Over the next 5 years (annual average): _____ percent

Q3.3 [Wave 1] Over the next 12 months, how do you expect the level of interest rates on the 10-year government bond to move?

Q3.3 [Wave 2] Over the next 12 months, I expect the level of mortgage rates to change by

_____ percentage points

Q3.4 How much do you think your household spending on non-durable goods and services will change **over the next year** compared to the past year? Please include spending on food and beverages (including grocery and restaurants), clothing, transportation and fuel, communication, travel and recreation, toiletry and cosmetics, cleaning products.

I expect my household spending on non-durable goods to change by

_____ percent [Range: -100 - 100]

Q3.5 [Wave 2] How about your spending **over the next 5 years**? Please provide your answers in **annual average rates**.

_____ percent [Range: -100 - 100]

Q3.6 Based on the information provided, please indicate whether you are more or less likely to make a purchase of the following items over the next [horizon (= 12 months in Wave 1; 5 years in Wave 2)]:

Choice: more likely, no change, less likely

- Cars, trucks, motorcycles

- New furniture or appliances

Q3.7 [Wave 1] Are you currently employed (including self-employed or part-time employment)? [Yes/No]

Q3.7A [Wave 1; if Q3.7 = yes] Based on the information provided, how do you expect the following aspects of your job to change over the next 12 months?

Choices: much higher, higher, no change, lower, much lower

- Hourly wage
- Working hours per week
- Probability of being laid off
- Probability of receiving a better job offer

Q3.7B [Wave 1; if Q3.7 = no] Based on the information provided, how do you expect the following aspects of your job search to change over the next 12 months?

Choices: much higher, higher, no change, lower, much lower

- Probability of finding a job
- Amount of time searching for jobs

Q3.8 [Wave 2] We would like to understand your considerations. With the new government policy, how does the following aspects affect your predictions about the future?

Options: increase/decrease/not relevant

- Government spending during policy rollout
- Government spending in the longer future
- Tax burden during the policy rollout
- Tax burden in the longer future
- Level of government debt [too high/too low/not relevant]
- Additional government debt

Section 4: Background

Q4.1. Were you born in the country you currently live in? [Yes/No]

Q4.1A. [If Q4.1 = no] How many years have you lived in your current country of residence?

Q4.2. Which of the following best characterizes your household:

(1) Own our house/apartment without a mortgage
(2) Own our house/apartment and have a mortgage
(3) Rent our house/apartment
(4) Other (please specify)

Q4.2A [If Q4.2 == (1) or (2)] How many houses do you own?

Q4.4. Which category represents the total combined pre-tax income of all members of your household (including you) during the past 12 months?

- Less than €10,000
- €10,000 to €14,999
- €15,000 to €19,999
- €20,000 to €24,999
- €25,000 to €29,999
- €30,000 to €39,999
- €40,000 to €49,999
- €50,000 to €59,999
- €60,000 to €74,999
- €75,000 or more

Q4.5. What is the total value of your household's savings and financial investments, excluding the value of your primary residence?

- Less than one month of income
- 1 - 3 months of income
- 3 - 6 months of income
- 6 - 12 months of income
- 1 - 5 years of income
- More than 5 years

Q4.6. What is your gender?

- Male
- Female
- Other
- Prefer not to answer

Q4.7. Which year were you born?

Q4.8. What is the highest level of school you have completed, or the highest degree you have received?

- Less than high school
- High school diploma
- Some college but no degree
- Bachelor's Degree
- Postgraduate Degree

B Summary statistics

Table B.1: SUMMARY STATISTICS: DEMOGRAPHICS

	Control	T1	T2	Total	p-value
N	3,069	2,948	2,856	8,873	
Age	46.77	47.32	47.58	47.21	0.13
Gender					0.10
Male	0.49	0.47	0.47	0.48	
Female	0.51	0.53	0.53	0.52	
Education					0.60
No college degree	0.57	0.57	0.56	0.57	
College graudates	0.43	0.43	0.44	0.43	
Income Category					0.43
Less than €25,000	0.30	0.29	0.29	0.30	
€25,000 to €49,999	0.41	0.43	0.42	0.42	
€50,000 or more	0.29	0.28	0.29	0.29	
Savings					0.64
Less than one month of income	0.26	0.28	0.26	0.27	
1 - 3 months of income	0.21	0.21	0.22	0.21	
3 - 6 months of income	0.16	0.16	0.15	0.16	
6 - 12 months of income	0.15	0.14	0.15	0.15	
1 - 5 years of income	0.15	0.15	0.16	0.15	
More than 5 years	0.07	0.06	0.06	0.06	
Homeownership					0.30
Homeowners	0.64	0.63	0.62	0.63	
Renters	0.36	0.37	0.38	0.37	
Number of household members	2.61	2.59	2.59	2.60	0.81
Monthly average spending (past year)	2252.02	2294.18	2191.42	2246.52	0.76

Notes: The units are as follows: the number of respondents for N, average age, average number of household members, and average spending in €. All other variables are categorical, and the numbers correspond to the fraction of respondents. p-values are based on F-tests (ANOVA) for continuous variables, testing equality of means across groups, and Chi-squared tests for categorical variables, testing equality of distributions across groups.

Table B.2: SUMMARY STATISTICS: BY COUNTRY

	France	Germany	Italy	Spain	Netherlands	Total
N	1,809	1,816	1,823	1,848	1,577	8,873
Age	48.16	47.94	46.80	45.73	47.51	47.21
Gender						
Male	0.48	0.48	0.48	0.48	0.48	0.48
Female	0.52	0.52	0.52	0.52	0.52	0.52
Education						
No college degree	0.55	0.65	0.60	0.51	0.52	0.57
College graudates	0.45	0.35	0.40	0.49	0.48	0.43
Income Category						
Less than €25,000	0.35	0.27	0.34	0.34	0.15	0.30
€25,000 to €49,999	0.43	0.36	0.43	0.47	0.40	0.42
€50,000 or more	0.23	0.37	0.22	0.19	0.45	0.29
Savings						
Less than one month of income	0.31	0.27	0.31	0.23	0.21	0.27
1 - 3 months of income	0.20	0.22	0.22	0.22	0.20	0.21
3 - 6 months of income	0.15	0.16	0.13	0.18	0.18	0.16
6 - 12 months of income	0.12	0.14	0.12	0.16	0.19	0.15
1 - 5 years of income	0.16	0.15	0.14	0.15	0.16	0.15
More than 5 years	0.07	0.05	0.07	0.06	0.06	0.06
Homeownership						
Homeowners	0.61	0.40	0.80	0.74	0.61	0.63
Renters	0.39	0.60	0.20	0.26	0.39	0.37
Number of household members	2.45	2.35	2.80	2.87	2.49	2.60
Monthly average spending (past year)	1987.99	2814.44	2063.96	2221.17	2129.83	2246.52

Notes: The units are as follows: the number of respondents for N, average age, average number of household members, and average spending in €. All other variables are categorical, and the numbers correspond to the fraction of respondents.

Table B.3: SUMMARY STATISTICS: PRE-TREATMENT EXPECTATIONS

	Inflation		**GDP**		**Spending**		**Interest**
	1-year	5-year	1-year	5-year	1-year	5-year	1-year
France							
mean	3.37	4.94	2.02	2.38	3.81	12.02	2.66
sd	2.96	4.02	2.36	2.23	7.00	15.20	2.83
Germany							
mean	3.47	4.39	1.64	2.19	5.39	11.02	2.32
sd	2.85	3.48	2.29	2.10	6.89	12.99	2.63
Italy							
mean	3.15	4.79	1.77	1.99	4.80	11.91	2.17
sd	3.16	4.17	2.14	2.00	7.17	13.50	2.75
Spain							
mean	3.34	4.80	2.58	2.83	4.76	11.91	2.28
sd	3.03	3.96	2.08	2.01	7.04	13.08	2.69
The Netherlands							
mean	3.71	4.70	2.51	2.72	4.55	10.96	2.10
sd	2.90	3.60	2.22	2.05	6.73	13.32	2.55
Total							
mean	3.41	4.72	2.10	2.42	4.67	11.59	2.30
sd	2.99	3.86	2.25	2.10	6.99	13.64	2.70

Notes: This table reports the mean and standard deviation of pre-treatment macroeconomic expectations, by country and for the full sample. Statistics are constructed using Huber-robust weights, derived from Huber-robust regressions (Huber, 1964) on a constant.

C Model Details

C.1 The Debt Evolution Process

The government budget constraint (5.1) can be rewritten as

$$\frac{I_{t-1}}{\Pi_t}\frac{Y_{t-1}}{Y_t}b_{t-1}+\frac{G_t}{Y_t}=\mathcal{T}_t+b_t. \tag{C.1}$$

Note that the steady-state relationship satisfies

$$\beta\frac{\bar{I}}{\bar{\Pi}}=1, \qquad \frac{\bar{G}}{\bar{Y}}=\phi, \qquad \frac{\bar{b}\bar{I}}{\bar{\Pi}}=\bar{\mathcal{T}}+\bar{b}-\phi.$$

Utilizing the steady-state conditions, log-linearizing the government budget constraint (C.1) yields

$$\frac{\bar{b}\bar{I}}{\bar{\Pi}}(1+\hat{b}_{t-1}+\hat{y}_{t-1}-\hat{y}_t-\hat{\pi}_t+\hat{i}_{t-1})+\phi+\hat{g}_t-\phi\hat{y}_t=\bar{\mathcal{T}}+(1-\bar{\mathcal{T}})\hat{\tau}_t+\bar{b}(1+\hat{b}_t),$$

which implies

$$\beta^{-1}\bar{b}(\hat{b}_{t-1}+\hat{y}_{t-1}-\hat{y}_t-\hat{\pi}_t+\hat{i}_{t-1})+\hat{g}_t-\phi\hat{y}_t=(1-\bar{\mathcal{T}})\hat{\tau}_t+\bar{b}\hat{b}_t.$$

This expression gives the following government debt evolution process

$$\hat{b}_t=\beta^{-1}\left[\hat{b}_{t-1}-(\hat{y}_t-\hat{y}_{t-1})-\hat{\pi}_t+\hat{i}_{t-1}\right]+\bar{b}^{-1}\hat{g}_t-\bar{b}^{-1}\phi\hat{y}_t-\bar{b}^{-1}(1-\bar{\mathcal{T}})\hat{\tau}_t. \tag{C.2}$$

Further substituting $\hat{\tau}_t$ from (5.2) into (C.2), we get

$$\begin{aligned}\hat{b}_t=\beta^{-1}\Big\{\Big[1-\beta\bar{b}^{-1}(1-\bar{\mathcal{T}})\alpha\Big]\hat{b}_{t-1}-(\hat{y}_t-\hat{y}_{t-1})-\hat{\pi}_t+\hat{i}_{t-1}\Big\}-\bar{b}^{-1}\phi\hat{y}_t\\ +\bar{b}^{-1}[1-(1-\bar{\mathcal{T}})\eta\Lambda]\hat{g}_t,\end{aligned} \tag{C.3}$$

which gives the expression in (5.5).

C.2 The IS Curve

Log-linearizing (5.7) gives the IS curve in the form of consumption:

$$\hat{c}_t=\mathbb{E}_t\hat{c}_{t+1}-\frac{1}{\sigma_c}\left[\hat{i}_t-\mathbb{E}_t\hat{\pi}_{t+1}\right], \tag{C.4}$$

where $\sigma_c \equiv -\bar{C}u_{cc}(\bar{C})/u_c(\bar{C}) > 0$ is the inverse of IES of private consumption.

The goods-market clearing condition (5.9) implies

$$(1-\phi)\hat{c}_t + \hat{g}_t = \hat{y}_t. \tag{C.5}$$

Thus, combining (C.4) and (C.5), we obtain the IS curve (5.10):

$$\hat{y}_t - \hat{g}_t = \mathbb{E}_t\left[\hat{y}_{t+1} - \hat{g}_{t+1}\right] - \frac{1}{\sigma_y}\left[\hat{i}_t - \mathbb{E}_t\hat{\pi}_{t+1}\right], \tag{C.6}$$

where $\sigma_y \equiv \sigma_c \bar{Y}/\bar{C}$.

C.3 The Phillips Curve

Rewrite the term of real marginal cost in (5.13) in terms of output. The average real marginal cost is

$$MC_t = w_t.$$

Substituting the labor supply condition (5.8) into this expression and taking log-linearization, we have[10]

$$\widehat{mc}_t = \sigma_h \hat{h}_t + \sigma_c \hat{c}_t + \hat{\tau}_t. \tag{C.7}$$

Combining (C.5) and (C.7) and noticing $\hat{y}_t = \hat{h}_t$, we can then rewrite the real marginal cost as

$$\widehat{mc}_t = (\sigma_y + \sigma_h)\hat{y}_t - \sigma_y \hat{g}_t + \hat{\tau}_t. \tag{C.8}$$

Thus, substituting $\widehat{mc}_t$ from (C.8) into (5.13) gives

$$\hat{\pi}_t = \beta \mathbb{E}_t \hat{\pi}_{t+1} + \kappa(\hat{y}_t - \Gamma \hat{g}_t) + \psi \hat{\tau}_t,$$

which is equation (5.14).

C.4 Calibration

We calibrate our model to an annual frequency; see Table C.4. The following parameters are standard in the literature. We assume a zero inflation rate at the steady state $\bar{\Pi} = 1$. The discount factor of the household is $\beta = 0.98$, implying the annualized steady-state real interest of 2%. The inverse of the IES of household consumption, $\sigma_c \equiv -u_{cc}(\bar{C})\bar{C}/u_c(\bar{C})$, is

[10] To a first-order approximation, $\hat{\tau}_t = \mathcal{T}_t - \bar{\mathcal{T}}$, provided that $\bar{\mathcal{T}}$ is of first-order magnitude.

Table C.4: CALIBRATED PARAMETER VALUES

Parameter	Value	Description
β	0.98	Subjective discount factor
σ_c	1	Inverse of the intertemporal elasticity of substitution
σ_h	1	Frisch elasticity of labor supply
$\bar{\Pi}$	1	Steady state inflation
κ	0.31	The Phillips curve slope
ϕ_π	2.4	Taylor rule inflation response
ϕ_y	0.36	Taylor rule output response
$\bar{\alpha}$	0.07	Response of income tax rate to debt
b^*	0.6	Long-term target of debt-to-GDP ratio
ϕ	0.37	Steady-state government spending to GDP ratio
χ	2	Matching the crossing in Figure 1 at debt-to-GDP ratio of 90%

set to one, implying $\sigma_y = \sigma_c/(1-\phi)$. The Frisch elasticity of labor supply σ_h is also set to one.

The slope of the Phillips curve is set to $\kappa = 0.31$, following the estimation in Barnichon and Mesters (2020). We assume parameters in the Taylor rule $\phi_\pi = 2.4$ and $\phi_y = 0.36$, following Christiano et al. (2014). The response of tax rate to debt-to-GDP ratio is set to $\bar{\alpha} = 0.07$, based on the estimate in Bianchi and Melosi (2017). The long-term debt target is assumed to be $b^* = 0.6$, corresponding to an annual debt-to-GDP ratio of 60% as required under the EU fiscal framework. The steady-state government spending-to-GDP ratio is set to $\phi = 0.37$, matching the historical average across the five countries in our survey sample.[11]

Finally, we calibrate $\chi = 2$ so that, the model-generated short-term fiscal multipliers under tax financing and debt financing coincide when the annual debt-to-GDP ratio is around 90% in Figure 5 to be consistent with Figure 1.

[11]The historical average is calculated over the period 1950–2019 using the IMF Public Finances in Modern History Database.