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Electoral Competition with Third Party Entry in the Lab

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Abstract

Electoral competition between two vote-share maximizing candidates in the context of the unidimensional spatial model leads to platform convergence: both candidates end up proposing the ideal policy of the median voter (Downs, 1957). Palfrey (1984) famously argued that if third candidate entry is expected after the two main candidates choose their platforms, the unique equilibrium is such that the two main candidates locate substantially far from each other. By conducting a laboratory experiment, we put this popular idea to test, for the first time. We allow entry to take place with a probability $p \in [0,1]$ and we find that, indeed, the degree of polarization of the two main candidates' platforms increases as third candidate entry becomes more likely to occur, providing strong evidence in support of Palfrey's (1984) formal results and underlying intuition.

Keywords: electoral competition; entry; third party; spatial model; experiment.

JEL classification: D72

1 Introduction

The conclusion of Downs (1957) regarding the dynamics of electoral competition between two vote-share maximizing candidates, is one of the fundamental results in political economics literature: if voters have single peaked preferences over policy outcomes, then the candidates will converge and

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both propose the ideal policy of the median voter. Despite the strong and clear intuition behind the Downsian prediction, in reality we observe that candidates propose non-identical platforms: if anything, electoral competition in contemporary politics, especially in the U.S.A., is considered to be polarized rather than convergent (see, for instance, Shor and McCarty, 2011). Hence, there have been many attempts in the literature to explain this departure from the described theoretical prediction. Among the most prominent attempts, Calvert (1985), Wittman (1977, 1983, 1990) and Roemer (1994) proposed that polarized platforms may arise in a variation of the Downsian model in which the candidates, apart from electoral incentives, also have policy motives, while Alesina and Rosenthal (2000) and Ortuno-Ortin (1997) stressed the role of institutions (power-sharing vs. winner takes all) in the degree to which the platforms of policy-motivated candidates diverge. All these interesting theories, though, assume that the objectives of the candidates are substantially different to pure vote-share maximization, and hence the fact that they predict policy divergence is critically driven by this.

Palfrey (1984) extended the Downsian model, considering that after the two main candidates propose their platforms, there is the prospect of a third candidate entering the race, while leaving the main assumptions of Downs (1957) regarding candidates' objectives unchanged. He demonstrated that in equilibrium the two main candidates no longer converge to the ideal policy of the median voter; they locate equidistantly away from the median voter proposing substantially differentiated platforms. The underlying intuition behind this result is that each of the two main candidates wants to avoid being "sandwiched" by the other main candidate and the entrant, and these dynamics drive them far away from each other. To our knowledge, Palfrey (1984) was the first to try to explain why platforms of two purely vote-share motivated candidates may diverge using a plausible reasoning –to mitigate the consequences of a potential third party entry– and this is why it earned a predominant position in the literature. Indeed, a long series of studies regarding the effects of third party entry can be traced back to Palfrey (1984). Results for alternative concepts of office-motivation, entry protocols, electoral rules, and heterogeneous candidates' characteristics can be found in Weber (1992, 1997), Greenberg and Shepsle (1987), Rubinchik and Weber (2007), Callander (2005), Callander and Wilson (2007), Shapoval et al. (2016), Xefteris

(2016a) and Buisseret (2017).[1]

In this paper, we put the entry theory to test, for the first time, by the means of laboratory experiment designed to answer whether the polarization prediction is empirically relevant, or its appeal is mostly theoretical. Despite the fact that the setup of Palfrey (1984) was modified in a number of ways, we prefer to stick with the original approach in which all candidates –both the main two ones and the entrant– are vote-share maximizers and entry occurs independently of the platform choices of the main two candidates. Indeed, many of the extensions of the original model are relevant and interesting, but if one puts to test a theory one should arguably put it to test in its most basic and influential form: in the entry literature Palfrey (1984) is the unchallenged reference point.[2] Our experimental design involves: a) a discrete policy space with seven equidistant policies/locations (we will be using those terms interchangeably throughout the paper) and a uniform distribution of voters, and b) two main candidates –each impersonated by a subject– that simultaneously choose policies in order to maximize vote-share, given minimal order constraints.[3] When making their choices the two main candidates know the probability with which entry will occur, but not whether entry will actually take place or not.

In order to provide clean results with respect to the strategic polarization of the two main candidates when third party entry is expected, we consider that all non-sophisticated choices –i.e. the location choice of the third candidate and the voting decisions of voters– are made by the computer.[4] Indeed, the location choice of a vote-share maximizing entrant is trivial given the

[1]Osborne and Slivinski (1996) and Besley and Coate (1997) consider models of endogenous candidacy where candidates' policies are exogenously fixed, under plurality and runoff rules. Dellis (2009) and Dellis and Oak (2006, 2016) extend these analyses to alternative electoral systems. Moreover, Feddersen et al. (1990), Osborne (1993), Brusco et al. (2012) and Xefteris (2016b) provide results for the case in which both entry and location choices of all candidates are endogenous. Loertscher and Muehlheusser (2011) also study a similar setup but in contrast to these models they consider sequential entry. For an excellent review of endogenous candidacy models one is referred to Bol et al. (2016). Examples of multi–candidate versions of the Downsian model without entry are Eaton and Lipsey (1975), Shaked (1982) and Osborne and Pitchik (1986).

[2]Arguably, the appeal of the original setup is more general than the latter variants, since it is closer in spirit to the models used in the literature on product differentiation in industrial organization.

[3]That is, one candidate is allowed to locate from the leftmost location up to the central location, while the other is allowed to locate from the central location up to the rightmost location. This allows subjects to focus solely on forming expectations regarding polarization, and does not let expectations about who will locate to the left or to the right blur their reasoning.

[4]The behavior of voters in Palfrey (1984) is sincere –they vote for the candidate they like best– and it is hence non-sophisticated. The selection of the policy location by the entrant is also non-sophisticated in the sense that she/he has to make this choice on the basis of available information (policy/locations of the two main candidates and the expected voting behavior of sincere voters).

location choices of the two main candidates, and, importantly, in the original approach of Palfrey (1984) the game is formally defined as a two player one, taking the subsequent behavior of the entrant for granted.

We test four variations of this game that differ with respect to the likelihood of third candidate entry: a) third candidate entry never occurs (Downs, 1957), b) third candidate entry always takes place (Palfrey, 1984), c) third candidate entry most probably does not occur (i.e. an entrant appears with a positive probability smaller than 1/2), and d) third candidate entry most probably takes place (i.e. an entrant appears with a positive probability larger than 1/2).

To be able to predict the players' behavior in each of these cases, we solve a model in which the two main candidates believe that an entrant will appear with some probability $p \in [0,1]$. This can be considered as a generalization of the original model such that Downs (1957) and Palfrey (1984) are the special cases corresponding to $p = 0$ and $p = 1$, respectively. We characterize the equilibrium of this generalized entry game for the discrete policy space that we employ in our experiment and we find that *the degree of polarization that it exhibits* –the distance between the equilibrium positions of the two main candidates– *is increasing in the likelihood of third candidate entry*: a) for p small enough the two main candidates locate at the central location and hence polarization is low, b) for p large enough the two main candidates locate at the second and sixth location respectively and hence polarization is high; and c) for intermediate values of p the two main candidates locate at the third and fifth location respectively and hence polarization is moderate. That is, polarization is increasing in the probability of entry of a third candidate and deviations from the Downsian convergence-to-the-center result is much more general: it does not happen only when entry is sure to happen. This reinforces substantially the empirical relevance of the idea that the prospect of entry fuels centrifugal dynamics, since the main candidates can not be really sure when they choose their platforms that another individual will or will not declare candidacy at a later stage.[5]

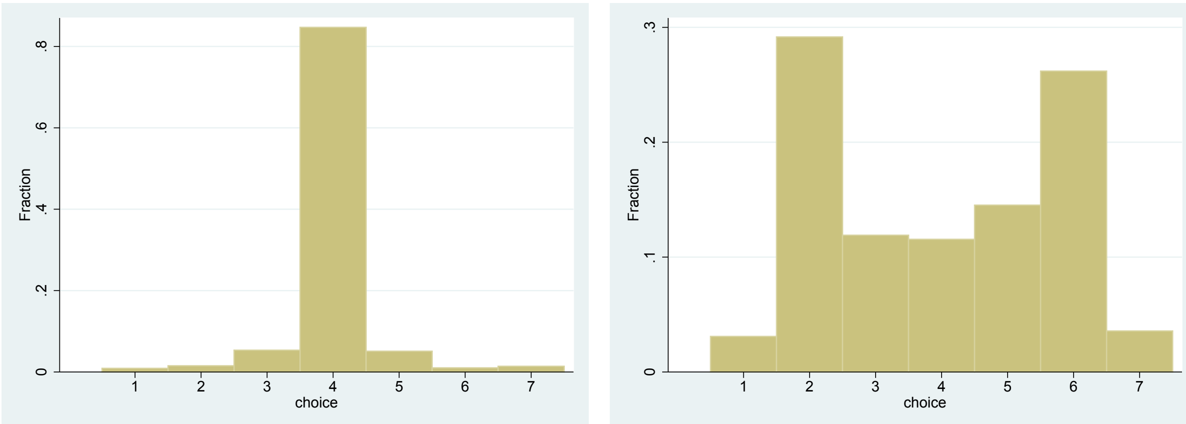
By executing a laboratory experiment, we find that when entry never occurs ($p = 0$) subjects –almost always– locate at the center of the policy space while when entry always occurs ($p = 1$) subjects most frequently polarize to a considerable degree (see, Figure1). That is, we find strong

[5]To our knowledge, this paper is the first to make this observation and, arguably, this is of interest on its own.

evidence in support of Palfrey's (1984) theory that the prospect of third party entry generates centrifugal incentives for the two main candidates and leads to high polarization. Perhaps more importantly, we find proof that entry need not be deterministic for these centrifugal incentives to appear: when we consider that entry is likely but not certain, then candidates' polarization is substantially higher compared to the no-entry case and substantially lower compared to when entry always occurs. In fact, polarization is found to be monotonically increasing in the probability of a third candidate's entry: *polarization is larger when entry is more probable compared to when it is less likely, even if we restrict attention to the cases in which entry is uncertain*. That is, candidates polarize at the mere prospect of possible entry, and therefore, we may observe two polarized main candidates, without a third candidate having entered the race; as long as the probability of entry is sufficiently large, candidates typically diverge from the center of the policy space.

We conduct our analysis at the individual level, that is, in each period, each subject plays one of the four variants of the game with an alternating opponent, and in each session the number of periods corresponding to each variant of the game (henceforth, treatment) is roughly identical. This gives us power in our comparative estimates and allows us to identify behavioral patterns in individual departures from the equilibrium predictions. Of course, the main interest of the study is to test whether the prospect of entry, and its likelihood, affect candidate polarization in the predicted manner, and not to provide a full account of the behavioral factors that amplify/mitigate the degree of policy polarization predicted by the theory.

Despite that, we provide a level-k analysis of the game (Stahl and Wilson, 1994, 1995; Nagel, 1995) and validate that departures from equilibrium play can be well explained by bounded rationality. In fact, such an analysis predicts that the relationship between deviations from Nash equilibrium play and the probability of third party entry is *non-monotonic*. When entry is very unlikely to happen, the subjects should easily identify that their optimal strategy is to locate at the center of the policy space. As the probability of entry increases and equilibrium polarization starts to appear, subjects should find it more and more difficult to identify the best option available, but only up to a certain point. When entry is very likely to take place, then equilibrium strategies are again more easily identifiable by bounded rational subjects. For example, when entry is sure to take place, the subjects' behavior seems like a noisy but fair approximation of Palfrey's (1984) polarized equilibrium. Indeed, as we can see in the right panel of Figure 1, the equilibrium strategy (i.e. the second location for the leftist main candidate and the sixth location for the rightist main candidate) is the most popular among the subjects' choices.



(a) No entry ($p = 0$) – Downs (1957)

(b) Certain entry ($p = 1$) – Palfrey (1984)

Figure 1: Subjects' choices when (a) there is no entry and when (b) entry is certain. The unique Nash equilibrium strategy profiles are $(4, 4)$ when there is no entry and $(2, 6)$ when entry is certain.

Finally, we find indicative evidence that learning takes place: a) the distance between actual behavior and equilibrium predictions decreases over time, and b) the conditional effect of the probability of entry on actual play with respect to the period of the experiment is stronger in later periods. These findings reinforce the conclusion that, indeed, the main reason for deviations away from Nash equilibrium behavior is related to the processing of the choices' consequences from the part of the subjects.

Our results contribute to the literature that experimentally tests entry-related questions in the context of electoral democracy. Indeed, there is a renewed interest in contemporary experimental political economy about candidates' entry and its effect on electoral competition outcomes. Grosser and Palfrey (2017) test the predictions of citizen-candidate model with incomplete information about players' preferences and find the theoretical prediction that entrants are mostly candidates with extreme policy preferences (Grosser and Palfrey, 2014) to be consistent with how actual individuals behave in such a setting. Cadigan (2005) and Kamm (2016) also test the predictions of citizen-candidate models, but unlike Grosser and Palfrey (2017), they employ a framework in which players' preferences are common information. Moreover, Bol et al. (2017) test a model in which policy-motivated candidates first decide whether to declare candidacy or not and then, after entry decisions are observed, they strategically propose platforms under alternative electoral rules. They find that under proportional representation more candidates enter and platforms are more dispersed over the policy space, while under plurality rule less candidates declare candidacy and propose, mostly, similar platforms.

More broadly, our analysis relates to experimental studies regarding political economy issues that utilize a spatial representation of the policy space.[6] Notably, Aragones and Palfrey (2004) utilize a discrete policy space, like us, with three locations to test candidates' platform choices when one candidate enjoys a non-policy advantage over the other, while Collins and Sherstyuk (2000) and Huck et al. (2002) study the three- and four-player variants of Downsian electoral competition model, validating certain theoretical predictions, for instance, regarding the increased dispersion of candidates' platforms compared to the two-player case.

The remainder is organized as follows: in Section 2 we develop our theoretical predictions, in Section 3 we proceed to our experimental design and present our results in detail; and finally, in Section 4, we conclude.

2 Theory

We consider a discrete version of a generalized Palfrey (1984) model, in which the entry of a third candidate takes place with some fixed probability. The policy space is $X = \{1, 2, 3, 4, 5, 6, 7\}$ and a unit mass of voters has its ideal policies distributed uniformly on X. That is, a fraction $\frac{1}{7}$ of voters have ideal policy x, for each $x \in X$. Voters have single peaked preferences on X. That is, a voter, i, with ideal policy, $x_i \in X$, strictly prefers $x \in X$ to $y \in X$ if $|x - x_i| < |y - x_i|$, strictly prefers $y \in X$ to $x \in X$ if $|y - x_i| < |x - x_i|$, and is indifferent otherwise.

We have three candidates, $N = \{A, B, C\}$ –two main candidates, A and B, and one entrant, C– who wish to maximize their vote-shares. In the first stage of the game the two main candidates choose simultaneously policies: candidate A proposes $a \in X_A = \{1, 2, 3, 4\}$ and candidate B

[6]This is not the only class of experiments in political economics. For example, voting decisions in different –and not necessarily spatial– contexts have been recently studied by Levine and Palfrey (2007), Battaglini et al. (2010), Bouton et al. (2016) and Blais and Hortala-Vallve (2016). For an excellent review of several experiments in this field, one is referred to Palfrey (2009).

proposes $b \in X_B = \{4, 5, 6, 7\}$, knowing the probability $p \in [0, 1]$ that the entrant will be allowed to play. In the second stage, the location choices of the two main candidates become public information and we have a random draw from a Bernoulli distribution with parameter p whose realization determines whether the entrant will be allowed to play or not. In the third stage of the game, if the entrant is allowed to play (this occurs with probability p), he proposes $c \in X$; and if he is not allowed to play, then this stage is skipped and we move directly to the fourth one. In the fourth stage, all candidates' policies become public information and voters vote for the candidate whose platform they like best. In case a measure of voters are indifferent between two or among all three candidates, then they split evenly. In the last stage of the game the payoffs of all players are realized.

The behavior of the voters is, essentially, parametric in such models so they need not be properly considered as players. Moreover, since the behavior of the entrant is also unambiguous –given the policy choices of the two main candidates it is very easy to rank options from the least to the most profitable– we follow Palfrey (1984) and we define a solution of the game only with respect to the two main candidates. Unlike Palfrey (1984) who faces technical issues in properly defining the entrant's best response function due to the continuity of the policy space that he considers and resorts to limits of epsilon best responses, our discrete framework allows us to straightforwardly define the entrant's best response correspondence. To evade ambiguity that might be generated by multiple best responses to the same pair of policy choices by the two main candidates, we consider that the entrant always mixes uniformly among the policies that provide him the largest vote-share. That is, if he has a unique best response he deterministically locates there, but if he has more, we consider that he locates to each of these locations equiprobably.

Given a profile of strategies, $(a, b) \in X_A \times X_B$, of the two main candidates, we denote by $V_A(a, b)$ the expected vote-share of candidate A and by $V_B(a, b)$ the expected vote-share of candidate B. In Table 1 we describe the payoff matrix of the game. Given the symmetry of the game, we notice that $V_B(a, b) = V_A(8-b, 8-a)$ and, hence, we just present the payoff of main candidate A, $V_A(a, b)$.

We employ three alternative solution concepts in order to formulate testable hypotheses in the most informed manner possible. Our first solution concept is the Nash equilibrium in pure strategies, which is a pair $(a^*, b^*) \in X_A \times X_B$ such that $V_A(a^*, b^*) \geq V_A(a, b^*)$, for every $a \in X_A$,

$a \downarrow b \rightarrow$	4	5	6	7
1	2	$2.5 - 0.17p$	$3 - 1.25p$	$3.5 - 1.5p$
2	2.5	3	$3.5 - p$	$4 - 1.25p$
3	3	$3.5 - p$	$4 - 2p$	$4.5 - 2.17p$
4	$3.5 - 1.5p$	$4 - 3p$	$4.5 - 3p$	$5 - 3p$

Table 1: The payoff of main candidate A, $V_A(a, b)$ as a function of the probability of entry $p \in [0, 1]$ of the third candidate C, for every combination of strategies $(a, b) \in X_A \times X_B$.

and $V_B(a^*, b^*) \geq V_B(a^*, b)$, for every $b \in X_B$. Our second solution concept is the Nash equilibrium in dominant strategies, which is a pair $(a^*, b^*) \in X_A \times X_B$ such that $V_A(a^*, b) > V_A(a, b)$, for every $(a, b) \in X_A \setminus \{a^*\} \times X_B$, and $V_B(a, b^*) > V_B(a, b)$, for every $(a, b) \in X_A \times X_B \setminus \{b^*\}$. Finally, we characterize the level-k strategies for all parametrizations of the game (Stahl and Wilson, 1994, 1995; Nagel, 1995). According to level-k reasoning players strategies are as follows: level-0 players are assumed to uniformly mix among all strategies while level-$(k+1)$ players consider that their opponent uses a level-k strategy and best-respond to it. We are particularly interested in identifying the speed of convergence of level-k reasoning to a Nash-equilibrium.

First we provide a characterization of all Nash equilibria of the game in pure strategies.

Proposition 1 *In a generalized electoral competition game with two main candidates and a potential entrant, and entry occurring with probability $p \in [0, 1]$, the set of pure strategy equilibria is such that:*

a) when $p < \frac{1}{4}$ there is no polarization in equilibrium (Downs, 1957): the unique pure strategy equilibrium is such that both main candidates locate at the center, $(a^*, b^*) = (4, 4)$.

b) when $\frac{1}{4} < p < \frac{1}{3}$ we have at most moderate polarization in equilibrium: along with the convergent equilibrium, a mildly divergent equilibrium also exists such that each main candidate locates a policy away from the center, $(a^*, b^*) \in \{(4, 4), (3, 5)\}$.

c) when $\frac{1}{3} < p < \frac{1}{2}$ we have moderate polarization in equilibrium: the unique pure strategy equilibrium is such that each main candidate locates a policy away from the center, $(a^*, b^*) = (3, 5)$.

d) when $p > \frac{1}{2}$ there is substantial polarization in equilibrium (Palfrey, 1984): in the unique pure strategy equilibrium both main candidates choose the policy next to the extremes, $(a^*, b^*) = (2, 6)$.

For the boundary probabilities $\frac{1}{4}$, $\frac{1}{3}$ and $\frac{1}{2}$ the equilibria of both adjacent regions coexist.

Hence, our Nash equilibrium analysis implies a monotonic relationship between the likelihood of third candidate entry and the maximum (minimum) degree of equilibrium polarization.[7] Notice that we have constrained candidate A to being the leftist candidate and candidate B to being the rightist candidate. We need to stress here that the equilibria that we characterize still exist even if we let both main candidates locate anywhere they wish on the policy space. The only difference would be that on top of these equilibria we would have some symmetric mixed equilibria (by the fundamental properties of finite games). Since, in the real world candidates for a seat are usually nominees of parties which have known relative positions on the political axis (e.g. the Democratic party is less conservative than the Republican one) we would like to focus our testing of the theory on the case in which both main candidates know their order and hence channel their cognitive resources on trying to determine the optimal degree of extremism of their platforms, rather than trying to guess at which side of the axis their competitor will lie.

Next, we investigate under which conditions, any of these equilibria are in dominant strategies.

Proposition 2 *In a generalized electoral competition game with two main candidates and a potential entrant, and entry occurring with probability $p \in [0, 1]$, a Nash equilibrium in dominant strategies exists if and only if $p < \frac{1}{4}$.*

That is, the main candidates have a strictly dominant strategy[8] only when the probability of entry is sufficiently small and this dominant strategy is to locate at the center of the policy space. This means, that the no-entry prediction is much stronger than the certain-entry prediction –at least in a framework where candidates are bounded in different halves of the policy space– and this further reinforces the need for empirical investigation of the entry game. Finally, we describe the level-k strategies of the game and how they relate to Nash equilibrium strategies.

[7] One would be interested to know about mixed equilibria as well in order to make as accurate predictions as possible. Fortunately, mixed equilibria do not exist generically in this game except for $p \in [\frac{1}{4}, \frac{1}{3}]$ (and the degenerate case of $p = \frac{1}{2}$). As stated in our proposition, when the probability of entry lies in this range we have two pure equilibria. One can show (details are available by the authors upon request) that for such values of the entry probability there also exists a mixed equilibrium in which players mix between the central location and the one next to it. This further reassures us that when $p \in [\frac{1}{4}, \frac{1}{3}]$ polarization should be expected to be larger than the polarization of the $p \in [0, \frac{1}{4})$ case and smaller compared to the polarization of the $p \in (\frac{1}{3}, \frac{1}{2})$ case.

[8] One could instead consider weak dominance and end up with essentially the same findings: the range of cases for which an equilibrium in weakly dominant strategies exists is $p \leq \frac{1}{4}$.

When p is:	Nash Eqm.	Level-1	Level-2	Dominant	Nash prediction is:
from 0 to 25%	$(4,4)$	4	4	Yes	Very strong
from 25% to 33%	$(4,4)$, $(3,5)$	4	4	No	Strong
from 33% to 38%	$(3,5)$	4	3	No	Weak
from 38% to 50%	$(3,5)$	3	3	No	Strong
from 50% to 68%	$(2,6)$	3	2	No	Weak
from 68% to 100%	$(2,6)$	2	2	No	Strong

Table 2: The robustness of the Nash predictions for different values of p. Level-1 and Level-2 strategies are reported for player A.

Proposition 3 *In a generalized electoral competition game with two main candidates and a potential entrant, and entry occurring with probability $p \in [0,1]$:*

a) the level-1 strategy is the central location if $p < \frac{200}{533} \approx 0.38$; the level-1 strategy is the location next to the central one if $\frac{200}{533} < p < \frac{50}{73} \approx 0.68$; and the level-1 strategy is the location next to the extreme if $p > \frac{50}{73}$.

b) the level-2 strategy is a Nash equilibrium strategy for all $p \in [0,1]$;

This highlights that the implications of the Nash equilibrium analysis regarding the relationship between the likelihood of entry and the polarization of the platforms of two main candidates are quite robust: extremism should be increasing in the probability of third candidate entry, even if subjects are boundedly rational and apply level-k reasoning. Intriguingly, the thresholds of the entry probability at which the Nash and the level-1 predictions change, do not coincide. For instance, while the Nash equilibrium predicts that players will start locating next to the extremes just when entry becomes more likely than no entry (i.e. when p crosses the 0.5 threshold), the level-1 prediction is that this will start occurring only when entry becomes very likely (i.e. when p crosses the 0.68 threshold). On the whole, our theoretical analysis indicates that there is a non-monotonic relationship between the robustness of the Nash equilibrium predictions and the probability of third candidate entry. In Table 2 we present in detail the results from the three approaches that we employed, for all values of p, and, depending of the alignment of these solutions, we derive conclusions regarding the strength of the Nash equilibrium prediction.

One should note here that the existence of a $k \in \mathbb{N}_{++}$ such that the level-k strategy (and hence every level-$k + j$ for all $j \in \mathbb{N}_{++}$) coincides with a Nash equilibrium strategy is not guaranteed in every symmetric normal form game. That is, there is no sure path from level-k reasoning to Nash equilibrium play. Fortunately, in our context, such a path exists for every $p \in [0, 1]$, and as we show above it is shorter for certain values of p and longer for others, allowing us to expect different magnitudes of deviations from Nash equilibrium play depending on the exact third party entry probability. While level-2 convergence to Nash play might at first seem quite fast, recent studies conclude that subjects that play similar two-player games with a finite strategy space rarely exceed level-3 reasoning (e.g. Arad and Rubinstein, 2012) and also that their behavior is quite robust to repetitions (e.g. Lindner and Sutter, 2013). This reassures us that the results derived in Proposition 3 for different values of the entry probability might be empirically relevant and have a bite in explaining potentially different degrees of convergence to the predicted Nash equilibrium play.

3 The Experiment

3.1 Experimental Setup

The experiment took place at the Laboratory for Experimental Economics at the University of Cyprus (UCY LExEcon). A total of 84 subjects were recruited in 6 sessions, with 14 subjects in each session. Average total payment was approximately 13.7 euros and the experiment lasted about 90 minutes.[9] The experiment lasted for 40 periods, prior to which there were 4 practice periods that aimed at helping the subjects familiarize with the experimental environment. The experiment was designed on z-Tree (Fischbacher, 2007).

In each period, the subjects were paired randomly in groups of two and were assigned one of the two roles, i.e. that of player A who chooses one of the "low" locations $a \in \{1, 2, 3, 4\}$, and that of player B who chooses one of the "high" locations $b \in \{4, 5, 6, 7\}$. They were then presented with the probability of a third player entering the game in the following form:

On your screen you will see a total of 10 balls, some of which will be RED and the rest will

[9]Final earnings were determined by selecting randomly one of the 40 periods that the subjects played in the main part of the experiment. The practice rounds could not be selected to determine the final earnings. The payment included a 5 euros participation fee.

be BLACK. Subsequently, after you and your opponent choose your locations the computer will choose randomly one of the 10 balls. If the chosen ball is RED, then a third player will enter the game, whereas if the chosen ball is BLACK he will not enter.

The subjects were also informed that there would be four different combinations of red and black balls that they might face –four different probabilities of entry– which would appear in a mixed order during the experiment.[10] The four combinations correspond to our four different treatments and were the following: (i) 0 red balls and 10 black balls (probability of entry 0%), (ii) 4 red balls and 6 black balls (probability of entry 40%), (iii) 6 red balls and 4 black balls (probability of entry 60%) and (iv) 10 red balls and 0 black balls (probability of entry 100%). The subjects could see the number of balls of each color prior to making their choice, but were not aware of the color of the selected ball, until after they had chosen location. As it becomes apparent, we employed a within–subject design, since each subject faced decision problems corresponding to all four treatments during a session.

The third player was simulated by the computer and the subjects were informed about this ex–ante. In particular, it was explained to them that the incentives of the simulated player would be the same as theirs and it was programmed to choose a location so as to maximize its own hypothetical earnings. It was also made clear that, in case of indifference, the third player would locate to one of the locations that maximize his hypothetical earnings equiprobably.

The earnings of each subject in each period were calculated as follows: In each one of the seven locations there were 60 hypothetical citizens who would support the player who chose the location closest to their own. If two (resp. three) players were located equally close, then 30 (resp. 20) citizens would support each. The monetary earnings of a subject (if that period was selected in the end) would be equal to the number of his supporters divided by 20.

3.2 Hypotheses and Results

Before beginning our analysis, it is useful to define two quantities: (1) the *extremism* of a player's chosen location, $e_j \in \{0, 1, 2, 3\}$ for $j \in \{A, B\}$, as the distance of a player's location from the

[10] We used three different sequences of probabilities generated by MatLab, in two sessions each. In every sequence all probabilities appeared exactly ten times with the following minor exception: inadvertently, in the first two sequences the probability of entry 0 appeared nine times and the probability of entry 0.6 appeared eleven times.

central location, (2) the *deviation* from the predicted Nash equilibrium strategy, $d_j^p \in \{0, 1, 2, 3\}$ for $j \in \{A, B\}$, which describes the distance of a player's chosen location from the Nash equilibrium location corresponding to that probability of entry.

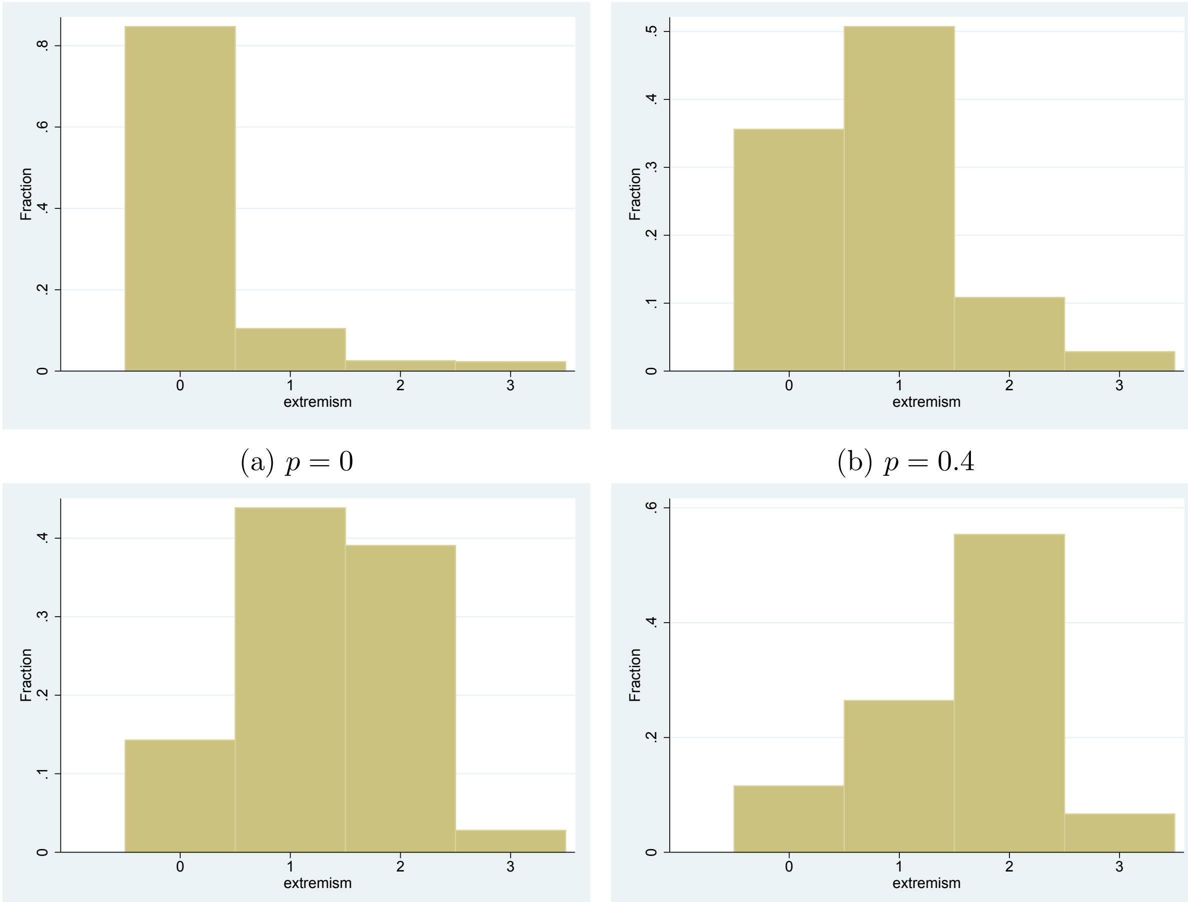
We start by presenting a snapshot of the experimental data. Figure 2 presents the fraction of choices of the subjects that correspond to each level of extremism for the four treatments. It becomes apparent that the vast majority of the subjects chose the central location when entry was not possible and the choices became more dispersed as the probability of entry increased. The mode of the distribution shifts towards substantial extremism when entry becomes sure, in accordance with the predictions of the Nash equilibrium. The frequency of the modal choice is smaller in the intermediate cases, and in particular for $p = 0.6$, where apart from the corner choices, the frequency of the two central extremism levels is rather similar. Another informative presentation of the data can be seen in Figure 3. In particular, focusing on $p = 0.6$ it is interesting to observe that it shares the same box plot as $p = 1$, but the same median as $p = 0.4$.

We then present our testable hypotheses, which follow mainly from the theoretical results. Recall that Proposition 1 suggests that a higher probability of entry will be associated with a higher degree of polarization. Propositions 2 and 3 suggest a non–monotonic shape of the deviations from Nash equilibrium, which are expected to be increasing in probability until $p = 0.6$ and then be decreasing. Finally, in addition to these, we test for learning over time, and in particular, whether deviations from Nash equilibria reduce over time. Formally:

Hypothesis 1 (Monotonicity in Polarization) *The degree of polarization of location choices of the two main candidates should be larger when entry of a third candidate is more likely.*

In Proposition 1 we have presented the pure strategy Nash equilibria for all values of p. For those values that are used in the experiment, $p \in \{0, 0.4, 0.6, 1\}$ the Nash equilibrium is unique and is characterized by weakly increasing polarization as the probability increases. Moreover, in Proposition 2 we have seen that the extremism of the level-1 strategy is also increasing in p. We provide several forms of evidence that support this claim.

Result 1.1 (Increasing average extremism) *The sample average value of extremism is increasing in the probability of entry.*



(a) $p = 0$ (b) $p = 0.4$

(c) $p = 0.6$ (d) $p = 1$

Figure 2: Fractions of extremism in different treatments.

Figure 4 shows the average values of extremism for the four different treatments. There is an apparent positive trend in the values as the probability of entry increases. We perform one–sided t–tests on all pairs of successive treatments, in all of which the null hypothesis is rejected even at the 0.01% significance level. The same results are yielded if we perform a non–parametric Wilcoxon–Mann–Whitney test to test whether the compared samples are from the same distribution, which is explored more thoroughly in Result 1.2.[11]

For the next result, let $F(e|p)$ denote the empirical CDF of choices' extremism conditional on the probability of entry p.

[11]At the t–test, for $(p_1, p_2) = (0, 0.4)$ the t-statistic is equal to -17.5615, for $(p_1, p_2) = (0.4, 0.6)$ the t–statistic is equal to -13.8953 and for $(p_1, p_2) = (0.6, 1)$ the t–statistic is equal to -7.3067. Our sample sizes are big enough to assume normality of sample means. At the Wilcoxon–Mann-Witney tesy, for $(p_1, p_2) = (0, 0.4)$ the z-statistic is equal to -19.150, for $(p_1, p_2) = (0.4, 0.6)$ the z–statistic is equal to -13.856 and for $(p_1, p_2) = (0.6, 1)$ the z–statistic is equal to -7.799.

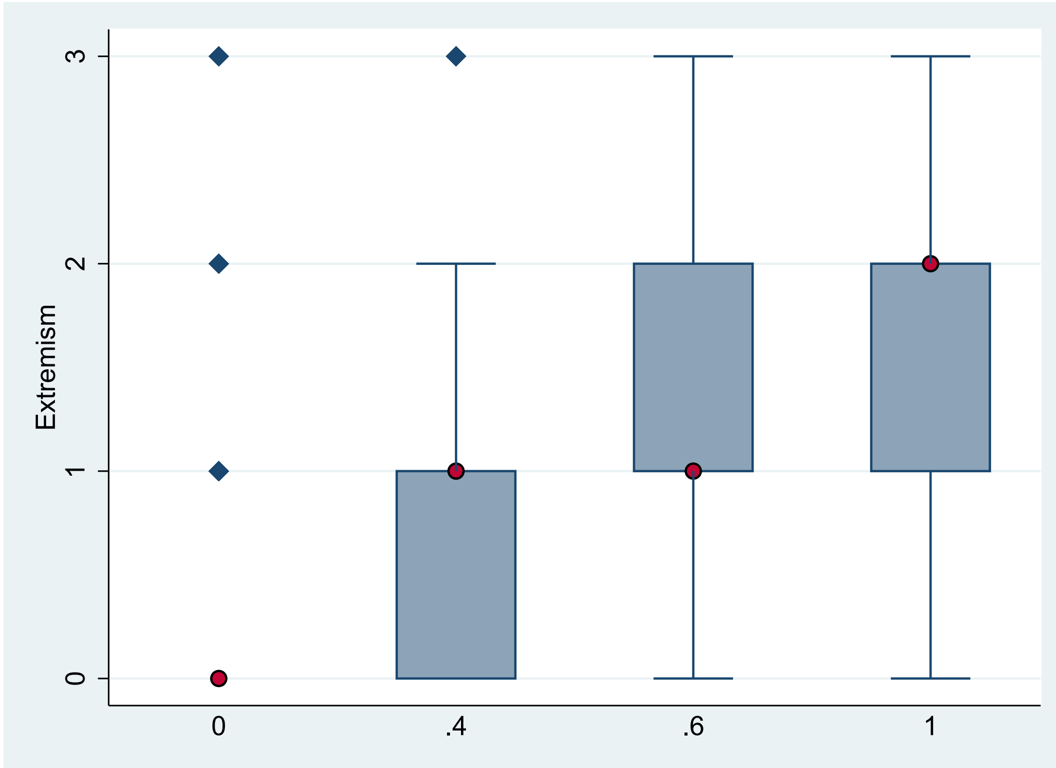


Figure 3: The box plots of extremism for the different treatments. The red dots show the median.

Result 1.2 (First–order stochastic dominance) *Let* $p_1, p_2 \in \{0, 0.4, 0.6, 1\}$ *such that* $p_1 < p_2$. *Then,* $F(e|p_2)$ *first–order stochastically dominates* $F(e|p_1)$.

Support: Figure 5 shows the empirical CDFs of extremism for the different probabilities of entry. Even visually, it is apparent that higher probabilities shift the distribution to the right. Nevertheless, we perform a two–sample one–sided Kolmogorov–Smirnov test on each pair of distributions of consecutive values of p, where for each pair (p_1, p_2) with $p_1 < p_2$ the alternative hypothesis is that $F(e|p_1) > F(e|p_2)$. We reject the null–hypothesis in all comparisons even at the 0.01% significance level.[12] Note that, we observe a significant difference even in the last case, despite the fact that the Nash equilibrium prediction is the same. In theoretical terms, Propositions 2 and 3 explain this observation to some extent.

In addition to the previous results, we have performed a number of regressions of the level of extremism on certain explanatory variables. Due to the nature of our variables, we have used an

[12]For $(p_1, p_2) = (0, 0.4)$ the p–value is equal to 5.8e-88, for $(p_1, p_2) = (0.4, 0.6)$ the p–value is equal to 6.8e-28 and for $(p_1, p_2) = (0.6, 1)$ the p–value is equal to 2.6e-16.

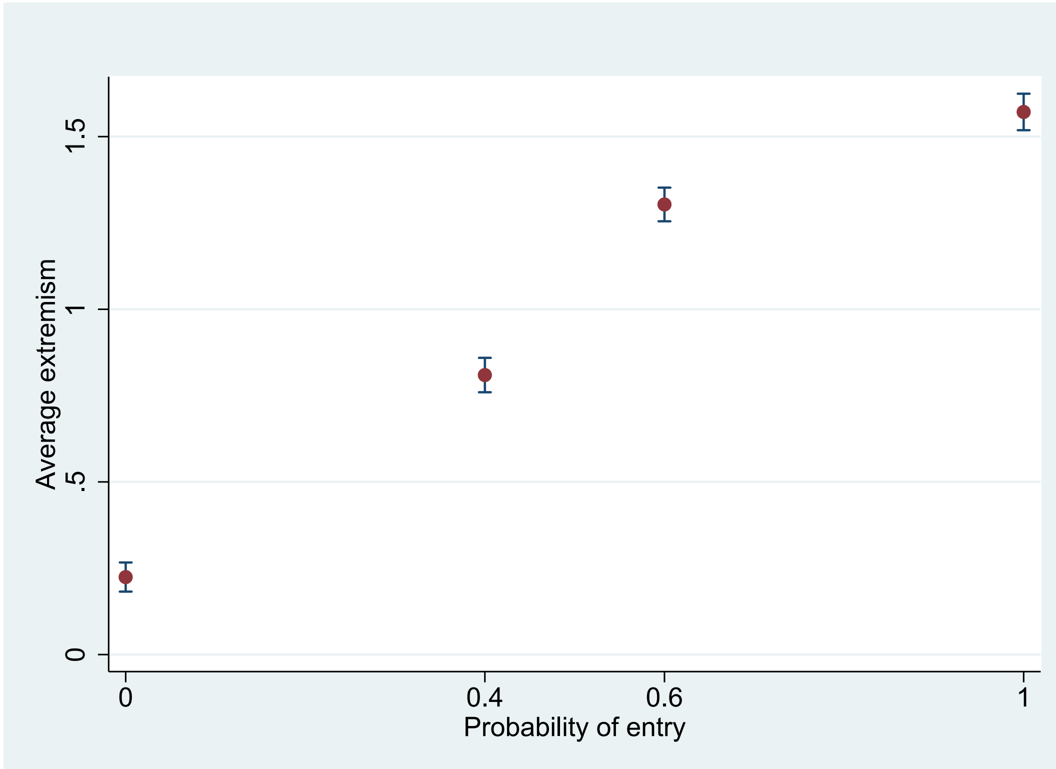


Figure 4: Average degrees of extremism and their 95% confidence intervals for different treatments.

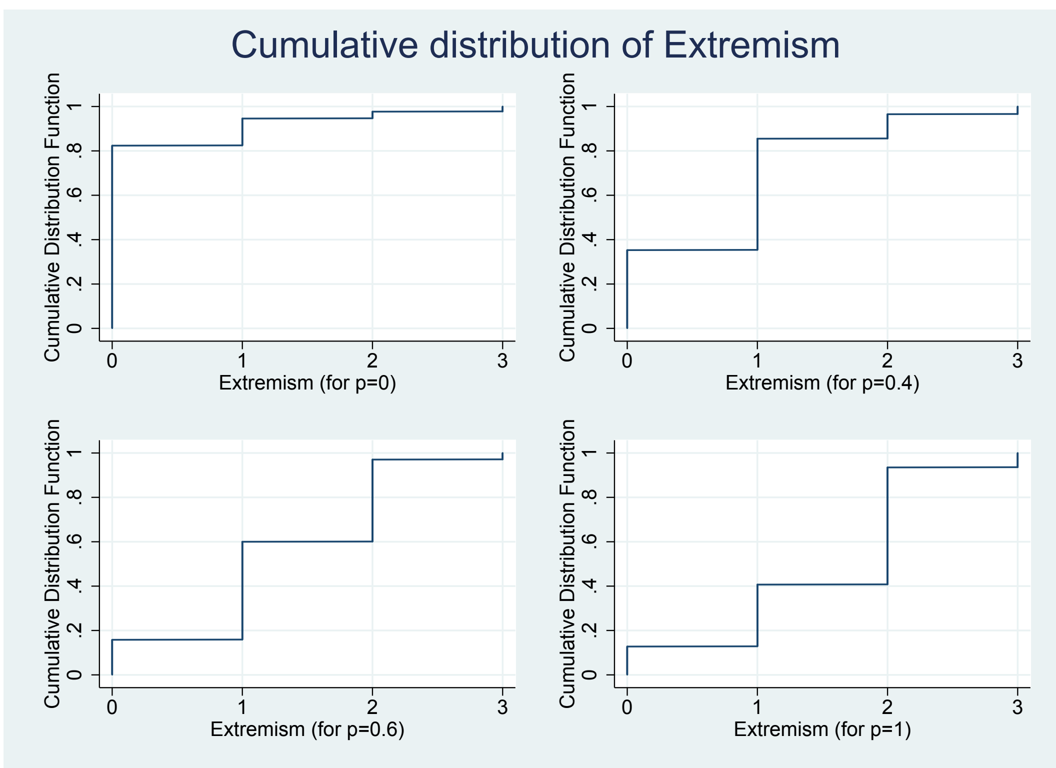


Figure 5: Empirical cumulative distribution functions of extremism for the different treatments.

Ordered Logit Model, considering also in some cases session or subject fixed effects. The results of the regressions can be found in Table A.1 in the Appendix. The interpretation of the coefficients of the logistic regression is tricky in general, however there is a number of apparent observations that can be made. First, as expected, there is a strong positive effect of probable entry, in comparison to the benchmark no–entry case, which becomes more prominent as the probability of entry increases. This is further clarified when we look at the marginal effects of the probability of entry on the estimated probability of each level of extremism being chosen (Figure 6). The top–left and bottom–left subfigures, that correspond to probabilities of extremism being equal 0 and 2 respectively are probably the most informative, as they show two clear trends, downward and upward respectively, which are again in line with the theory. The time does not seem to play a crucial role in extremism, although we will see in the next part that this is no more the case if one looks at deviations from Nash equilibrium. Interestingly, there seems to be a negative effect of the opponent's previous profits on both the extremism and the deviation from Nash equilibrium strategy.

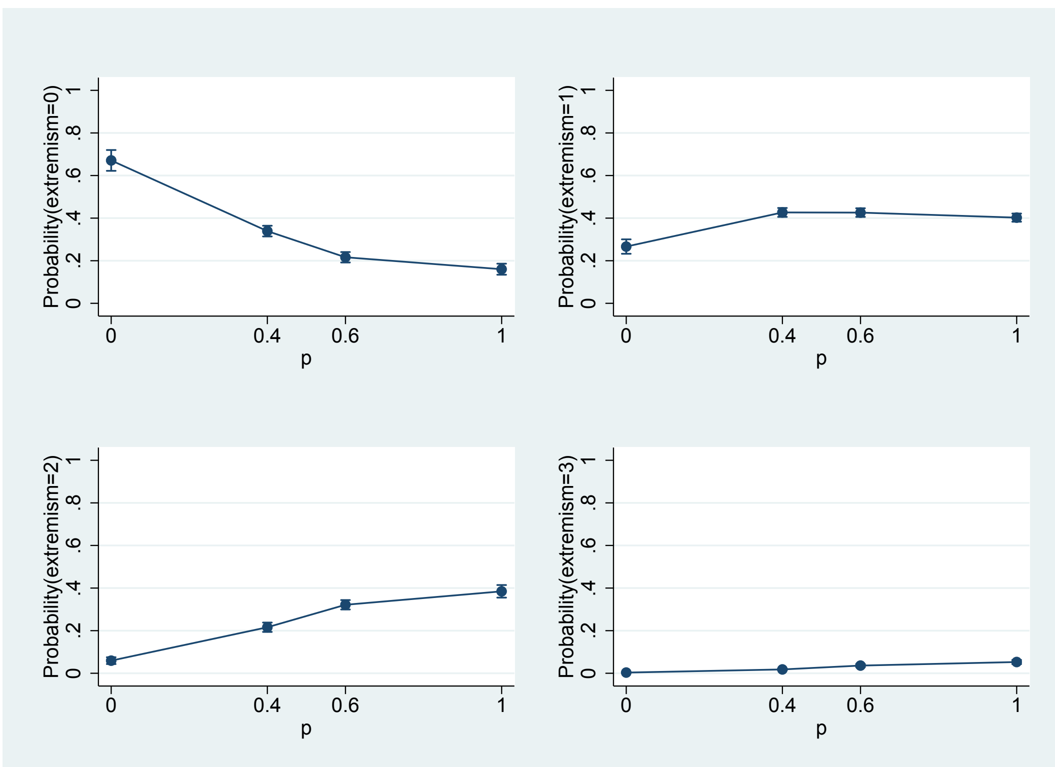


Figure 6: Estimated probabilities of different values of extremism being chosen across treatments. The results correspond to Table A.1 column (4), in the Appendix.

Hypothesis 2 (Non-monotonicity in deviations from Nash equilibrium predictions) *The deviation away from Nash equilibrium predictions should be smaller when entry occurs with* $p = 0$*, intermediate when entry occurs with* $p = 0.4$ *and* $p = 1$ *and larger when entry occurs with* $p = 0.6$*.*

Hypothesis 2 is based on both Propositions 2 and 3. In particular, despite the existence of a unique Nash equilibrium in all of these cases we expect deviations to occur with different frequencies in each case. By Proposition 2, for $p = 0 < 1/4$, the Nash equilibrium strategy is also dominant. This suggests that there will be very few deviations from this equilibrium strategy. By Proposition 3, for $p = 0.4$ and $p = 1$, the Nash equilibrium strategies may not be dominant but coincide with the level–1 strategy. This is not true for $p = 0.6$, which suggests that one would expect more deviations from Nash equilibrium strategies for $p = 0.6$ compared to the other two cases. This difference can also partially explain the statistically significant differences in the degrees of polarization observed between the treatments with $p = 0.6$ and $p = 1$ that share the same Nash equilibrium.

Result 2.1 (Non–monotonicity in average deviations from Nash equilibrium predictions) *Average size deviations from Nash equilibrium predictions are smaller for* $p = 0$*, intermediate for* $p = 0.4$ *and* $p = 1$ *and larger for* $p = 0.6$*.*

Support: Figure 7 shows the average deviations from Nash equilibrium predictions for the four treatments, where it is apparent the stated non–monotonic pattern. To ensure that the averages are indeed different, we perform one–sided t–tests on all pairs of successive treatments, in all of which the null hypothesis is rejected even at the 0.01% significance level. We also perform a two sided t–test on the pair of treatments $(0.4, 1)$ in which case we cannot reject the null hypothesis that the two averages are equal. The results are identical if we perform a non–parametric Wilcoxon–Mann–Whitney test. Once again, for all successive pairs we reject the null hypothesis that the data come from the same distribution, while we cannot reject the null hypothesis when comparing the pair $(0.4, 1)$.[13]

[13] At the t–test, for $(p_1, p_2) = (0, 0.4)$ the t-statistic is equal to -10.3133, for $(p_1, p_2) = (0.4, 0.6)$ the t–statistic is equal to -7.7235, for $(p_1, p_2) = (0.6, 1)$ the t–statistic is equal to 5.7486 and for $(p_1, p_2) = (0.4, 1)$ the t–statistic is equal to -1.3243. At the Wilcoxon–Mann–Whitney test, for $(p_1, p_2) = (0, 0.4)$ the z-statistic is equal to -13.584, for

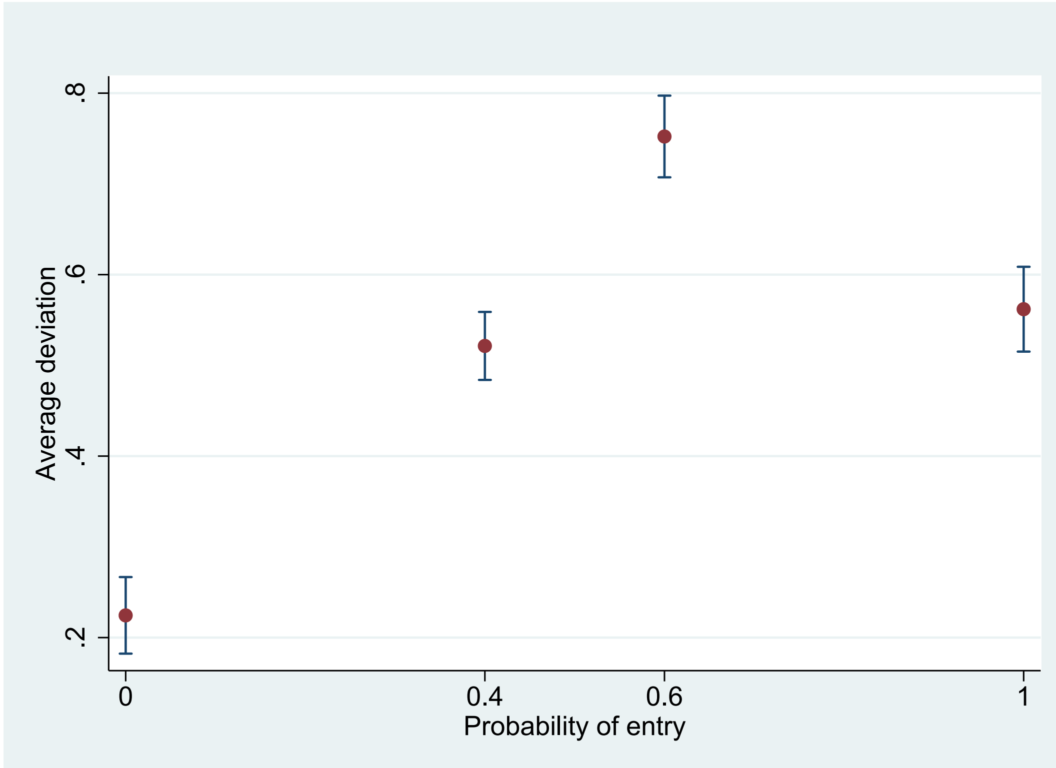


Figure 7: Average deviations from Nash equilibrium predictions and their 95% confidence intervals for different treatments.

The result should be considered with caution as it focuses on the average values of deviation, which may be affected by the construction of the variable of deviation. For instance, a deviation of size 2 when $p = 0.4$ signifies that the subject chose location 1 or 7, which are dominated, thus, less probable. To the contrary a deviation of size two when $p \in \{0.6, 1\}$ signifies that the subject chose location 4, which is not dominated. As an attempt to obtain some more firm understanding, we look at the probability of deviation, irrespectively of its size and subsequently provide a set of regressions of deviation on certain variables.

Result 2.2 (Non–monotonicity in average deviations from Nash equilibrium predictions) *The probability of deviating from Nash equilibrium predictions is smaller for $p = 0$, intermediate for $p = 0.4$ and $p = 1$ and larger for $p = 0.6$.*

Support: We repeat a similar analysis to the previous result. In particular, Figure 8 contains the fraction of cases in which subjects deviated from Nash equilibrium per treatment. The same

$(p_1, p_2) = (0.4, 0.6)$ the z–statistic is equal to -6.794, for $(p_1, p_2) = (0.6, 1)$ the z–statistic is equal to 6.188 and for $(p_1, p_2) = (0.4, 1)$ the z–statistic is equal to 0.091.

pattern is observed as before. Once again we perform one–sided t–tests on all pairs of successive treatments and reject the null hypothesis of the mean probabilities of deviation being equal and similarly for Wilcoxon–Mann–Whitney test we reject the null that they come from the same distribution. Interestingly, when comparing treatment $p = 0.4$ and $p = 1$, we can reject the null hypothesis but only at the 10% significance level. This is mainly due to the fact that there is a larger number of deviations towards the central location when $p = 0.4$, which suggests that the subjects probably undervalue the likelihood of entry in this case.[14]

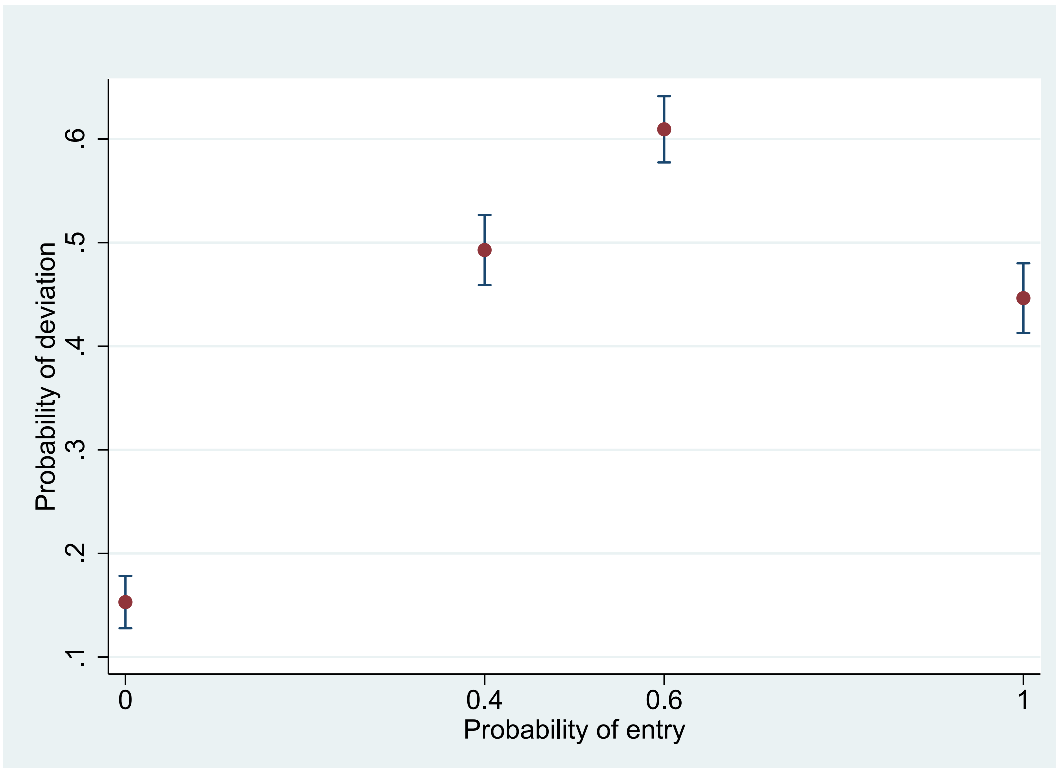


Figure 8: Probability of deviation from Nash equilibrium predictions and their 95% confidence intervals for different treatments.

In addition to the previous results, we still want to see whether deviations from Nash can be explained to some extent by the existence of a dominant strategy and/or the coincidence of level–1 and Nash equilibrium strategies. In order to test these, as well as some subsequent, hypotheses we

[14] At the t–test, for $(p_1, p_2) = (0, 0.4)$ the t-statistic is equal to -15.7836, for $(p_1, p_2) = (0.4, 0.6)$ the t–statistic is equal to -4.9068, for $(p_1, p_2) = (0.6, 1)$ the t–statistic is equal to 6.8826 and for $(p_1, p_2) = (0.4, 1)$ the t–statistic is equal to 1.9075. At the Wilcoxon–Mann–Whitney test, for $(p_1, p_2) = (0, 0.4)$ the z–statistic is equal to -14.561, for $(p_1, p_2) = (0.4, 0.6)$ the z–statistic is equal to -4.878, for $(p_1, p_2) = (0.6, 1)$ the z–statistic is equal to 6.796 and for $(p_1, p_2) = (0.4, 1)$ the z–statistic is equal to 1.906.

perform a set of regressions of deviation on certain variables, using again an Ordered Logit Model. The following two results are obtained immediately from the outcome of these regressions that can be found in Table A.2 in the Appendix.

Result 2.3 (Existence of Dominant Strategy) *Deviation from Nash equilibrium is reduced when there is a dominant strategy.*

Result 2.4 (Level–1 Strategy Coincides with Nash Equilibrium Strategy) *Deviation from Nash equilibrium is reduced when the level–1 strategy coincides with the Nash equilibrium strategy.*

Support: We have added as regressors two dummy variables corresponding to different treatments that state whether there is a dominant strategy and whether the level–1 strategy coincides with the Nash equilibrium strategy. The coefficients of these two variables are negative and strongly significant (see Table A.2 in the Appendix).

In relation to Result 2.2 we observe that the coefficient that corresponds to the treatment $p = 0.4$, which in this case captures only differences between treatments $p = 0.4$ and $p = 1$, is not significant, suggesting that there are not important differences between the deviations observed in these two treatments. The non–monotonicity in deviations can also be seen in Figure 9, which shows the estimated probability of no–deviation from Nash equilibrium. As expected, Figure 9 has a shape exactly opposite to the one of Figure 8.

One might consider that deviations from Nash equilibrium strategies might have been triggered by the beliefs that subjects formed regarding the strategies followed by their opponents. If that was the case and deviations from Nash equilibrium strategies were justified, then they should not lead to substantial decrease in profits (in terms of citizens' support). We try to validate this hypothesis by running a set of linear regressions of profits on deviations from Nash equilibrium strategies, controlling for treatment and other explanatory variables.

Result 2.5 (Effect of Deviation on Profits) *A deviation from Nash equilibrium strategies reduces the citizens' support that the player achieves.*

Support: Table A.3 in the Appendix contains the results of the linear regressions of profits on deviation that suggest that each unit of deviation from Nash equilibrium strategy is associated

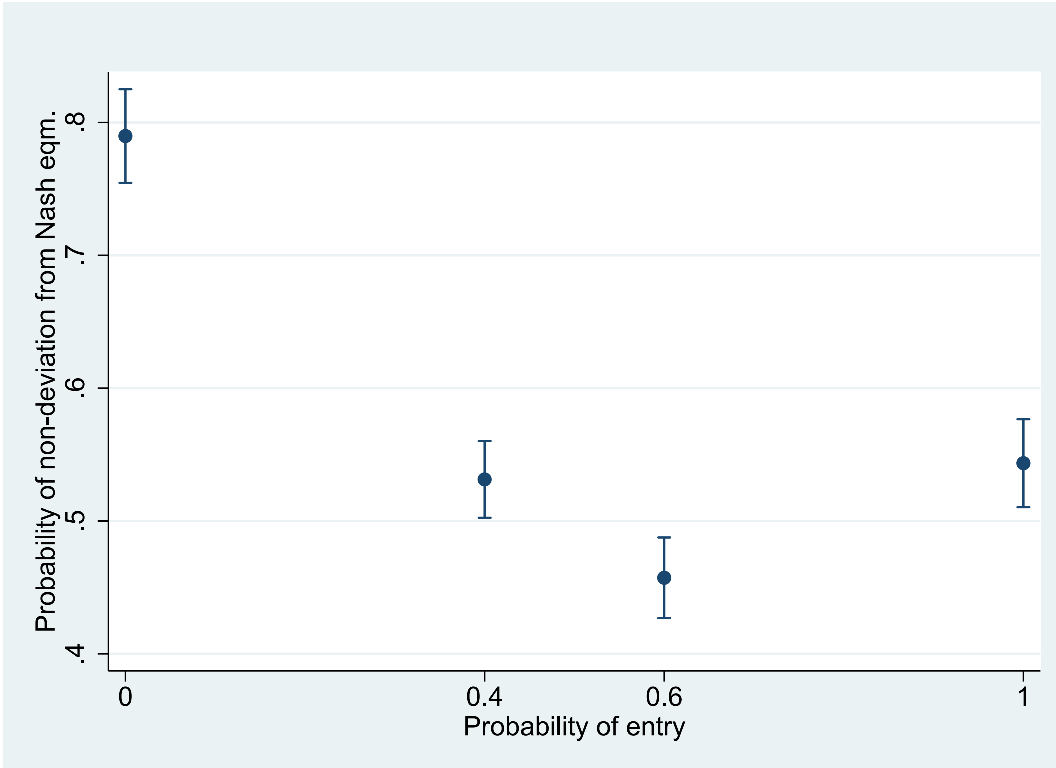


Figure 9: Estimated probabilities of no–deviation from Nash equilibrium with their 95% confidence intervals. The results correspond to Table A.2 column (3), in the Appendix.

with the loss of approximately 24 supporting citizens. As it is expected the support is strongly affected by the probability of entry. Interestingly, extremism is associated with additional decrease in support, which suggests that deviations towards the extremes are more harmful.

Hypothesis 3 (Learning) *Deviations from Nash equilibrium predictions reduce over time.*

The last hypothesis constitutes a purely experimental question, as we seek to understand whether the subjects tend to choose locations closer to the predictions of Nash equilibrium over time.

Result 3.1 *Time has a negative effect on deviations from Nash equilibrium strategies.*

Support: This can be seen in Table A.2 in the Appendix, where the variable *time*, which is defined as the *inverse of period*, affects deviations positively. A similar result is obtained if we use as regressor the period directly, however if we include both regressors simultaneously only time affects deviations significantly. This suggests that the effect is non–linear, as most learning occurs in the initial periods.

In addition to this, we look at the marginal effect of the probability of entry on the probability of a subject choosing the central location. This effect is obviously always negative, but as it can be seen in Figure 10 it is also increasing in magnitude over time. This suggests that as the periods evolve the subjects become increasingly less likely to choose the central location for higher probabilities of entry, which is another signal of learning.

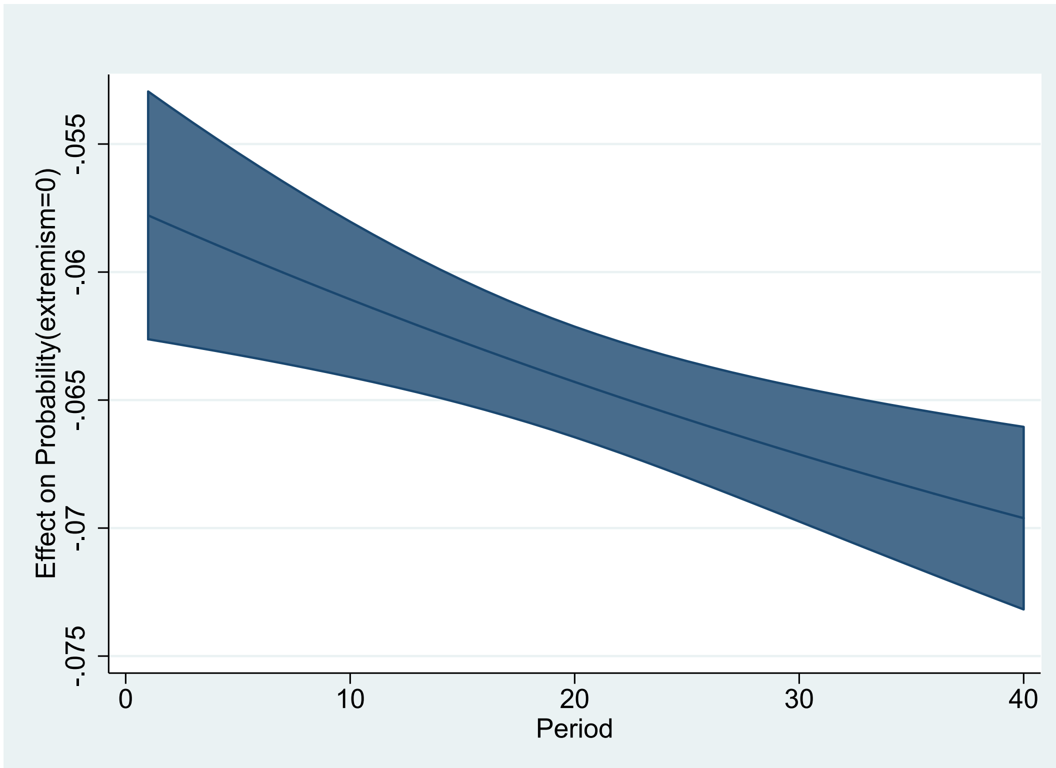


Figure 10: Average marginal effect of p on the probability of choosing the central location over time with the 95% confidence intervals. The graph is obtained through an ordered logit regression of extremism on p, period and their interaction term and subsequently taking the average marginal effect of p in each period.

4 Concluding remarks

In this paper we have tested experimentally a model of electoral competition with: a) two main candidates that choose policies simultaneously, b) a third candidate that enters the race with probability $p \in [0, 1]$ after the two main candidates select their policy platforms, and c) a discrete number of policy alternatives. Our approach nests Downs (1957) and Palfrey (1984), and all the cases in between them, allowing us to examine in more detail the idea that potential third party entry generates centrifugal incentives to the two main candidates. Our results point to a clear relationship between the likelihood of third party entry and the polarization of the platforms of the two main candidates providing strong support, not only for the formal results of Palfrey (1984), but mainly for the underlying intuition that supports them. Indeed, candidates did not deviate away from the convergent Downsian behavior only when entry was certain to take place, but also when it was merely likely.

Naturally, our study does not close the issue of the effects of entry on electoral competition. As the theoretical literature developed after Palfrey (1984) attempts to understand the consequences of the prospect of third party entry on the main candidates' platforms under alternative electoral rules (e.g. Callander, 2005; Buisseret, 2017) or under alternative assumptions regarding when the third party enters such as rank-motivation (e.g. Weber, 1992), minimum vote-share requirement (e.g. Weber, 1997), etc.; similarly, experimental approaches should be applied to many different political contexts in which entry is relevant. Fortunately, apart from our paper there is a series of recent experimental studies which focus on the effect of candidate entry on electoral competition outcomes (e.g. Grosser and Palfrey, 2017; Bol et al., 2017) and hence we already have a validation of several theoretical results. This is quite promising as, among others, it suggests that the results of the formal study of political economy issues are not a theoretical artifact, but carry empirically relevant implications as well.

Appendix: Tables

Table A.1: The effect of the probability of entry on extremism.

	Ordered Logistic Regression					
Extremism	(1)	(2)	(3)	(4)	(5)	(6)
probability of entry (p)						
p=0.4	2.156^{***}	1.640^{***}	2.184^{***}	1.719^{***}	2.362^{***}	1.889^{***}
	(0.119)	(0.140)	(0.120)	(0.142)	(0.124)	(0.145)
p=0.6	3.365^{***}	2.320^{***}	3.408^{***}	2.454^{***}	3.709^{***}	2.796^{***}
	(0.123)	(0.157)	(0.124)	(0.159)	(0.131)	(0.165)
p=1	4.064^{***}	2.690^{***}	4.128^{***}	2.872^{***}	4.502^{***}	3.305^{***}
	(0.129)	(0.176)	(0.131)	(0.180)	(0.138)	(0.188)
Period		-0.00520		-0.00473		-0.00306
		(0.00321)		(0.00323)		(0.00328)
Lag Own Extremism		1.118^{***}		1.077^{***}		0.855^{***}
(last period of same treatment)		(0.0530)		(0.0534)		(0.0559)
Lag Opp. Extremism		0.124^{**}		0.0754		0.110^{*}
(last period of same treatment)		(0.0477)		(0.0486)		(0.0497)
Lag Own Profit		-0.000719		-0.000448		-0.000686
(last period of same treatment)		(0.000753)		(0.000761)		(0.000786)
Lag Opp. Profit		-0.00213^{**}		-0.00187^{*}		-0.00185^{*}
(last period of same treatment)		(0.000747)		(0.000755)		(0.000769)
Session F.E.			✓	✓		
Subject F.E.					✓	✓
N	3360	3276	3360	3276	3360	3276

$^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$

Note: Results of Ordered Logit regressions of the level of extremism. The lag refers to the previous period of the corresponding treatment. Standard errors in parentheses.

Table A.2: The determinants of deviations from Nash equilibrium.

	Ordered Logistic Regression					
Deviation	(1)	(2)	(3)	(4)	(5)	(6)
dominant		-1.372***		-1.357***		-1.669***
		(0.156)		(0.156)		(0.164)
level1		-0.371***		-0.405***		-0.509***
		(0.101)		(0.102)		(0.105)
probability of entry (p)						
p=0.4	1.412***	0.0402	1.415***	0.0579	1.689***	0.0195
	(0.140)	(0.106)	(0.140)	(0.106)	(0.147)	(0.110)
p=0.6	1.742***		1.762***		2.178***	
	(0.146)		(0.147)		(0.155)	
p=1	1.372***		1.357***		1.669***	
	(0.156)		(0.156)		(0.164)	
time	1.112***	1.112***	1.090***	1.090***	1.087***	1.087***
	(0.242)	(0.242)	(0.243)	(0.243)	(0.249)	(0.249)
Lag Own Deviation	1.259***	1.259***	1.225***	1.225***	0.841***	0.841***
(last period of same treatment)	(0.0625)	(0.0625)	(0.0630)	(0.0630)	(0.0673)	(0.0673)
Lag Opp. Deviation	0.126*	0.126*	0.0834	0.0834	0.140*	0.140*
(last period of same treatment)	(0.0608)	(0.0608)	(0.0616)	(0.0616)	(0.0642)	(0.0642)
Lag Own Profit	-0.000149	-0.000149	-0.000437	-0.000437	-0.000754	-0.000754
(last period of same treatment)	(0.000795)	(0.000795)	(0.000804)	(0.000804)	(0.000831)	(0.000831)
Lag Opp. Profit	0.00273***	0.00273***	0.00247**	0.00247**	0.00287***	0.00287***
(last period of same treatment)	(0.000824)	(0.000824)	(0.000832)	(0.000832)	(0.000864)	(0.000864)
Session F.E.			✓	✓		
Subject F.E.					✓	✓
N	3276	3276	3276	3276	3276	3276

${}^{*}p < 0.05$, ${}^{**}p < 0.01$, ${}^{***}p < 0.001$

Note: Results of Ordered Logit regressions of the deviations from Nash equilibrium. The lag refers to the previous period of the corresponding treatment. In regressions (2), (4) and (6), the two variables are ommited because of multicollinearity. The variable *time* is defined as *1/Period*. Standard errors in parentheses.

Table A.3: The determinants of candidates' payoffs.

	Ordinary Least Squares					
Supporting Citizens	(1)	(2)	(3)	(4)	(5)	(6)
deviation	-22.68***	-24.41***	-23.37***	-24.93***	-23.45***	-25.23***
	(1.156)	(1.220)	(1.159)	(1.222)	(1.281)	(1.354)
probability of entry (p)						
p=0.4	-30.44***	-27.20***	-30.10***	-27.14***	-30.07***	-26.89***
	(2.154)	(2.275)	(2.142)	(2.263)	(2.152)	(2.291)
p=0.6	-32.07***	-26.13***	-31.45***	-26.04***	-31.41***	-25.57***
	(2.178)	(2.569)	(2.168)	(2.559)	(2.191)	(2.632)
p=1	-60.35***	-53.49***	-59.97***	-53.69***	-59.94***	-53.20***
	(2.177)	(2.688)	(2.165)	(2.679)	(2.177)	(2.754)
time	1.516	1.518	1.710	1.702	1.731	1.748
	(4.368)	(4.356)	(4.341)	(4.331)	(4.350)	(4.340)
extremism		-4.656***		-4.288***		-4.573***
		(1.077)		(1.081)		(1.149)
Session F.E.			✓	✓		
Subject F.E.					✓	✓
N	3360	3360	3360	3360	3360	3360

$^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$

Note: Results of Ordinary Least Square regressions of citizens' support on deviations from Nash equilibrium. The variable *time* is defined as *1/Period*. Standard errors in parentheses.

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