

# When do Fiscal Consolidations Lead to Consumption Booms?

## Lessons from a Laboratory Experiment\*

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### Abstract

According to the expectations channel, a fiscal consolidation may give rise to less contractionary, or even expansionary effects on consumption, despite a decline in current disposable income. Intuitively, people may accumulate a stock of savings in anticipation of the consolidation and may start to reduce their savings to support consumption once it occurs. We design a laboratory experiment to study the conditions under which the expectations channel operates. Our results indicate that fiscal contractions that occur in an unsustainable fiscal environment exert less contractionary effects on consumption, which supports the expectations channel. We also find that the expectations channel is more pronounced if the fiscal authority can convincingly commit to abstain from tax increases in the future, whereas increasing subjects' level of awareness by running a transparent policy has only little influence on the outcomes.

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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 consolidations may give rise to expansionary effects even in the short run.<sup>1</sup>

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, 2013), a number of studies reaches opposite conclusions (see e.g. Guajardo et al., 2014; Jordà and Taylor, 2016). 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). Second, the channels and mechanisms through which a fiscal contraction may generate expansionary effects are not fully understood. Alesina and Perotti (1996) and Alesina et al. (2015) stress that fiscal contractions can give rise to expansionary 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).

In this paper, we focus on the so-called expectations channel (Blanchard, 1990; Bertola and Drazen, 1993; Sutherland, 1997; Ardagna, 2004), through which a fiscal consolidation may also exert expansionary effects. 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 build up a stock of savings that can be used to compensate the 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. If this channel is active, then any contractionary effects induced by the consolidation are counteracted and, if the channel is strong enough, the increase in aggregate demand may translate into expansionary

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<sup>1</sup>They analyzed the effects of fiscal consolidations in Ireland and Denmark where fiscal reforms coincided with consumption booms during the 1980s.

effects at the macroeconomic level.

For the expectations channel, forward-looking decision making and the perception of fiscal policy play a crucial role. The purpose of this paper is to study these aspects in a laboratory experiment. Specifically, we explore under which circumstances, subjects' behavior gives rise to an active expectations channel. 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 determine the macroeconomic effects of fiscal policy.<sup>2</sup>

In our experimental design, subjects make repeated consumption and savings decisions taking into account current and future fiscal policy. Since the fiscal position before and after a consolidation plays a crucial role for the expectations channel, we vary the extent to which the fiscal stance prevailing at the start of the experiment is sustainable across treatments. We also vary the type as well as the amount of information available to the subjects across treatments, to study how subjects process information about fiscal positions.

We find that initial fiscal conditions do matter in the sense that consumption declines less in response to a consolidation if the initial position is unsustainable. In other words, fiscal consolidations that occur in an unsustainable fiscal environment exert less contractionary effects on consumption, which is in line with the expectations channel. Nevertheless, we also find that subjects exhibit strong tendencies to maintain a stock of savings after the consolidation. We obtain this result despite the fact that the consolidation is credible in the sense that further tax increases are not necessary.

We conclude that although precautionary behavior is required to build up a sufficiently large saving stock before the consolidation, by the same virtue, subjects refrain from consumption after the contraction, even if the consolidation leads to a sustainable fiscal position. We obtain stronger effects if the fiscal authority can convincingly commit to abstain from tax increases in the future. Thus, while the existing literature emphasizes that consolidations have to be credible in the sense of leading to a sustainable fiscal position (e.g. Giavazzi and Pagano, 1996; Bergman and Hutchison, 2010), our findings show that this may not be sufficient for a quantitatively more pronounced expectations channel. We also find that increasing subjects' level of awareness of the sustainable nature of the fiscal position by running a transparent policy has only little influence on the outcomes.

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<sup>2</sup>E.g. the level of economic development, the exchange rate regime, openness (see e.g. Ilzetzi et al., 2013), monetary policy (see e.g. Bi et al., 2013), credit market conditions (see e.g. Auerbach et al., 2010), or the level of public debt (see e.g. Ilzetzi et al., 2013; Bi et al., 2013).

The paper is related to several strands of the experimental literature. The bulk of the experimental literature on fiscal policy in a macroeconomic context evaluates the Ricardian equivalence proposition (Cadsby and Frank, 1991; Slate et al., 1995; Ricciuti and Di Laurea, 2003; Adji et al., 2009; Meissner and Afschar, 2014, among others).<sup>3</sup> While Ricardian equivalence is also based on the assumption that agents take future fiscal policy into account when making consumption decisions, our paper differs from these contributions in terms of our focus on fiscal contractions and in terms of the experimental design.<sup>4</sup> A large strand of the experimental literature explores the formation of expectations (see e.g. Hommes, 2011) and Bernasconi et al. (2009) study expectation formation in the context of fiscal policy. They show that subjects have only a limited ability to forecast and interpret real world fiscal data, but do not analyze potential implications for consumption behavior, which is the focus of our analysis. Although our analysis is about fiscal policy, the paper is also related to Kryvtsov and Petersen (2013), who investigate expectation effects in the context of monetary policy.<sup>5</sup> In terms of the experimental design, our setting shares some similarities with experimental work on dynamic consumption and saving behavior (see, for instance Hey and Dardanoni, 1988; Noussair and Matheny, 2000; Lei and Noussair, 2002; Ballinger et al., 2003; Carbone and Hey, 2004; Brown et al., 2009). Nevertheless, in our design, we abstract from a number of complications, which typically arise in intertemporal choice experiments,<sup>6</sup> to focus on the crucial elements of the expectations channel.

The remainder of the paper is structured as follows: In Section 2, we formulate our research questions and Section 3 introduces the experimental design and our hypotheses. 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

The expectations channel holds that unsustainable fiscal positions prior to a consolidation play a crucial role. This point is emphasized by Blanchard (1990), Bertola and Drazen (1993), and

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<sup>3</sup>See Duffy (2012) for surveys of the experimental macroeconomics in general.

<sup>4</sup>In fact, as we will discuss below, Ricardian equivalence does not hold in our setting.

<sup>5</sup>A large empirical literature studies the effects of central bank communication and forward guidance and expected policy in the context of monetary policy (see e.g. Neuenkirch, 2012; Campbell et al., 2012). See Leeper (2009) for a discussion of the similarities between fiscal and monetary policy with respect to transparency and anchoring of expectations.

<sup>6</sup>E.g. the complexity of the decision problem (Noussair and Matheny, 2000), the critical role of experience (Ballinger et al., 2003), and the limited ability of subjects to deal with long planning horizons and stochastic processes (Carbone and Hey, 2004).

Sutherland (1997) among others. Thus, we formulate our first research question (RQ1) as: *Are fiscal contractions less contractionary (or more expansionary) if initial fiscal positions are unsustainable?*

The expectations channel also holds that a fiscal consolidation should be less contractionary if it eliminates the expectation of future, perhaps more disruptive, adjustments (see McDermott and Wescott, 1996; Giavazzi and Pagano, 1996; Alesina and Perotti, 1996; Bergman and Hutchison, 2010), which leads us to our second research question (RQ2): *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 (RQ3) as: *Are fiscal contractions less contractionary if subjects are more aware of the unsustainable (sustainable) nature of fiscal policy before (after) a fiscal consolidation?*

### 3 Experimental Design

Rather than implementing a specific theoretical model, our design is geared towards studying the conditions under which the expectation channel is active in a simple and easy to explain set-up. We use a between subject, individual choice design without any interactions between subjects.

Each treatment comprises of  $t = 1, \dots, 12$  periods. In each period, subjects receive an income,  $y_t$ , of 18 consumption goods. A tax,  $tax_t$ , is subtracted from  $y_t$ , and the net income  $y_t - tax_t$  can either be consumed or saved, where savings can be used for consumption in future periods. Thus, subjects face the following constraint in each period:

$$c_{it} + s_{it} = y_t - tax_t + s_{it-1}, \quad (1)$$

where  $c_{it} \geq 0$  is consumption in period  $t$  and  $s_{it} \geq 0$  denotes the stock of saving in period  $t$ . Note that subjects do not earn interest on savings and are not able to borrow. Introducing interest income and the opportunity to borrow against future income might complicate the task. Also note that since subjects essentially face a credit constraint, Ricardian equivalence does not hold in this setting.<sup>7</sup>

In all treatments subjects are instructed that an exogenously imposed solvency requirement

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<sup>7</sup>To explore the robustness of our results we also conducted treatments where we allow subjects to borrow (see Section 6.4 below).

for the government has to be met: total tax revenues collected from each subject over the course of the experiment amount to 72 units:

$$\sum_{t=1}^{12} tax_t = 72. \quad (2)$$

Subjects are also explicitly instructed in all treatments that an average tax of 6 units per period is necessary to satisfy the government's solvency condition and that deviations from a tax of 6 units in any period have to be compensated over the course of the treatment.

Consumption in period  $t$  yields a period payoff according to

$$Payoff_{it} = \begin{cases} 0 & \text{if } c_{it} < 9 \\ c_{it} & \text{if } c_{it} \geq 9 \end{cases}. \quad (3)$$

The task of subject  $i$  is to choose consumption such that the total payoff

$$Payoff_i = \sum_{t=1}^{12} \beta_t Payoff_{it} \quad (4)$$

is maximized, where  $\beta_{1,\dots,12} = 1.00, 0.98, 0.96, \dots, 0.78$  are the period-specific discount factors. At the end of the experiment, we deduct 10 percent of a subjects' total payoff for each period where consumption was below the threshold of 9 units, in addition to a period payoff of 0 in these periods. We impose the threshold level in the payoff function and this penalty to provide incentives to accumulate savings in a way which is easy to explain in the instructions. This formulation of the task allows us to study intertemporal decision making in a simple environment that avoids complications associated with intertemporal optimization which arise in more general settings. Yet, we are able to study the crucial elements of the expectations channel. Subjects face a tradeoff between early consumption, incentivized via discounting, and saving to avoid falling below the threshold in case of high values of  $tax_t$  in future periods. Note that without discounting, subjects would have a clear incentive to postpone consumption above the threshold until the last period, essentially eliminating the possibility to observe a consumption boom in early periods.

## 4 Treatments and Hypotheses

We implement four treatments varying either the initial tax level, to evaluate the role of initial conditions, or the information available to the subjects. In all treatments, subjects are instructed on their constant gross income, the total amount of tax payments, and the corresponding average per period tax. In each treatment, a tax increase of 6 units of the consumption good occurs in period  $t = 5$ . While we focus on treatments where subjects cannot accumulate debt, all treatments are repeated with the opportunity to use credits. We discuss these treatments separately in the results section (Section 6.4). Our hypotheses also apply to the debt versions of the treatments.

**Treatment UNSUST** In this treatment,  $tax_t = 2$  in periods  $t = 1, \dots, 4$ . Thus, fiscal conditions are initially inconsistent with the constraint that total revenues have to amount to 72 units, and therefore unsustainable. A one-time, permanent tax increase to  $tax_t = 8$  in period  $t = 5$  eliminates the unsustainability. The tax path is illustrated in Panel (a) of Figure 1.

[Insert Figure 1 about here]

**Treatment SUST** This treatment replicates Treatment UNSUST, but with a tax path that is already sustainable from the beginning. The tax path is shown in Panel (b) of Figure 1. Although it is not necessary in terms of sustainability, the tax increases in period  $t = 5$  and, to ensure that total tax revenues sum to 72 tokens, the tax increase is followed by a permanent tax reduction in period  $t = 7$ .

**Treatment COMMIT** In this treatment we use the tax path from Treatment UNSUST, but at the time of the consolidation in period  $t = 5$ , the entire future tax path (for periods  $t = 5, \dots, 12$ ) is announced and therefore any uncertainty about future fiscal policy is eliminated.

**Treatment TRANSP** Here, the tax follows again the path from Treatment UNSUST and subjects have essentially the same information as in Treatment UNSUST, but we provide additional interpretations in the form of statements that are displayed on the screen stating explicitly that the current tax level is either not sufficient (in periods  $t = 1, \dots, 4$ ) or that the tax is suf-

ficient (in periods  $t = 5, \dots, 12$ ).<sup>8</sup> The statements which are intended to raise awareness are shown in Table 1.<sup>9</sup>

[Insert Table 1 about here]

A less contractionary effect should be the result of a combination of high savings before the consolidation and a reduction in savings during or shortly after the consolidation. Since unsustainable fiscal positions should provide a stronger incentive to build up a stock of savings, we expect less contractionary effects of the adjustment on consumption in UNSUST compared to SUST. Thus, we formulate Hypothesis 1: The change of consumption from period  $t = 5$  to period  $t = 4$ ,  $c_{i5} - c_{i4}$ , should be less contractionary in UNSUST than in SUST.

In Treatment COMMIT,<sup>10</sup> 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 after the adjustment sets in. In fact, due to discounting they have a strong incentive to immediately consume their accumulated savings. Thus, Hypothesis 2: We expect  $c_{i5} - c_{i4}$  to be larger in COMMIT than in UNSUST.

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 higher savings prior to the consolidation and a stronger reduction of the savings stock after the contraction compared to the Treatment UNSUST and we formulate Hypothesis 3 as:  $c_{i5} - c_{i4}$  should be larger in TRANSP than in UNSUST.<sup>11</sup>

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<sup>8</sup>This treatment might be considered as an attempt to ‘nudge’ subjects towards precautionary savings. Nudging as a form of liberal paternalism intends to alter people’s behavior without restricting the choice set or incentive structure (Thaler and Sunstein, 2003, 2009). Nudging towards higher savings rates involves techniques to overcome deficiencies in self control and myopicity (Thaler and Benartzi, 2004), to exploit heuristics in designing savings plans (e.g. Benartzi and Thaler, 2007), or to use subtle cues to the benefits of savings (Choi et al., 2012). The approach in TRANSP is slightly different. We use verbal interpretations of the existing (and commonly known) situation to increase the subjects’ awareness. While this is related to the approach in Choi et al. (2012) our information regards the fiscal situation, not the effects of savings itself.

<sup>9</sup>The statements are neutrally phrased interpretations of the current fiscal situation. We vary the formulation of the sentences slightly to make it more likely that subjects pay attention to the messages.

<sup>10</sup>Since we announce the future tax path in this treatment, the analysis shares some similarities with experimental studies of central bank communication and forward guidance (see e.g. Kryvtsov and Petersen, 2013; Petersen and Arifovic, 2015).

<sup>11</sup>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.



## 5 Procedure

The experiments were conducted computerized, using z-Tree (Fischbacher, 2007), at the University of Innsbruck. We had 40 participants in each treatment. Participants were mostly undergraduate students from various faculties. No subject participated more than once. Upon arrival participants were randomly assigned to workstations that were separated by blinds. Instructions were distributed and read aloud, and participants were given a few more minutes to go through the instructions and to ask questions.<sup>12</sup>

Prior to the actual start of the experiment, subjects went through two practice rounds to acquaint themselves with the operation of the program. Subjects were told that they have 30 seconds time for their decision in each period. We implement an open time limit in the sense that the experiment proceeds to the next period only after all subjects have entered and confirmed their consumption choice. Any remaining wealth was automatically saved for future periods. We displayed the relevant information for the task on the decision screen: endowment, the current tax, the resulting net income, the stock of savings, and the wealth.

Since the expectations channel relies on the perception of future fiscal policy, we elicited beliefs on future net income in all treatments with the exception of COMMIT. In COMMIT we refrained from elicitation, since we worried about confusing subjects by asking them to state beliefs in an environment without any uncertainty. We elicited beliefs in the following way: at the end of each period, subjects were asked whether they expected their net-income, in subsequent rounds on average to be higher, approximately the same (+/- one unit), or lower compared to the current period. To incentivize the elicitation, subjects received one additional payoff point on top of their total payoff for each correct forecast.

The duration of the experiments varied from 35 to 50 minutes – depending on the treatment. Total payoffs were converted to euros using a rate of 1.00 euro per 15 payoff points. The determinants of the reimbursement were common knowledge. On average, in Treatment SUST, UNSUST, COMMIT and TRANSP subjects earned EUR 13.44 euros including a 4 euro show-up fee (min: 5.70 euros, max: 15.10 euros).

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<sup>12</sup>See Appendix A for the instructions.

## 6 Results

### 6.1 Measuring the Consumption Response

Figure 2 shows consumption, averaged across subjects, for each treatment, together with net income represented by the light-gray lines. Although the tax increases by the same amount in all treatments in period  $t = 5$ , the average response of consumption differs markedly across treatments. In Treatments SUST, UNSUST, and TRANSP, consumption declines, with less pronounced reactions in Treatments UNSUST and TRANSP. In Treatment COMMIT, average consumption increases. Also note that the decline in consumption is rather temporary in Treatment SUST, which is consistent with the subsequent tax reduction that occurs only in this treatment in period  $t = 7$ , whereas consumption recovers rather slowly in Treatments UNSUST and TRANSP.<sup>13</sup>

[Insert Figure 2 about here]

To study the consumption responses in greater detail, Table 2 shows the average consumption response to the consolidation, calculated as the change in consumption from period  $t = 4$  to period  $t = 5$ ,  $c_{i5} - c_{i4}$ , averaged across subjects in each treatment.<sup>14</sup> We see that average consumption declines significantly by 8.43 units in Treatment SUST. In Treatments UNSUST and TRANSP, the average declines in consumption of 3.36 units and 3.17 units, respectively, are substantially less pronounced, albeit still significant. In Treatment COMMIT, consumption significantly increases by 5.49 units on average.

[Insert Table 2 about here]

Table 2 also reports pairwise Mann Wittney rank sum tests in the lower panel, which indicate that consumption declines significantly more in Treatment SUST than in Treatment UNSUST. This ordering of the effects confirms Hypothesis 1 and with respect to RQ1, we conclude that consolidations occurring under an unsustainable initial fiscal position exert significantly less contractionary effects on consumption.

Note that since the tax increases by the same amount in all treatment, which facilitates comparability across treatments, net income in Treatment SUST falls below the consumption

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<sup>13</sup>In Figure B.1 in Appendix B we show average consumption paths together with the 10th, 25th, 50th, 75th, and the 90th percentile of the distribution of consumption choices to provide a more detailed description of subjects' choices.

<sup>14</sup>Considering only the immediate consumption response in the period, in which the consolidation occurs, does not appear to be restrictive, since Figure 2 shows that the responses generally occur rapidly. Hence, we are not excluding any potentially delayed effects in the analysis.

threshold, whereas it remains above the threshold in treatments with unsustainable tax paths. Therefore, it appears conceivable that consumption choices vis-à-vis the contraction are biased downwards in Treatment SUST since subjects receive no period payoff for consumption below the threshold. While this may impair the comparison of the exact magnitudes in Treatments SUST and UNSUST, the ordering of effects should not be affected. Nevertheless, to see whether average consumption in SUST is indeed influenced by the parameterization of the threshold, we repeated Treatments SUST and UNSUST with a lower consumption threshold of 5 units of the consumption good (instead of 9 units in the payoff function in (3) in the baseline treatments).<sup>15</sup> Figure B.2 in Appendix B shows average consumption outcomes for Treatments SUST and UNSUST for the two different threshold values. We see that consumption choices are essentially not influenced by the parameterization of the threshold. With the lower threshold, average consumption drops by 5.67 units in response to the consolidation in Treatment SUST, and by 4.05 units in Treatment UNSUST. As in the baseline treatments, these declines differ significantly from each other according to the Mann Wittney rank sum test (p-value: 0.03).

To address RQ2 concerning the role of commitment, we compare outcomes in Treatments UNSUST and COMMIT. Both treatments share an initially unsustainable tax level, but differ with respect to the provided information. According to Table 2, the null hypothesis of equal consumption responses in Treatments UNSUST and COMMIT can be rejected at the one percent level. In other words, we cannot reject Hypothesis 2. Hence, we conclude that commitment renders the consolidation effect on consumption significantly less contractionary.

Turning to RQ3, we compare outcomes in Treatments UNSUST and TRANSP. Do we need a fully credible commitment to obtain a less contractionary outcome, or does an increased level of awareness about the overall fiscal position suffice? Although the consumption response in Treatment TRANSP is slightly less pronounced than in Treatment UNSUST, as expected, the difference is not statistically significant. Thus, we reject Hypothesis 3 and conclude that a more transparent policy is not sufficient to significantly alter the effect of a fiscal consolidation in an unsustainable environment.

In short, we conclude that the effect of a fiscal consolidation on consumption depends crucially on the initial conditions and on the ability of the fiscal authority to credibly commit to a tax path after the consolidation. While the existing literature emphasizes that a contraction has to be credible in the sense that it leads a sustainable fiscal position, our results suggest

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<sup>15</sup>For the treatments with the lower consumption threshold we had 80 participants, 40 in SUST and 40 in UNSUST.

that this may not be enough to stimulate consumption sufficiently after a consolidation. At least for strongly less contractionary outcomes, or even an expansionary effect on consumption, a credible commitment is required.

As a next step of our analysis, and to introduce an additional perspective on our results, we compare the path for average consumption to a specific reference path in Figure 3. This reference path is the path we would obtain if subjects followed a simple rule according to which they consume the average net income and save the remainder if net income is above average. If subjects follow this rule, then the consumption path should be flat at a level of 12 units of the consumption good in all treatments. The intuition behind this rule is that whenever  $tax_t$  is below 6 (the average per period tax level which is required to meet the solvency requirement), subjects consume  $18$  (endowment) -  $6$  (sustainable tax) =  $12$  units and save the remainder to be prepared for future tax increases. Thus, in the run up to the fiscal contraction, the rule takes the sustainability of the initial fiscal position into account.

[Insert Figure 3 about here]

For easy reference, Figure 3 also shows the actual, average consumption paths as well as the net income from Figure 2. The reference path is represented by the bold dashed line. Looking at Treatment SUST, average consumption appears to be relatively close to the reference path in early periods, indicating that subjects take the sustainable nature of the tax path into account and do not really anticipate a contraction. In the treatments with the initially unsustainable tax, the actual, average consumption path generally lies between the current net income and the reference path, but somewhat closer to the reference path. Thus, the simple behavioral rule according to which subjects consume average net income has some merit as a description of subjects' behavior in our experiment.

Having characterized consolidation effects on the aggregate level, Figure 4 summarizes the distribution of consumption responses to provide a more detailed description of individual consumption choices. The vertical line indicates the average contraction response which is also shown in Table 2. In Treatment SUST, none of the subjects increases consumption due the tax increase. While the distribution shifts somewhat to the right in Treatments UNSUST and TRANSP, it is still roughly only 20 percent of the subjects that increase consumption in response to the consolidation in these two treatments. In Treatment COMMIT, in contrast, around 80 percent increase consumption. Using pairwise Kolmogorov-Smirnov tests, we can reject the null hypothesis that consumption responses are drawn from the same distribution at the one percent

level for all cases except for the comparison of outcomes in Treatments UNSUST and TRANSP (p-value: 0.91). Thus, this analysis at the level of individual subjects confirms our previously reported results.

[Insert Figure 4 about here]

## 6.2 Savings Behavior

For the expectations channel to be active, subjects need to accumulate savings before the consolidation and have to reduce their savings once the consolidation sets in. Therefore, to shed more light on the source of the observed variation in the consumption response across treatments, we study savings behavior before and after the consolidation.

Table 3 shows average savings rates before and after the consolidation for each treatment. We calculate the savings rate for each subject as  $s_{it}/(y_t - tax_t)$  and average over the subjects participating in a treatment. To characterize savings behavior before and after the consolidation, we average over either 4 periods before the consolidation, or 4 periods following the consolidation, including the consolidation period itself. 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-experiment effects. In Treatment SUST, the contraction is followed by a tax reduction, which complicates a comparison of outcomes in the post-consolidation sample. Therefore we do not calculate the average savings rate for Treatment SUST after the contraction.

[Insert Table 3 about here]

We see that subjects save on average 5 percent of their net income before the consolidation in Treatment SUST. In treatments with unsustainable tax paths, we observe savings rates of 16 percent (Treatment TRANSP) and 18 percent (Treatments UNSUST and COMMIT). Pairwise Mann-Whitney rank sum tests indicate that the savings rate in Treatment SUST is significantly lower than in any of the other treatments. Hence, in an environment with sustainable initial conditions, subjects accumulate a significantly smaller stock of savings, which limits their ability to sustain consumption when the tax is increased. This finding supports the expectations channel and is consistent with the significantly more contractionary effect of the consolidation on consumption in Treatment SUST.

However, above we also find that consumption responses differ significantly across Treatments with initially unsustainable tax paths (Treatments UNSUST, TRANSP, and COMMIT),

while Table 3 shows that savings rates prior to the consolidation, do not differ significantly across these treatments. Thus, differences in savings rates before the consolidation only explain the variation in the consolidation effect between treatments with sustainable and unsustainable tax paths, but do not tell us why the consolidation effect also differs strongly within the treatments with unsustainable tax paths.

Turning to savings behavior in the post-consolidation periods, we observe negative savings rates in Treatments UNSUST, TRANSP, and COMMIT. Thus, subjects use accumulated savings to sustain consumption after the fiscal consolidation to some extent. However, savings rates are only slightly, and in fact insignificantly, negative in Treatments UNSUST and TRANSP, indicating that subjects essentially rely on their current net incomes to support consumption and reduce their accumulated stock of savings only gradually in these treatments. In Treatment COMMIT the post-consolidation savings rate is strongly and significantly negative. Thus, in Treatment COMMIT, subjects strongly consume out of their accumulated savings once the tax is increased. In addition, pairwise Mann-Whitney 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 short, differences in savings behavior before, as well as after the consolidation, contribute to the variation in the consolidation effect discussed above. If initial conditions are unsustainable, subjects generally realize that taxes have to increase in the future and build up a stock of savings, which makes the tax increase less contractionary. However, even if the tax increase renders the fiscal position sustainable, subjects are still reluctant to consume their accumulated savings stock, as long as additional tax increases in the future are not explicitly ruled out.

To illustrate the dynamics of savings in more detail, Figure 5 shows the evolution of average savings rates in Treatments UNSUST, TRANSP, and COMMIT over time. 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. In  $t = 4$ , the last period before the contraction, the average savings rate is even slightly negative in Treatment SUST. After the contraction, the savings rate increases briefly in Treatment SUST, which mirrors the strong decline in consumption in this treatment.<sup>16</sup> In Treatments UNSUST and TRANSP average savings rates start to decline after the contraction, but only slowly. In Treatment COMMIT,

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<sup>16</sup>Since net income drops below the minimum consumption level, subjects have a strong incentive to cut back on consumption.

the average savings rate declines quickly and strongly when the consolidation occurs.

[Insert Figure 5 about here]

### 6.3 Elicited Beliefs

According to the expectations channel, variation in consumption responses and savings rates across treatments should be ultimately due to differences in subjects' elicited beliefs. In this section, we explore whether this is the case.

As a first step of the analysis, we check whether 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 with the same number of subjects and compare the distribution of average consumption for each period across treatments. According to a Kolmogorov-Smirnov test we cannot reject the null hypothesis that average consumption levels in the two treatments are drawn from the same distribution (p-value: 0.99). Thus, we conclude the elicitation of beliefs itself does not influence subjects' behavior.

Figures 6, 7, and 8 show the distributions of elicited beliefs for each period and for Treatments SUST, UNSUST, and TRANSP, respectively. In each figure, starting from the left, the dark-grey bars show the fraction of subjects who believe that net income will decrease. The adjacent light-grey bars show the fraction of subjects who believe that net income remains roughly constant. And finally, the medium-grey bar on the right gives the fraction of subjects who believe that net income will decrease.

[Insert Figures 6, 7, and 8 about here]

We see from Figure 6 that the majority of subjects initially expect a roughly constant level of net income in Treatment SUST, which is consistent with the sustainable tax path. In period  $t = 5$ , when the tax increase occurs, subjects start to correctly expect a tax decrease and on average a higher net income for the remainder of the treatment.

For Treatments UNSUST and TRANSP with initially unsustainable tax paths, Figures 7 and 8 show that the majority of subjects correctly expect that taxes will be raised in the future, resulting in a lower expected net income. Interestingly, however, we also see that this fraction starts to decline somewhat from period  $t = 2$  onwards in Treatment UNSUST, whereas it remains relatively stable in Treatment TRANSP, which indicates that the additional messages

provided in Treatment TRANSP help subjects to correctly interpret the environment. Similarly, after the tax increase, subjects adjust their beliefs substantially faster in Treatment TRANSP as the share of subject who expect net income to remain constant drops immediately from 60 percent in period  $t = 4$  to below 20 percent in period  $t = 5$ . In Treatment, UNSUST, this share also drops by roughly the same magnitude, but the adjustment of beliefs is substantially more gradual and lasts until period  $t = 8$ . Which illustrates again, that the displayed messages in the TRANSP Treatment play some role for the formation of beliefs.

To see how the variation in beliefs corresponds to the treatment variation of the consumption response, we focus on the fraction of subjects indicating that net income will decrease on average over the course of the experiment in the remainder of the analysis. We concentrate on this fraction since it should be primarily the subjects expecting a tax increase who build up a savings stock prior to the consolidation. And, a credible consolidation should convince subjects that taxes will not increase again.

To compare beliefs before and after the consolidation, we average these fractions 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. Thus, if tax path is sustainable, subjects worry less about future tax hikes, which is consistent with the significantly lower average savings rate prior to the consolidation in Treatment SUST, and ultimately, a strong decline in consumption once the tax is increased. For Treatments UNSUST and TRANSP, the null hypothesis of equal fractions of subjects expecting a tax increase cannot be rejected, which is in line with the fairly similar savings rates observed prior to the consolidation in these treatments.

[Insert Table 4 about here]

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. While the decline is highly significant in both treatments, the magnitude is larger in Treatment



TRANSP.<sup>17</sup> In addition, Table 4 shows that the null hypothesis of equal fractions in Treatment UNSUST and TRANSP after the consolidation can be rejected at the 5 percent level.

Although the stronger effect of the consolidation on subjects' beliefs in Treatment TRANSP is in line with our expectation, savings rates, as discussed above, do not differ significantly across Treatments UNSUST and TRANSP. Hence, although the additional announcements provided in Treatment TRANSP appear to convince subjects that additional tax increases will not occur, they are insufficient to induce subjects to adjust their consumption choices accordingly. Table 5 presents Spearman's rank correlation coefficients between beliefs in the contraction period and changes in consumption due to the contraction for Treatments SUST, UNSUST and TRANSP. While we observe a weakly significant and positive correlation in Treatment SUST, the correlation coefficients are insignificant in Treatments UNSUST and TRANSP, where subjects tend to worry more about additional future tax hikes. These results are consistent with Armantier et al. (2015) who find that people do not always act on their beliefs, and underlines again the crucial role of commitment in our setting.

[Insert Table 5 about here]

#### 6.4 Allowing for Debt Accumulation

In the treatments discussed so far, subjects did not have the opportunity to borrow. While avoiding debt accumulation helps to keep the environment simple and minimizes the potential for confusion, it is conceivable that the opportunity to borrow influences savings behavior and therefore also changes the effects of the consolidation. To explore this issue, we generated 40 additional observations for each of the Treatments SUST, UNSUST, TANSF, and COMMIT and allowed subjects to borrow. In other words, the savings account balance  $s_{it-1}$  is no longer required to be positive. We refer to these new treatments as SUST-DEBT, UNSUST-DEBT, TRANSP-DEBT, and COMMIT-DEBT. Apart from subjects' ability to acquire debt, the general design and the parameterization are identical to the respective baseline treatments. While subjects do still not earn interest on positive savings, as discussed in Section 3, they are charged a rate of 2 percent per period if  $s_{it-1} < 0$ .<sup>18</sup>

Although consumption can exceed disposable income and accumulated savings in these treatments in a given period, we are able to ensure that subjects can fully repay their debt

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<sup>17</sup>Based on Mann-Whitney ranksum-tests, the null hypothesis of equal fractions before and after the consolidation within treatments can be rejected at the one percent level for both treatments.

<sup>18</sup>Recall that for discounting future payoffs, we use a weight  $\beta \leq 1$  which is linearly decreasing at a rate of 0.02 each period. The 2 percent interest rate is close to this discount rate.

by the end of the experiment by constraining consumption choices in the following way:

$$c_{it} \leq c_{it}^{max} = \sum_{\tau=t}^{12} \frac{(y_{\tau} - tax_{\tau})}{1.02^{\tau-t}} + b_{it}, \quad (5)$$

where

$$b_{it} = \begin{cases} s_{it-1} & \text{if } s_{it-1} \geq 0 \\ 1.02s_{it-1} & \text{if } s_{it-1} < 0 \end{cases}. \quad (6)$$

Thus, in any given period, consumption cannot exceed the sum of the present value of net incomes over the remaining periods of the experiment plus the savings account balance at the beginning of period  $t$ ,  $b_{it}$ . In the DEBT treatments, we show  $c_{it}^{max}$  on the decision screen in addition to the information also shown in the baseline treatments without debt accumulation (that is, gross income, tax, net income, and account balance). Note that information about the interest rate and total net income are known to subjects. Hence, showing  $c_{it}^{max}$  does not provide any additional information in the DEBT treatments. The procedure was analogous to our baseline treatments. On average subjects earned, including the show-up fee, 12.25 euros in the DEBT treatments (min: 6.70 euros, max: 15.10 euros).

Figure 9 shows per period consumption, averaged across subjects, for the DEBT treatments (bold black), and for the baseline treatments without debt (dots). The light grey line represents net income. We see that average consumption in the DEBT treatments generally exceeds average consumption in the respective baseline treatments without debt in the first and second period. Thus, subjects tend to borrow mainly in early periods.

[Insert Figure 9 about here]

Table 6 shows the change in consumption in the contraction period,  $c_{i5} - c_{i4}$ , averaged across subjects. In general, differences across the DEBT treatments are less pronounced and less significant than in the baseline treatments, which mirrors the stronger variation in the data due to the somewhat more complex environment. Nevertheless, we see from the top panel of the table, where consumption is averaged over all subjects participating in a certain treatment, that the ordering of the consumption responses is the same as in the baseline treatments without debt. We observe the strongest consumption decline in Treatment SUST-DEBT (3.96 units), whereas drops are less pronounced in UNSUST-DEBT (2.53 units) and TRANSP-DEBT (3.64 units). We observe the most muted reaction in Treatment COMMIT-DEBT. Overall, we conclude that although introducing debt influences subjects' behavior, as expected, our main results remain

robust.

[Insert Table 6 about here]

The accumulation of debt in early periods may already severely limit choices at the time of the consolidation due to constraint (5). To see how indebtedness at the time of the consolidation influences the results, we report average consumption responses separately for subjects with a non-negative level of savings at the beginning of period  $t = 5$  in the middle panel of Table 6, and for subjects with negative savings at the beginning of period  $t = 5$  in the bottom panel of the table. We see that when we consider only subjects with non-negative savings, the results resemble closely those obtained in the baseline treatments. The results reported in the bottom panel shows that consumption generally declines stronger when we only consider subjects who have negative savings at the time of the consolidation. Thus, subjects who have already accumulated debt prior to the consolidation appear to be less able to maintain a certain consumption level when net income declines.

Table 7 shows pre- and post-contraction savings rates observed in the DEBT treatments. The top panel shows savings rates for all subjects, the middle panel shows savings rates for subjects with non-negative savings account at the beginning of period  $t = 5$ , and the bottom panel presents savings rates for subjects with negative savings account at the time of the consolidation. We see from the top panel of the table that savings rates are negative on average before the consolidation, which shows again that some subjects acquire substantial amounts of debt in early periods. Also note that average savings rates are positive in the aftermath of the consolidation as subjects are required to repay their debts.

[Insert Table 7 about here]

From the middle panel of the table, we see that for subjects with non-negative savings at the time of the consolidation, savings rates are remarkably similar to those observed in the treatments without debt. During pre-contraction periods, this subset of subjects saves on average only a fraction of 7 percent in Treatment SUST-DEBT, but 15 percent in Treatment UNSUST-DEBT and 17 percent in both, Treatment TRANSP-DEBT and COMMIT-DEBT. These results again suggest that the initially sustainable tax path results in lower savings. For periods 5 to 8, we see that average savings rates are negative, which is also in line with the outcomes in the baseline treatments. The bottom panel of the table shows that for subjects who are already indebted at the time of the consolidation, average savings rates turn positive

in the aftermath of the consolidation. This outcome illustrates again that these subjects are primarily concerned with repaying their debts.

Interestingly, although subjects borrow in early periods in the DEBT treatments, as discussed above, they are rather reluctant to borrow in order to smooth the effect of the consolidation on net income. In Treatments UNSUST-DEBT, TRANSP-DEBT, and COMMIT-DEBT only 2 subjects accumulate new debt in period  $t = 5$ . In Treatment SUST-DEBT, this number is higher (24 subjects), since net income drops below the consumption threshold in this Treatment and therefore subjects have a strong incentive to borrow and consume at least the threshold level. Thus, although consumption choices at the time of the consolidation are limited for subjects who have already acquired debt in early periods, subjects also appear to be generally reluctant to borrow in order to sustain consumption. This result is consistent with the interpretation that subjects exhibit debt aversion (see e.g. Meissner, 2015).

## 7 Concluding Remarks

According to the expectations channel, fiscal consolidations may give rise to expansionary effects on consumption at the macroeconomic level if people build up a sufficient stock of savings before the consolidation, since they realize that a fiscal consolidation has to occur. When the consolidation finally occurs, and eliminates the need for further savings, a consumption boom should follow.

While our results provide support for the expectations channel in the sense that consolidations occurring in an unsustainable fiscal environment are less contractionary, we also find that the remaining uncertainty in the aftermath of a consolidation plays a crucial role. In our experimental setting, subjects are generally reluctant to reduce savings sufficiently after the consolidation occurs, even if the fiscal situation becomes sustainable. We obtain substantially stronger effects in line with the expectations channel if the fiscal authority can credibly commit to refrain from additional tax hikes in the future, thereby eliminating any uncertainty in the aftermath of a consolidation.

While we do not want to overextend the external validity of our results, given the stylized nature of laboratory experiments, the analysis shows a rather cautious picture of the circumstances under which fiscal consolidations may turn out to have expansionary macroeconomic effects through the expectations channel. To obtain a quantitatively strong expectations channel effect, the fiscal authority may have to overcome severe communication and commitment

issues.

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## A Instructions for Treatments SUST, UNSUST, and COMMIT<sup>19</sup>

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 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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<sup>19</sup>Instructions are translated from German. The instructions are almost identical for Treatment TRANSP. We just additionally mention that there are messages on the current tax.

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 end 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, affect 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 time 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 reimbursed individually. Please bring the receipt and the card indicating your workstation number with you. The payout will be in private.

## Questions of Understanding to Revise the Contents

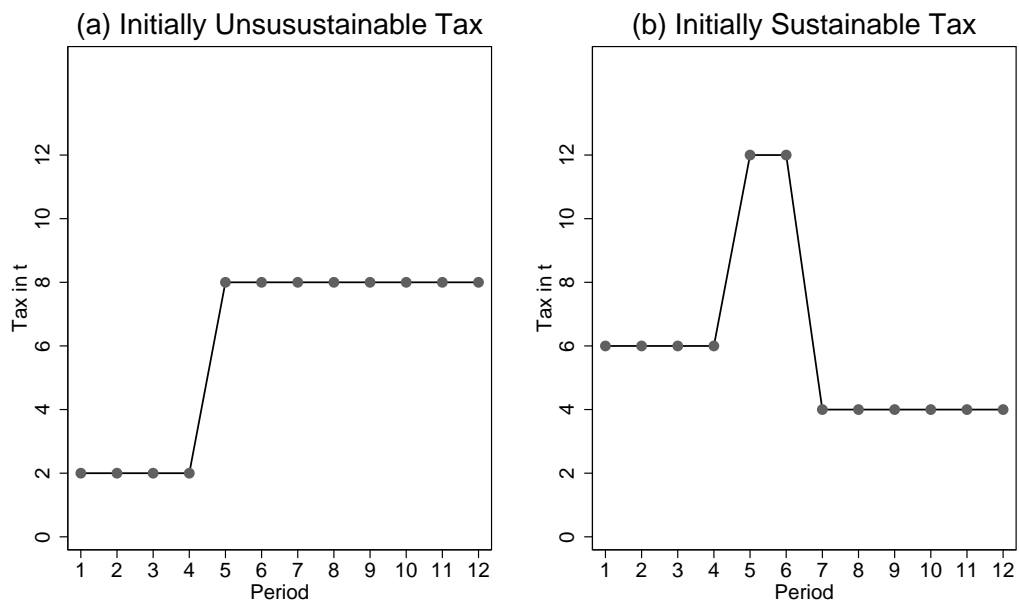
- What happens concerning your payout if you have made consumption expenses in one period that amount to 4 tokens?
- How much is the total tax burden that you have to pay over the 12 periods?
- Say consumption in period 6 amounts to  $x$  token, with which weight does the amount  $x$  enter your payout?
- Say you still have savings after period 12, do these savings contribute to your payout?

## **B Additional Figures**

INSERT FIGURE B.1 HERE.

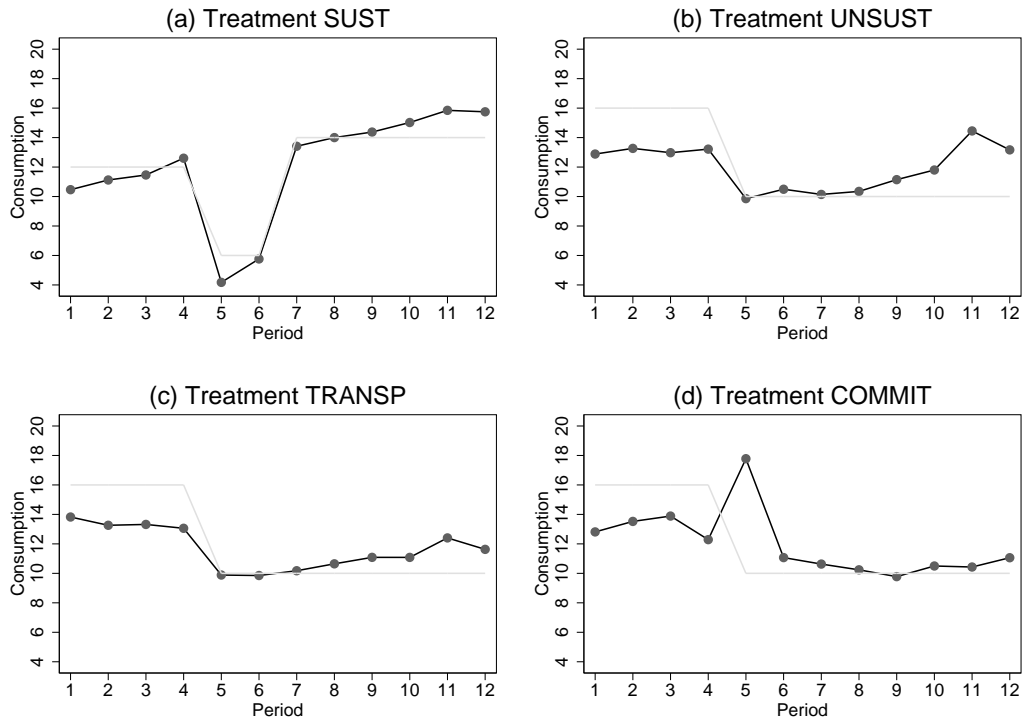
INSERT FIGURE B.2 HERE.

Figure 1: Tax Paths



Notes: The figure shows the prevailing tax in each period for the two different tax regimes we use in the experiment. In both treatments, total tax revenues sum to 72 units over the course of the treatment.

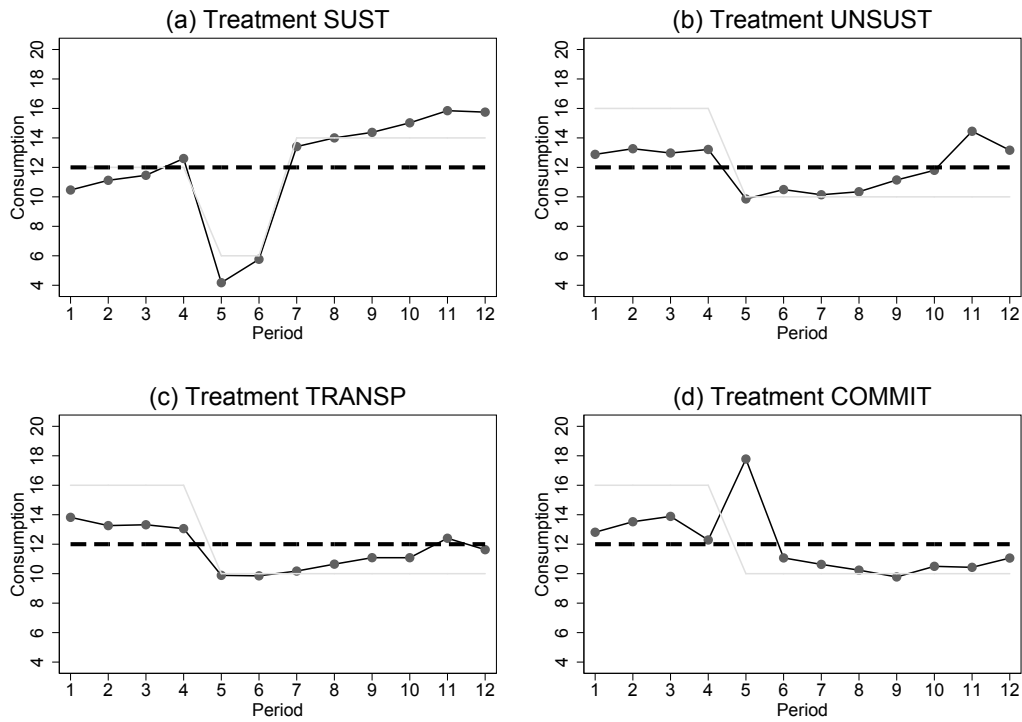
Figure 2: Average Consumption



Notes: The figure shows consumption averaged across subjects for each period of the experiment. The consolidation occurs in all treatments in period  $t = 5$ . For easy reference we also plot net income (light grey line).

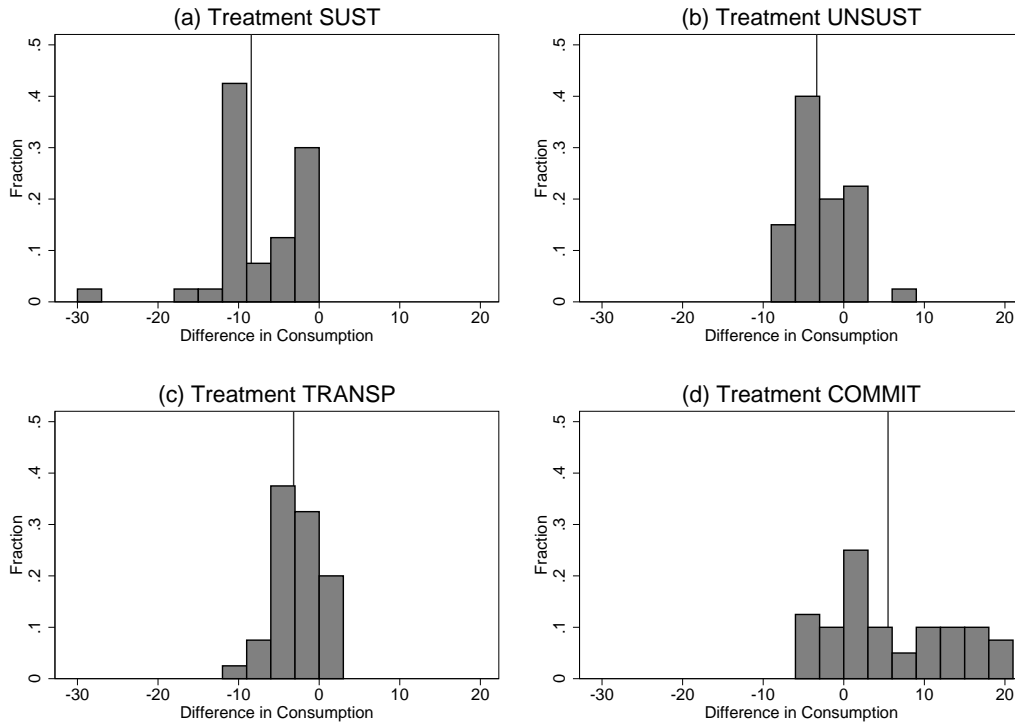


Figure 3: Average Consumption and the Reference Path



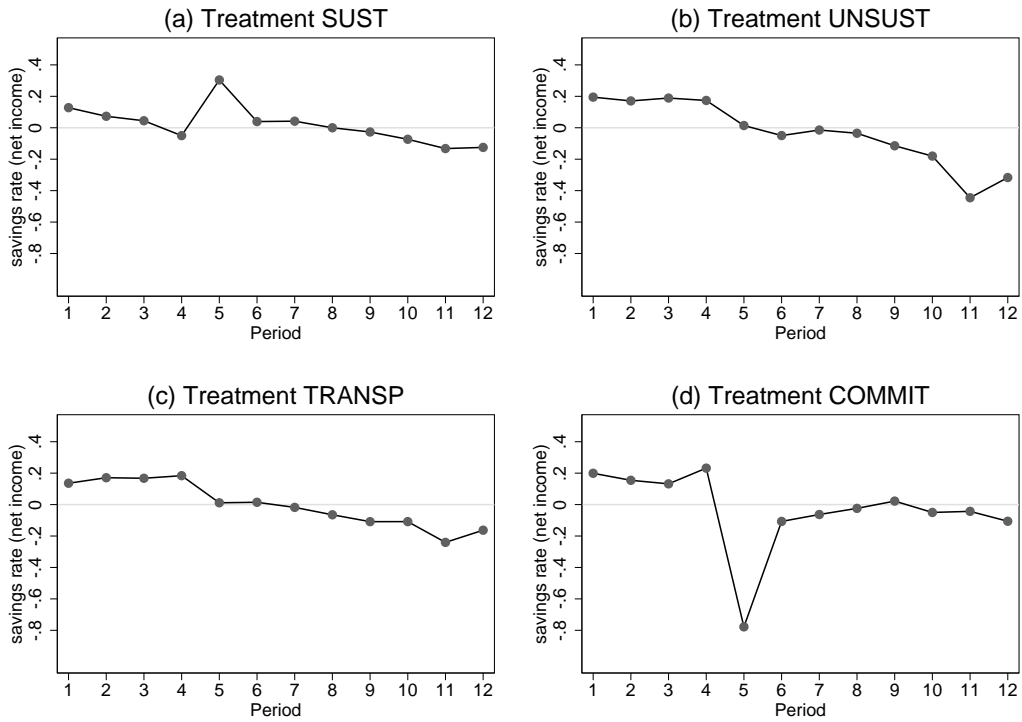
Notes: The figure shows consumption averaged across subjects and the reference path. The solid line with dots is average consumption, and the reference path is represented by the bold dashed line. For easy reference we also show net income which is the light grey solid line. The consolidation occurs in all treatments in period  $t = 5$ .

Figure 4: Distribution of Consumption Responses to the Consolidation



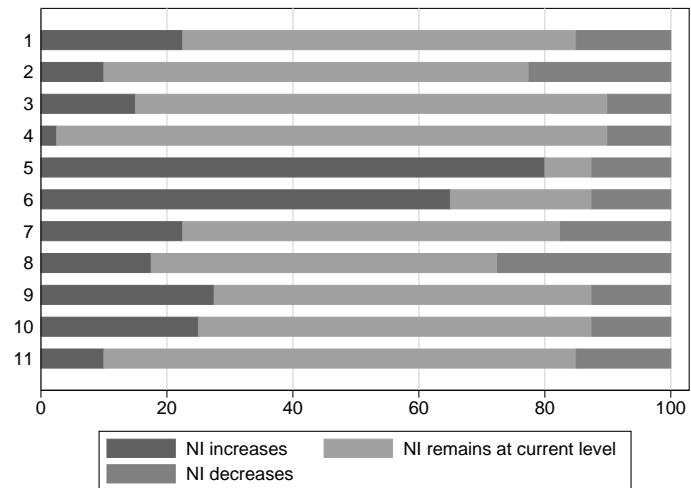
Notes: The figure shows relative frequencies of the change in consumption from period  $t = 4$  to  $t = 5$  ( $c_{i5} - c_{i4}$ ). The vertical line indicates the average contraction response for the respective treatment.

Figure 5: Savings Rates



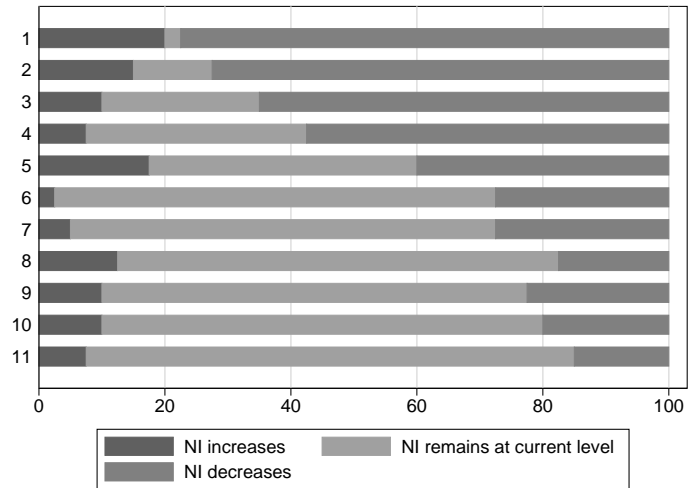
Notes: The figure shows savings rates averaged across subjects for each period of the experiment. The consolidation occurs in all treatments in period  $t = 5$ .

Figure 6: Distribution of Beliefs across Periods in SUST



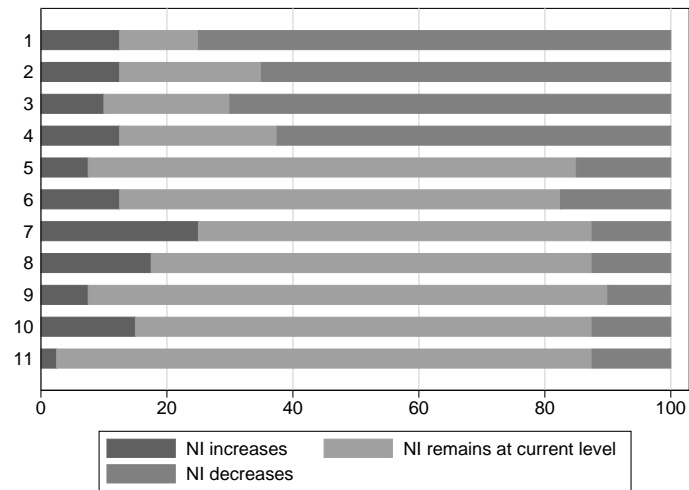
Notes: The figure shows the fractions (in percent) of subjects that believe that net income (NI) will increase, remain at the current level, or decrease on average compared to the respective period. The consolidation occurs in period  $t = 5$ .

Figure 7: Distribution of Beliefs across Periods in UNSUST



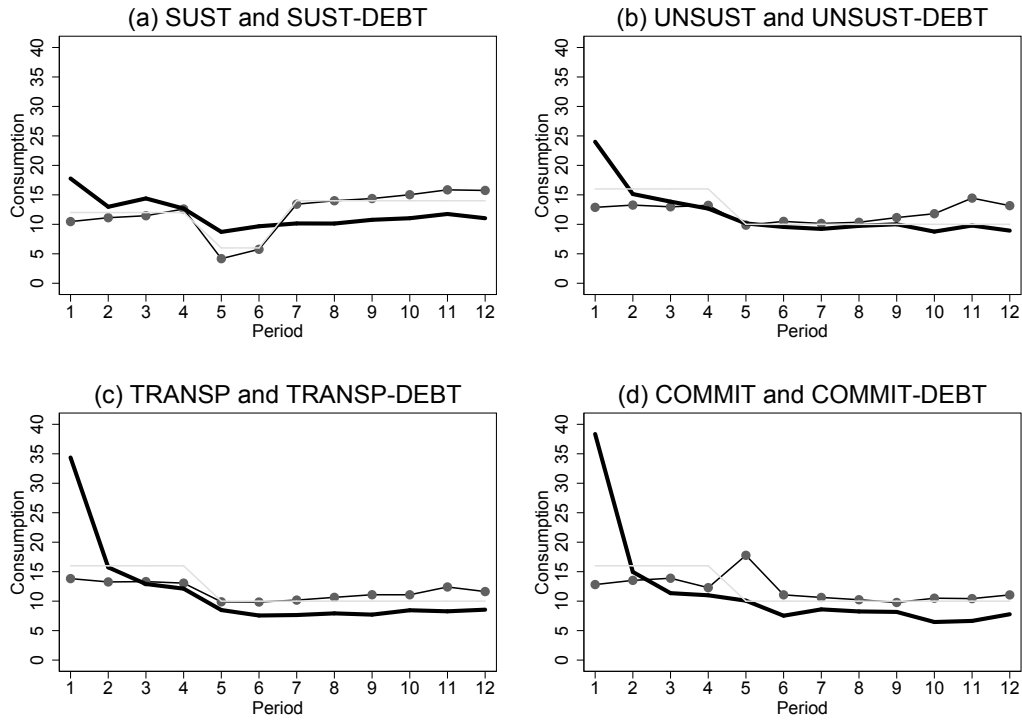
Notes: The figure shows the fractions (in percent) of subjects that believe that net income (NI) will increase, remain at the current level, or decrease on average compared to the respective period. The consolidation occurs in period  $t = 5$ .

Figure 8: Distribution of Beliefs across Periods in TRANSP



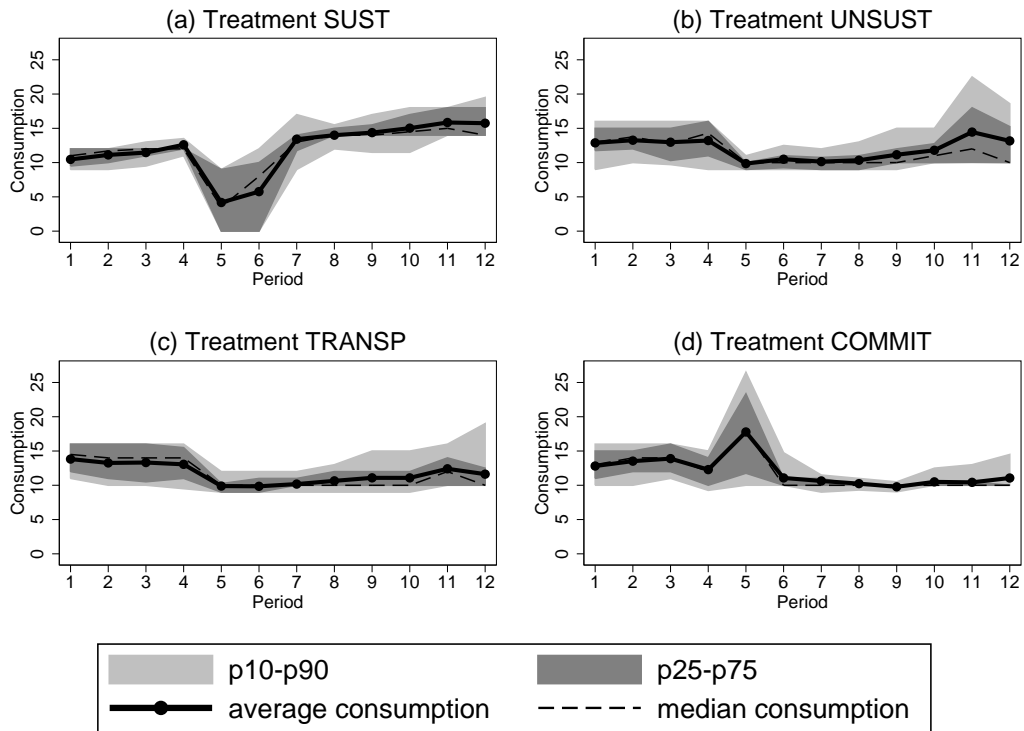
Notes: The figure shows the fractions (in percent) of subjects that believe that net income (NI) will increase, remain at the current level, or decrease on average compared to the respective period. The consolidation occurs in period  $t = 5$ .

Figure 9: Average Consumption with and without Debt



Notes: The figure shows consumption averaged across subjects for each period of the experiment. Average consumption in treatments with debt is indicated by the bold black line, average consumption in baseline treatments with no debt is indicated by the thinner line with dots. For easy reference we also plot net income which is the light grey line. The consolidation occurs in all treatments in period  $t = 5$ .

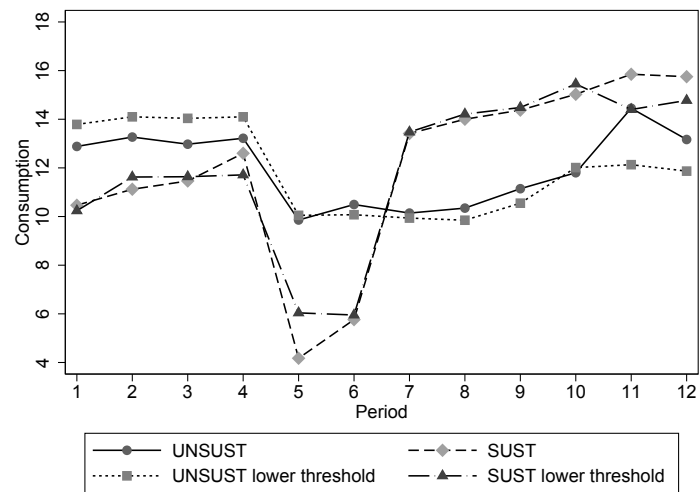
Figure B.1: Average Consumption and the Distribution of Consumption



Notes: The figure shows consumption averaged across subjects for each period of the experiment (bold line with dots). Additionally, to provide information about the distribution of consumption, we plot the median consumption (dashed line) and shade the area between the 10th and the 90th percentile in light grey and the area between the 25th and the 75th percentile in dark grey. The consolidation occurs in all treatments in period  $t = 5$ .



Figure B.2: Different Consumption Thresholds in Treatments SUST and UNSUST



Notes: The figure shows consumption averaged across subjects for each period of the experiment for Treatments SUST (dashed line with diamond symbols), UNSUST (solid line with dot symbols), SUST with the lower threshold (dot-dashed line with triangle symbols), and UNSUST with the lower threshold (dotted line with square symbols). The consolidation occurs in all treatments in period  $t = 5$ .

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 off 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
Stand. error	0.91	0.55	1.21	0.45
Stand. deviation	5.76	3.48	7.66	2.86
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
Stand. error	0.01	0.02	0.01	0.03
Stand. deviation	0.04	0.12	0.09	0.16
p-values: $H_0 : \sum_{t=1}^4 s_t / (y_t - tax_t) / 4 = 0$	0.00	0.00	0.00	0.00
Savings rate averaged over period 5-8		-0.02	-0.24	-0.01
Stand. error		0.02	0.03	0.03
Stand. deviation		0.10	0.18	0.17
p-values: $H_0 : \sum_{t=5}^8 s_t / (y_t - tax_t) / 4 = 0$		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		0.52	0.00	

Notes: The savings rate is  $s_{it}/(y_t - tax_t)$ . 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	0.97	
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.

Table 5: Correlation between Beliefs and Changes in Consumption due to the Consolidation

	SUST	UNSUST	TRANSP
$Corr(c_5 - c_4, belief_5)$	0.27	0.05	-0.19
p-values: $H_0 : Corr(c_5 - c_4, belief_5) = 0$	0.10	0.76	0.24

Notes: We show Spearman's rank correlation coefficients. The p-values reported refer to Spearman's rank correlation test. The corresponding null hypothesis is that the consumption responses due to the contraction and beliefs in  $t = 5$  are independent.

Table 6: Changes in Consumption due to the Consolidation

	SUST-DEBT	UNSUST-DEBT	COMMIT-DEBT	TRANSP-DEBT
All subjects				
Average change: $c_5 - c_4$	-3.96	-2.53	-0.92	-3.64
Stand. error	1.43	0.86	1.74	1.80
Stand. deviation	9.05	5.41	11.02	11.04
p-values: $H_0 : c_5 - c_4 = 0$	0.01	0.01	0.60	0.05
p-values: pairwise comparisons				
vs UNSUST-DEBT	0.68			
vs COMMIT-DEBT	0.08	0.17		
vs TRANSP-DEBT	0.30	0.52	0.33	
Subjects with non-negative savings account in $t = 5$				
Average change: $c_5 - c_4$	-3.19	-1.34	2.06	-1.85
Stand. error	1.07	0.98	1.78	0.82
Stand. deviation	4.29	5.02	8.17	3.95
p-values: $H_0 : c_5 - c_4 = 0$	0.01	0.19	0.26	0.04
p-values: pairwise comparisons				
vs UNSUST-DEBT	0.30			
vs COMMIT-DEBT	0.18	0.37		
vs TRANSP-DEBT	0.22	0.97	0.48	
Subjects with negative savings account in $t = 5$				
Average change: $c_5 - c_4$	-4.48	-4.72	-4.21	-6.05
Stand. error	2.29	1.49	2.96	4.09
Stand. deviation	11.24	5.59	12.92	16.87
p-values: $H_0 : c_5 - c_4 = 0$	0.06	0.01	0.17	0.16
p-values: pairwise comparisons				
vs UNSUST-DEBT	0.44			
vs COMMIT-DEBT	0.39	0.14		
vs TRANSP-DEBT	0.80	0.22	0.43	

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-DEBT, UNSUST-DEBT, TRANSP-DEBT, and COMMIT-DEBT. We have 24 subjects with negative savings accounts in  $t = 5$  in Treatment SUST-DEBT, 14 in UNSUST-DEBT, 19 in COMMIT-DEBT, and 17 in TRANSP-DEBT.

Table 7: Pre- and Post-Consolidation Saving

	SUST-DEBT	UNSUST-DEBT	COMMIT-DEBT	TRANSP-DEBT
All subjects				
Savings rate averaged over period 1-4	-0.20	-0.03	-0.18	-0.17
Stand. error	0.07	0.05	0.08	0.08
Stand. deviation	0.44	0.33	0.48	0.50
p-values: $H_0 : \sum_{t=1}^4 s_t/(y_t - tax_t)/4 = 0$	0.01	0.62	0.02	0.03
Savings rate averaged over period 5-8		0.03	0.14	0.21
Stand. error		0.04	0.07	0.07
Stand. deviation		0.26	0.47	0.42
p-values: $H_0 : \sum_{t=5}^8 s_t/(y_t - tax_t)/4 = 0$		0.42	0.07	0.00
Period 1-4				
p-values: pairwise comparisons				
vs UNSUST	0.01			
vs COMMIT	0.25	0.27		
vs TRANSP	0.08	0.55	0.82	
Period 5-8				
p-values: pairwise comparisons				
vs COMMIT		0.95		
vs TRANSP		0.24	0.35	
Subjects with non-negative savings account in $t = 5$				
Savings rate averaged over period 1-4	0.07	0.15	0.17	0.17
Stand. error	0.02	0.03	0.03	0.02
Stand. deviation	0.07	0.13	0.10	0.07
p-values: $H_0 : \sum_{t=1}^4 s_t/(y_t - tax_t)/4 = 0$	0.00	0.00	0.00	0.00
Savings rate averaged over period 5-8		-0.07	-0.14	-0.04
Stand. error		0.03	0.04	0.03
Stand. deviation		0.16	0.17	0.12
p-values: $H_0 : \sum_{t=5}^8 s_t/(y_t - tax_t)/4 = 0$		0.04	0.00	0.11
Period 1-4				
p-values: pairwise comparisons				
vs UNSUST	0.06			
vs COMMIT	0.02	0.58		
vs TRANSP	0.00	0.32	1.00	
Period 5-8				
p-values: pairwise comparisons				
vs COMMIT		0.11		
vs TRANSP		0.94	0.13	
Subjects with negative savings account in $t = 5$				
Savings rate averaged over period 1-4	-0.39	-0.35	-0.57	-0.64
Stand. error	0.10	0.09	0.10	0.11
Stand. deviation	0.49	0.35	0.42	0.43
p-values: $H_0 : \sum_{t=1}^4 s_t/(y_t - tax_t)/4 = 0$	0.00	0.00	0.00	0.00
Savings rate averaged over period 5-8		0.23	0.55	0.45
Stand. error		0.08	0.11	0.11
Stand. deviation		0.30	0.49	0.45
p-values: $H_0 : \sum_{t=5}^8 s_t/(y_t - tax_t)/4 = 0$		0.02	0.00	0.00
Period 1-4				
p-values: pairwise comparisons				
vs UNSUST	0.89			
vs COMMIT	0.14	0.14		
vs TRANSP	0.06	0.05	0.60	
Period 5-8				
p-values: pairwise comparisons				
vs COMMIT		0.21		
vs TRANSP		0.04	0.48	

Notes: The savings rate is  $s_{it}/(y_t - tax_t)$ . 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-DEBT, UNSUST-DEBT, TRANSP-DEBT, and COMMIT-DEBT. Because the contraction is followed by a tax reduction in SUST-DEBT, the comparison of outcomes in the post-consolidation periods is impaired. Therefore we do not calculate the average savings rate for Treatment SUST-DEBT after the contraction. We have 24 subjects with negative savings accounts in  $t = 5$  in Treatment SUST-DEBT, 14 in UNSUST-DEBT, 19 in COMMIT-DEBT, and 17 in TRANSP-DEBT.