When do Fiscal Consolidations Lead to Consumption Booms? Lessons from a Laboratory Experiment

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Abstract

According to the so-called expectations channel, a fiscal consolidation may give rise to less contractionary, or even expansionary effects on consumption despite the decline in current disposable income. We propose a design for a laboratory experiment to study the conditions under which the expectations channel operates. We find that unsustainable fiscal conditions prior to a consolidation render the consolidation less contractionary as subjects sustain consumption to a greater extent through accumulated savings, which provides support for the expectations channel. We also find, however, that subjects are generally reluctant to reduce savings distinctly after the consolidation unless the consolidation is accompanied by a credible commitment of the fiscal authority to abstain from additional tax hikes. Overall our results suggest that the conditions, under which the expectations channel operates, are rather restrictive.

Keywords: Expansionary Fiscal Consolidation, Expectations, Intertemporal Choice, Experimental Macroeconomics

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1   Introduction

Throughout the industrialized world, debt-to-GDP ratios have increased strongly in the aftermath of the global financial crisis, resulting in frequent calls for fiscal austerity measures. An important issue in this context are the macroeconomic consequences associated with fiscal consolidations. While standard Keynesian arguments suggest that fiscal consolidations should be associated with declines in overall economic activity, Giavazzi and Pagano (1990) were among the first to point out that fiscal consolidations may give rise to expansionary effects even in the short run.[1]

Nevertheless, the idea that fiscal consolidations can exert expansionary effects remains controversial for at least two reasons: First, empirical evidence is inconclusive. While several authors report instances of fiscal consolidations that were accompanied by higher GDP growth (see e.g. Perotti, 1999; van Aarle and Garretsen, 2003; Alesina and Ardagna, 2010), a number of studies reaches opposite conclusions (Guajardo et al., 2014; Jordà and Taylor, 2013). Also, from a broader perspective, the literature on fiscal multipliers is similarly ambiguous and reports a wide range of estimated multipliers (Cogan et al., 2010; Ramey, 2011). And second, the channels and mechanisms through which a fiscal contraction may generate expansionary effects are not well understood. Alesina and Perotti (1996) and Alesina et al. (2012) stress that fiscal contractions can give rise to beneficial supply side effects. The argument is that adjustments that involve cuts in the government wage bill lead to wage moderation in the private sector, which in turn stimulates employment and, ultimately, growth. In addition, cutting back on public debt can reduce sovereign default risk and interest rates, which may then boost investment and consumption (McDermott and Wescott, 1996).

Another channel through which a fiscal consolidation may exert expansionary effects is the so-called expectations channel (Blanchard, 1990; Bertola and Drazen, 1993; Sutherland, 1997; Ardagna, 2004). The intuition goes as follows: If the fiscal position is initially perceived to be unsustainable, then consumers expect a consolidation to occur in the future and refrain from consumption to build up a stock of savings that can be used to compensate a expected decline in disposable income associated with the consolidation. When the consolidation finally occurs, households respond with an increase in consumption, resulting in higher aggregate demand and, ultimately, expansionary effects at the macroeconomic level.

Note that the expectations channel, in contrast to the channels discussed above, relies heav-

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[1]They analyzed the effects of fiscal consolidations in Ireland and Denmark where fiscal reforms coincided with consumption booms during the 1980s.

ily on behavioral assumptions about intertemporal decision making under uncertainty. The purpose of this paper is to study these behavioral aspects in a laboratory setting. Since it is rather challenging to identify the effects of forward-looking behavior in macroeconomic data, a laboratory setting is a promising environment. In addition, the experimental method allows us to isolate the expectation channel and abstract from other factors that may plausibly affect the macroeconomic effects of fiscal consolidations.[2]

In our experimental design, subjects make repeated consumption and savings decisions. In each period, subjects receive an exogenous income from which a tax is subtracted. An increase in the tax represents a fiscal consolidation. Although future fiscal policy is uncertain, subjects can infer the extent to which the fiscal stance prevailing at the start of the experiment is sustainable, that is, whether a tax increase has to occur or not, from the provided information. Using this design, we study the conditions under which the expectation channel is active. Since the fiscal position before and after a consolidation plays a crucial role for the expectations channel, we vary initial fiscal conditions across treatments. The expectations channel also holds that fiscal contractions should be less contractionary, if the consolidation makes public finances sustainable in the sense that it eliminates the expectation of future, perhaps more disruptive, adjustments. To address this issue, we run an additional treatment in which we eliminate any uncertainty about fiscal policy after the consolidation. Intuitively, this treatment captures a situation where the fiscal authority is able to steer expectations by making fully credible commitments. And finally, we study the role of awareness about fiscal policy more generally. Since the sustainability (or unsustainability) of fiscal positions cannot be directly observed, it is the perceived sustainability of fiscal policy before and after a contraction that should matter. Even if the initial fiscal position is unsustainable and a consolidation makes the fiscal stance sustainable, people may be simply not fully aware of these developments. Intuitively, the increased awareness corresponds to a situation where the fiscal authority runs a rather transparent policy and where the public is generally well informed. [3]

We find that initial fiscal conditions do matter in the sense that the decline in the consumption in response to a consolidation is less pronounced when the initial position is unsustainable. This results is in line with the expectations channel and points towards a crucial role of precautionary savings prior to the consolidation. Nevertheless, we also find that subjects exhibit

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[2]E.g. the level of economic development, the exchange rate regime, openness, monetary policy, credit market conditions, or the level of public debt (see e.g. Auerbach et al., 2010; Ilzetzki et al., 2013; Bi et al., 2013; Jordà and Taylor, 2013).

[3]This issue is closely related to research studying the role of central bank communication for the conduct of monetary policy (see e.g. Neuenkirch, 2012).

strong tendencies to maintain a stock of savings after the consolidation, although further tax increases are not necessary, but nevertheless possible. Thus, although precautionary behavior is required to build up a sufficiently large saving stock prior to the consolidation, by the same virtue subjects refrain from consumption after the contraction. If the post-consolidation tax path is announced at the time of the consolidation, in other words, if the fiscal authority can credibly commit to not raising taxes any further, we obtain significantly less contractionary effects. Finally, increasing the level of awareness by running a transparent policy seems to have only little influence on the outcomes.

Our research is related to several strands of the experimental literature. Similar to the expectations channel, that may give rise to expansionary fiscal consolidations, the Ricardian equivalence proposition is based on the assumption that agents take expected fiscal policy into account when making decisions. In this sense, our analysis is related to experimental tests of Ricardian equivalence (see Cadysby and Frank, 1991; Slate et al., 1995; Ricciuti and Di Laurea, 2003; Adji et al., 2009; Meissner and Afschar, 2014, among others).[4] Bernasconi et al. (2009) study the formation of expectations about future fiscal policy by confronting subjects with real world fiscal data.[5] In terms of experimental design, our setting also shares some similarities with experimental work on dynamic consumption-saving behavior (see e.g. Brown et al., 2009)

The remainder of the paper is structured as follows: In Section 2, we formulate our research question and in Section 3 we introduce our experimental design. In Section 4 we discuss the implemented treatments and Section 5 provides information about procedure. In Section 6, we present our results and Section 7 concludes the paper.

2 Research Questions

Recall that the expectations channel holds that the unsustainability (sustainability) of fiscal positions prior (post) a consolidation plays a crucial role. This point is emphasized by Mc-Dermott and Wescott (1996), Perotti (1999), Barry and Devereux (2003) among others. Thus, we formulate our first research question as: *Are fiscal contractions less contractionary (more expansionary) if initial fiscal positions are unsustainable?* To explore this issue, we vary initial fiscal conditions across treatments.

The expectations channel also holds that fiscal contractions should be less contractionary

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[4]It is important to point out that despite these similarities, Ricardian equivalence does not hold in our experimental setting.

[5]See Duffy (2012) for a survey of the experimental literature on fiscal policy from a macroeconomic perspective.

if the consolidation makes public finances sustainable in the sense that it eliminates the expectation of future, perhaps more disruptive, adjustments (see McDermott and Wescott, 1996; Giavazzi and Pagano, 1996; Alesina and Perotti, 1996; Briotti, 2005; Bergman and Hutchison, 2010), which leads us to our second research question: *Are fiscal contractions less contractionary if subjects can be certain that there will not be additional tax hikes?*

And finally, we study the role of awareness about fiscal policy more generally. We formulate our third research question as: *Are fiscal contractions less contractionary (more expansionary) if subjects are more aware of the unsustainable (sustainable) nature of fiscal policy before (after) a fiscal consolidation?* To address this issue, we vary the presentation of the information available to subjects across treatments. Note that we do not provide any new information in this treatment.

Based on the discussion above, we expect that the fiscal contraction gives rise to a less contractionary effect on consumption if the initial positions are unsustainable and if if known with certainty that there will not be additional consolidation. We also expect a potentially expansionary effect on consumption to be stronger if subjects are more aware of the fiscal situation.

3 Experimental Design

In this section we describe our experimental design. Rather than implementing a specific theoretical model, our design is geared towards studying the main behavioral aspects associated with the expectations view in a simple and easy to explain set-up.

The experiment is a between subject design and each treatment of the experiment comprises of $t = 1, \ldots, 12$ periods. In each period, subjects receive an endowment of 18 tokens, y_t, which can be thought of as consumption goods, that they can either consume or store for the future (at a zero interest rate). In each period, a tax, denoted by tax_t, is subtracted from y_t, and net income $y_t - tax_t$ can either be consumed or saved. Thus, subjects face the following constraint:

$$c_{it} + s_{it} \leq y_t - tax_t + s_{it-1},$$

where $s_{it} \geq 0$ denotes the stock of saving in period t. Subjects do not earn interest on savings and are not able to borrow, that is, $s_{it} \geq 0$, to keep the design as simple as possible. Introducing interest income and the possibility to borrow against future income would be an unnecessary

complication, which might interfere with the decision making process.[6]

While we vary the amount of information available across treatments, subjects are instructed in all treatments that the government has to meet an exogenously imposed solvency requirement. Specifically, total tax revenues over the course of the experiment have to amount to 72 units:

$$\sum_{t=1}^{12} tax_t = 72.$$

Subjects are also explicitly informed in all treatments that an average tax of 6 units per period is necessary to satisfy the government's solvency condition. In addition, subjects are informed that temporary deviations from a tax of 6 have to be compensated in the course of the treatment.[7]

Consumption in period t, c_{it} yields a period payoff which we specify as

$$Payoff_{it} = \begin{cases} 0 & if \quad c_{it} < 9 \\ c_{it} & if \quad c_{it} \geq 9. \end{cases}$$

This payoff function is intended to give rise to precautionary savings in a way that is easy to explain in the instructions. The task of subject i is to choose consumption such that the total payoff

$$Payoff_i = \sum_{t=1}^{12} \beta_t Payoff_{it}$$

is maximized, where $\beta_{1,\dots,12} = 1.00, 0.98, 0.96, \dots, 0.78$ are the period–specific weights. This way subjects discount future consumption against current consumption and we induce an incentive for early consumption. In case subjects do not sustain a minimum consumption in period t, the payoff is not only 0 irrespective of $c_t < 9$ but they receive an additional payoff relevant penalty at the end of the experiment: for each period where $c_{it} < 9$ subject i receives 10% discount on its total payoff. This particular property of the utility function is intended to further stimulate precautionary motives in a simple way that can easily be explained and comprehended by subjects.[8] Note that we are primarily interested in differences in the consumption-savings behavior across the treatment variation, and not in the absolute level of savings stocks. Hence, in the experiment, we wanted to emphasize incentives for precautions.

Note that our design is such that subjects face a tradeoff between early consumption, due

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[6]Note that since subjects face a credit constraint, Ricardian equivalence does not hold in this setting.

[7]The Instructions for are provided in Appendix A.

[8]Note that the constraint that subjects cannot borrow in order to achieve a consumption level above the threshold even in periods with high values of tax_t should also reinforce precautionary behavior.

to discounting, and saving to avoid falling below the threshold in case of high values of tax_t.[9]

4   Treatments and Hypotheses

We implement four treatments varying either the initial tax level, to evaluate the role of initial conditions, or the amount of information available to the subjects as well as the way in which the information is presented. In all treatments, subjects are instructed about before tax income, the total debt and the corresponding average per-period tax. In each treatment, the tax increases by the same amount in period $t = 5$.

Treatment UNSUST   In this treatment, the tax is unsustainably low at $tax_t = 2$ for periods 1 to 4. Thus, fiscal conditions are initially inconsistent with the constraint that total revenues have to amount to 72 tokens. The one-time permanent tax increase to $tax_t = 8$, which is sustained from period 5 until the end of the experiment, eliminates the unsustainability. The tax path is illustrated in Panel (a) of Figure 1.

Treatment SUST   In this treatment, we replicate UNSUST, but with a tax path that is already sustainable from the beginning. In other words, the initial tax level is consistent with the constraint that total revenues have to amount to 72 tokens and hence, the tax increase, which also amounts to 6 in period $t = 5$ is not necessary from a solvency point of view and has to be followed by a tax reduction. The tax path is shown in Panel (b) of Figure 1.

Treatment COMMIT   The tax path in this treatment is identical to the one in Treatment UNSUST. But, at the time of the consolidation in period $t = 5$, the entire future tax path is announced and therefore any uncertainty about future fiscal policy is eliminated.

Treatment TRANSP   This treatment also uses the tax path from the UNSUST Treatment and subjects have the same information as in the UNSUST Treatment. However, we provide additional interpretations in the sense of statements that are displayed on screen stating explicitly that the current tax level is either not sufficient (in periods 1 to 4) or that the tax is sufficient (periods 5 to 12). The statements are shown in Table 1.[10] Launching the interpretations –

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[9]Without discounting, subjects would have an incentive to postpone consumption above the threshold until the last period, essentially eliminating the possibility to observe a consumption boom in early periods.

[10]Note that the statements are neutrally phrased interpretations. We also experimented with different, more 'dramatically' phrased statements, but the results, which are available upon request, are almost identical.

while leaving the information set unchanged – should play the role of increasing transparency of fiscal policy.

A less contractionary effect should be the result of a combination of low consumption, due to high precautionary savings, before a consolidation and a reduction in precautionary savings during or shortly after a consolidation. Since unsustainable fiscal positions should provide a stronger incentive to build up a stock of savings, we expect the following ordering of the consumption responses at the time of the consolidation: SUST<UNSUST.

In Treatment COMMIT, we eliminate any uncertainty about the future tax path at the time of the consolidation, and therefore subjects have essentially no reason to maintain a stock of savings. In fact, due to discounting they have a strong incentive to immediately consume their total wealth. Thus, we expect the following ordering: UNSUST<COMMIT.

While the additional statements introduced in Treatment TRANSP do not provide new information, they may influence the perception of fiscal sustainability before and after the consolidation and therefore, influence behavior. Thus, we expect stronger precautionary behavior prior to the consolidation and a stronger reduction of the savings stock after the contraction compared to the Treatment UNSUST, giving rise to less contractionary effects: UNSUST<TRANSP.[11]

5 Procedure

In each treatment, 40 subjects participated. The experiments were conducted computerized using z–Tree (Fischbacher, 2007) at the University of Innsbruck. Participants were mostly undergraduate students from different faculties. They were randomly assigned to workstations that are separated by blinds. Instructions were distributed and read aloud[12], and participants were given a few more minutes to go through the instructions and ask questions. Moreover, we included control questions at the end of the instructions to raise subjects' attention for the most important aspects.

Prior to the actual start of the experiment, subject went through two practice rounds such that they had the opportunity to experience how the program operates and what information they receive on the decision screen. Note that subjects had a relatively easy task; they just had to enter current consumption expenses, and in treatments with elicitation of beliefs they

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[11]We do not have an unambiguous hypothesis concerning the relative effects in TRANSP and COMMIT. While the absence of uncertainty after the consolidation should reduce savings in the aftermath of the consolidation, and hence give rise to larger effect on consumption, in COMMIT, subjects may build up a larger stock of savings in TRANSP giving rise to a larger effect in TRANSP.

[12]The instructions are shown in the appendix

additionally had to state their estimate on the course of future net income. Subjects were told that they have 30 seconds time for their consumption decision but we have implemented a soft close such that the experiment proceeds into the next stage only when all subjects have entered and confirmed their consumption decision. The remaining wealth is automatically saved for future periods.

Since the potentially expansionary effect of a fiscal consolidation should be closely related to expectations about future fiscal policy, we elicit beliefs on future net income in all treatments but COMMIT. In COMMIT we refrain from elicitation, since we worried about confusing subjects' by asking them to state beliefs in an environment without uncertainty. We elicit beliefs in the following way: at the end of each of period, subjects are asked whether they expect their net-income, in the subsequent rounds on average to be higher, approximately the same ($+/-$ one unit), or lower compared to the current period. Basically, this can easily be done by subtracting total future taxes from total future endowment and divide it by the number of periods ahead. Note that subjects do not have to provide a point prediction about the exact value of future income, but rather a rough estimate on the direction of the course of their net-income. This should make the task easier and is sufficient for our purposes. Elicitation is incentivised. On their total payoff, subjects receive one additional token for each correct forecast. To assess the genuine effect of the elicitation on consumption, we run Treatment UNSUST with and without elicitation.

The entire duration of the experiments varied from approximately 35 to 50 minutes – depending on the treatment. Naturally, subject were quickest in Treatment UNSUST without elicitation of beliefs and Treatment COMMIT whereas the experiment took more time in treatments with elicitation of beliefs.

To calculate the total payoff for each subject we sum up the per period consumption (multiplied with the respective weight) and add one token for each correct projection on net income in treatments with elicitation. The conversion rate was 1.00 Euro (1.38 USD) for 15 tokens. Moreover, subjects received a 4 Euro show up fee. The determinants of the reimbursement were common knowledge. On average subjects earned EUR 13.44. Variations in the reimbursement are rather small (i.e. standard deviation was EUR 1.00).

6 Results

6.1 Measuring the Consumption Response

Figure 2 shows consumption, averaged across subjects, for each period, together with net income represented by the light-gray lines. Although the tax increases by the same amount in period 5 in all treatments, the average response of consumption differs across treatments. In Treatment SUST, consumption declines temporarily in response to the tax increase in period 5. The temporary nature of the reaction is consistent with the tax reduction in period 7 in this treatment. Although consumption also declines in Treatments UNSUST and TRANSP, the reaction is less pronounced. Also note that consumption recovers rather slowly in these treatments, which is in line with the persistent tax decline. In Treatment COMMIT, we observe an increase in consumption, which is in stark contrast to the outcomes in the other treatments. Although the consumption reaction is also short-lived in Treatment COMMIT, the reason is not an additional tax change, as in Treatment UNSUST, but rather the fact that subjects use a large fraction of their accumulated savings to increase consumption in the period the consolidation sets in. Hence, in the remainder of the treatment, subjects consume roughly their disposable income, which gives rise to lower consumption than in the consolidation period.

Since consumption paths are not fully comparable across treatments due to the different path for net income in Treatment SUST, we will focus on the immediate response of consumption to the tax increase in period 5 in the remainder of our analysis. We measure the immediate consumption response as the change in consumption from period 4 to period 5 ($c_{i5} - c_{i4}$) and average across subjects in each treatment.[13]

We see from Table 2 that average consumption declines significantly by 8.43 units in Treatment SUST. In Treatments UNSUST and TRANSP, the average declines of 3.36 units and 3.17 units, respectively, are still significant, but less pronounced. In Treatment COMMIT, consumption significantly increases by 5.49 units.

Pairwise Mann Wittney rank sum tests indicate that consumption declines significantly stronger in Treatment SUST than in Treatment UNSUST. This ordering of the effects corresponds to our hypothesis and, with respect to our first research question, we conclude that consolidations occurring under an unsustainable, initial fiscal position exert less contractionary effects on consumption.

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[13]Note that our focus on the immediate consumption response does not appear to be restrictive, since Figure 2 shows that the response occurs rapidly within one period. Hence, we are not excluding any potentially delayed effects.

Recall that our second research question addresses the role of commitment. Comparing Treatments UNSUST and COMMIT, where both treatments share an initially unsustainable tax level, but differ with respect to the provided information, we see that the consolidation is even less contractionary, if it is accompanied by a fully credible announcement that no further consolidations will occur. We can reject the null hypothesis that the consumption responses are of equal magnitudes in Treatments UNSUST and COMMIT at the one percent level. Hence, we conclude that commitment also renders the consolidation effect on consumption less contractionary.

Finally, we address our third research question and explore whether transparency leads to less contractionary effects? In other words, do we need a fully credible commitment to obtain a less contractionary outcome, as in Treatment COMMIT, or does an increased level of awareness about the overall fiscal position suffice? Comparing the outcomes in Treatments UNSUST and TRANSP shows that this does not appear to be the case. Although the consumption response in Treatment TRANSP is slightly less pronounced than in Treatment UNSUST, as expected, the difference is not statistically significant at standard levels. Thus, a more transparent policy in the sense of providing additional interpretations is not sufficient to significantly alter the effect of a fiscal consolidation in an unsustainable environment.

Having characterized the consolidation effect averaged across subjects, Figure 3 summarizes the distribution of consumption responses to provide a more detailed description of individual consumption choices. In Treatment SUST, all subjects reduce consumption in the period of the tax increase. While the distribution shifts somewhat to the right in Treatments UNSUST and TRANSP, roughly 80 percent of the subjects still reduce consumption in response to the consolidation in these two treatments. In Treatment COMMIT, in contrast, only around 20 percent of the subjects reduce consumption. We employ pairwise Kolmogorov-Smirnov tests to test the null hypothesis that consumption responses are drawn from the same distribution to compare the densities. We can reject the null hypothesis at the one percent level for all comparisons except the one among Treatment UNSUST and TRANSP. In this case, the null hypothesis that the consumption responses are drawn from the same distributions cannot be rejected (p-value: 0.91). Thus, this analysis at a less aggregated level confirms that a less contractionary effect of a fiscal consolidation depends crucially on the initial conditions and, especially, on the ability of the fiscal authority to credibly commit to a tax path after the consolidation.

6.2 Savings Behavior

In this subsection, we study savings behavior to shed more light on the sources of the observed variation in the consumption responses across treatments. A less contractionary effect of the consolidation can be due to relatively high savings prior to the consolidation, and/or to a decline in savings after the consolidation.

To characterize savings behavior before and after the consolidation, we calculate savings rates as $(1 - c_{it})/(y_{it} - tax_{it})$ and average these savings rates across subjects in each treatment, as well as over either 4 periods before the consolidation or 4 periods following the consolidation, including the consolidation period itself. Note that we limit the analysis of savings rates in the aftermath of the consolidation to four periods following the consolidation to make sure that we do not pick up end-of-treatment effects. We do not calculate the average savings rate for Treatment SUST for the time after the consolidation, since the consolidation is followed by a tax reduction which complicates a comparison with the other treatments.

Table 3 shows the results. In Treatment SUST, subjects save on average 5 percent of their net income before the consolidation, which is significantly lower than in the remaining treatments featuring an initially unsustainable tax path. Hence, we conclude that in an environment with a sustainable initial condition, subjects accumulate a smaller stock of savings, which limits their ability to use savings to sustain consumption when the tax is increased. In treatments with an initially unsustainable tax path, subjects accumulate more savings before the consolidation and and therefore consume more during and after a consolidation. This finding is consistent with the expectations channel and confirms that the fiscal environment, in which a consolidation occurs, plays a crucial role.

Although the low average savings rate before the consolidation in Treatment SUST explains the strongly contractionary effect of the consolidation in this treatment, savings rates before the consolidation do not differ significantly across Treatments UNSUST, TRANSP, and COMMIT, despite significant differences in the consumption responses. Turning to the post-consolidation periods, we observe that although subjects generally dissave, which is again in line with the expectations channel, the savings rate is significantly negative only in Treatment COMMIT. In addition, pairwise Mann-Witney tests indicate that although post-consolidation savings rates in Treatment COMMIT differ significantly from the savings rates in Treatments UNSUST and TRANSP, the null hypothesis that savings rates are equal in Treatments UNSUST and TRANSP is not rejected. In other words, while subjects essentially consume their net incomes and reduce

their accumulated stock of savings only gradually in Treatments UNSUST and TRANSP, they strongly consume out of their accumulated savings in Treatment COMMIT once the tax is increased.

In sum, differences in savings behavior prior as well as after the consolidation contribute to the variation in the consolidation effect discussed above. Higher savings prior to the consolidation help to explain the less contractionary outcomes when initial conditions are sustainable. However, the precautionary behavior that precipitates higher savings before the consolidation, also induces subjects to reduce their accumulated savings only reluctantly after the consolidation, even if the consolidation leads to a sustainable fiscal position. Thus, precautionary behavior gives rise to two counteracting effects. A strong commitment that rules out additional tax increases, substantially reduces the influence of persistent precaution, and thereby leads to substantially less contractionary outcomes.

To illustrate the dynamics of savings, Figure 4 shows the evolution of average savings rates in Treatments UNSUST, TRANSP, and COMMIT over time. Note that in Treatment SUST, the average savings rate quickly falls during the initial periods, whereas it remains fairly constant in the treatments with an initially unsustainable tax path. Hence, while subjects show preferences to initially built-up savings buffer in all treatments, they keep on increasing it particularly in an unsustainable tax environment. Note that in period 4, the last period before the contraction, in Treatment SUST the average savings rate is even in the negative territory. After the contraction, the savings rate increases briefly in Treatment SUST, which mirrors the strong decline in consumption in this treatment.[14] In Treatments UNSUST and TRANSP after the contraction, average savings rate start to decline, but only slowly. We assign the drop in the savings rate at the end of the experiment mainly to the end of experiment effect. In Treatment COMMIT, the average savings rate declines quickly and strongly when the consolidation occurs.

6.3 Elicited Beliefs

According to the expectations channel, the effect of a fiscal consolidation ultimately depends on the expectations about the future course of fiscal policy, both before and after the consolidation. Thus, if the expectations channel is at work, the treatment variation in consumption and savings outcomes should be closely related to differences in subjects' elicited beliefs.

Before we study differences in the formation of beliefs across treatments, we check whether

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[14]Since net income drops below the minimum consumption level, subjects are strongly encouraged to cut back on consumption and may even be forced to reduce consumption to 0.

the elicitation of beliefs influences outcomes. Possibly, the elicitation procedure alters the subject's awareness for the nature of the fiscal path which in turn might affect consumption decisions. To do so, we repeated Treatment UNSUST without elicitation. Figure 5 compares the average consumption levels for Treatment UNSUST without the elicitation of beliefs and with elicited beliefs, reproduced from Figure 2. We see that average consumption levels look almost identical.[15] Thus, we conclude that the elicitation of beliefs itself does not influence subjects' behavior substantially.

To compare the influence of beliefs across treatments, we focus on the fraction of subjects indicating that net income will decrease on average over the course of the experiment, since the expectation of higher future taxes should be associated with lower consumption and higher savings. To compare beliefs before and after the consolidation, we again average this fraction over four periods before the consolidation and over four periods after the consolidation for Treatments SUST, UNSUST, and TRANSP. Recall that we do not elicit beliefs in Treatment COMMIT. Also, we refrain from interpreting beliefs in Treatment SUST in the aftermath of the consolidation, due to the limited comparability as a result of different paths for net income.

Table 4 shows that 14 percent of the subjects participating in Treatment SUST expect lower future net income before the consolidation. In Treatments UNSUST and TRANSP, this fraction is substantially, and also significantly, higher at 68 percent. This variation in beliefs across treatments is in line with the significantly higher average savings rate prior to the consolidation in Treatment SUST, and confirms that subjects worry less about future tax hikes if the current tax path is perceived to be sustainable. For Treatments UNSUST and TRANSP, the null hypothesis of equal fractions of subjects expecting a tax increase cannot be rejected, which also corresponds closely to the fairly similar savings rates observed prior to the consolidation in these treatments.

After the consolidation, the fraction of subjects with the belief that net income will decline further, falls to 28 percent in Treatments UNSUST and to 14 percent in Treatment TRANSP. Thus, in both treatments, the consolidation appears to convince subjects that additional tax increases will not occur and therefore the consolidation reduces the incentives for precautionary behavior. However, while the decline is highly significant in both treatments[16], the magnitude

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[15]Kolmogorov-Smirnov test states that the null hypothesis that consumption levels in both treatments are drawn from the same distribution cannot be rejected for almost all periods. Only in periods 2 and 4 the null hypothesis can be rejected at the 5 percent level. Nevertheless, we infer that differences among the treatments are not systematic.

[16]We employ Mann-Whitney ranksum-tests to compare the pre- and post-consolidation average fractions in pairwise comparisons. In both cases we can reject the null hypothesis of equality at the one percent level.

is larger in Treatment TRANSP. In fact, the null hypothesis of equal fractions of pessimistic beliefs in Treatment UNSUST and TRANSP after the consolidation can be rejected at the five percent level. Although the stronger effect of the consolidation on subject's beliefs in Treatment TRANSP is consistent with our hypothesis, savings rates, as discussed above, do not differ significantly across Treatments UNSUST and TRANSP. Hence, although the additional announcements provided in Treatment TRANSP are insufficient to induce subjects to adjust their consumption choices, the effect of the announcements on the formation of beliefs is significant. This outcome underlines again the crucial role of commitment.

For a more detailed illustration on the dynamics of beliefs and on how tax regimes shape beliefs in pre- and post-contraction periods, Figures 6, 7, and 8 show the distributions of elicited beliefs, for each period and the Treatments SUST, UNSUST, and TRANSP respectively. In each of these figures, starting from the left, the dark-grey bars show the fraction of those who belief that net income will decrease. The adjacent light-grey bars show the fraction of those who belief that net income remains roughly constant. The medium-grey bar from on the right is the fraction of those subjects who believe that net income will decrease. Note that the consolidation is realized in period 5.

In Treatment SUST, the correct belief, given the information provided during the experiment and in the instructions, is a roughly constant level of net income for the first four periods, increasing net income for periods 5 and 6, and an approximately constant net income for the remainder of the treatment.[17] We see that this is roughly the case. In Treatments UNSUST and TRANSP, the correct belief is that net income will decrease during the first 4 periods of the experiment and a constant net income after the consolidation in period 4.

Comparing the distribution of beliefs depicted in Figure 7 and Figure 8 shows that subjects adjust their beliefs substantially faster in Treatment TRANSP as the share the share of subject who expect net income to remain constant drops immediately from 60 percent in period 4 to below 20 percent in period 5. Looking at the medium-grey bars, that is the fraction of pessimistic subjects, in Figure 8, we see that there is really a distinct change in the set of beliefs coinciding with the tax regime switch. In Treatment, UNSUST, this share also drops by about the same magnitude, but the decline is substantially more gradual, since it takes until period 8 for the share to decline to slightly below 20 percent. Hence, the additional interpretations provided in Treatment TRANSP appear to improve the understanding of fiscal policy. Nevertheless,

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[17]Note that subjects should be able to deduce these paths for future net income at fairly low computational and cognitive costs in all treatments.

recall that we do not find systematic differences in saving decisions and thus, transparency proves ineffective to precipitate expansionary effects on consumption. This result indicates that uncertainty over additional tax hikes has apparently a very strong effect that gives rise to the hesitation to dissave. Hence, we conclude that if there were consumption promoting effects of transparency, they are clearly drown out by the prevailing uncertainty.

7   Conclusion

According to the expectations channel, fiscal consolidations may give rise to expansionary effects at the macroeconomic level if two crucial behavioral assumptions hold: First, people save out of a precautionary motive if the fiscal position is considered to be unsustainable prior to the consolidation. And second, the consolidation reduces the incentives to save sufficiently to generate a consumption boom.

While our results generally support the view that fiscal consolidations tend to be less contractionary in an environment where subjects behave along these lines, we also find that remaining uncertainty in the aftermath of a consolidation plays a crucial role. Subjects are generally reluctant to reduce savings sufficiently after the consolidation occurs, even if the fiscal situation becomes sustainable. In other words, the consolation does not only have to be sufficient to eliminate the need for future consolidations, fiscal policy also has to credibly commit to refrain from additional future tax hikes.

While we do not want to overextend the external validity of our experimental results because of the stylized nature of laboratory experiments, our results still show a cautious picture of the circumstances under which fiscal consolidations may turn out to have less contractionary macroeconomic effects due to the expectations channel. For the fiscal authority it may be crucial to overcome severe communication and commitment issues, even if the overall fiscal position is sustainable due to the consolidation.

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A Instructions for Treatments SUST, UNSUST, and COM-MIT[18] [19]

Welcome to the experiment. Please do not speak to other participants and use only applications on the computer that are required for the experiment. Please remove all personal items from your desk and switch off your mobile phone and similar electronic devices. Please note that activities which are not related to the experiment such as playing computer games, surfing on the internet or reading non-experiment related material leads to an expulsion from the experiment. In this case you do not receive a payout. Thank you for your understanding.

The goal of this experiment is to study decision-making behavior. You can earn real money. Your payout depends only on your decisions according to the rules of the experiment and explained in the instructions at hand. Data from the experiment is anonymized and cannot be traced back to participants. Neither the other participants nor the experimenters know which decisions you have taken and how much you have earned.

Overview

This experiment is about fictitious consumption and savings decisions. Specifically, you decide on how much of your (fictitious) income after taxes you want to spend on current consumption and how much you want to save. Savings may be used in succeeding periods.

Income

Each period you receive a **gross income of 18 tokens**. From this gross income each period a **tax** is subtracted.

Your **net income**, in this case 18 tokens less taxes, can be either used for consumption purposes or saved and spent in later periods.

Please note that taxes, and hence, net income, may vary from period to period.

The maximum amount of tokens you can spend on consumption goods equals the sum of your net income plus **total savings** from previous periods. The amount which is not spend on consumption will automatically be saved and can be consumed in later periods.

Please note that you do **not earn interest** on savings. Hence, if you save e.g. 2 tokens in period 4, then you may use exactly these 2 tokens for consumption purposes in later periods.

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[18]Instructions are translated from German

[19]The instructions are almost identical for Treatment TRANSP. We just additionally mention, that there are messages on the current tax in TRANSP.

The experiment lasts for 12 periods. **Savings which are leftover after period 12 are FORFEITED and do not contribute to your payout!**

Consumption and Payout

Your payout in euros at the and of the experiment depends on how much you spend on consumption in total – hence, in all periods.

However, only those consumption expenses increase your payout, which are higher than 9 tokens!

Consumption expenses, which are below 9 tokens, influence your payout negatively in two ways:

1. Consumption expenses below 9 tokens are **NOT** considered. If you spend, say 5 tokens, in any period, then your wealth decreases by 5 tokens, but your payout does not increase.

2. Your **total payout at the end of the experiment** in tokens **will be reduced by 10%** for each period in which consumption is below 9 tokens.

Consumption expenses of at least 9 tokens enter your payout positively although with different weights, where the weight depends on the period in which you consume. A weight is a factor with which consumption in a given period is multiplied. Weights of later periods are smaller and hence, consumption in later periods contributes less to your payout.

Period	Weight
1	*1.00*
2	*0.98*
3	*0.96*
4	*0.94*
5	*0.92*
6	*0.90*
7	*0.88*
8	*0.86*
9	*0.84*
10	*0.82*
11	*0.80*
12	*0.78*

As you can see from the table, consumption in the first period enters your payout with a weight of 1 – hence, in full. Expenses which are made in e.g. period 6 receive a lower weight of 0.90.

Example: Given your consumption expenses in period 3 amount to 11.5 tokens, then these expenses increase your payout by $11.5 \times 0.96 = 11.04$ tokens.

To calculate your payout at the end of the experiment, consumption expenses of any period – if they are at least 9 tokens – are multiplied by the weight and summed up:

Total Payout (in tokens) = consumption in period 1 $\times$ 1.00 + consumption in period 2 $\times$ 0.98 + ... + consumption in period 12 $\times$ 0.78.

From this amount 10% are subtracted for each period you spend less than 9 tokens on consumption. The resulting amount in tokens is converted in euros with the following exchange rate:

15 tokens = 1 Euro

Additionally, you receive 4 Euro for your participation regardless of your consumption choices.

Summary "Consumption and Payout" On the one hand high consumption in early periods is contributing relatively more to your payout.

On the other hand, with lower consumption and the accumulation of savings you are able to make sufficiently high consumption expenses in case of low net income.

Taxes and Total Tax Burden

In every period a certain amount is subtracted as tax from your gross income. This amount may vary from period to period. The current tax level for the respective period is displayed on your screen.

The total tax burden over the 12 periods **have to sum up to 72 tokens**.

Hence, the **average tax per period** is given by **6 tokens**. If the tax is below or above 6 tokens in any period, then the deviation has to be compensated over the remaining periods.

Example: Suppose you have already paid a 60 tokens as taxes over the first 10 periods, then 12 tokens have to be paid in the course of the remaining 2 periods of the experiment.

Forecasts

At the end of each period you have to provide an estimate concerning your net income **for the remaining** periods. Specifically, you have to state whether **net income will on average** increase, remain constant, or decrease.

For each correct forecast you will receive an additional token on top of your total payout.

Operation

To make consumption expenses, please write the amount of tokens you want to spend in the respective field and click on the "Continue" button. You have 30 seconds for this task.

You can use (maximally) the first decimal place for your entry. Please note that the comma "," has to entered as dot ".".

You carry out your consumption decision on the Decision Screen. On this screen you also see a button which symbolizes a calculator. Clicking on the button opens a calculator, which you are welcome to use.

The decision screen is followed by an Overview Screen which provides an overview over the previous periods.

End of the Experiment

After having completed a short questionnaire, participants will be individually reimbursed. Please bring the receipt and the card indicating your workstation number with you. The payout will be private.

Questions of Understanding to Revise the Contents

- What happens concerning your payout if you have made consumption expenses in one period that amount to 4 tokens?

- How much is the total tax burden that you have to pay over the 12 periods?

- Say consumption in period 6 amounts to x token, with which weight does the amount x enter your payout?

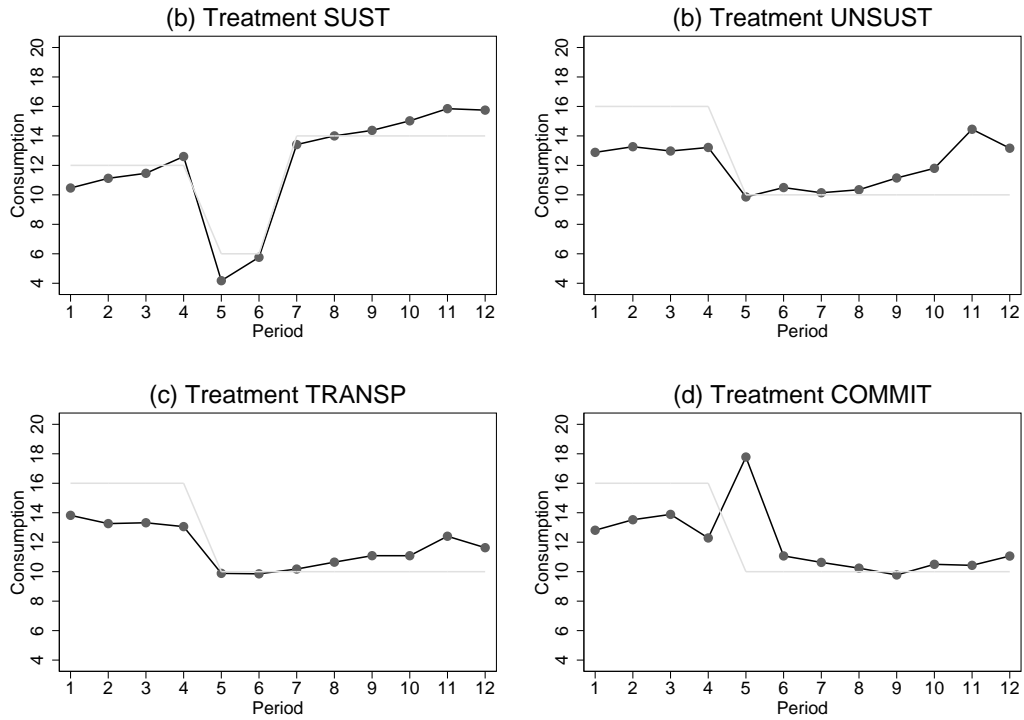- Say you still have savings after period 12, do these savings contribute to your payout?

Figure 1: Tax Paths

(a) Initially Sustainable Tax   (b) Initially Unsusustainable Tax
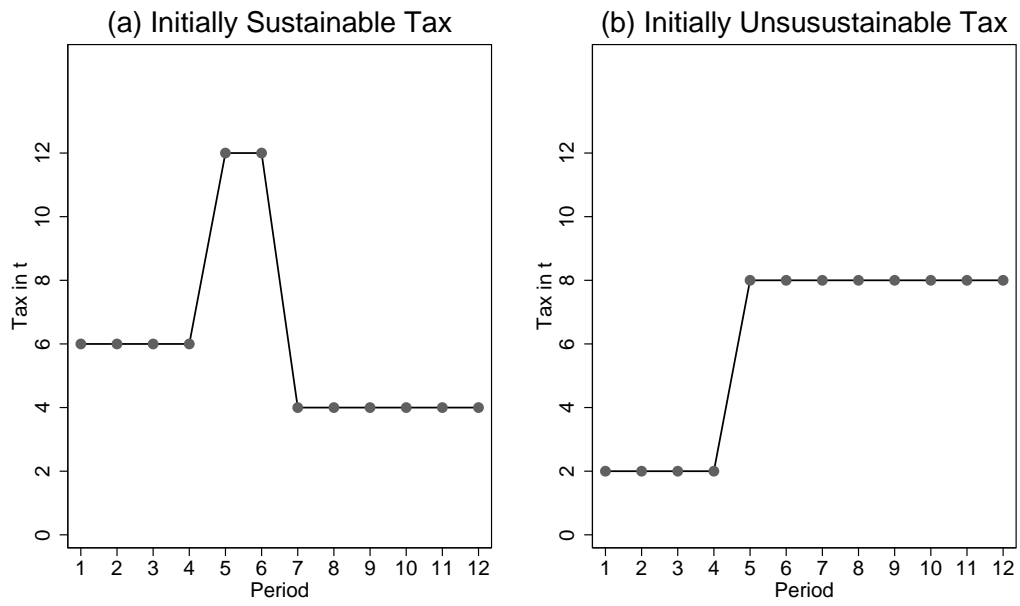
Notes: The figure shows the prevailing tax in each period for the two different tax regimes we use in the experiment.
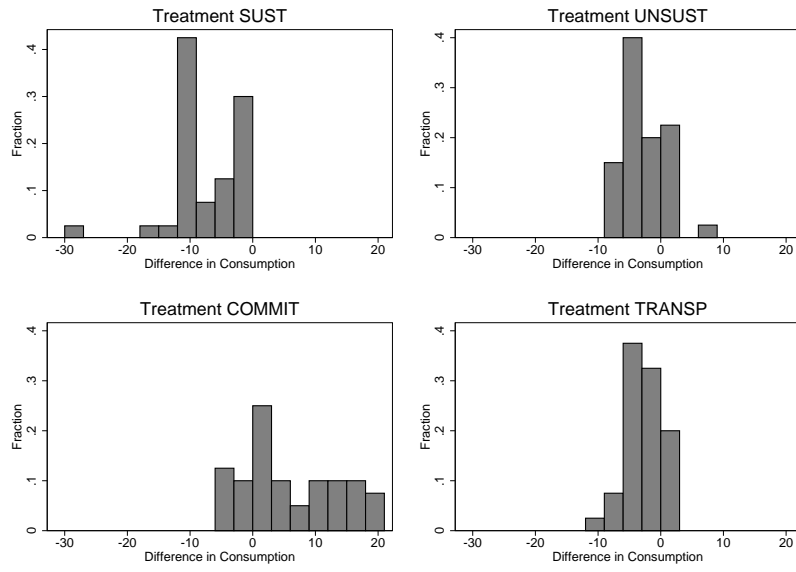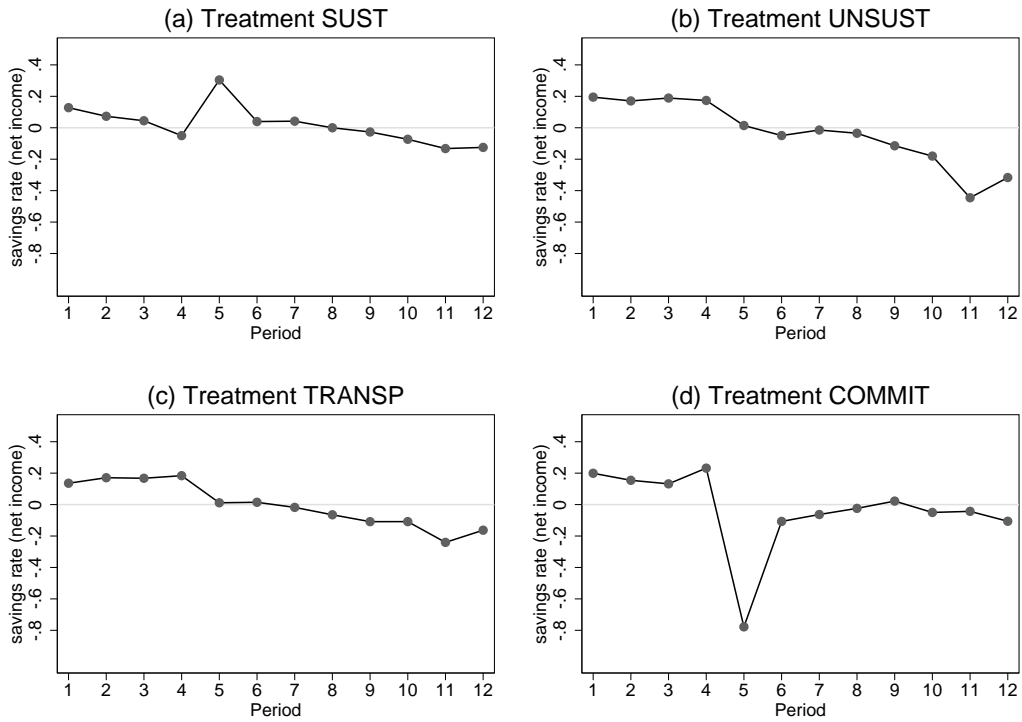
Figure 2: Consumption Levels over Time

Notes: The figure shows consumption averaged across subjects for each period of the experiment. The consolidation occurs in all treatments in period 5. The light-grey line corresponds to net income.

Figure 3: Distribution of Consumption Responses to the Consolidation

Notes: The figure shows relative frequencies of the change in consumption from period 4 to 5 ($c_{i5} - c_{i4}$) for Treatments SUST, UNSUST, TRANSP, and COMMIT.

Figure 4: Savings Rates

Notes: The figure shows savings rates averaged across subjects for each period of the experiment. The consolidation occurs in all treatments in period 5.

Figure 5: Consumption in Treatment UNSUST with and without the Eliciation of Beliefs
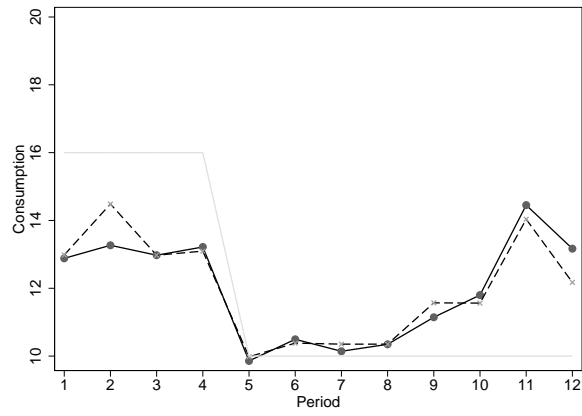

Notes: The figure shows consumption averaged across subjects for each period of the experiment for Treatment UNSUST with (circle symbol) and without (X symbol) elicitation of beliefs.

Figure 6: Distribution of Beliefs across Periods in SUST
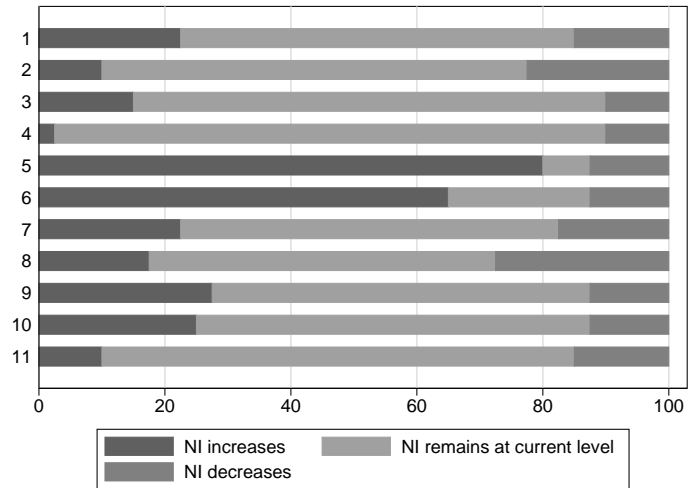
Notes: The Figure shows the fractions (in percent) of subjects that believe that net income (NI) will increase, remain at the current level, or decrease. The consolidation occurs in period 5.

Figure 7: Distribution of Beliefs across Periods UNSUST
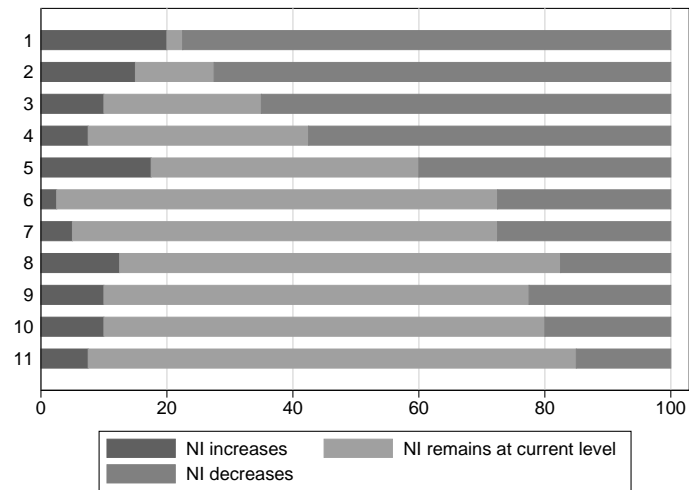
Notes: The Figure shows the fractions (in percent) of subjects that believe that net income (NI) will increase, remain at the current level, or decrease.

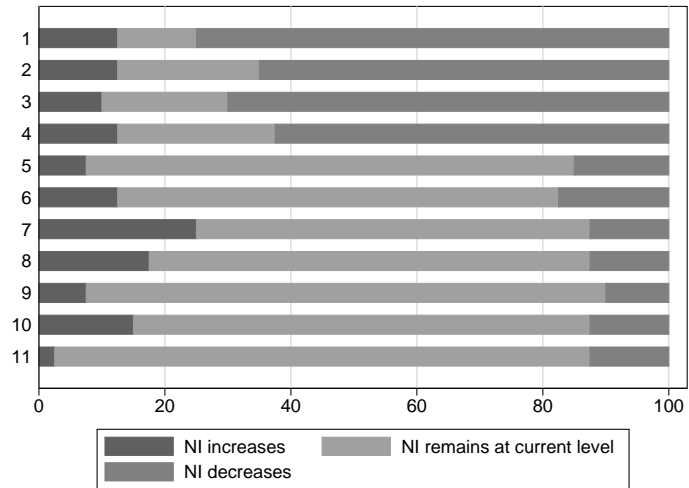Figure 8: Distribution of Beliefs across Periods TRANSP

Notes: The Figure shows the fractions (in percent) of subjects that believe that net income (NI) will increase, remain at the current level, or decrease.

Table 1: Displayed Interpretations of the current fiscal stance

Period	Messages (translated from German)
1	Taxes are going to rise during the experiment.
2	This tax-level cannot be sustained until the end of the experiment.
3	With respect to the total amount of tax due, current tax is below average tax.
4	This tax-level would not be sufficient to pay the amount of taxes due.
5	In the course of the experiment taxes might rise, but they do not have to rise.
6	This tax-level would be sufficient to pay the amount of taxes due, if it will be retained.
7	There is no necessity to increase taxes.
8	The current tax level can be sustained.
9	Tax increases are still not necessary.
10	This tax-level would be sufficient to pay the amount of taxes due.
11	The tax level can be sustained.
12	The total amount of tax due is paid with this last tax payment.

Notes: The messages are only shown in Treatments TRANSP and are identical for each subject.

Table 2: Changes in Consumption due to the Consolidation

	SUST	UNSUST	COMMIT	TRANSP
Average Change: $c_5 - c_4$	-8.43	-3.36	5.49	-3.17
p-values ($H_0 : c_5 - c_4 = 0$)	0.00	0.00	0.00	0.00
p-values: pairwise comparisons				
vs UNSUST	0.00			
vs COMMIT	0.00	0.00		
vs TRANSP	0.00	0.56	0.00	

Notes: To test whether the consumption response to the contraction is different from 0, we employ a one-sample t-test. The p-values reported in the last three rows for the pairwise comparisons refer to Mann-Whitney rank-sum tests. The corresponding null hypothesis is that the consumption responses due to the contraction are equal among Treatments SUST, UNSUST, TRANSP, and COMMIT.

Table 3: Pre- and Post-Consolidation Saving

	SUST	UNSUST	COMMIT	TRANSP
Savings rate averaged over Period 1-4	0.05	0.18	0.18	0.16
p-values: $H_0 = 0$	0.00	0.00	0.00	0.00
Savings rate averaged over Period 5-8		-0.02	-0.24	-0.01
p-values: $H_0 = 0$		0.17	0.00	0.61
p-values: pairwise comparisons		Period 1-4		
vs UNSUST	0.00			
vs COMMIT	0.00	0.87		
vs TRANSP	0.00	0.27	0.21	
p-values: pairwise comparisons		Period 5-8		
vs COMMIT		0.00		
vs TRANSP		0.49	0.00	

Notes: The savings rate is $netincome_{it}/saving_{it}$. To test whether the savings rates averaged across the respective periods are different from 0, we employ a one-sample t-test. The p-values for the pairwise comparisons refer to Mann-Whitney rank-sum tests. The corresponding null hypothesis is that the savings rates averaged across the respective periods are equal among Treatments SUST, UNSUST, TRANSP, and COMMIT.

Table 4: Fraction of Belief "Net Income will Decrease"

	SUST	UNSUST	TRANSP
Fraction averaged over Period 1-4	0.14	0.68	0.68
Fraction averaged over Period 5-8		0.28	0.14
p-values: pairwise comparisons		Period 1-4	
vs UNSUST	0.00		
vs TRANSP	0.00	0.96	
p-values: pairwise comparisons		Period 5-8	
vs TRANSP		0.03	

Notes: The p-values refer to Mann-Whitney rank-sum tests. The corresponding null hypothesis is that the fraction of the beliefs "net income will decrease" averaged across the respective periods are equal among Treatments SUST, UNSUST, and TRANSP.