CHANGING DIMENSIONALITY IN THE POLITICAL ISSUE SPACE: EFFECTS ON POLITICAL PARTY COMPETITION

César García-Díaz
Department of Industrial Engineering
Universidad de los Andes
Cra. 1E 19A-40 (ML-702)
Bogotá, Colombia
E-mail:
ce.garcia392@uniandes.edu.co

Gilmar Zambrana
Department of Management
University of Antwerp
Prinsstraat 13 (Z.108),
Antwerpen, BE-2000, Belgium
E-mail:
gilmar.zambrana@ua.ac.be

Arjen van Witteloostuijn
Department of Organization and Strategy
Tilburg University
K1102A, 5000 LE, Tilburg, The Netherlands
E-mail:
a.vanwitteloostuijn@uvt.nl

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ABSTRACT

We built an agent-based model of political party competition in order to explore the effect of the decrease in the number of relevant political issues on the number of political parties and the corresponding voter shares. We find that, when the space experiences a *political shock* and suddenly reduces in the number of dimensions, the number of political parties declines. We also observe that, after the shock, (i) the inert parties tend to improve their performance and that (ii) a few of the adaptive large size-seekers cushion their increased mortality hazard by locating in the zone with most intense competition (close to the political space center), which generates strong party size effects.

INTRODUCTION

By and large, the number of political parties in political systems has been associated with both the existence of social cleavages and the features of electoral institutions. On the one hand, political parties are founded to stand for specific social cleavages that represent the regional, religious or ethnic heterogeneity in a political system (Grumm 1958; Lipset and Rokkan 1967; and Rose and Urwin 1970). On the other hand, features of electoral institutions such as the majority rule, proportional representation, district magnitude and ballot structure are important in explaining the number of political parties. The most accepted models propose a direct link between district magnitude, i.e. the number of legislators elected in a district, and the number of political parties (Lijphart 1990; Riker 1982; Taagepera and Shugart 1993; Cox 1997; Neto and Cox, 1997; Ordeshook and Shvetsova 1994; Powell 1986; Taagepera and Grofman 1985). However, there are multiparty systems in which these models fail to predict the number of political parties, especially where district magnitude is high (Lowery et. al. 2011). These models fail to take into account the competition among political parties for voters, especially when a political system is overcrowded with political parties. In this setting, parties need to differentiate themselves in order to attract sufficient number of voters (Lowery et. al. 2010). In modern democracies, the emergence of new sources of political conflict such as environmental protection, women's rights and living standard issues have created new forms of competition among political parties. Nowadays, short term factors such as issues and candidate images are considered by the electorate when they cast their ballot (Dalton, 1996). Lowery et al. (2011) show that, in the Netherlands, the outcome of competition among political parties can be co-explained by the number of relevant issues. The larger the issue agenda space is, the higher the chances that new political parties can develop a distinctive issue configuration that attracts enough voters to survive, and vice versa. Therefore, environmental changes that modify the number of issues affect the density of political parties in a political system, keeping the *resource* availability – i.e., the number of voters – constant. Unlike prior work that focuses on stable environments, we would like to concentrate on the impact of shocks or crises that have the potential to suddenly change the issue agenda space – e.g., terrorist attacks, economic crises or territorial wars. Our aim is to analyze the consequences of a shock that decreases the dimensionality (i.e., number of political issues) of political space. We follow and extend the model developed by Laver and Sergenti (2011), who built an agent-based model to explain how different adaptive party strategies to compete for votes.

AGENT-BASED MODELING OF POLITICAL COMPETITION PROCESSES

Rational choice theory based on mathematical modeling, although elegant, is inadequate to explain complex phenomena in dynamic settings (Laver and Sergenti 2011). Rather, they start from unrealistic assumptions concerning the agents engaged in political competition, particularly perfect rationality of voters and political parties. A realistic model of multiparty competition should consider that politics is *dynamic*, (i.e., does not reach a static equilibrium, but instead evolves over time), *complex*, (i.e., results feedback generate iterative inputs to the system), *diverse*, (i.e., politicians use different strategies to tackle the same

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problem) and *not random* (i.e., system-level predictions can be made) (Laver and Sergenti 2011). Agent-based modeling (ABM) investigates outcomes from interaction among a diverse set and large number of boundedly rational agents that adapt in an evolving system. ABM is based "on adaptive learning rather than forward looking strategic analysis" (Laver and Sergenti 2011:5). Therefore, ABM constitutes a more realistic approximation when agents – here, political parties – constantly adapt to changing circumstances, interact with other agents and make decisions with limited or partial information.

POLITICAL NICHE THEORY AND CHANGING ISSUE SPACE DIMENSIONALITY

The representation of the political system using a spatial rendering has been used to map voters' policy preferences in a one-dimensional issue space (Dowson 1957). More recently, ABM was applied to analyze political competition in a multidimensional issue space setting. In such a space, a political party selects a position taking into account the relevant political issues in order to attract voters (Muis 2010; Laver 2005; Laver and Schilperoord 2007; Laver and Sergenti 2011; Kollman et al. 1992). The majority of these studies analyze political processes in a context of environmental stability. However, criteria and issues determining whether or not to adhere to a political party may change radically over time. Issues that are initially rather unimportant might become extremely relevant over the course of time, and may reshape voter preferences. Examples include *shock events* that might change the political agenda of parties. A major event can radically redefine strategic positioning in political space. An event like the assassination of Pim Fortuyn in 2002 had a decisive impact on the subsequent political agenda of parties in the Netherlands, triggering high volatility where some parties experienced a surprising defeat while others benefited from an unexpected revival and unprecedented success (Muis 2010). Similarly, the occurrence of terrorist attacks has proved to affect cabinet duration (Gassebner et al. 2008, 2011) and coalition formation (Indridason, 2008).

During the 1990s, a number of Latin American countries witnessed dramatic changes in their political system, either generating an expansion with entry of new parties capturing a large part of the electorate (e.g., Uruguay) or contraction due to the disappearance of many political parties (e.g., Paraguay). In other cases, such as Peru and Venezuela, there was a collapse of the system that involved an electoral decline of incumbent political parties and their subsequent disappearance (Wills-Otero 2009). The reasons for the collapse in Peru and Venezuela were not primarily structural causes or poor economic performance; rather, they are related to internal conflict and crisis of representativeness before the collapse (Mainwaring et. al. 2006).

To analyze the consequences of a collapse in the agenda issue space, we concentrate on systems with a *multidimensional political space* and *multiparty competition*. Many democracies in the world comprise *multiparty settings* (e.g., Continental European and Latin American countries). Another important assumption we adopt is that *a coalition is needed* to form a government. This has implications for the behavior of the voters. When a coalition of parties is part of the government, voters realize that voting sincerely for the preferred party does not harm the possibilities that their preferences are represented in the government coalition formation process (Downs 1957, Lowery et. al. 2010).

There are two factors that affect the opportunities to build a distinctive policy profile. The first involves an increase (reduction) in the number of issues. Having more (fewer) issues, to compete for votes, increases (reduces) the possibilities to differentiate from other political parties (Lowery et. al. 2011). The second relates to increases (decreases) of the span of the issues. When more (less) extreme positions are created regarding an existing issue, more (less) possibilities for a distinguishable political identity emerge (Péli and Witteloostuijn, 2008). In our case, we keep constant the span of the issue space. A political party uses its position to attract specific voters, refered to as the fundamental niche (Hannan and Freeman 1977). These positions may overlap with those of other political parties. The realized voter reflects a political party's realized niche (Péli and Witteloostuijn, 2008). The fundamental niche can be understood as the demand of political representation that a group of voters has, considering a set of issues. Then, the political party is the organization that tries to satisfy such a demand, which can be represented by a location in the *n*-dimensional issue space. The chosen location reflects the party's strategy for *niche differentiation* (Lowery et. al. 2010). Chances for niche differentiation increase with the available issues in the political space. This may happen when a new issue appears (Péli and Nooteboom 1999), which generates extra room for differentiation from which a new party may benefit. If issue space dimensionality collapses, then creating a differentiating issue configuration is harder (Lowery et. al. 2011), with similar parties competing for similar voters under higher *niche overlap*. This collapse or expansion of the issue agenda space affects the birth and mortality rates of political parties.

Conjecture 1: With a constant voter population, the smaller the number of issues on the political agenda, the smaller the number of political parties that survive.

Political parties can use different strategies to attract voters. Some parties are more successful than others in responding to their constituencies; some parties adapt more successfully to challenging changes than others do (Wills-Otero, 2009). Democratic parties that adapt

policies according to the preferences of their constituency are called *aggregators*, ideologically driven parties with an unchangeable policy set are referred to as *stickers*, and parties that constantly modify their policies to increase their size are coined *hunters* (Laver, 2005). *Hunters* and *aggregators* employ adaptive strategies. However, while *hunters* are driven to attract new voters to increase their vote share, *aggregators* move to accommodate preference shifts of their current electorate. *Stickers* never change position. Mass-based populist parties are more successful in adapting to challenging contexts because they have flexible and less institutionalized structures, whereas parties that have highly routinized and more institutionalized structures fact limitations to adapt to those contexts (Wills-Otero, 2009). This argument favors more flexible political parties over their more inert counterparts.

Conjecture 2: A shock that decreases issue space increases the relative mortality hazard of immobile parties (i.e., stickers) vis-à-vis their mobile counterparts (i.e., aggregators and hunters).

However, organizations must be inert to engage in reliable and accountable transactions (Peli et. al. 2000). In a similar vein, political parties can stick to their position to increase their credibility with the aim to attract voters. A political party that changes its policy set frequently cannot build a credible political position, which might affect its voter share negatively. Additionally, party adaptability is restrained by the availability of human and financial resources, as well as by the uncertainty and distrust associated with change (Denemerk 2003). Organizational change studies have revealed that failure increases after changes in organizational core elements (Greve 1999). A sudden change in the political issue space will trigger adaptive behavior of aggregators and hunters. These moves through space are risky, threatening survival chances.

Conjecture 2alt: A shock that decreases issue space increases the relative mortality hazard of mobile parties (i.e., hunters and aggregators) vis-à-vis their immobile counterparts (i.e., stickers).

THE MODEL

Preliminaries

We use a NetLogo implementation in which we assume a population of N voters distributed in a two-dimensional political issue space (Laver 2005; Kollman et al. 1992). We use Laver's model (2005) as a departure point. We introduce four key changes: (i) the voter's utility function measures distances to party policies according to a weighted block distance, as opposed to the traditional Euclidean-based approach; (ii) hunter strategists maximize party size according to the weights of the corresponding dimensions; (iii) issue-related weights are a function of time; and (iv) capabilities that might make a citizen turn into a politician develop endogenously over time. Like Kollman et al. (1992), we assume a political space with discrete positions. We consider two-dimensional uniform, unimodal and bimodal distributions of the voters' ideal preference points.

Political parties decide to take a position in the n-dimensional issue space in order to capture voters. In principle, issue spaces may feature a high number of dimensions. For instance, Kollman et al. (1992) assume a political space with 15 issues. However, Laver (2005) argues that many dimensions can be reduced to a few representative ones, since many of them happen to be highly correlated in real life. Péli and Nooteboom (1999) argue that individuals face a cognitive limitation when trying to decide with reference to more than five or six different criteria. Without loss of generality, we adopt a two-dimensional issue space, but assign different weights to both issues. Adopting ideas from Kollman et al. (1992), we assume that a weight s_i is associated with every issue (i = 1, 2,…, n). Such weights represent the importance of a given issue in citizens' preferences. A weight can range from 1 if the issue is fully active to 0 if the issue is completely inactive. If we define x_{ij} as the voter j's ideal point on issue i, and y_{ik} as party k's positioning on this i-th issue (i = 1, 2,..., n), then voter j's utility is

$$u_j(k) = -(\Sigma^{n}_{i=1} s_i | x_{ij} - y_{ik} |)^2, \quad (1)$$

where |.| stands for "block distance" (see Laver and Sergenti 2011).

Birth and death of parties

Following Laver and Schilperoord (2007), the number of parties in the model is endogenous. We assume that there are two types of citizens: supporters and leaders. Only leaders can form parties, while supporters adopt the role of plain voters. Any citizen has a chance to become a party leader, but past leaders are more likely to become party leaders again. To model this, we assume that every citizen has a capability-related measure at each point in time, Cap_t. The higher the capability measure, the higher the chance this citizen will found a party. The initial condition is $Cap_0 = 10$ for every citizen. When a citizen becomes a party leader, her or his capabilities increase according to the captured voting population: $Cap_{t+1} = Cap_t + CapCoef \cdot PartySize_t$, where $CapCoef$ is a coefficient (we set $CapCoef = 0.5$) and $PartySize$ is realized party size at time t.

Voters compute their utilities associated with the existing parties's positions and become supporters of the party that maximizes their utility (Downs 1957). Every citizen j computes a cumulative dissatisfaction level (Laver and Schilperoord 2007). Since the maximum utility value is zero, each utility value can be interpreted as a deviation from the optimal value – i.e., when the voter's ideal point is perfectly matched by a

party's position in space. Every voter can cumulatively compute a dissatisfaction value according to the cumulative sum of deviations from her or his own ideal point. If individual j computes, at time t, the utilities $u_j(1)$, $u_j(2)$, ..., $u_j(k)$ with respect to k existing parties, then the instantaneous dissatisfaction value (at time t) is defined according to (see Laver and Schilperoord 2007)

$$D_{j,t} = \max_k (u_{j,t}(k)). \quad (2)$$

We denote cumulative dissatisfaction as:

$$D^*_{j,t} = D_{j,t} + \alpha D^*_{j,t-1}, \quad (3)$$

with $\alpha \in [0,1]$ as a cumulative dissatisfaction coefficient (Laver and Schilperoord 2007). The cumulative dissatisfaction value is confronted with a certain threshold or critical point in order to define the likelihood of becoming a party supporter. More specifically, the critical point at time t is defined as (Laver and Schilperoord 2007).

$$D^c_{j,t} = \beta(D^*_{j,t} / \text{mean}(D^*_{j,t}). \quad (4)$$

The coefficient β corresponds to a scale factor. The denominator of the above expression represents the average dissatisfaction value among all voters. The probability to found a party (i.e., to become a party leader) at time t is then

$$(Cap_{j,t} / \Sigma^N_{k=1} Cap_{k,t}) D^c_{j,t} . \quad (5)$$

Each newly born party has an equal probability of picking up any of the above-mentioned strategies. Parties that fall below a certain affiliation share are declared dead, and are dissolved. We take this minimum affiliation value as three per cent of the total vote share. When a party share goes below the minimum affiliation value, the party leader becomes a normal citizen and the voters seek for an alternative affiliation according to the rules described above. In terms of an ecological approach, the party dies due to lack of fitness with its niche.

Party strategies and the role of changing spaces

As introduced above, following the work by Laver (2005), Laver and Schilperoord (2007) and Laver and Sergenti (2011), we define three vote-seeking strategies of parties: *sticker* (the party never changes position), *aggregator* (the party always relocates at the centroid of mean voter support), and *hunter* (the party gradually moves in space toward a perceived size-maximizing position; otherwise the party moves backwards). Since dimensions – or issues – might have different degrees of importance (weights), *hunters* move as to the weights value in each dimension. That is, *hunters* move the farthest in the dimensions that matter the most.

We assume that political issue spaces change due to a transformation of the relative importance of political issues. This means that the coefficients s_i are a function of time. The point at which there is a sudden change of the s_i coefficients, is defined as a *shock*. There are two different types of space change: (ii) *an absolute space collapse* takes place when one of the dimensions absorbs all relevance in the computation of the citizens' utility values; (ii) *a change of relative issue dominance* implies that the relative importance of issues does change (for instance, when an issue that is relatively unimportant becomes highly relevant). Here, we focus on the former.

We introduce a two-dimensional space that runs until time t = 1000 (i.e., the moment of collapse); then, a shock occurs. Following the shock, the simulation continues for another 1000 time steps, reaching a total of 2000 time steps. We set the initial number of parties at five with randomized strategies, and $\alpha = \beta = 1$.

SUMMARY OF RESULTS

We ran our three simulation experiments with a constant voter population of 5,000 voters. Each experiment takes a different voter distribution: uniform, unimodal, and bimodal. We ran 100 simulations for each experiment. We use weights $s_x = s_y = 1$ before the shock, and weights $s_x = 1$, $s_y = 0$ after the shock. In the case of the uniform distribution, the number of political parties declines from 18 to 12. See Figure 1.

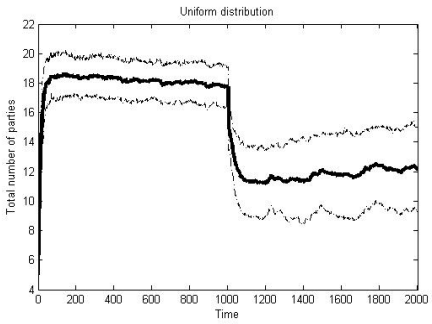

Figure 1. A space collapse shows that the number of parties in the model declines just after the shock at t = 1000. The black central line indicates average behavior and the dotted lines indicate a one standard deviation value range.

Conjecture 1 is confirmed for the uniform distribution. Also, remarkably similar results were observed for the runs with unimodal and bimodal distributions. That is, a collapse in the number of parties always occurs after the shock. The narrower the issue agenda space, the lower the chance that new political parties can develop an issue configuration to attract voters successfully. Similar parties compete for voters with similar preferences. The collapse of the space triggers increased party niche overlap, which leads to increasing competition and the subsequent reduction of the density of political parties in the political system.

Strategy performance in a uniform distribution

A closer look at the performance of different party strategies reveals an effect on the likelihood of survival. *Aggregators* perform best before the shock in terms of

number of parties and aggregated mean vote share (or average party size). See Figure 2. After the shock, the aggregators' performance drops since they are not able to adapt to the post-shock space. A shock reduces opportunities for differentiation and largely hits the aggregators' strategy. Before the shock, each party performs, on average, roughly equal in terms of voter share; after the shock, the average *hunter* party significantly increases performance.

When a sudden decrease in the number of issues occurs, the party niches increase in overlap, boosting competition as now similar parties compete in the same space for voters. The immediate effect is that fewer political parties obtain the support of voters. The *aggregators* exhibit the worst performance in terms of both number of political parties and mean vote share after the shock.

When *aggregators* face other party strategies, especially *hunters,* they do not engage in direct competition but rather seek to protect their current share, leaving room for the advancement of *hunters*. *Aggregators* are pushed out of political space by the *hunters*' large size-seeker behavior. *Stickers* have similar long-run success rates as *hunters* in terms of number of political parties, being able to enlarge their vote share. However, in terms of vote share, *hunters* have a notable advantage over *stickers*, since the former capture a large chunk of the electorate of the *aggregators* after the shock. See Figure 3.

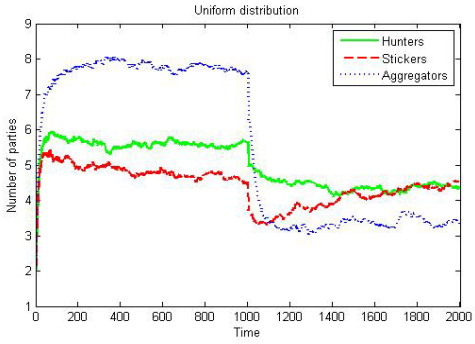

Figure 2. Average performance of party strategies under a uniform distribution of voters. Shock at $t = 1000$.

Strategy competition in a unimodal distribution

Surprisingly, *stickers* are more successful in terms of the number of political parties in a unimodal distribution of voters. See Figure 4.

With respect to the mean vote share, *hunters* are the largest. *Stickers* tend to survive in locations where voters are not densely concentrated; *hunters* steadily locate where the voter mass is more abundant (closer to the electoral space center). However, competition is more intense close to the electoral space center.

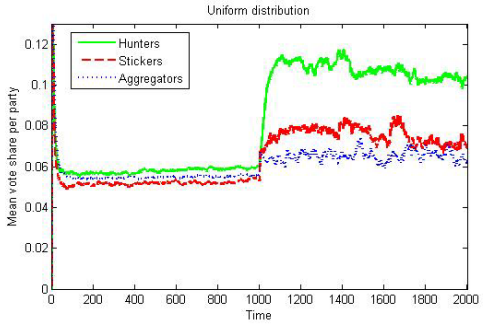

Figure 3. Mean vote share per party under a uniform distribution of voters. Shock at $t = 1000$.

The surviving parties near the center manage to attract more voters than those located further away. Above, we argued that *aggregators* do not perform well in the presence of competition. That it is the reason for their bad performance from the beginning. After the shock, many political parties die. The most affected are *hunters* since they are located in more central positions, when there is a collapse of issue dimensionality; hence, competition increases even more where they are located. Therefore, fewer hunters are able to survive after the shock. *Stickers*, by and large, locate further away from the center, and do not face the same negative impact of space collapse as *hunters* do.

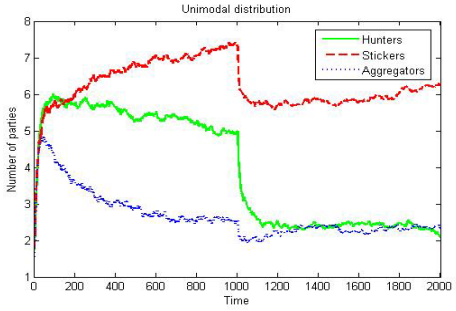

Figure 4. Average performance of party strategies under a unimodal distribution of voters. Shock at $t = 1000$.

The above argument is in line with ecological theories that argue that selection favors inert organizations, as reflected in Conjecture 2alt. This set of results deserves a more detailed analysis. First, our findings reveal how inert organizations can benefit from "standing still", as traditional models in organizational ecology have claimed. In our model, a collapse of resource space means that only a relevant "survivor" dimension sustains the whole set of political issue preferences. In such a space, a party that concentrates on a very specific, fixed voter preference might find itself favored by the reduced set of political preferences. Second, our results exemplify how parties with an inflexible (or perhaps, extremist) position might be hit by luck during a space collapse, gaining subsequent popularity. Nevertheless, surviving *hunters* can expand their vote share in quantities larger than their competitors. In the case of a unimodal distribution, being immobile pays off in terms of survival when the party is located

between the tails and the center. In terms of vote share, however, party size might be able to offset the negative impact of the increased mortality hazard of locating in the area of intense competition (near the center).

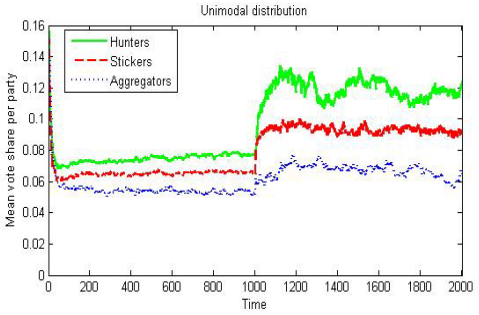

Figure 5. Mean vote share per party in a unimodal distribution of voters. Shock at $t = 1000$.

The bimodal case

In the bimodal case, results as to the behavior of the different strategies are similar to those observed in the case of the unimodal distribution. Worth mentioning is that resources are divided in two different groups of voters, with party competition occurring within these groups because parties cannot easily move across the whole political space. Competition is higher around the space peaks. *Hunters* perform as well as *stickers* before the shock in terms of the number of parties, and maintain a higher aggregated voter share. See Figure 6. After the shock, however, tougher competition increases the mortality hazard of *hunters*. Like in the unimodal case, the increase in the mortality hazard due to intensified competition is offset by the increase in average party size, implying that larger hunter survivors expand their vote share. See Figure 7.

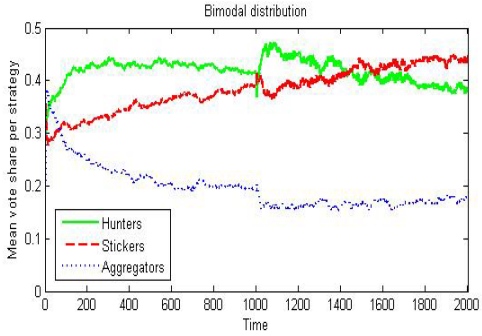

Figure 6. Mean vote share per behavioral strategy in a bimodal distribution of voters. Shock at $t = 1000$.

CONCLUSIONS

The model's results show consistency with the expected outcomes described in the Conjecture 1. Simulation outcomes reveal that the number of political parties after the shock immediately decreases. The results hold independently of the distribution of voters' preferences. Regarding Conjectures 2 and 2alt, we claim that an adaptive strategy does not always guarantee the survival of political parties. *Hunters* and *aggregators* adapt; however, the direction of the adaptation matters. Besides, the location and strategy of the political parties play a role in the survival of a political party. The inert *stickers* are more successful in surviving challenging conditions, when they are not located close to the center. The adaptive *hunters* survive by locating in spots where voters are more densely concentrated. Although fewer *hunters* survive in comparison to *stickers* after the shock, they capture more voters. A smaller distance to the center is associated with a larger mortality rate, but larger party sizes seem to offset the distance effect. For future research, additional explorations include the change of relative dominance of a particular political issue and the study of independent voter distributions per dimension.

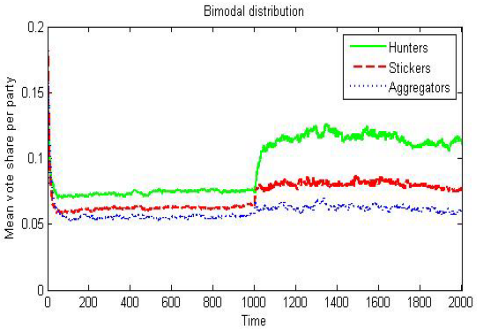

Figure 7. Mean vote share per party in a bimodal distribution of voters. Shock at $t = 1000$.

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AUTHOR BIOGRAPHIES

CESAR GARCIA-DIAZ is a visiting scholar at the Department of Industrial Engineering at Universidad de los Andes (Colombia) and an affiliated researcher at the Management Department of the University of Antwerp (Belgium). He holds BSc/MSc degrees in Industrial Engineering from Universidad Javeriana (Colombia) and Universidad de los Andes (Colombia), respectively, and a PhD in Economics and Business from the University of Groningen (the Netherlands). His research interests are complex adaptive social systems and agent-based computational modeling in the social sciences. More information about him can be found at http://sites.google.com/site/cesaregarciadiaz/.

GILMAR ZAMBRANA is a PhD student at the Faculty of Applied Economics of the University of Antwerp (Belgium). He holds a MA degree in Development Studies from the Institute of Social Studies (The Hague, the Netherlands) and a BA degree in Economics from the Bolivian Catholic University San Pablo. He has been actively involved in the design and evaluation of public policies in governmental agencies. His professional and research interests are political economy, public economics, development, poverty and inequality, and social mobility.

ARJEN VAN WITTELOOSTUIJN is Professor of Organization and Strategy at Tilburg University (the Netherlands), Research Professor of Economics and Management at the University of Antwerp (Belgium), and Professor of Economics at Utrecht University (the Netherlands). He holds degrees in economics, business and psychology from the University of Groningen (the Netherlands) and a PhD degree in Economics from the University of Maastricht (the Netherlands). He is multidisciplinary social scientist who has published in major journals across a wide variety of disciplines, such as the *Academy of Management Journal, Academy of Management Review, Organization Science, Strategic Management Journal*, *American Journal of Political Science, American Sociological Review* and *Journal of Public Administration Research and Practice*.

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