Strategic Use of Fiscal Deficit:
an Experimental Study

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Abstract

I extend Sutter's (2003) experimental study on the strategic use of fiscal deficit by adding a panel structure to his design. The results strengthen Sutter's conclusions. Panel estimates are strong and with the expected signs. Generally, the results support the political-economic theory applied to fiscal deficits. In particular, the impact of polarization and reelection probability on deficit levels is as predicted.
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1 Introduction

The political economy literature features models in which the deficit is a strategic variable used to tie the hands of a future incumbent with different political goals than the current government. Three very influential papers are Persson and Svensson (1989), Alesina and Tabellini (1990) and Tabellini and Alesina (1990). In these theoretical papers a simplified 2-period model is used to study the strategic use of deficit, having as essential variables the probability of reelection and the degree of polarization in the electorate.

The empirical literature testing these models shows contradictory results (Sutter, 2003). Whereas single country studies provide evidence supporting the model (Pettersdon-Lidbom, 2001) cross-country studies do not (Franzese, 2001). This seems to indicate the need for empirical studies based on panel data, which combine the main characteristics of cross-section and times series. Although a few studies have attempted to collect such data in the field, there are no clear results to date (Lambertini, 2003). Limited data availability is a major obstacle for such empirical studies, in particular the comparability and consistency across countries.

Sutter (2003) argues in favor of an experimental approach to the study of the strategic use of fiscal deficit. His design provides both within-subject (analogous to single-country) and between-subject analysis (cross-country). His results mirror empirical field results.

Laboratory control allows one to fully benefit from a combination of cross section and times series. In this study I extend Sutter's (2003) design and add a panel structure to it.

I find similar within-subject results. However, contrary to Sutter, I also find significance when comparing across-subjects. The panel coefficient estimates are strongly significant and in line with the political economy theory.

The rest of the paper is organized as follows: Section 2 presents the model and section 3 the experimental design. In section 4 I present the results with some concluding remarks in section 5.

2   The Model

The model is based on that presented by Tabellini and Alesina (1990) and used by Sutter (2003). In each of two periods a budget must be allocated over two public goods, f and g. Debts can be incurred in the first period and must be fully repaid in the second. The constraints read:

$$f_1 + g_1 - d \leq w \tag{1}$$
$$f_2 + g_2 + d \leq w \tag{2}$$
$$-w \leq d \leq w$$

The variable of interest is the debt d. Per period balanced budget is w. For simplification there is no time discount or interest on the debt. Being in charge in period one, an individual i has to decide over d, f_1 and g_1. After period 1, with probability r individual i is reelected to be in charge in period 2. The individual in charge in period two decides over the remaining allocation, i.e., over g_2 and f_2. Figure 1 shows a simplified game tree.
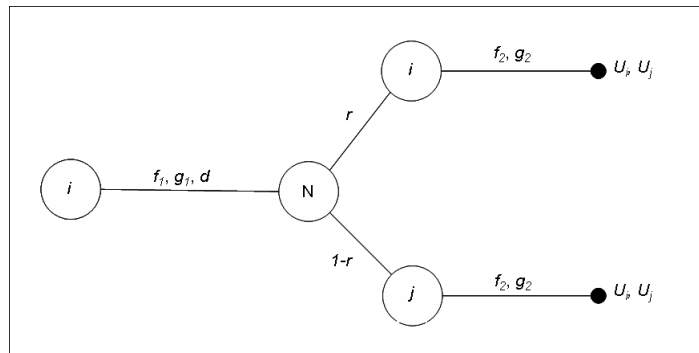

Figure 1: Simplified Game Tree

Per-period utilities are given by:

$$v_{i,t} = \alpha_i u(g_t) + (1 - \alpha_i)u(f_t) \tag{3}$$

Here $u(\cdot)$ is a standard utility function, strictly increasing, twice continuously differentiable, with $u(0) = 0$ and $u'(0) \to \infty$. The parameter α_i captures individual preferences over the public goods. The model can be interpreted as one of a median voter whose identity can change (with probability $1 - r$) from period 1 to period 2. The median voter in a period determines the allocation.

Individual i in charge in period one maximizes over d, f_1 and g_1 subject to (1) and (2) an expected intertemporal utility function:

$$
\begin{aligned}
E[U_i] &= v_{i,1} + E[v_{i,2}] \\
&= \alpha_i u(g_1) + (1 - \alpha_i)u(f_1) + \alpha_i E[u(g_2^*(\alpha_j, d))] + (1 - \alpha_i)E[u(f_2^*(\alpha_j, d))] \tag{4}
\end{aligned}
$$

2

$E[\cdot]$ is the expectation operator indicating the uncertainty about the identity of the decision maker in period 2. Variables g_2^* and f_2^* are the optimal choices in period two as a function of d and α_j.

As shown in the referred papers, a government certain to be effective in both periods would choose $d = 0$. The uncertainty about the decisions in the second period leads to deficits. The equilibrium deficit d^* increases as the difference between current preferences and the expected preference for period two increases:

$$|\alpha_i - E[\alpha_j]| \tag{5}$$

In a simplified framework with only two possibilities for preferences, i and j, expression (5) can be rewritten as:

$$|(1-r)\alpha_i - (1-r)\alpha_j| \tag{6}$$

This implies that d^* increases as the reelection probability r decreases and as the degree of polarization $|\alpha_i - \alpha_j|$ increases. The main goal of the experiment in Sutter (2003) as well as here is to test these relations.

3   Experimental Design

My design is a straightforward extension to the design in Sutter (2003). There are 20 tokens available per round (i.e., $w = 10$) to be allocated in two periods. In period 1 with equal probabilities one of two individuals is chosen to be the decision maker. He has to decide how many tokens to use and distribute them between f_1 and g_1. Period gains are then announced. With probability r the same individual will be the decision maker in period two. The decision maker of period two has to allocate the remaining tokens into f_2 and g_2. Period gains are announced.

A subset of Sutter (2003) parameterizations was used, summarized in the four treatments shown in Table 1. These varied the extent of polarization and the reelection probability in a full 2x2 design. There were a total of 36 participants. They were randomly matched in the beginning of the session and in each pair one of the subjects was assigned a preference parameter α_1 and the other α_2. These parameters as well as the pairings were kept constant throughout the experiment. After an initial trial round, three rounds were played with the low reelection probability and then three more with the high reelection parameterization. Therefore I had 18 independent pairs, to wit, 9 in the Extreme Polarization setting and 9 in the Low Polarization, allowing for across-subjects comparison. Within-subjects comparison is possible for the reelection probability.

	$r = 0.25$	$r = 0.75$
Extreme Polarization: $\alpha_1 = 0.01, \alpha_2 = 0.99$	$d^* = 9$	$d^* = 4$
Low Polarization: $\alpha_1 = 0.2, \alpha_2 = 0.5$	$d^* = 2$	$d^* = 0$

Table 1: Parameters α, r and theoretical equilibrium d^*

Sutter's (2003) design provides analogies to single-country and cross-country studies. As a natural extension my design provides an analogy to panel data studies. This is achieved by the partner design, which keeps specific idiosyncrasies constant. Moreover the experimental setting allows for the application of a Random Effects model, which uses all variation in data.

Utilities were calculated with $u(x) = 36\sqrt{x}$. Subjects received 2 tables showing the gains for each combination of f and g: one for his own gains, one for the other player gains. The online appendix reproduces the instructions given and the auxiliary tables[1]. Students were undergraduate students in the School of Economics of the Fundação Getúlio Vargas in São Paulo, Brazil. Participation and experimental gains were converted into grade points of a Game Theory course.

4 Results

Figure 2 shows the average debt, d, per round per treatment group. Detailed information on the average is given in Table 2.
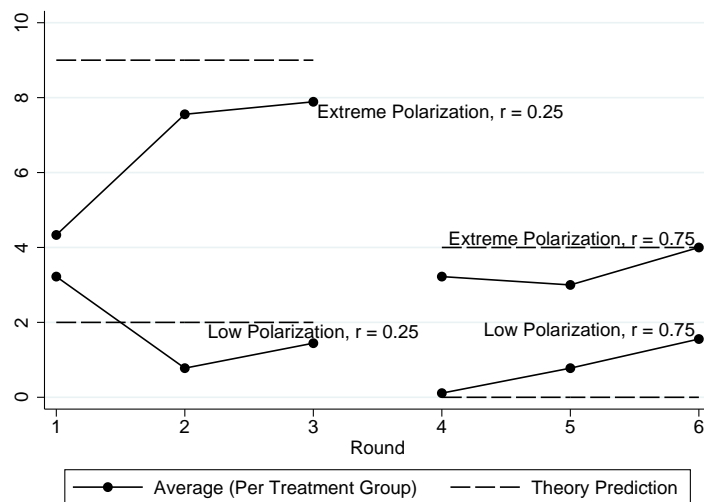

Figure 2: Average d per round and equilibrium predictions

	$r = 0.25$	$r = 0.75$
Extreme Polarization: $\alpha_1 = 0.01, \alpha_2 = 0.99$	6.592	3.407
	(4.651)	(4.491)
Low Polarization: $\alpha_1 = 0.2, \alpha_2 = 0.5$	1.82	0.814
	(2.542)	(2.166)

$N = 27$ in each cell

standard deviation of d in parentheses

Table 2: Average d

Note that, on average, observed deficit differences have the expected signs. Groups with Extreme Polarization have on average a higher deficit and when the reelection probability is increased the average deficit is reduced. Moreover, deficit levels are close to the equilibrium predictions. Considering confidence intervals of the mean estimations, results are stronger across polarization sets than across reelection parameters.

Table 3 shows non-parametric tests for the main group comparisons. All pairwise comparisons reject the null hypothesis of samples coming from the same distribution.

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[1]The online appendix is available at http://www.fee.uva.nl/creed/pdfiles/SUFD_2008_appendix.pdf and is also available upon request

The signs of the differences in Table 3 are as expected and their differences are significant (marginally so for LPHR vs. EPHR).

	Wilcoxon rank-sum (Mann-Whitney) Test (p-value)
Across-Subjects:	
LPLR vs. EPLR	0.0007
LPHR vs. EPHR	0.0567
LP vs. EP	0.0004
Within-Subjects:	
LPLR vs. LPHR	0.0404
EPLR vs. EPHR	0.0123
LR vs. HR	0.0041

LP: Low Polarization; EP: Extreme Polarization
LR: Low Reelection Prob.; HR: High Reelection Prob.

Table 3: p-value for non-parametric group comparison

When comparing to Sutter (2003), the results of the within-subject analysis are similar. He, however, did not find significant results in his across-subjects analysis. The fact that I do find significant cross-subject results may be attributed to the panel structure, which is an obvious next step from Sutter's (2003) design. To fully exploit this data structure, I estimate the model:

$$d_{i,t} = \beta_0 * \text{Constant} + \beta_1 * \text{Polarization}_{i,t} + \beta_2 * (\text{Reelection Probability})_{i,t} + \varepsilon_i + u_{i,t} \quad (7)$$

Where $Polarization = |\alpha_1 - \alpha_2|$, $Reelection\ Probability$ was already defined and ε_i is a fixed effect that captures individual idiosyncrasies of each pair i and is assumed constant across rounds. Since the independent variables are exogenously set by the experimenter a Random Effects model applies. In line with the theory, I expect a positive sign for the polarization and a negative sign for the reelection variable.

Table 4 shows the estimates for a Random Effects Model and for a Panel Corrected Standard Errors model. Coefficients are highly significant and with the expected signs, supporting the theory under investigation. Therefore the experimental evidence offers great support for the political economic predictions.
Sutter (2003) uses his results to support using single country data as better source for empirical studies. Based on my evidence, panel data would be even better.

5 Concluding remarks

Tabellini and Alesina (1990) as well as Persson and Svensson (1989) and Alesina and Tabellini (1990) presents theoretical models for the strategic use of deficit, predicting debt increasing in the degree of polarization and decreasing in the reelection probability. Empirical tests of these models have shown contradictory evidence. In an experimental setting Sutter (2003) test the simplified model in ways analogous to the single and cross-country studies using field data. In my experiment I extend Sutter's (2003) design to allow for the use of panel data techniques.

	(1)	(2)
	RE	Panel Corrected Std. Error, AR1
polarization	5.419***	5.030***
	(1.53)	(1.81)
reelection probability	-4.185***	-4.500***
	(1.25)	(0.87)
Constant	1.782*	2.205*
	(1.05)	(1.17)
Observations	108	108
Number of Group	18	18
R^2	.	0.20

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 4: Regression Diagnostics for d

The results of the within-subjects analysis corroborate Sutter's (2003) evidence, while the across-subject analysis deviates by showing significance. As a central point in my study, the panel estimates are very significant and in line with the theory.

The experimental evidence supports the comparative statics predicted by theory, and remarkably, even the observed deficit levels are close to those theoretically expected.

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