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Public Debt and Household Inflation Expectations

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ABSTRACT: We use randomized controlled trials in the US, UK, and Brazil to examine the causal effect of public debt on household inflation expectations. We find that people underestimate public debt levels and increase inflation expectations when informed about the correct levels. The extent of the revisions is proportional to the size of the information surprise. Confidence in the central bank considerably reduces the sensitivity of inflation expectations to public debt. We also show that people associate high public debt with stagflationary effects and that the sensitivity of inflation expectations to public debt is considerably higher for women and low-income individuals.

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1 Introduction

The economic recovery after the COVID-19 pandemic has been characterized by a sharp increase in inflation against the background of record-high levels of public debt. The surge in inflation has sparked renewed interest in understanding the behavior and determinants of inflation expectations, leading to a rapidly expanding body of new academic research (Weber et al., 2022). This paper complements ongoing efforts to understand inflation expectations by analyzing whether high public debt levels contribute to raising household inflation expectations.

This question is motivated by two considerations. First, the large fiscal packages to counter the global financial crisis in 2008 and the COVID-19 pandemic in 2020 have pushed public debt levels to historic highs in many countries, raising pressing questions about their macroeconomic effects. For example, a key concern is that high public debt levels may weaken central banks' determination to fight inflation given the positive effects on fiscal burdens. Second, understanding the effects of public debt on inflation expectations is important well beyond the current economic conjuncture. The influence of public debt on inflation expectations is indeed central to the contentious debate about the role of fiscal policy in the determination of the price level, as for example discussed in Leeper and Leith (2016) and Cochrane (2023).

Identifying the causal effect of public debt on household inflation expectations using conventional macro and household survey data is highly problematic. This is because inflation expectations are affected by a vast array of factors—beyond possibly public debt levels—that cannot be jointly controlled for. To overcome this challenge, the analysis uses surveys specifically designed for our research question that incorporate a randomized controlled trial based on an information provision experiment. The core structure of the surveys involves asking people about their inflation expectations, providing a treatment group with information about the correct level of public debt, and finally allowing all respondents to revise their inflation expectations. The key identification assumption is that the information treatment leads to an exogenous update of people's information set about the level of public debt. The econometric analysis then measures whether the information treatment affects people's expectations by comparing the revisions of inflation expectations among the treatment group against the control group. This information provision experiment thus provides a clean causal identification of the effects of public debt on inflation expectations.

The surveys also collect a rich set of additional information to quantify the effects of public debt on inflation expectations more accurately and enrich the analysis along vari-

ous dimensions. First, we elicit prior beliefs about debt levels. This is essential to measure the direction and size of the information treatment shock and isolate genuine belief updates from priming effects. Second, we inquire about people's confidence in monetary and fiscal institutions to understand the extent to which institutional credibility anchors inflation expectations and reduces their sensitivity to debt information. Third, we ask survey participants about the likelihood that the central bank will engage in monetary finance and about their expectations regarding the future unemployment rate. We use these questions to shed light on the cognitive channels linking public debt to inflation. Finally, we gather a rich set of demographic and socioeconomic characteristics to explore potential sources of heterogeneity.

Another key strength of the analysis is that the surveys were administered in three countries to assess the robustness of the results across different economic and institutional environments. We consider two advanced economies (the US and the UK) and one emerging market (Brazil). These countries share some similarities that make them particularly suitable for our study. In particular, they have high public debt—likely increasing people's awareness about the potential effects on inflation—but also inflation-targeting central banks that should anchor inflation expectations. Yet these countries also differ along important dimensions and thus constitute a good testing ground to assess the robustness of the results across different environments. For example, the US arguably faces ample fiscal space given its reserve currency status; the UK instead confronted severe market turbulence in September 2022 after the announcement of large tax cuts; and Brazil is at a lower level of economic development.

We find that across all countries people on average largely underestimate the level of public debt and revise inflation expectations upwards when informed about the correct levels. Furthermore, the extent of the revisions to inflation expectations is proportional to the size of the information shock. Specifically, people with lower prior beliefs about public debt increase inflation expectations more strongly once they are informed about the correct debt level. These results provide robust evidence that public debt levels have a causal effect on household inflation expectations. The quantitative effects are sizeable: an increase in public debt by 10 percent of GDP leads to an increase in one-year ahead inflation expectations by about 0.6 percent.

The analysis also shows that the credibility of the central bank plays a key role in anchoring inflation expectations and reducing their sensitivity to debt levels. People who are more confident about the central bank's determination to fight inflation or are more knowledgeable about the inflation target, revise inflation expectations much more modestly. We also find some evidence that confidence in fiscal restraint by the government

attenuates the impact of public debt on inflation expectations. But overall the results show that people attribute a predominant role to the central bank above the fiscal authorities in determining the inflation outlook.

Regarding the cognitive mechanisms that link public debt to higher inflation expectations, we do not find evidence that people think about the risks of monetary finance. Survey respondents that increase inflation expectations when informed about public debt levels are not more likely to expect that the central bank will engage in monetary finance than people in the control group. People instead interpret high public debt levels as bad news for the economic outlook, leading to both higher inflation and unemployment expectations. Through the lenses of macroeconomic models, high debt levels are thus perceived as negative supply shocks, with stagflationary effects on the economic outlook.

We also examine whether the sensitivity of inflation expectations is heterogeneous across people. A particularly robust finding is that women increase inflation expectations much more strongly than men when informed about debt levels, on average twice as much. This is true even when controlling for additional individual characteristics. Lower-income households also display a higher sensitivity of inflation expectations to debt levels. These results are partly explained by the fact that women and lower-income households have weaker confidence in the central bank and less knowledge about its inflation target.

Related literature. The paper builds on a recent yet rapidly growing literature that uses information provision experiments to understand the determinants of household inflation expectations.[1] Earlier studies have focused on the sensitivity of inflation expectations to information about past and current inflation. Armantier et al. (2016) find that people tend to re-anchor inflation expectations around the levels predicted by professional forecasters when provided with such information, consistent with Bayesian updating. Cavallo, Cruces and Perez-Truglia (2017) show that household inflation expectations are influenced by personal shopping experiences even when provided with accurate inflation statistics, thus highlighting the role of cognitive limitations.

Recent contributions have examined whether and how central banks can influence household expectations about inflation and other macroeconomic variables. Haldane and McMahon (2018) find that using more accessible language in inflation reports helps an-

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[1]Information provisions experiments have also been used to examine household expectations about other variables, for example house prices (Armona, Fuster and Zafar, 2018) and personal economic prospects (Roth and Wohlfart, 2020). Furthermore, several papers have employed similar techniques to examine firm expectations (Coibion, Gorodnichenko and Kumar, 2018; Coibion, Gorodnichenko and Ropele, 2020; Coibion et al., 2021; Savignac et al., 2022). See Haaland, Roth and Wohlfart (2023) for a broader literature review on information provision experiments, including outside of macroeconomics.

chor people's expectations around the central bank's forecasts. D'Acunto et al. (2020) show that household expectations are more responsive to central bank communication about policy targets than policy instruments, such as the path of interest rates. Coibion, Gorodnichenko and Weber (2022) compare the effects of different forms of monetary policy communication on household inflation expectations. Coibion et al. (2023c) show that information about average inflation targeting does not change household expectations relative to information about traditional inflation targeting. Coibion et al. (2023b) examine the effects of forward guidance on household expectations about inflation and interest rates.

Our paper complements this literature on the determinants of household inflation expectations by analyzing whether and how expectations are affected by fiscal variables, specifically by the level of public debt. Coibion, Gorodnichenko and Weber (2021) also examine the influence of fiscal variables on inflation expectations. Using survey data from the US, they find that news about future debt levels increase household expectations about inflation, government spending, and interest rates on government debt. Our analysis differs in several dimensions. First, we elicit people's debt beliefs before the information treatment which is crucial to test if revisions to inflation expectations respond to the size and direction of the information shock.[2] Second, we extend the analysis beyond the US by also running the survey in the UK and Brazil. Third, we enrich the analysis by showing that the sensitivity of inflation expectations to debt levels crucially depends on the central bank's credibility and by shedding light on the cognitive channels linking debt to inflation.

Our paper is also related to the work of Roth, Settele and Wohlfart (2022) that examines the impact of public debt on people's preferences for government spending and taxation rather than on people's inflation expectations. Consistent with our results, they find that US households considerably underestimate the level of public debt. Finally, Andre et al. (2022) provide complementary evidence to ours about the effects of fiscal variables on people's expectations. Their analysis uses hypothetical vignettes asking people about the effects of several macroeconomic shocks—among which an increase in government spending and a rise in taxation—on inflation and unemployment. They document considerable heterogeneity in people's responses with a tendency to expect higher inflation after a government spending increase. Our paper focuses on the effects of debt levels rather than expansionary or contractionary fiscal shocks, uses information treatments

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[2]Coibion, Gorodnichenko and Weber (2021) also tried to measure prior debt beliefs by asking survey participants how many years it would take to repay the stock of US government debt if all GDP was used for this purpose. However, the question was likely too complex for survey respondents—leading to an average response of 10 years—and was thus not used in the analysis.

based on real data rather than hypothetical scenarios, and expands the analysis beyond the US.

We organize the paper as follows. Section 2 describes the structure and modalities of the survey. Section 3 analyzes the effect of the debt information treatment on inflation expectations and Section 4 examines whether the strength of the effect depends on the credibility of monetary and fiscal institutions. Section 5 explores cognitive transmission channels and heterogeneity across people's individual characteristics. Section 6 concludes.

2 Survey design

The analysis uses survey data collected by YouGov, an international data analytics company. YouGov conducts public opinion surveys online and has access to a panel of over 22 million registered members across more than 40 countries.[3] Members are at least 18 years old and receive points for answering surveys that can eventually be converted to cash.

The survey participants for the analysis were selected by YouGov to ensure the national representativeness of the sample based on a host of different demographic and socioeconomic characteristics. Participants were invited via email. To ensure that only those selected for the survey could participate, YouGov asked people to enter their usernames and passwords before answering the questionnaire. Furthermore, each respondent could take the survey only once. To fine-tune the representativeness of the sample, YouGov provided us with sample weights that are used throughout the analysis.

To limit cognitive fatigue, the questionnaire was administered individually and only included questions related to the study. Furthermore, the survey was brief, involving only 8 questions besides collecting demographic and socioeconomic characteristics.[4] At no point in the survey people were informed about the purpose of the analysis. Screenshots from the survey are presented in Appendix A.

The survey involved the participation of 2,000 individuals in each country (US, UK, and Brazil) and was administered between November 23rd and December 2nd, 2022.

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[3] Online surveys involve two key advantages. First, they allow people to provide more truthful answers, free from the embarrassment that may arise when talking to a real-person interviewer. This is especially important when eliciting people's views about general knowledge questions, such as inflation rates and public debt levels. Second, people can participate in the questionnaire at a time of their convenience, thus being able to devote more time and attention to the questions.

[4] People were asked to provide information about their age, gender, income, education, employment status, number of children, and geographical location.

Participants were randomly allocated to a control and a treatment group of equal size.[5] All survey questions were common to both groups. This is crucial to control for possible priming effects. People may indeed revise inflation expectations between the beginning and the end of the survey not only because they are provided with certain information but merely because other questions in the survey may nudge people to think about factors that are relevant to inflation. By presenting the treatment and control group with the same questions, the econometric analysis can remove possible priming effects by comparing the treatment group against the control group.

The survey included five pre-treatment questions. People were asked about the expected inflation rate over the next 12 months, the central bank's inflation target, and the level of public debt in percent of GDP. All questions provided simple definitions of the relevant economic concepts, for example defining the inflation rate as "the percentage increase in the prices of goods and services consumed by people". People were always given the option not to respond to avoid collecting uninformative answers. People were also asked about their degree of confidence that (i) the central bank will prevent large increases in inflation and (ii) the government will prevent large increases in government debt. Answers to these questions were provided on a scale from 1 to 5, with higher values denoting stronger confidence.

The treatment group was then informed about the correct level of public debt in percent of GDP, equal to 122, 87, and 88 percent in the US, UK, and Brazil, respectively. No information was instead provided to the control group. This information treatment will be exploited in the econometric analysis to estimate the causal effect of debt levels on inflation expectations. The survey continued with three post-treatment questions. People were first provided with the opportunity to revise their inflation expectations, after being reminded about their previous answer. Participants were then asked about the expected unemployment rate in 12 months and the likelihood that the central bank would print money to finance government spending or repay government debt.

3 Public debt and inflation expectations

Table C.1 in Appendix C reports summary statistics showing the average values for each survey response by country, as well as differentiating between the control and treatment groups. To ensure that the analysis is not biased by implausible answers, we drop 158 respondents out of 6,000 that report inflation expectations in excess of 100 percent or debt levels above 200 percent of GDP or below 0. We also treat it as missing a dozen of

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[5]Table B.1 confirms that the group assignment is not predictable by individual characteristics.

observations that report beliefs about the inflation target above 100 percent and expected unemployment rates above 100 percent or below zero.

The first finding of the analysis is that in all countries people strongly underestimate the level of public debt. On average, people report public debt levels in the US, UK, and Brazil equal to 54, 63, and 36 percent of GDP, respectively. The correct values at the end of 2022 were instead 122, 87, and 88 percent of GDP.[6] This result is consistent with the findings in Roth, Settele and Wohlfart (2022) for the US, showing that people considerably underestimate the level of public debt.[7]

A preliminary indication that high debt levels may raise inflation expectations comes from the cross-sectional relation between pre-treatment debt beliefs and inflation expectations. As illustrated in Figure C.2 in Appendix C, in all countries people that report higher levels of public debt tend also to have higher inflation expectations. Yet it would be premature to attribute a causal effect of public debt on inflation expectations based on this cross-sectional evidence since omitted variables may drive this correlation. For example, people with little confidence in domestic economic fundamentals could be more inclined to think that the country suffers from both high debt levels and high inflation, even if they do not perceive a causal link between these variables.

To identify the causal effect of public debt on inflation expectations, it is thus necessary to generate an exogenous shift in people's perceptions about debt levels and then examine if people revise inflation expectations accordingly. We accomplish this step by exploiting the information provision treatment in the survey. The participants assigned to the treatment group are informed about the correct level of public debt in their country while people in the control group receive no information. The survey elicits people's inflation expectations before and after the information treatment, and the econometric analysis examines revisions to inflation expectations in the treatment group relative to the control group.

As previously discussed, people substantially underestimate public debt levels. Therefore, people in the treatment group receive an upward surprise about the size of public debt. If higher debt has a causal positive impact on inflation expectations, we should thus observe that people in the treatment group revised inflation expectations upwards relative to the control group. To test for this hypothesis, we estimate the following regression:

$$\Delta E_i \pi = \alpha + \beta T_i + \xi X_i + \epsilon_i. \tag{1}$$

[6]Figure C.1 in Appendix C illustrates the distribution of the public debt responses in each country.

[7]Roth, Settele and Wohlfart (2022) surveyed about 4,000 respondents in the US between 2017 and 2019 and ask about the level of public debt in 2016 as a percent of GDP. The median response was 60 percent while the correct level of debt was 105 percent.

The dependent variable captures revisions in inflation expectations before and after the treatment, with $\Delta E_i \pi = E_i^{post}\pi - E_i^{pre}\pi$. The subscript i denotes individual survey participants and T_i is a dummy that identifies people in the treatment group. The regression equation controls for a vector X_i of demographic and socioeconomic characteristics of the survey participants, including age, gender, geographical region, employment status, education level, income group, and whether they have kids.

The regression coefficient α captures possible revisions in the inflation expectations of people in the control group. In principle, people in the control group are not expected to systematically revise inflation expectations since they are not provided with any information about public debt levels or other variables. Yet they may still revise inflation expectations because they are influenced by other questions in the survey or just because they are given the opportunity to update their inflation expectations. Our primary interest lies in the regression coefficient β which measures whether people in the treatment group revise inflation expectations upwards more strongly than people in the control group. We estimate equation (1) for each country as well as by pooling all observations together in which case the regression also includes country-fixed effects.[8] Columns (1) to (4) in Table 1 report the results. Across all countries and in the panel specification people in the treatment group substantially increase inflation expectations on average relative to the control group after being informed about debt levels. These effects are highly statistically significant and economically sizeable, involving upward revisions in inflation expectations by several percentage points.

The estimates of equation (1) capture the average treatment effect of the information provision experiment on the inflation expectations. To corroborate these findings and quantify the impact of public debt on inflation expectations more precisely, we also examine if the inflation revisions are correlated with the size of the information shock received by each survey participant. All people in the treatment group receive the same information about the correct level of public debt in their respective countries. However, this information treatment should have different effects across people depending on their prior debt beliefs. People that had good knowledge about the level of public debt should adjust inflation expectations less in response to the information treatment relative to people that grossly underestimated the stock of public debt.

Note that we can perform this crucial step of the analysis because we collected information about people's debt beliefs before the information treatment. This is a key strength of our paper and an important feature that differentiates our work from Coibion,

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[8]The regression equation for the pooled specification is $\Delta E_{i,j}\pi = \alpha_j + \beta T_{i,j} + \xi X_{i,j} + \epsilon_{i,j}$ where j denotes the country.

Table 1: Treatment effects on inflation expectations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	US	UK	Brazil	All	US	UK	Brazil	All
Constant	-0.29	-0.08	-2.74	-2.38**	-1.34	-2.00**	-3.83	-4.91***
	(1.72)	(0.90)	(2.54)	(1.21)	(2.26)	(0.89)	(3.04)	(1.60)
Treatment	6.00***	3.60***	10.64***	6.58***	9.19***	7.47***	13.33***	10.94***
	(0.74)	(0.42)	(1.07)	(0.44)	(1.54)	(1.01)	(1.84)	(0.93)
Debt					0.02**	0.01***	0.03	0.03***
					(0.01)	(0.00)	(0.02)	(0.01)
Treatment × debt					-0.04**	-0.06***	-0.06*	-0.07***
					(0.02)	(0.01)	(0.04)	(0.01)
Observations	1,114	1,499	1,216	3,829	819	1,023	1,011	2,853
R-squared	0.10	0.08	0.09	0.08	0.11	0.13	0.10	0.10

Notes: All regressions use sampling weights and include controls for gender, age, geographical area, employment, number of children, education, and income. Column (4) also includes country fixed effects. Robust standard errors in parentheses.

Gorodnichenko and Weber (2021). By examining whether inflation revisions correlate with the size of the information shock, we can also better distinguish the effects of genuine belief changes from possible priming effects due to the fact that the treatment group is reminded about the relevance of public debt via the information treatment. To explore the correlation between inflation expectations and the size of the information shock, we extend equation (1) to include the pre-treatment level of public debt D_i as reported by each participant:

$$\Delta E_i \pi = \alpha + \gamma D_i + (\beta + \delta D_i) T_i + \xi X_i + \epsilon_i. \tag{2}$$

If the size of the inflation revisions is correlated with the size of the information shocks, the coefficient δ should be negative. People with higher prior debt beliefs—hence less surprised by the correct level of public debt—should revise inflation expectations upwards less strongly.

Columns (5) to (8) in Table 1 report the regression estimates showing that the coefficient δ is indeed negative and statistically significant across all countries. Figure 1 illustrates these results by reporting the change in inflation expectations for people in the treatment and control groups at different levels of prior debt beliefs. We observe that people in the treatment group with the lowest initial debt perceptions—thus receiving the largest information shock about actual debt levels—revise inflation expectations upwards the most. The size of the upward revisions in inflation expectations declines as we consider people with higher prior debt beliefs. Inflation revisions are no longer statistically different between the treatment and control group for people whose debt be-

Figure 1: Revisions to inflation expectations and debt level perceptions (Percent)

(a) US

(b) UK

(c) Brazil

(d) All
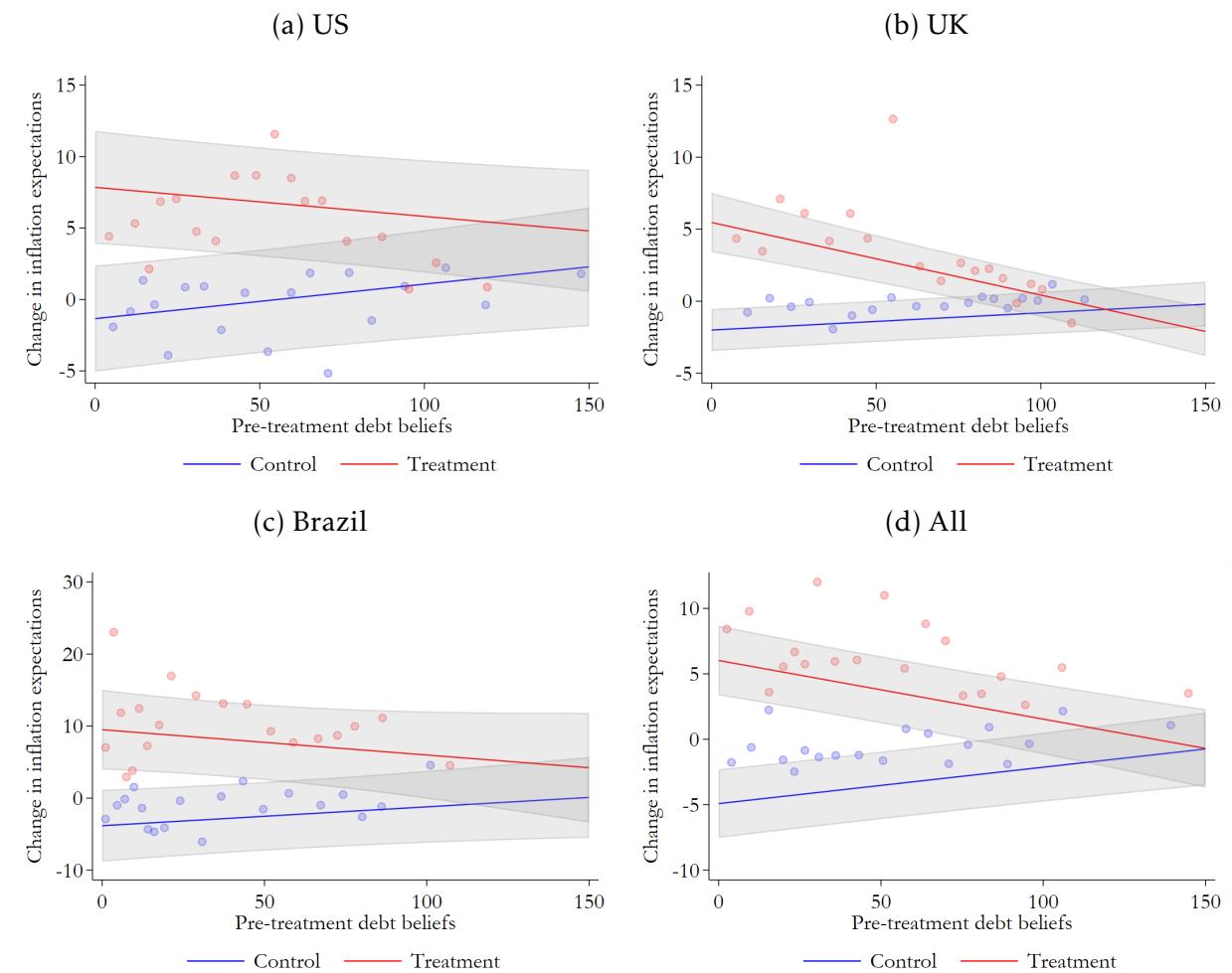
Notes: The figure presents binscatter charts of changes in inflation expectations over perceived levels of public debt in percent of GDP. The estimates are obtained with OLS regressions using sampling weights. All regressions include controls for gender, age, geographical area, employment, number of children, education, and income. Panel (d) also includes country-fixed effects.

liefs were close to the correct debt values and were thus not surprised by the information treatment.

These results provide strong evidence that people increase inflation expectations when they are surprised by the high level of public debt. Furthermore, the extent of the revision in the inflation expectations is proportional to the size of the information shock, being larger for people that had lower initial debt perceptions. Regarding the quantitative effects, the regression coefficient δ implies that an increase in public debt by 10 percent of GDP generates an upward revision in inflation expectations by about 0.6 percent. Interestingly the estimates are fairly consistent across countries. The δ coefficient is almost identical for the UK and Brazil—0.062 and 0.061, respectively—and only modestly smaller for the US, 0.045.

4   The role of credibility

In this section, we delve further into the causal effect of public debt on inflation expectations by examining whether it is influenced by the credibility of monetary and fiscal institutions. A commonly held view is that central bank credibility should contribute to anchoring inflation expectations and thus reduce their sensitivity to external shocks, including news about public debt levels.

To examine this aspect, we included in the survey two questions to assess people's perceptions of the central bank and knowledge about its mandate. Survey participants were asked about their degree of confidence on a scale from 1 to 5 that the central bank will prevent large increases in inflation. Furthermore, they were also asked about the central bank's inflation target. Our prior is that people that are more informed about the inflation target are likely to better understand the price stability mandate of the central bank. The sensitivity of inflation expectations to debt levels may also depend on the credibility of the fiscal authorities. To assess this aspect, the survey also inquired about people's confidence that the government will prevent large increases in government debt.

To test whether the degree of confidence in the central bank and the government influence the impact of debt levels on inflation expectations, we estimate the following regression

$$\Delta E_i \pi = \alpha + \beta T_i + \bar{\beta} T_i \times C_i + \bar{\alpha} C_i + \xi X_i + \epsilon_i. \tag{3}$$

The vector C_i includes the degree of confidence in the central bank, the absolute gap between people's beliefs about the inflation target and the correct value, and the degree of confidence in the government. The regression results are reported in Table 2. In columns

(1) to (4) we focus on the role of the central bank. Across all countries and in the panel specification people who have more confidence in the central bank tend to revise inflation expectations upwards less strongly when informed about public debt levels. These effects are highly statistically significant and economically sizeable. In the panel specification, for example, people with the lowest degree of confidence in the central bank increase inflation expectations three times as much as people with the highest degree of confidence. We also find evidence that people with more limited knowledge about the inflation target tend to revise inflation expectations more strongly. The regression coefficients on the interaction between the treatment effect and the inflation target gap are indeed positive across all specifications and statistically significant for the US and the panel regression.

Table 2: How credibility affects the impact of debt on inflation expectations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Central bank credibility				Government credibility			
	US	UK	Brazil	All	US	UK	Brazil	All
Constant	-0.02	-0.00	-2.21	3.93	1.99	0.59	-3.96	2.54
	(2.11)	(1.11)	(3.02)	(2.67)	(2.00)	(0.93)	(2.59)	(2.37)
Treatment (T)	10.81***	4.19***	17.59***	8.34***	9.22***	4.22***	15.79***	7.75***
	(1.90)	(1.32)	(3.45)	(1.18)	(1.54)	(1.12)	(2.50)	(0.95)
T × CB confidence	-2.69***	-1.02**	-2.53**	-1.27***				
	(0.68)	(0.44)	(1.01)	(0.44)				
CB confidence	0.33	-0.28*	0.54	-0.19				
	(0.48)	(0.16)	(0.44)	(0.24)				
T × IT gap	0.14***	0.32	0.09	0.15***				
	(0.05)	(0.20)	(0.06)	(0.04)				
IT gap	-0.09**	-0.01	-0.08*	-0.09***				
	(0.04)	(0.09)	(0.05)	(0.03)				
T × Govt confidence					-1.27**	-0.30	-1.86**	-0.49
					(0.55)	(0.53)	(0.79)	(0.39)
Govt confidence					-0.66*	-0.36**	0.42	-0.53***
					(0.38)	(0.18)	(0.35)	(0.20)
Observations	948	1,310	1,068	3,326	1,082	1,474	1,187	3,743
R-squared	0.13	0.12	0.10	0.09	0.12	0.08	0.10	0.08

Notes: All regressions use sampling weights and include controls for gender, age, geographical area, employment, number of children, education, and income. Column (4) and (8) also includes country fixed effects. Robust standard errors in parentheses. The variables "CB confidence" and "Govt confidence" capture the degree of confidence in the central bank and the government, respectively. The variable "IT gap" is the absolute gap between people's beliefs about the central bank inflation target and the correct value.

In columns (5) to (8) we assess the role of government credibility. The regression results show that stronger confidence in the government is associated with smaller revisions in inflation expectations in the US and Brazil. However, we do not detect statistically sig-

nificant effects in the case of the UK and for the panel sample. The role of government credibility weakens further if we also control for measures of central bank credibility in the same regression. Therefore, the analysis reveals that the credibility of the central bank rather than of the government plays the predominant role in anchoring inflation expectations and shaping the sensitivity of inflation expectations to debt levels.

5   Cognitive transmission channels and heterogeneity

In the survey, we also included two questions to investigate possible cognitive channels that may link public debt to inflation in people's minds. To understand if people associate higher public debt with concerns about monetary finance, survey participants were asked about the likelihood that the central bank "will print money in the future to finance government spending or repay government debt". Answers were recorded on a scale from 1 to 5. Furthermore, the survey inquired about people's expectations about the unemployment rate in the near future to understand whether people associate high public debt with a deterioration of the economic outlook.

To limit survey fatigue and cognitive strain, these questions (unlike inflation expectations) were asked only once at the end of the survey, thus after people in the treatment group were informed about public debt levels. The empirical analysis uses an instrumental variable approach to assess the extent to which revisions in inflation expectations triggered by the debt information treatment are correlated with the likelihood of money printing or unemployment expectations. More specifically, we estimate the following equation

$$Y_i^{post} = \alpha + \beta E_i^{pre}\pi + \gamma E_i^{post}\pi + \xi X_i + \epsilon_i \tag{4}$$

where Y_i^{post} denotes either the likelihood of money printing or the expected unemployment rate. The variables $E_i^{pre}\pi$ and $E_i^{post}\pi$ are the inflation expectations recorded before and after providing the information treatment, respectively. To isolate the variation due to the information treatment, ex-post inflation expectations are instrumented with the following equation:

$$E_i^{post}\pi = \alpha + \beta T_i + \nu E_i^{pre}\pi + \xi X_i + \epsilon_i \tag{5}$$

Table 3 reports the regression estimates for equation (4). In Columns (1) to (4), we do not find evidence that post-treatment inflation expectations are correlated with the likelihood of monetary finance. We also examined the results by limiting the sample to people with a college education that may have more familiarity with the notion of monetary finance. Yet we still did not detect any correlation between post-treatment

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inflation expectations and the likelihood of monetary finance. Therefore, we conclude that people do not associate higher public debt with a stronger propensity of the central bank to expand the money supply and finance the government.

Table 3: Monetary finance and unemployment, IV regressions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Likelihood of monetary finance				Expected unemployment			
	US	UK	Brazil	All	US	UK	Brazil	All
Constant	3.11***	2.74***	3.22***	3.17***	6.24***	7.32***	10.81***	10.21***
	(0.14)	(0.18)	(0.13)	(0.11)	(2.13)	(2.05)	(2.54)	(2.16)
Post-T expected inflation	-0.00	0.02	0.00	0.01	0.34**	0.35**	0.34***	0.34***
	(0.01)	(0.01)	(0.00)	(0.00)	(0.14)	(0.17)	(0.11)	(0.08)
Pre-T expected inflation	0.00	-0.01	-0.00	-0.00	0.36***	0.08	0.21**	0.27***
	(0.01)	(0.01)	(0.00)	(0.00)	(0.14)	(0.17)	(0.09)	(0.07)
F-statistic	2.096	85.40	1.357	3.180	31.24	16.97	16.80	46.16
Observations	670	1,125	797	2,592	1,028	1,311	1,145	3,484

Notes: All regressions use sampling weights and include controls for gender, age, geographical area, employment, number of children, education, and income. Column (4) and (8) also includes country fixed effects. Robust standard errors in parentheses. The "Pre-T" and "Post-T" labels denote variables collected before and after the information treatment. Post-treatment expected inflation is instrumented according to equation (5).

We find instead strong evidence that people associate the inflationary consequences of high debt with a deterioration of the economic outlook. Columns (5) to (8) show that post-treatment inflation expectations are systemically correlated with higher expected unemployment. The strength of this relation is remarkably similar across countries, with a one percent increase in inflation expectations due to the debt information treatment leading to an increase in unemployment expectations by 0.34-0.35 percent. People, therefore, appear to interpret high public debt levels as negative supply shocks, leading to stagflationary effects involving weaker economic activity and higher inflation. The positive correlation between unemployment and inflation is consistent with the findings in Coibion, Gorodnichenko and Kumar (2018) and Coibion et al. (2023a), showing that Italian firms and Dutch households tend to associate high inflation with worse economic outcomes.

We conclude the analysis by exploring possible heterogeneity in the effects of public debt on inflation expectations depending on the demographic and socioeconomic characteristics of survey participants. To this end, we estimate the following regression

$$\Delta E_i \pi = \alpha + \beta T_i + \bar{\beta} T_i \times W_i + \bar{\alpha} W_i + \xi X_i + \epsilon_i \tag{6}$$

where the treatment dummy is interacted with a vector of individual characteristics W_i.

This vector includes dummies to identify women, people above 46 years of age, people with children, with a college education, with high income, and people that are employed.[9] The regression estimates are reported in Table 4. The most striking and robust result which is common to all countries is that women react considerably more strongly than men to the information treatment. Columns (1) to (4) show that when women are informed about high public debt levels, they revise inflation expectations upwards by about twice as much as men.

Table 4: Heterogeneity in the treatment effects on inflation expectations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	US	UK	Brazil	All	US	UK	Brazil	All
Constant	1.06	0.47	-1.45	1.52	-0.67	-0.51	0.48	1.28
	(1.79)	(0.94)	(2.52)	(2.33)	(1.46)	(0.94)	(2.55)	(2.38)
Treatment (T)	3.66***	2.28***	7.28***	4.25***	4.63**	4.00***	4.27**	4.69***
	(0.93)	(0.48)	(1.37)	(0.54)	(2.33)	(1.04)	(2.17)	(1.08)
T × women	5.07***	2.90***	6.63***	4.91***	4.21***	3.18***	5.78***	4.34***
	(1.55)	(0.88)	(2.13)	(0.92)	(1.50)	(0.90)	(2.16)	(0.91)
T × age 46+					2.63	-2.11**	2.33	-0.23
					(1.65)	(0.87)	(2.49)	(0.89)
T × children					3.19*	1.36	4.46**	3.84***
					(1.93)	(1.22)	(2.23)	(1.12)
T × high education					-2.24	-1.54*	0.67	-1.98**
					(1.68)	(0.92)	(2.54)	(0.87)
T × high income					-4.35***	-2.99***	-4.66	-4.47***
					(1.56)	(0.77)	(3.90)	(1.02)
T × employed					-1.71	0.31	1.22	-0.02
					(1.50)	(0.80)	(2.20)	(0.97)
Observations	1,114	1,499	1,216	3,829	1,085	1,470	1,194	3,749
R-squared	0.11	0.08	0.09	0.08	0.12	0.10	0.10	0.09

Notes: All regressions use sampling weights and include controls for gender, age, geographical area, employment, number of children, education, and income. Column (4) and (8) also includes country fixed effects. Robust standard errors in parentheses.

These results echo the findings of Armantier et al. (2016) and Coibion, Gorodnichenko and Weber (2022) which document that women react more strongly to information treatments regarding inflation rates and monetary policy decisions. What explains the stronger responsiveness of women's inflation expectations? In Appendix D, we show that this is partly due to women having less confidence in the central bank and less knowledge about the central bank inflation target. We instead do not find systematic gender differences regarding prior debt beliefs.

[9]We define high-income people as those individuals who report income at least twice as large as the average domestic level of GDP per capita for 2021.

The stronger responsiveness of women's inflation expectations to debt levels is robust to controlling for other individual characteristics in columns (5) to (8). These regressions also show that people with higher education and higher income tend to revise inflation expectations less strongly. The quantitative effects are particularly pronounced for income groups, with high-income men being largely unresponsive to information about public debt. As in the case of women, this result appears to be related to people's perceptions about the central bank since higher-income individuals report stronger confidence in the central bank and have better knowledge about the inflation target.

6 Conclusions

In this paper, we have examined the results of household surveys specifically designed to assess the causal effect of public debt on household inflation expectations. The research design used a randomized controlled trial based on an information provision treatment following these key steps. After eliciting people's inflation expectations and beliefs about public debt levels, a treatment group was informed about the correct level of domestic public debt. Survey participants were then given the opportunity to revise their inflation expectations. The econometric analysis isolates the causal effect of public debt on inflation expectations by comparing revisions of inflation expectations between the treatment and control groups. The surveys were run in the US, UK, and Brazil, thus making it possible to assess the robustness of the results across countries.

The analysis finds that people substantially underestimate public debt levels and revise inflation expectations upwards when informed about the correct levels. The extent of the revisions is proportional to the size of the information shock, with inflation expectations increasing more strongly for people with lower prior debt beliefs. The quantitative effects are sizeable, with a 10 percent increase in the debt-to-GDP ratio raising one-year-ahead inflation expectations by about 0.6 percent. These results raise some concerns about the potential effects of the current high levels of public debt on inflation expectations, especially because people considerably underestimate the stock of public debt. Therefore, events that may draw people's attention to the fiscal situation—for example, market pressures due to ongoing monetary tightening—could likely raise household inflation expectations. The findings of the analysis also provide supporting evidence in favor of theories that underscore the influence of fiscal variables in the determination of inflation.

Yet central banks emerge from our analysis far from powerless in anchoring household inflation expectations. People who are more confident in the central bank's determination

to keep inflation low or are more knowledgeable about the central bank's inflation target tend to revise inflation expectations much more modestly when they are informed about public debt levels. Notably, confidence in the central bank matters much more strongly than confidence in the fiscal rectitude of the government to anchor inflation expectations.

Regarding the cognitive mechanisms that may drive people's association between public debt and inflation, we found no evidence that high debt levels stir concerns about monetary finance. People that raise inflation expectations when informed about debt levels are not more likely to expect that the central bank will print money to finance the government. The analysis shows instead that people interpret high public debt levels as adverse supply shocks, leading to both higher inflation and higher unemployment. This finding is partly good news for the inflationary risks stemming from public debt levels. It implies that an increase in inflation expectations due to high public debt is unlikely to stimulate private demand because people would also expect a deterioration of the economic outlook.

In the paper, we have also documented that the sensitivity of inflation expectations to debt levels is heterogeneous across individual characteristics. In particular, inflation expectations are much more sensitive to debt levels among women and lower-income people. This result is partly linked to the fact that women and lower-income people tend to have lower confidence in central banks and less knowledge about inflation targets. Hence, targeted communication campaigns to inform these segments of the population about central banks' mandates and track records could be particularly effective to strengthen the anchoring of inflation expectations.

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Appendix

A   Survey questionnaire

We report below screenshots of the survey questions used in the United States. All questions were common to all survey participants. The only difference is that the treatment group was informed about the correct level of public debt at the beginning of question 6, equal to 122 percent of GDP for the US at the end of 2022 according to the October 2022 World Economic Outlook database. Note that in question 6, the number reported after "Earlier in this survey you typed" was equal to the answer provided to question 1.

We used the same survey questions in the United Kingdom and Brazil (translated into Portuguese). References to the "Federal Reserve (Fed)" were replaced with references to the "Bank of England (BoE)" in the UK and to the "Banco Central do Brazil (BCB)" in Brazil. The public debt levels provided to the treatment group in question 6 were 87 percent for the UK and 88 percent for Brazil, as reported in the October 2022 World Economic Outlook database for the end of 2022.

Question 1

We would like to ask you about your expectations of the **inflation rate**. The inflation rate is the percentage increase in the prices of goods and services consumed by people. What do you think the inflation rate will be over the next 12 months? Don't worry if you are not sure, we are keen to hear your best estimate. (Please type your answer as a percentage in the box below)

[   ] %

☐   I cannot guess

Question 2

What do you think is the **inflation target** of the Federal Reserve (Fed)? The inflation target is the rate of inflation that the Fed aims to achieve. Don't worry if you are not sure, we are keen to hear your best estimate. (Please type your answer as a percentage in the box below)

[   ] %

☐   I cannot guess

Question 3

How confident or not are you that the Federal Reserve (Fed) will prevent large increases in **inflation** relative to the current level?

1 - Not confident at all   (1)   (2)   (3)   (4)   (5)   5 - Very confident

☐ I cannot guess

Question 4

What do you think the current level of **government debt** is in percent of the country's Gross Domestic Product (GDP)? GDP is the total annual value of the goods and services produced by the country. Don't worry if you are not sure, we are keen to hear your best estimate. (Please type your answer as a percentage in the box below)

[   ] %

☐ I cannot guess

Question 5

How confident or not are you that the government will prevent large increases in **government debt** relative to the current level?

1 - Not confident at all   (1)   (2)   (3)   (4)   (5)   5 - Very confident

☐ I cannot guess

Question 6 - Control group

We would like to give you an opportunity to revise your expectations of the **inflation rate** over the next 12 months. Don't worry if you are not sure, we are keen to hear your best estimate. (Please type your answer as a percentage in the boxes below).

Earlier in this survey you typed **10%.**

Inflation rate over the next 12 months

[   ] %

☐ I cannot guess

Question 6 - Treatment group

Considering that **government debt is 122 percent** of the country's Gross Domestic Product (GDP), we would like to ask you again about your expectations of the **inflation rate**. Don't worry if you are not sure, we are keen to hear your best estimate. (Please type your answer as a percentage in the box below).

Earlier in this survey you typed **10%**.

Inflation rate over the next 12 months

[   ] %

☐ I cannot guess

Question 7

What do you think the **unemployment rate** will be in 12 months? Don't worry if you are not sure, we are keen to hear your best estimate. (Please type your answer as a percentage in the box below)

[   ] %

☐ I cannot guess

Question 8

How likely or not do you think it is that the Federal Reserve (Fed) will print money in the future to finance government spending or repay government debt?

1 - Not at all likely   ① ② ③ ④ ⑤   5 - Very likely

☐ I cannot guess

B   Randomization across treatment and control groups

Table B.1: Treatment predictability

	(1)	(2)
	F-statistic	p-value
US	0.525	0.948
UK	0.494	0.966
Brazil	0.788	0.724
All	0.348	0.999

Notes: The table reports the F-statistic and associated p-value for the joint statistical significance of the regression coefficients in $T_i = \alpha + \beta X_i + \varepsilon_i$, where i denotes the survey respondent and X is a vector of individual characteristics including age groups, gender, and a dummy variable for high education. The regression for all countries also includes country fixed effects.

C   Descriptive statistics and charts

Table C.1: Summary statistics

|	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	All			Treatment group			Control group		
	US	UK	Brazil	US	UK	Brazil	US	UK	Brazil
Pre-treatment									
Expected inflation	19.1	12.2	17.7	18.8	12.5	17.3	19.5	11.9	18.1
Inflation target	16.6	6.1	14.3	15.8	6.3	13.6	17.5	5.9	15.0
Confidence in central bank	2.8	2.2	3.2	2.8	2.3	3.2	2.7	2.2	3.2
Public debt beliefs	54.0	62.8	36.1	55.0	62.4	35.5	52.9	63.3	36.6
Confidence in government	2.5	2.0	2.9	2.5	2.0	2.9	2.5	1.9	2.9
Post-treatment									
Expected inflation	22.2	13.9	22.5	25.1	16.3	27.9	19.4	11.6	17.4
Expected unemployment	18.6	13.6	24.4	18.8	14.8	25.7	18.3	12.4	22.9
Likelihood of monetary finance	3.2	3.0	3.1	3.2	3.1	3.1	3.2	3.0	3.1

Notes: The table presents the mean of pre-treatment and post-treatment variables, for the entire sample as well as differentiating between treatment and control groups. All calculations use sampling weights.

Figure C.1: Pre-treatment public debt beliefs
(Percent of GDP)

(a) US

(b) UK
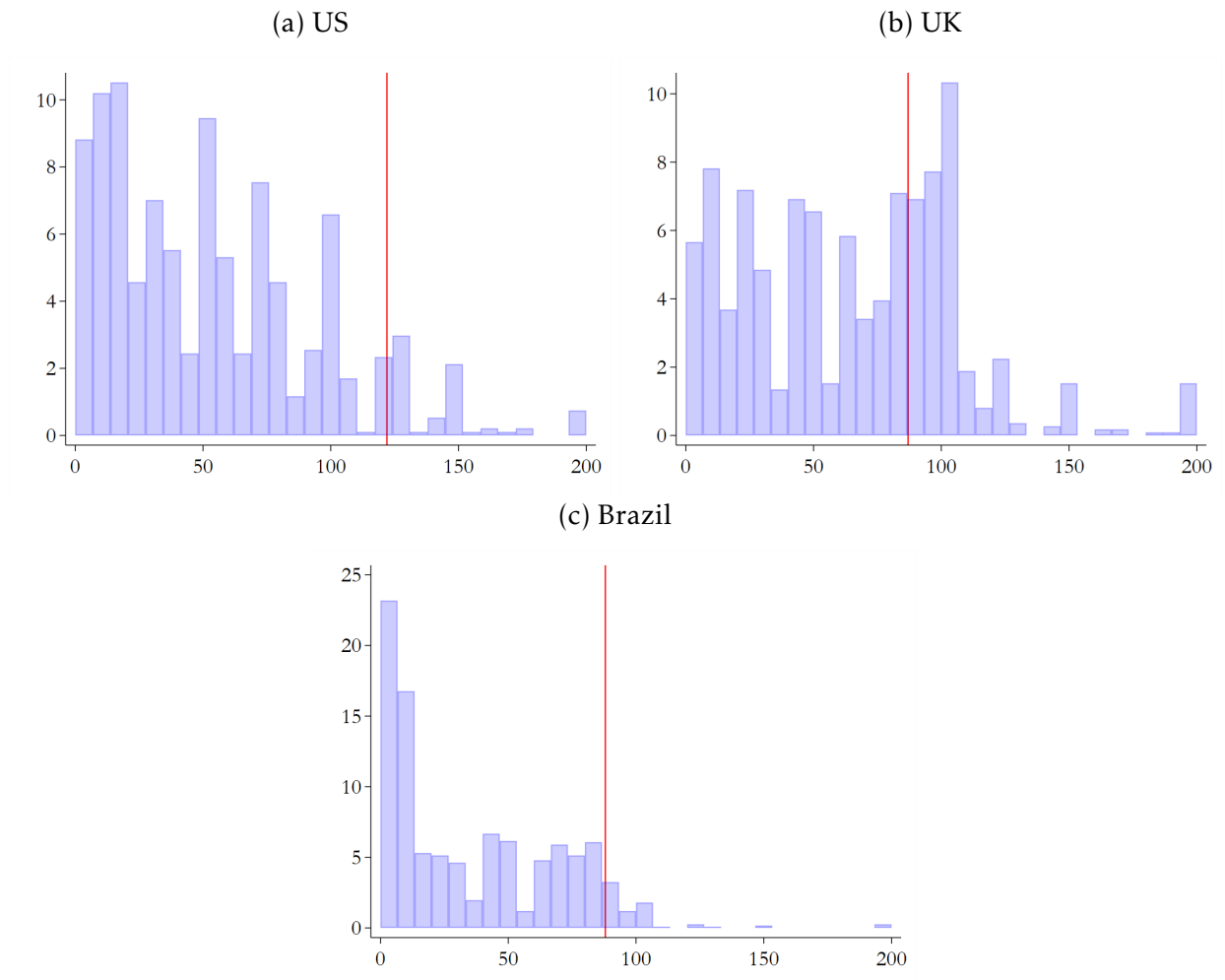
(c) Brazil

Notes: The vertical red lines denote the correct levels of public debt at the end of 2022, equal to 122, 87, and 88 percent of GDP for the US, UK, and Brazil, respectively.

Figure C.2: Pre-treatment inflation expectations and public debt beliefs
(Percent)

(a) US

(b) UK

(c) Brazil

(d) All
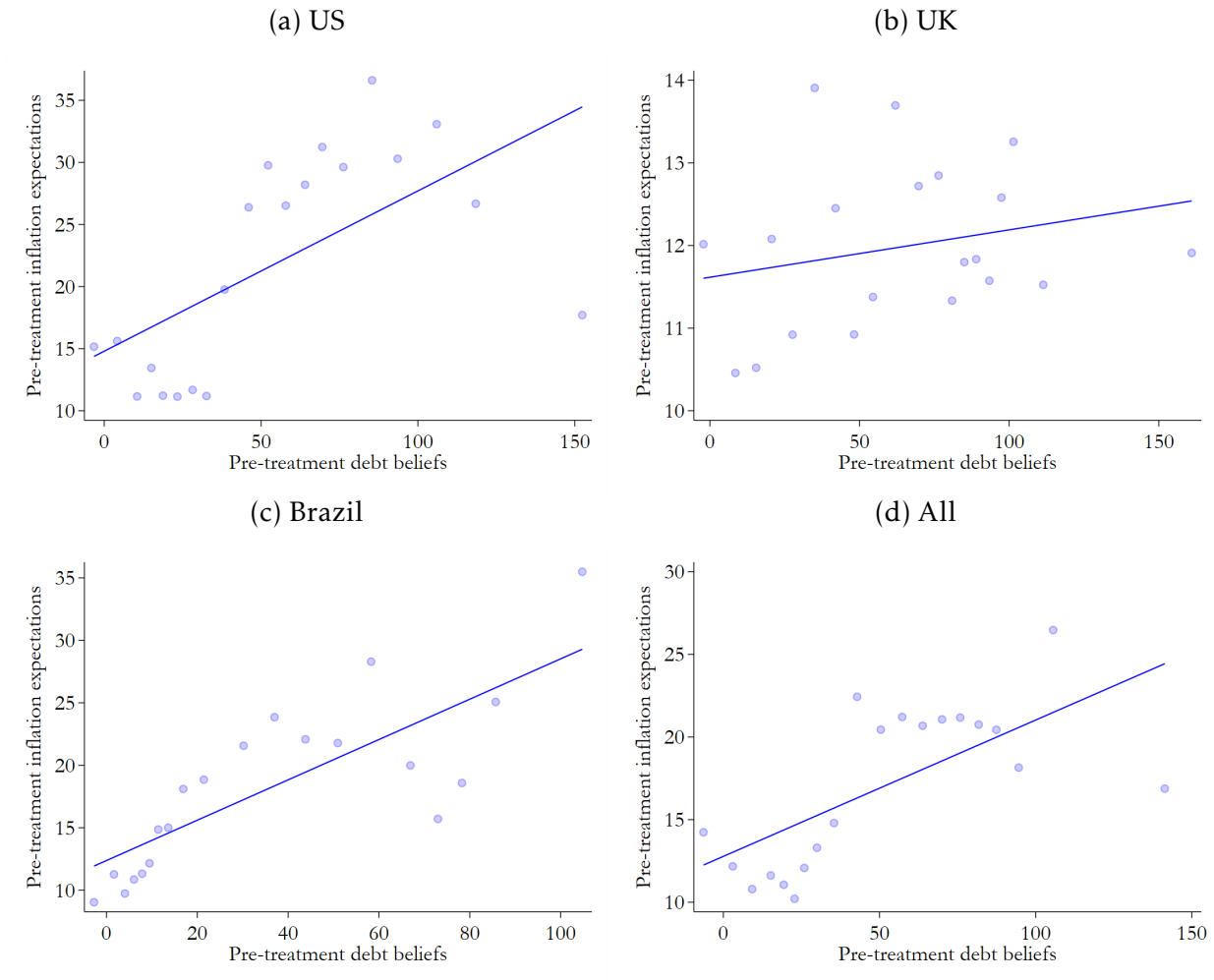
Notes: The figure presents the binscatter plots of pre-treatment inflation expectations over public debt beliefs by country and for the pooled data. Panel (d) shows orthogonalized data with respect to country fixed effects.

D   Central bank credibility and individual characteristics

Table D.1: Central bank credibility and individual characteristics

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Confidence in the central bank				Inflation target gap			
	US	UK	Brazil	All	US	UK	Brazil	All
Constant	2.91***	2.09***	3.10***	3.04***	18.81***	5.49***	8.71***	8.75***
	(0.11)	(0.09)	(0.13)	(0.12)	(2.10)	(0.78)	(2.02)	(1.56)
Women	-0.16***	0.03	-0.13**	-0.09***	4.66***	1.75***	2.62*	2.88***
	(0.06)	(0.05)	(0.06)	(0.03)	(1.30)	(0.37)	(1.48)	(0.64)
Age 46+	-0.57***	0.24***	0.15**	-0.06	-11.53***	-1.89***	-3.30**	-5.41***
	(0.08)	(0.05)	(0.07)	(0.04)	(1.52)	(0.46)	(1.39)	(0.65)
Children	0.21***	0.10	0.04	0.14***	8.89***	0.06	2.83**	3.93***
	(0.08)	(0.06)	(0.06)	(0.04)	(1.63)	(0.56)	(1.33)	(0.72)
High education	-0.06	-0.03	-0.15**	-0.07**	-5.66***	-2.42***	-4.35***	-3.80***
	(0.07)	(0.05)	(0.07)	(0.03)	(1.38)	(0.39)	(1.44)	(0.59)
High income	0.27***	0.04	0.12	0.21***	-6.01***	-1.36***	-0.66	-3.11***
	(0.08)	(0.08)	(0.14)	(0.06)	(1.55)	(0.43)	(1.85)	(0.80)
Employed	0.10	-0.01	0.04	0.03	-0.05	0.31	0.94	0.26
	(0.07)	(0.05)	(0.06)	(0.04)	(1.39)	(0.40)	(1.46)	(0.66)
Observations	1,664	1,949	1,775	5,388	1,086	1,458	1,234	3,778
R-squared	0.10	0.02	0.01	0.11	0.17	0.06	0.02	0.11

Notes: The table presents regression estimates of the degree of the confidence in the central bank (cols 1 to 4) and the absolute gap between people's beliefs about the inflation target and the correct level (cols. 5 to 6) over individual characteristics. All regressions use sampling weights. Column (4) and (8) also include country fixed effects. Robust standard errors in parentheses.