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## Changes in voter behavior after an information signal: An experimental approach for Senegal

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Signal:  
An Experimental Approach for Senegal**

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# Abstract

Electoral competition is considered a control mechanism to guarantee a good performance of the government. However, in real life it often leads to a distorted policy implementation due to Government Capture and low Government Accountability. Therefore, the analysis of voter behavior is a key factor to understand government performance. More specifically, if voters choose more policy and retrospectively oriented, the government has greater incentives to implement efficient policies. In this sense, if voters have more information on politics, they are more likely to base their decision on policy issues. To assess changes in voter behavior, we carried out a political experiment, where information about the performance of the Senegalese government was delivered to a randomly selected group of voters. Then, based on election surveys data collected before and after the information signal, a probabilistic voter model with latent class using a panel data set was developed. Additionally, to evaluate changes in the relative importance of the three voting motives (policy, non-policy and retrospective), marginal effects and relative marginal effects were estimated. As expected, after the information signal, the relative importance of the policy and the retrospective components increased significantly. Furthermore, to see the impact on government performance, indicators for Capture and Accountability were calculated. Even though, the accountability index in Senegal is low, after the delivery of the political information, we observed an increment. Likewise, some capture indices changed from the first to the second round. Finally, we measured the changes in the optimal policy position of the incumbent party. Since there were changes in the policy positions of voters, if the incumbent wants to maximize its probability of winning the elections, it should make changes on its policy platform correspondingly.

*Keywords: probabilistic voter model, capture, accountability, agricultural policy, Senegal, Africa*

*JEL classification: Q18, C33, C35, C38*

# 1 Introduction

In political theory, electoral competition is considered a control mechanism, as voters have the power to either punish the bad performance of the government or reward the good one through their vote. However, in real life, electoral processes often lead to a distorted policy implementation due to Government Capture and low Government Accountability. Therefore, the analysis of voter behavior is a key factor to understand government performance.

One of the most influential authors concerning public choice theory [Downs, 1957], states that voters evaluate candidates based on their policy platforms, as well as, on an estimation of what such candidates would do were they in power (i.e. policy oriented). On the other hand, Grossman and Helpman [1996] affirm that voters have both, policy oriented and non-policy oriented voting motives. From their perspective, the relative importance of these voting motives depends on the level of information that voters have about politics. To elaborate further, if voters have limited information on politics by the time of casting a vote, they are likely to base their decision on non-policy issues, such as charisma or religion, giving less consideration to government policy positions. This behavior in turn, reduces the incentives for the government to implement efficient policies. Other authors also highlight the importance of information when it comes to make electoral choices. For instance, DellaVigna and Kaplan [2006] studied the impact of media bias upon voting, finding a significant effect of exposure to news on voting decision. Such exposure induced a substantial percentage of the viewers to change their decision. Pande [2011] in turn, explained that limited information is an explanation for low-quality politicians in low-income democracies. Therefore, information about the political process and politician performance improves electoral accountability. According to Coate [2004], voters update their beliefs rationally given the information they have received from advertising campaigns. Furthermore, Banerjee et al. [2011] found evidence that voters change quite substantially their electoral choice when they are given information about government performance and qualifications of the incumbent. They pointed out the fact that voters demonstrated sophistication using the information to judge performance and qualifications, as oppose to the fear that information would simply confuse them.

According to Khemani [2001], a large number of voters are motivated by party affiliation and other non-policy variables, while others that are indifferent between candidates or parties on ideological grounds, vote based on economic information (macro economic variables such as economic growth, inflation, poverty and income inequality). He interpreted voter responses to economic performance in Indian elections and argues that the evidence is consistent with greater voter vigilance and government accountability at local level. As pointed by Caplan [2007], in practice, democracies frequently adopt policies

that are damaging. This is partly due to the fact that voters embrace a long list of misconceptions that lead them to act irrationally and vote accordingly. Bardhan and Mookherjee [2000] distinguish between informed and uninformed voters. Informed voters are politically aware and choose based on the utility they expect to obtain. On the contrary, uninformed voters are swayed by campaign spending. In this sense, policy biases (Government Capture) emerge due to the existence of uninformed voters. Additionally, parties choose their policy platforms in order to maximize their probability of winning the elections.

In this regard, we conducted a political experiment where an information signal is delivered to different groups of voters. Then, based on voter survey data collected before and after this information signal, changes in voter behavior were measured by means of a probabilistic voter model. We were also interested in measuring the changes in the relative importance of the three voting motives (policy, retrospective and non-policy), as well as, in the government performance indicators. Finally, based on the first and the second order conditions, we measured the changes in the optimal policy position of the incumbent party BBY for three policy issues.

## 2 Experimental Study

The experimental study took place in Senegal few weeks before the presidential election of February 24th, 2019. Planning the implementation of the experiment and surveys according to upcoming elections is crucial for voter behavior analysis. In this sense, we assumed that the Senegalese electorate had made up their mind for the election, which provides reliable data regarding the actual voting decision. Additionally, all political parties had chosen their policy platforms and candidates.

The experiment was carried out in five regions of Senegal. It was a random experiment as individuals were randomly assigned to different groups. It consisted of a first round of 1000 interviews, conducted face-to-face in the corresponding dialect/language (Serere, Wolof, Pular and French). The next step, was the delivery of an information signal. To this end, the total sample of interviewees was divided into three groups: group 1 received a positive treatment, group 2 received a negative treatment and group 3 received a placebo treatment. After receiving the signal, a second round of interviews was conducted containing just some of the questions from the first round.

### 2.1 Information Signal

The tool implemented as information signal was a series of videos comprised of two parts. The first part, contained information about the role of the government and the power held by voters either to reward or punish their performance. The second part, showed

the performance of the government regarding the implementation of agricultural policies in the framework of the Malabo Declaration. The aforementioned declaration is a re-commitment to the goals of the Comprehensive Africa Agriculture Development Programme (CAADP) agreed by the Heads of State and Government of the African Union to provide effective leadership for the attainment of specific goals by the year 2025. The goals include ending hunger, tripling intra-African trade in agricultural goods and services, enhancing resilience of livelihoods and production systems, and ensuring that agriculture contributes significantly to poverty reduction.

One of the Malabo strategic objectives is the Commitment to Mutual Accountability to Actions and Results, which includes a Biennial Agricultural Review Process that involves tracking, monitoring and reporting the progress. These results are then presented in individual scorecards for each country, where the performance indicators are shown. These scorecards were obtained from the Regional Strategic Analysis and Knowledge Support System (ReSAKSS) [African Union, 2018] and an example of one of them can be found in the appendix (figure 5).

With the information contained in these scorecards, we decided to design a traffic light rating system. This system has the advantage of being universally recognized, and using the three colors of the real traffic lights (green, yellow and red), good and poor performance can easily be identified. The table showing the scores and thresholds from which the performance is defined to be either good or bad is also available in the appendix (figure 6). Based on these results, we proceeded to select three good and three bad indicators of the Senegalese performance taking into account the scores of the neighbor countries.

The indicators used to deliver the signal were:

Positive indicators:

- Public expenditures in agriculture
- Strengthening social protection
- Tripling Intra-African Trade for agriculture commodities and services

Negative indicators:

- Ensuring resilience to climate related risks
- Establishing CAADP based cooperation, partnership and alliance
- Establishing Intra-African policies and institutional conditions

The information signal was exhibited as a map displaying the selected indicators of the Senegalese performance compared to the same indicators for most of the neighbor



ECOWAP countries. Examples of the maps are presented in the appendix (figures 7 and 8).

As regards the placebo video, it was not related to the agricultural policy implementation, but instead it was a short documentary about the process of desertification in Senegal. In the video, rural communities receive training on planting patterns to enrich the soil and stop the desertification process. Unlike the other videos, the idea was not to change the opinion of the audience about the performance of the government in the agricultural sector [Elsen, 2016].

## 3 Methodology

### 3.1 Voter Behavior

To analyze voter behavior we estimated a probabilistic voter model that makes possible the inclusion, in the utility function, of a stochastic term containing all unknown factors. These models are usually estimated with Discrete Choice models, as they can explain choices between two or more alternatives. In this study, the alternative Abstention was also included in the choice set.

To derive the Discrete Choice model, it is common to apply a Random Utility Maximization (RUM) Model. Here, if voter  $i$  decides to participate in the election, he chooses party  $k$  only if this party provides him the highest utility  $V_{ik}$ . Similarly, if the voter chooses not to participate, the greater utility comes from the alternative Abstention. Also, we assume that the stochastic term is independently, identically extreme value distributed (iid) and thus a logit model was derived. This model was extended to a multi-alternative estimation based on McFadden [1974], meaning that voters can choose an alternative  $k$  from a set of alternatives  $K$ .

$$P_{ik}(K) = \frac{e^{V_{ik}}}{\sum_{k=1}^K e^{V_{ik}}} \quad (1)$$

Given the nature of the experiment, we created two datasets. Both of them contain all variables that did not change from round 1 to round 2, such as, the socio-demographic characteristics. Additionally, each dataset includes those variables built from questions asked in both rounds, like, distances, choice, satisfaction with president and satisfaction with policy. Then we combined the datasets by rows to create the wide panel data. Finally, in order to perform the estimations, the latter was transformed into a long panel data. An example is displayed in Table 1.

Table 1: Example of the long format panel dataset

	hh_id	Round	Choice	Age	Satisfaction_President	Social_Distance	Treatment
1.Abstention	1	1	0	36	4	0	Negative
1.BBY	1	1	1	36	4	2	Negative
1.Pastef	1	1	0	36	4	3	Negative
1.Pur	1	1	0	36	4	4	Negative
1.Niang	1	1	0	36	4	5	Negative
1.Rewmi	1	1	0	36	4	4	Negative
2.Abstention	1	2	1	36	2	0	Negative
2.BBY	1	2	0	36	2	3	Negative
2.Pastef	1	2	0	36	2	4	Negative
2.Pur	1	2	0	36	2	5	Negative
2.Niang	1	2	0	36	2	4	Negative
2.Rewmi	1	2	0	36	2	3	Negative
3.Abstention	2	1	0	50	4	0	Positive
3.BBY	2	1	1	50	4	2	Positive
3.Pastef	2	1	0	50	4	5	Positive
3.Pur	2	1	0	50	4	4	Positive
3.Niang	2	1	0	50	4	5	Positive
3.Rewmi	2	1	0	50	4	3	Positive
4.Abstention	2	2	0	50	5	0	Positive
4.BBY	2	2	1	50	5	2	Positive
4.Pastef	2	2	0	50	5	4	Positive
4.Pur	2	2	0	50	5	3	Positive
4.Niang	2	2	0	50	5	5	Positive
4.Rewmi	2	2	0	50	5	4	Positive
...	...	...	...	...	...	...	...

Source: own illustration

In a long format dataset the number of observations for each voter depends on the number of alternatives ( $K$ ) and rounds ( $t$ ). Additionally, the dependent variable *Choice* equals 1 if an alternative is chosen and 0 otherwise. Furthermore, individual specific variables are different for every voter/alternative combination and remain unchanged from round 1 to round 2. On the contrary, alternative specific variables vary across alternatives and rounds.

The logit model estimated in this paper includes three components or voting motives: non-policy oriented ( $V_{ik}^{NP}$ ), policy oriented ( $V_{ik}^P$ ) and retrospectively oriented ( $V_{ik}^R$ ). The voter's utility function is as follows:

$$V_{ik} = V_{ik}^{NP} + V_{ik}^P + V_{ik}^R \tag{2}$$

When voters are not well informed and aware of policies, they might apply non-policy indicators to estimate their expected utility. These indicators might be their socio-demographic characteristics  $x_{ij}$ , as well as, the concept of valence [Schofield, 2007], where voters perceive a specific competence of candidates based on specific characteristics  $z_i$ , like charisma and appearance. In addition, party identification works as an intensifier in the favoritism towards a candidate from the preferred political party, and therefore, it has been included in the utility function of the voter by several authors such as Erikson and Romero [1990]; Adams [2001] and Adams et al. [2005].

$$V_{ik}^{NP} = \sum_j^J \alpha_{kj} x_{ij} + \alpha_k z_i + \alpha P I_{ik} \quad (3)$$

On the other hand, the policy oriented voter's utility function is calculated based on the spatial voting model [Davis et al., 1970, Enelow and Hinich, 1984], as the weighted distance between a voter's position  $x_{di}$  on a specific issue  $d$  and the perceived position taken by the party or candidate  $y_{dik}$  on the same issue:

$$V_{ik}^P = -\sum_d^D \beta_d (y_{dik} - x_{di})^2 \quad (4)$$

The coefficient  $\beta$  is always negative, because the greater the distance between the voter's position and the party/candidate's position, the less is the utility. In the case of the alternative Abstention, the distance was set to 0. Therefore, the utility of non-voting is greater than the utility of voting and hence the voting paradox is fulfilled.

As regards the retrospective voting motive [Fiorina, 1981], voters can express a general assessment of the past performance of a party/candidate or the government. In this sense, voters use observable welfare indicators  $Z_{ir}$  which are determined by governmental policies ( $\gamma_G$ ).

$$V_{ik}^R = \sum_r^R \delta_{kr} Z_{ir} (\gamma_G) \quad (5)$$

This model assumes that all voters act homogeneously. However, since we are also interested in analyzing the impact of voter behavior on government performance, heterogeneity must be allowed. Therefore, this model needs to be extended to a latent class model, where the probability that voter  $i$  chooses party  $k$  is class-specific ( $c$ ).

$$P_{ikc} = \frac{e^{V_{ikc}}}{\sum_{k=1}^K e^{V_{ikc}}} \text{ where } V_{ikc} = V_{ikc}^{NP} + V_{ikc}^P + V_{ikc}^R \quad (6)$$

To generate the classes, individual characteristics of the voters were used. We refer to the vector containing these characteristics as covariates. To determine the class-specific utility  $v_{ic}$  and the probability of class membership  $p_{ic}$ , the following formulas were applied:

$$v_{ic} = \alpha_c + \sum_j^J b_{cj} x_{ij} \quad (7)$$

and

$$p_{ic} = \frac{e^{v_{ic}}}{\sum_{c=1}^C e^{v_{ic}}} \quad (8)$$

where  $\alpha_c$  is the class intercept,  $b_{cj}$  are the class-specific coefficients and  $x_{ij}$  are the individual characteristics of the voters.

In order to observe the changes between rounds, it was necessary to make the classes fixed, that is, classes 1 and 2 correspond to the first round and classes 3 and 4 correspond to the second round. Then, to calculate the probability that voter  $i$  chooses alternative  $k$  in round  $t$ , one has to weight the probability that voter  $i$  chooses alternative  $k$  given that he belongs to class  $c$  ( $P_{ikc}$ ) with the probability that voter  $i$  actually belongs to class  $c$  ( $p_{ic}$ ):

$$\bar{P}_{ikt} = \sum_c^C P_{ikc} * p_{ic} \quad (9)$$

### 3.2 Government Performance

To measure the changes in voter behavior and assess the impact of these changes on government performance, marginal effects and relative marginal effects were calculated for both rounds.

For the generic coefficient variables, the marginal effects were calculated as follows:

- For the distances:

$$ME_{ic}^P = \frac{\partial P_{ikc}}{\partial D_{dik}} = P_{ikc} (1 - P_{ikc}) \beta_d \text{ where } D_{dik} = (y_{dik} - x_{di}) \quad (10)$$

- For party identification:

$$ME_{ic}^{NP} = \frac{\partial P_{ikc}}{\partial PI_{ik}} = P_{ikc} (1 - P_{ikc}) \alpha \quad (11)$$

For the alternative specific coefficient variables, the marginal effects were calculated as follows:

$$ME_{ic}^R = \frac{\partial P_{ikc}}{\partial Z_{ir}(\gamma_G)} = P_{ikc} \left( \delta_{kG} - \sum_{k=1}^K \delta_{kr} P_{ikc} \right) \quad (12)$$

These show how the probability  $P_{ikc}$  changes when there is a one unit change in the independent variables. In other words, they indicate how sensitive voters are to changes

in non-policy, policy and retrospective components. Then, similar to the estimation of the probabilities, the marginal effects for the first round ( $t = 1$ ) comprehend the marginal effects for classes 1 and 2. Likewise, to calculate the marginal effects for the second round ( $t = 2$ ), the marginal effects for classes 3 and 4 were used.

$$ME_{it}^{NP} = \left| \sum_{c=1}^C [(\sum ME_{ic}^{NP}) p_{ic}] \right| \quad (13)$$

$$ME_{it}^P = \left| \sum_{c=1}^C [(\sum ME_{ic}^P) p_{ic}] \right| \quad (14)$$

$$ME_{it}^R = \left| \sum_{c=1}^C [(\sum ME_{ic}^R) p_{ic}] \right| \quad (15)$$

The results are in absolute values because we were interested in evaluating the magnitude of the impact rather than the direction.

To evaluate the relative importance of the different voting motives, the relative marginal effects ( $RME$ ) were calculated for each voter  $i$  per round  $t$ :

$$RME_{it}^{NP} = \frac{ME_{it}^{NP}}{ME_{it}^{NP} + ME_{it}^P + ME_{it}^R} \quad (16)$$

$$RME_{it}^P = \frac{ME_{it}^P}{ME_{it}^{NP} + ME_{it}^P + ME_{it}^R} \quad (17)$$

$$RME_{it}^R = \frac{ME_{it}^R}{ME_{it}^{NP} + ME_{it}^P + ME_{it}^R} \quad (18)$$

### 3.2.1 Government Accountability

In democratic systems, the function of accountability implies that electoral processes serve as control mechanisms. Therefore, electoral competition should encourage governments to develop and implement efficient policies. In this sense, we assumed that government accountability is low when voters choose more non-policy oriented and viceversa. Thus, based on the RME we derived a government accountability index ( $GA$ ) for each round  $t$ .

$$RME_t^{NP} = \sum_{i=1}^n RME_{it}^{NP} \quad (19)$$

$$RME_t^P = \sum_{i=1}^n RME_{it}^P \quad (20)$$

$$RME_t^R = \sum_{i=1}^n RME_{it}^R \quad (21)$$

$$GA_t = \frac{RME_t^P + RME_t^R}{RME_t^{NP} + RME_t^P + RME_t^R} \quad (22)$$

where the policy and retrospective components are added up in order to compare policy vs. non-policy voting motives.

### 3.2.2 Government Capture

The implementation of biased policies is the result of high levels of government capture. Here we assume that the more policy oriented a voter chooses, the more importance he has for parties. In this sense, we first calculated the individual relative political weights for each round  $t$ :

$$g_{it} = \frac{ME_{it}^P}{\sum_{i=1}^n ME_{it}^P} \quad (23)$$

and to compare different groups from the electorate we estimated various government capture indices ( $GC$ ) for each round  $t$ .

$$GC_{(1vs2)t} = \frac{\frac{\sum_{i \in 1} g_{it}}{a_1}}{\frac{\sum_{i \in 2} g_{it}}{a_2}} \quad (24)$$

where  $a_1$  and  $a_2$  are the share of voters in group 1 and 2 respectively.

### 3.3 Nash Equilibrium

We estimated logit models where the error terms were assumed to be Type I extreme value distributed. Therefore, a Local Nash Equilibrium (LNE) could be found [Schofield, 2007]. To identify the policy positions where the incumbent party could maximize the probability  $P_{igt}$ , the First Order Condition (FOC) was derived based on the approach of Petri and Henning [forthcoming]:

$$\frac{\partial P_{igt}}{\partial y_{digt}} = \sum_i \sum_c p_{ic} \frac{\partial P_{igc}}{\partial y_{digt}} = 0 \quad (25)$$

$$\frac{\partial P_{igt}}{\partial y_{digt}} = \sum_i \sum_c p_{ic} \beta_{dc} P_{igc} (1 - P_{igc}) 2 (y_{digt} - x_{dit}) = 0 \quad (26)$$

$$\frac{\partial P_{igt}}{\partial y_{digt}} = \sum_i \sum_c p_{ic} \beta_{dc} P_{igc} (1 - P_{igc}) 2 (y_{dgt}^* - x_{dit}) = 0 \quad (27)$$

$$\sum_i \sum_c p_{ic} \beta_{dc} P_{igc} (1 - P_{igc}) y_{dgt}^* = \sum_i \sum_c p_{ic} \beta_{dc} P_{igc} (1 - P_{igc}) x_{dit} \quad (28)$$

for simplicity we denote:

$$\sum_c p_{ic} \beta_{dc} P_{igc} (1 - P_{igc}) = \bar{g}_{digt} \quad (29)$$

where  $\bar{g}_{digt}$  is the absolute political weight of voter  $i$  for the governmental party  $g$  for the issue  $d$  in round  $t$ .

$$y_{dgt}^* \left( \sum_i \bar{g}_{digt} \right) = \sum_i x_{dit} \bar{g}_{digt} \quad (30)$$

$$y_{dgt}^* = \sum_i \left[ x_{dit} \left[ \frac{\bar{g}_{digt}}{\left( \sum_i \bar{g}_{digt} \right)} \right] \right] \quad (31)$$

where  $y_{dgt}^*$  is the optimal political position for the governmental party  $g$  for the issue  $d$  in round  $t$  and  $\frac{\bar{g}_{digt}}{\left( \sum_i \bar{g}_{digt} \right)}$  is the relative political weight of voter  $i$  for the governmental party  $g$  for the issue  $d$  in round  $t$ .

The FOC  $\frac{\partial P_{igt}}{\partial y_{digt}} = 0$  was satisfied, meaning that on these policy positions the ruling party maximizes the probability of winning the elections.

The next step, was to confirm if the Second Order Condition (SOC) was satisfied. In this study, the Hessian matrix was negative semi-definite, implying that a LNE was found. The SOC was derived as follows:

$$\frac{\partial^2 P_{igt}}{\partial y_{digt} \partial y_{eigt}} = \sum_i \sum_c p_{ic} P_{igc} (1 - P_{igc}) \left[ (1 - 2P_{igc}) \frac{\partial \hat{V}_{igc}}{\partial y_{digt}} \frac{\partial \hat{V}_{igc}}{\partial y_{eigt}} + \frac{\partial^2 \hat{V}_{igc}}{\partial y_{digt} \partial y_{eigt}} \right] \quad (32)$$

Thereby, it holds:

$$\sum_i \sum_c \frac{\partial^2 V_{igc}}{\partial y_{digt} \partial y_{eigt}} < 0 \quad \forall i, \forall d = e, \quad \frac{\partial^2 V_{igc}}{\partial y_{digt} \partial y_{eigt}} = 0 \quad \forall i, \forall d \neq e$$

## 4 Data

We designed two rounds of voter surveys including questions on socio-demographic characteristics, voting behavior, policy positions and network characteristics. The first and second round of interviews were applied in Senegal on the same day in January 2019 by the Senegalese Agricultural Research Institute. These were conducted face-to-face in the respective dialect or language of the interviewees. The sample contains 1000 individuals from five different regions across the country. After data cleaning, 844 complete observations remained for the analysis of voters' behavior. The observations with missing values in the variables choice-pre and choice-post were eliminated.

### 4.1 Dependent Variable

In a probabilistic voter model the dependent variable is usually the actual or intended vote choice. Given the approach of this paper, the interviewees had to answer, in both rounds, to the following question:

*If a presidential election were held tomorrow, which party would you vote for?*

To include the alternative Abstention, we followed the approach of Thurner and Eymann [2000]. They explain that the number of people who decide not to participate in an election is usually underestimated in surveys due to effects of social (un)desirability. Therefore, we have considered the interviewees who revealed their intention of abstaining, as well as, the potential non-voters. In other words, we have taken into account those respondents who answered "Will not vote" and "Don't know" as part of the Abstention alternative.

Table 2 shows the results of both surveys, as well as, the official presidential election outcome. Even though none of the surveys' results are close to the actual election outcome, the party in power BBY is a clear winner. For the analysis in the empirical section we consider all parties and Abstention. Then, the whole set of alternatives is:  $K = \{\text{BBY, Rewmi, Pastef, PUR, Niang and Abstention}\}$ .

Table 2: Senegalese presidential election results

	BBY	Rewmi	Pastef	PUR	Niang	Abstention
Presidential election 2019	38.48%	13.55%	10.35%	2.69%	0.98%	33.95%
Own survey 2019 (First round)	70.46%	3.72%	5.30%	1.13%	0.34%	19.05%
Own survey 2019 (Second round)	73.53%	3.96%	5.32%	1.02%	0.34%	15.84%

Source: [Constitutional Council of Senegal, 2019], own survey



## 4.2 Independent Variables

To explain the dependent variable, only independent variables with less than 10% of missing values were considered. Furthermore, the variables with missing values were imputed with the mean value, except for the policy positions that were imputed via linear regressions. For this study, they were divided into policy, retrospective and non-policy.

**Policy Variables:** Respondents were asked about their policy positions and their perceived policy positions of the parties on nine different issues. The positions were asked, based on a five-point scale, on the following issues:

1. Social
2. Ideology
3. Investment in: Public services vs. Economic growth (PSvsEG)
4. Investment in: Education and health services vs. Insecurity and violence reduction (EHvsIV)
5. Development of: Agricultural sector vs. Industrial sector (AGRvsIND)
6. Increase productivity of: Food crops vs. Cash crops (FoodvsCash)
7. Benefit the agricultural sector through: Technological progress vs. Access to markets (TPvsAM)
8. Agricultural sector should be: Taxed vs. Protected (TaxvsProtect)
9. Accountability

Then, distances for the parties were calculated as the difference between the voters' own policy position and the perceived policy position of the parties. In the case of the alternative Abstention, the distance was set to 0. Therefore, the utility of non-voting is greater than the utility of voting and hence the voting paradox is fulfilled.

**Retrospective Variables:** Questions of satisfaction with government performance were asked in both rounds. More specifically, there were questions addressing the level of satisfaction with the performance of the current president, as well as, the implementation of agricultural policies by the government.

**Non-policy Variables:** A whole set of sociodemographic variables such as gender, rurality, marital status and education was included, as well as, other variables measuring the level of trust of voters on different types of institutions. Moreover, regions and ethnic

groups were coded as dummy variables. For the specific characteristics of the candidates, we performed a factor analysis to reduce the number of variables resulting in a two-factors solution that we called factor "Image" and factor "Origin". Furthermore, to measure party loyalty, the variables Party ID were created as alternative specific dummies, where "1" indicates party affiliation for that specific party and "0" otherwise. In the case of the alternative Abstention, the variable was set to "0" since there is no such thing as party identification for Abstention.

Based on Mattes [2008], a Lived Poverty Index (LPI) was estimated, where the level of poverty is high if it is closer to 5 and low if it is closer to 0. Additionally, we created the dummy variables "treated", "positive", "negative" and "placebo" regarding the type of treatment. Finally, a political Knowledge Index (PKI) was designed based on the answers of the voters to a number of exogenous questions about political knowledge. Then, we created a dummy variable that defines if the voter is informed or uninformed.

## 5 Empirical Application and Results

### 5.1 Latent Class Model

With the data described in the former section, we estimated a probabilistic voter model with latent class using a panel data set to determine which factors influence and change voting behavior in Senegal. This latent class model (LCM) approach takes into account the heterogeneity of the data, which is relevant because voting motives differ across voters. The estimated LCM consists of two sub-models, the model for choices that determines which alternative is chosen and the model for classes that defines class membership. In the former, all variables that changed between rounds and the variable Party Identification were included, whereas in the latter, all variables that did not change between rounds were considered. As it was mentioned in the methodology section, the classes were fixed to see the changes between rounds, that is, classes 1 and 2 correspond to the first round and classes 3 and 4 correspond to the second round.

Different model specifications were estimated and the goodness of fit was measured with the Akaike Information Criterion (AIC). The models included only the significant independent variables chosen via the z-score test. In this paper we show the results of the two best models which are displayed in tables 3 and 4. However, for simplicity, present the entire analysis only for Model 1.

Table 3: Model 1 - Latent Class Model with Panel Data

		AIC = 4274.7902		Class 1 (0.4423)		Class 2 (0.0577)		Class 3 (0.4566)		Class 4 (0.0434)		
VARIABLES		Coeff.	z-value	Coeff.	z-value	Coeff.	z-value	Coeff.	z-value	Coeff.	z-value	
Model for Choices	<i>Attributes</i>	Abstention:(intercept)	3.3521	4.2739 ***	0.3105	0.2166	2.2568	4.3481 ***	-3.2386	-0.1268		
		BBY:(intercept)	1.7450	2.3241 *	-8.7911	-1.6717 .	0.8109	1.6174	0.5391	0.0210		
		Niang:(intercept)	-1.5231	-0.6657	-1.6990	-0.4296	-1.3392	-0.8646	-11.0344	-0.0867		
		Pastef:(intercept)	-1.0477	-0.8765	5.7851	2.4529 *	0.1731	0.2170	3.7602	0.1471		
		PUR:(intercept)	-0.1366	-0.1128	0.3934	0.1443	-1.8141	-1.6230	-5.2329	-0.1974		
		Rewmi:(intercept)	-2.3897	-2.0041 *	4.0011	1.9985 *	-0.0875	-0.0916	15.2065	0.5781		
		PSvsEG	-0.0265	-0.8357	-0.3246	-1.7913 .	0.0377	1.2372	-1.6306	-1.8658 .		
		FoodvsCash	-0.0561	-1.5531	-0.5460	-2.1038 *	-0.0633	-2.0617 *	-1.6810	-1.8981 .		
		Ideology	0.0282	0.6458	-0.4729	-2.3786 *	-0.0013	-0.0352	-0.9580	-1.7646 .		
		Party_ID	6.6453	6.9021 ***	7.8855	2.4386 *	6.2240	10.0347 ***	-3.7839	-1.3712		
	<i>Predictors</i>	Abstention:Satisfaction_president	-0.3949	-1.2144	0.6396	1.4274	-0.1153	-0.5486	1.3419	0.1617		
		BBY:Satisfaction_president	0.6818	2.2169 *	1.3344	1.1531	0.8856	4.3668 ***	1.2000	0.1440		
		Niang:Satisfaction_president	-0.3822	-0.2880	0.6318	0.5114	-0.3665	-0.5196	1.6750	0.0405		
		Pastef:Satisfaction_president	0.0348	0.0729	-1.5185	-1.9046 .	-0.2835	-0.8159	-0.8992	-0.1079		
PUR:Satisfaction_president		-0.1543	-0.3252	-0.2750	-0.2526	0.2982	0.7393	1.6735	0.1949			
Rewmi:Satisfaction_president		0.2148	0.4552	-0.8123	-1.1693	-0.4185	-0.9913	-4.9913	-0.5801			
Model for Classes	<i>Covariates</i>	classes:intercept	0.6739	1.7509 .	0.2227	0.3613	0.9482	2.4698 *	-1.8448	-2.3120 *		
		classes:Trust_president	0.3207	4.3349 ***	-0.3851	-3.0394 *	0.2738	4.0480 ***	-0.2095	-1.7308 .		
		classes:LPI	-0.1791	-1.8370 .	-0.0204	-0.1275	-0.2119	-2.2062 *	0.4114	2.0849 *		
		classes:factor_char_image	-0.3110	-3.9941 ***	0.2189	1.6799 .	-0.3114	-3.8461 ***	0.4035	2.5727 *		

\*\*\*p&lt;0.001, \*\*p&lt;0.01, \*p&lt;0.05, . p&lt;0.10

Source: Own estimation

Table 4: Model 2 - Latent Class Model with Panel Data

		<b>AIC = 4281.6220</b>		<b>Class 1 (0.4389)</b>		<b>Class 2 (0.0611)</b>		<b>Class 3 (0.4518)</b>		<b>Class 4 (0.0482)</b>	
<b>VARIABLES</b>		<b>Coeff.</b>	<b>z-value</b>	<b>Coeff.</b>	<b>z-value</b>	<b>Coeff.</b>	<b>z-value</b>	<b>Coeff.</b>	<b>z-value</b>	<b>Coeff.</b>	<b>z-value</b>
<b>Model for Choices</b>	<i>Attributes</i>	Abstention:(intercept)	3.1506	4.4931 ***	-0.8215	-0.2234	1.9732	3.8387 ***	-1.7868	-0.0664	
		BBY:(intercept)	1.5194	2.4380 *	-9.5455	-1.6580 .	0.5900	1.2100	2.3040	0.0853	
		Niang:(intercept)	-1.9535	-1.1498	-1.5656	-0.0916	-1.5425	-0.9868	-9.6910	-0.0721	
		Pastef:(intercept)	-0.7120	-0.6644	6.4115	1.5359	0.4050	0.5272	4.6385	0.1721	
		PUR:(intercept)	-0.2448	-0.2228	1.0923	0.2359	-1.9998	-1.7592 .	-3.4059	-0.1249	
		Rewmi:(intercept)	-1.7597	-1.5702	4.4288	1.1490	0.5741	0.7060	7.9412	0.2935	
		PSvsEG	-0.0282	-0.8586	-0.4604	-2.6375 **	0.0401	1.2800	-2.7491	-2.2451 *	
		FoodvsCash	-0.0616	-1.6388	-0.5841	-2.2111 *	-0.0593	-1.8338 .	-0.8361	-2.1035 *	
		TPvsAM	0.0127	0.4139	-0.5145	-2.4933 *	-0.0035	-0.1211	-0.2740	-1.6791 .	
		Ideology	0.0290	0.6468	-0.5119	-2.5895 **	0.0012	0.0301	-0.7011	-1.6273	
	Party_ID	6.3380	8.2442 ***	9.3519	3.4598 ***	6.3038	9.2443 ***	-4.5043	-1.5453		
<b>Model for Choices</b>	<i>Predictors</i>	Abstention:Satisfaction_president	-0.4281	-1.7649 .	1.2401	0.5723	-0.0225	-0.1058	0.6408	0.0730	
		BBY:Satisfaction_president	0.6897	3.3489 ***	1.5614	0.6594	0.9728	4.8071 ***	0.6727	0.0764	
		Niang:Satisfaction_president	-0.0108	-0.0169	-1.0038	-0.0949	-0.2883	-0.4050	1.0083	0.0230	
		Pastef:Satisfaction_president	-0.0716	-0.1856	-1.2438	-0.5518	-0.3491	-1.0353	-1.4409	-0.1637	
		PUR:Satisfaction_president	-0.1797	-0.4459	-0.0604	-0.0245	0.3440	0.8258	1.2630	0.1422	
		Rewmi:Satisfaction_president	0.0005	0.0013	-0.4935	-0.2245	-0.6570	-1.6206	-2.1440	-0.2426	
<b>Model for Classes</b>	<i>Covariates</i>	classes:intercept	0.1325	0.6347	0.1089	0.3500	0.3228	1.7660 .	-0.5641	-1.7990 .	
		classes:Trust_president	0.2993	4.5215 ***	-0.3560	-3.1316 **	0.2503	4.1650 ***	-0.1936	-1.8043 .	

\*\*\*p&lt;0.001, \*\*p&lt;0.01, \*p&lt;0.05, . p&lt;0.10

Source: Own estimation

Among the attributes in the model 1, are the alternative specific constants, that absorb all information not explicitly incorporated in the model. Also included, are the policy issues PSvsEG, FoodvsCash and Ideology, which are significant with negative coefficients for at least one class. This means that the greater the distance between the voter's position and the perceived position of the party, the less is the utility and the probability to choose that party. In the case of the alternative Abstention, the utility of non-voting is always greater than the utility of voting, which is consistent with the voting paradox. The last attribute was Party Identification, that turned out to be significant for three classes with positive coefficients. This means that if a voter feels close to a political party, the probability that he will chooses the corresponding candidate increases. On the other hand, those voters that are not close to any political party, do not increase their utility by casting a vote for any candidate, hence, they rather abstain.

As regards the predictors, the variable Satisfaction with President is significant for classes 1 and 3 with positive coefficients for the alternative BBY which is the incumbent party. This is consistent with the theory, as the greater the satisfaction with the president, the greater the probability to support the incumbent in the elections. Likewise, for class 2 the variable is significant for Pastef with negative coefficient, meaning that the greater the satisfaction with the president, the less the probability to choose this alternative.

Concerning the covariates, the intercepts for classes 1 and 3 are significant with positive coefficients which reflects the existence of bias towards belonging to class 1 in the first round and class 3 for the second round. Similarly, the probability to belong to class 1 in the first round and class 3 in the second round increases when voters trust the president, when their LPI is not high and when the image of the candidate is not relevant to them. The size of the class memberships is approximately as follows: Class 1: 44.23 (%) , Class 2: 5.77 (%) , Class 3: 45.66 (%) and Class 4: 4.34 (%). This evidences a weak heterogeneity.

With respect to the attributes and predictors in Model 2, the results are very similar. Nevertheless, it is worth noting that the policy issue TPvsAM also resulted significant. Furthermore, the variable Satisfaction with President turned out to be significant with negative coefficient for the alternative Abstention for class 1, which indicates that the greater the satisfaction with the president, the less likely is that the voter will abstain. Regarding the covariates, the variable Trust President was the only significant variable, which suggests a higher probability to belong to class 1 for the first round and class 3 for the second round when voters trust the president.

Finally, for model 1 we estimated the utilities and probabilities. Table 5 shows the mean probability for each alternative and round. As expected, there was a change from the first round to the second round. Notwithstanding, it is clear that in both rounds the incumbent party BBY had the highest probability of winning the elections.

Table 5: Mean Probabilities

<b>Alternatives</b>	<b>Round 1</b>	<b>Round 2</b>
Abstention	18.07%	16.44%
BBY	71.72%	73.71%
Niang	0.36%	0.34%
Pastef	5.22%	4.28%
PUR	1.05%	0.97%
Rewmi	3.58%	4.26%

Source: Own estimation

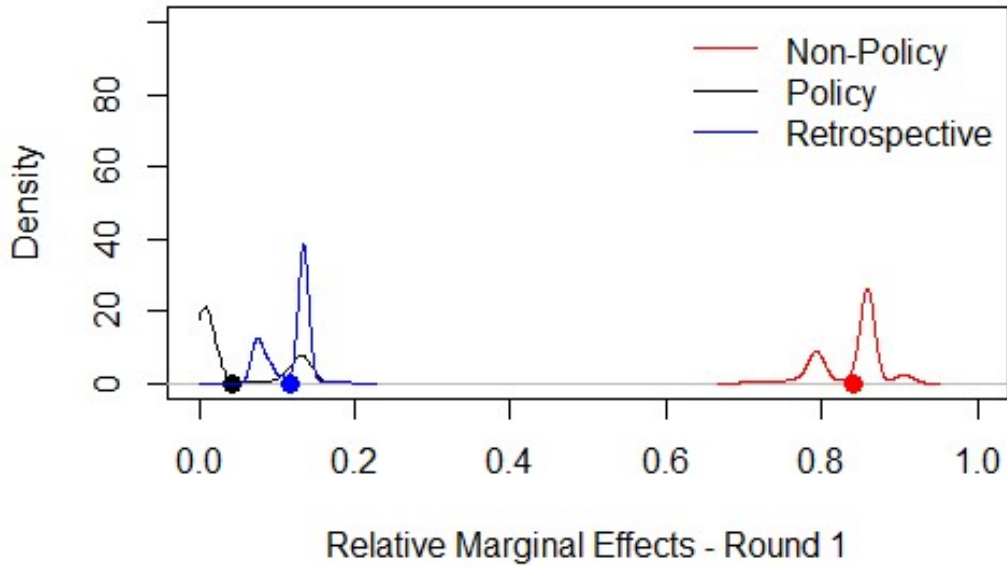
## 5.2 Government Performance Indicators

As mentioned in the methodology section, the probabilistic voter model is a logistic regression model. Therefore, its coefficients only allow to measure the direction of the impact, but to evaluate the magnitude of such impact, marginal effects (ME) had to be calculated. In the case of the LCM, these can be calculated only for the variables included in the model for choices.

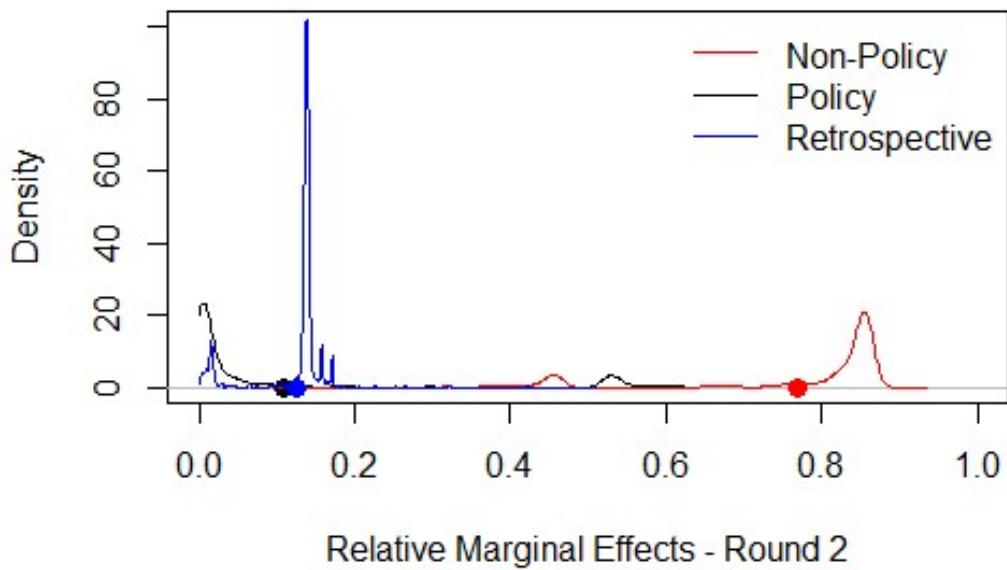
In addition to ME, the relative marginal effects (RME) for each voting motive and each round were calculated. As displayed in figure 1 the RME of the non-policy component is the highest in both rounds. On the contrary, the policy voting motive is the less relevant. However, it is important to notice that after the information signal, the RME of the non-policy component decreased from 84% in round 1 to 76,84% in round 2. On the other hand, the RME of the policy voting motive increased from 4,33% to 10,74%. Finally, the RME of the retrospective voting motive had a slight increment as it went from 11,67% to 12,42%. As expected, the information signal changed the voting behavior as voters chose more policy and retrospectively oriented in the second round. Even when we look at the treatments separately, the importance of the non-policy component decreased, whereas, the importance of the policy and retrospective components increased significantly. The previous analysis applies even to the recipients of the placebo signal, which lead us to think that the information contained in that video did not fulfill its mission to keep unchanged the intended vote choice of the interviewees.

Figure 1: Relative Marginal Effects

(a) Round 1



(b) Round 2



Source: Own estimation

Additionally, we analyzed the impact of the information signal on informed and uninformed voters, where similar results were observed. Table 6 shows that the importance of the non-policy voting motive is higher for the uninformed group. Also, the information signal had a higher impact on the informed group, than it had on the uninformed group.

Table 6: RME Informed vs. Uninformed

	<b>Round 1</b>	<b>Round 2</b>	<b>p-value</b>
<b>Non-Policy</b>			
<b>Informed</b>	83.76%	75.28%	<2.2e-16
<b>Uninformed</b>	84.37%	79.19%	0.0000
<b>Policy</b>			
<b>Informed</b>	4.91%	12.55%	0.0000
<b>Uninformed</b>	3.45%	8.01%	0.0000
<b>Retro</b>			
<b>Informed</b>	11.33%	12.17%	0.0017
<b>Uninformed</b>	12.18%	12.79%	0.0140

Source: Own estimation

### 5.2.1 Government Accountability

Governments act accountable when they implement policies serving the needs and desires of voters rather than favoring special interest of lobbying groups or intrinsic policy preferences of politicians. Based on the estimated model, the accountability indices were calculated for each round and also for each type of treatment as can be seen on table 7. The low index of accountability for all cases suggests that the function of elections of holding accountable the government is not fulfilled. However, it is important to highlight that the index increased for the entire sample, as well as, for each treatment group after the delivery of the information signal. Also relevant, is the fact that the biggest change was the one experienced by the group that received the positive treatment.

Table 7: Accountability indices

	<b>Round 1</b>	<b>Round 2</b>
Whole sample	16.00%	23.16%
Positive	16.17%	23.69%
Negative	15.94%	22.75%
Placebo	15.89%	23.06%

Source: Own estimation

### 5.2.2 Government Capture

Electoral competition can be biased in favor of special interests. To measure the political weight of certain groups of voters, government capture indices were calculated. Thus, we



could identify which groups were being favored at the expense of others. In table 8 is evident that for round 1, the rural population captures the urban, men capture women, young people capture the old, uneducated people capture the educated, married people capture people with other marital status, the muslim religion captures other religions, farmers capture non-farmers, residents of the region of Saint Louis capture residents of other regions and people belonging to the ethnic group Pulaar Toucouleur captures other ethnic groups. However, for round 2 we can see that in two cases the direction of the capture index changed. More specifically, the old people capture now the young, and people belonging to other ethnic groups capture those belonging to the Pulaar Toucouleur ethnic group.

Table 8: Capture indices

	Round 1	Round 2
Rural vs. Urban	1.0901	1.0601
Women vs. Men	0.8889	0.8133
Old vs. Young	0.8738	1.1901
Educated vs. Uneducated	0.8115	0.8656
Married vs. Other	1.1363	1.2728
Muslim vs. Other	1.3247	1.0170
Farmer vs. Non Farmer	1.1403	1.3025
Saint Louis vs. Other	1.2390	1.7352
Pulaar Toucouleur vs. Other	1.0820	0.7265

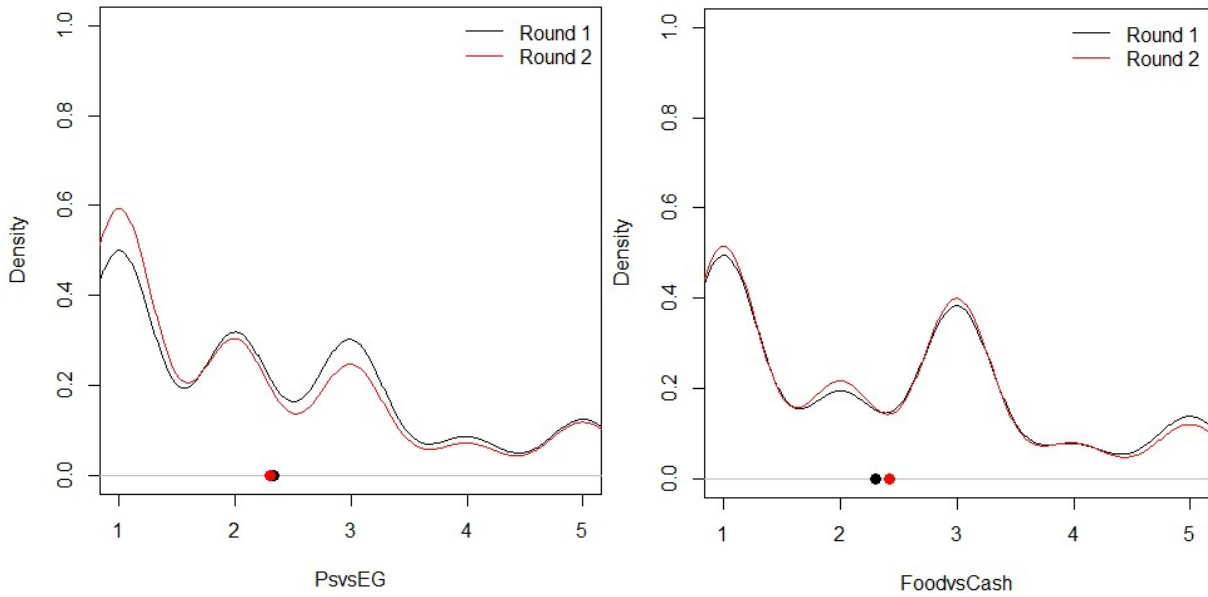
Source: Own estimation

Government capture indices were also estimated per type of treatment and we could see slightly different results between them. Tables 9, 10 and 11 display such results in the appendix.

## 6 Nash Equilibrium

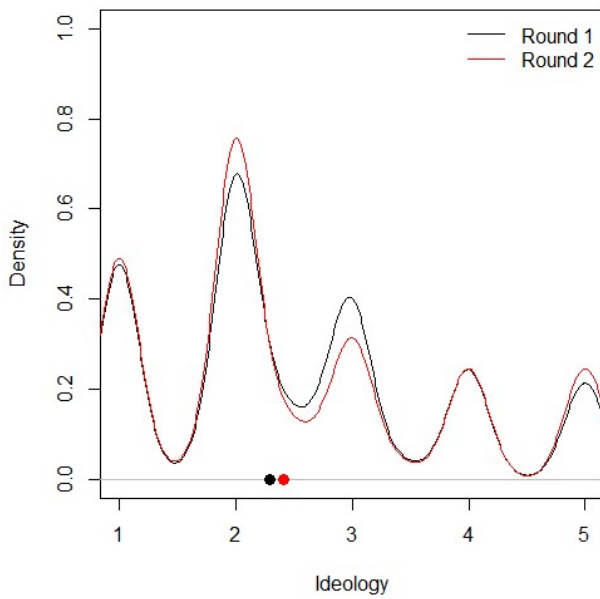
Based on the FOC, we identified the optimal policy positions of the incumbent party BBY for the issues PSvsEG, FoodvsCash and Ideology. The results are shown in figures 3. The curves in the Kernel distribution reflect the own policy positions of the voters, whereas the dots reflect the optimal policy positions of BBY.

Figure 3: Optimal Policy Positions of the Incumbent Party BBY



(a) Public Services vs. Economic Growth

(b) Food Crops vs. Cash Crops



(c) Socialism vs. Capitalism

Source: Own estimation

For the issue PSvsEG, there was a significant change for the voters' policy positions towards spending most of tax revenues in public services rather than using them to further improve economic growth. This in turn resulted in a change in the optimal policy position of BBY in the same direction from 2.3338 to 2.3058. As regards the issue FoodvsCash, the shift of the voters' positions implied a shift in the optimal position of BBY, from 2.3036 to 2.4168, towards increasing productivity of cash crops and securing a greater income.

Finally, with respect to the issue Ideology, there was a change in the voters' position, and consequently, the optimal position of BBY had a change going from 2.2931 to 2.4107 from left/Socialism to right/Capitalism.

After we estimated the optimal policy positions of the incumbent party BBY for these three issues, we confirmed that the SOC was fulfilled, i.e. the Hessian matrix was negative semi-definite. In other words, we empirically controlled the FOC and SOC for the ruling party to verify that we estimated a local Nash-Equilibrium.

In order to test the stability of the model, we performed separate estimations for each round. The results are presented in the appendix. Nevertheless, it is important to highlight the increase from 71.89% to 73.55% with a p-value = 0.22 in the probability of winning the election for BBY when using its optimal positions in the three significant policy issues. This means that the treatment caused a change in the Nash-Equilibrium and the information signal resulted favorable to the government in Senegal.

## 7 Summary and Conclusions

Senegal is a republic with a presidential system. The country has been considered for long as one of Africa's model democracies with a tradition of stable governments and civilian rule. There are more than 80 political parties and the unicameral National Assembly has 150 members elected separately from the President. Presidential elections are carried out every five years and the main political parties are the ruling coalition Benno Bok Yakaar (BBY), Rewmi, the Party of Senegal for work, ethics and fraternity (Pastef) and the Party of Unity and Rally (PUR). By the time the data was collected in February 2019, the president Macky Sall was running for reelection.

In this study, we performed a random experiment to deliver information to a group of voters in Senegal prior to the presidential election. The experiment comprised a series of videos containing information about the performance of the government in the agricultural sector. With the data collected from the experimental study, we proceeded to estimate a probabilistic voter model with latent class using a panel data set to determine which factors influence and change voting behavior in Senegal. With this approach we took into account the heterogeneity of the data, as voting motives differ across voters. The Latent Class Model (LCM) allowed us to determine which alternative is chosen, as well as, to identify two classes of voters for each round, based on their individual characteristics. In the optimal model, policy, non-policy and retrospective variables had a significant influence when making the decision. Probabilities were calculated for each alternative and, as expected, there were changes in the probabilities for some of them between rounds. For each round our surveys showed that the highest probability of being elected was for the

ruling party (BBY). Although, our estimations differ in terms of proportions compared to the official electoral outcome, they are consistent with the actual results.

With respect to the relative marginal effects (RME) of the three voting motives, the non-policy component is the most important motive in both rounds. Nevertheless, a significant decrease on such relevance was observed after receiving the information signal. Conversely, the policy and retrospective voting components experienced an increase in relevance from round 1 to round 2. From these results we concluded that the information signal did change the behavior of voters as they chose more policy and retrospectively oriented in the second round. Additionally, although the results obtained were similar, when looking at the impact of the information signal on informed and uninformed voters, it is important to highlight the fact that such impact was higher on informed voters. The next step was to estimate the index of accountability for each round and type of treatment. The low results of such indices indicate that the electorate in Senegal do not hold accountable the government. Notwithstanding, it is worth noting that the index for the whole sample and for each treatment group, increased after receiving the information signal. Likewise, capture indices were calculated to identify those groups favored by the government at the expense of others. Again, we observed changes in the results for each round and type of treatment.

Finally, based on the FOC and SOC, we calculated the optimal policy positions of the incumbent party BBY for the policy issues PSvsEG, FoodvsCash and Ideology. At these positions, the probabilities of winning the elections for BBY are maximized. The information signal changed the policy position of voters on the issues already mentioned. This in turn, encourages the ruling party to change its positions accordingly. Consequently, if BBY wants to maximize its probability of winning the elections, it should make changes on its policy platform.

In conclusion, a high degree of policy and retrospective voting behavior, increases the incentives for governments to implement efficient policies. Voter behavior in turn, can be influenced or changed by means of information signals, as it was demonstrated with our political experiment. In this regard, the quality of the information is crucial, as well as, the level of political knowledge of the audience receiving the signal. More specifically, the more informed was the voter, the higher was the impact of the information signal on his voting behavior.

# Appendix

Figure 5: Senegal Scorecard

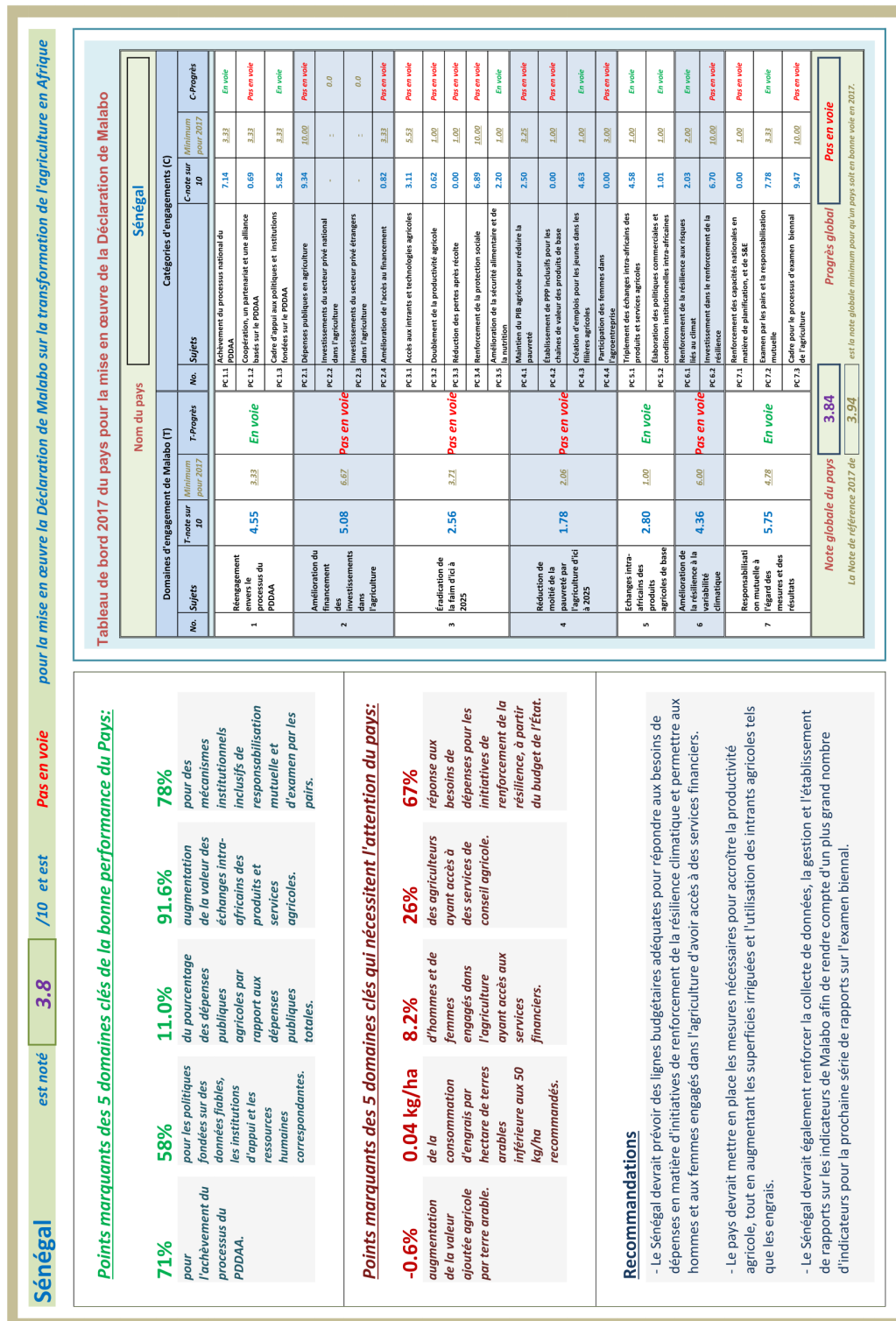


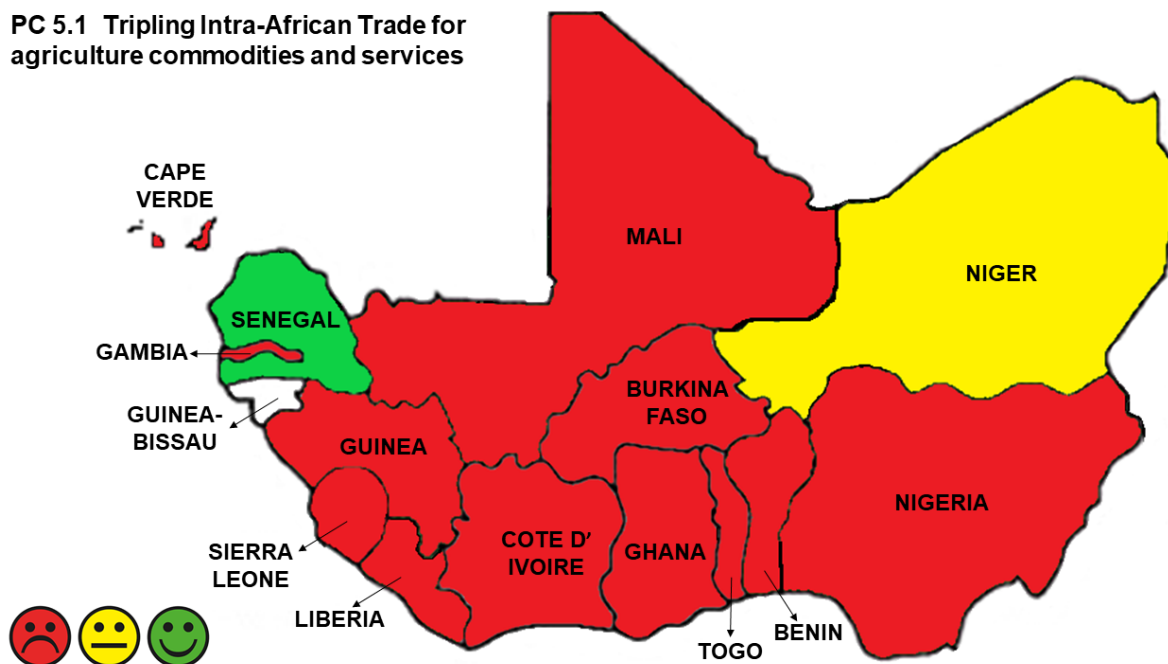
Figure 6: Indicators' scores and thresholds

	BENIN	BURKINA FASO	CAPE VERDE	COTE D'IVOIRE	GAMBIA	GHANA	GUINEA	GUINEA-BISSAU	LIBERIA	MALI	NIGER	NIGERIA	SENEGAL	SIERRA LEONE	TOGO
1.1	8.57	4.29	7.14	10.00	7.14	5.71	7.14			8.79	10.00	4.29	7.14	5.71	10.00
1.2	7.88	6.45	7.02	5.76	4.61	6.15	3.30			4.80	9.20	8.67	0.69	0.83	7.77
1.3	8.08	6.11	3.55	9.84	5.95	8.75	6.72			10.00	6.67	6.67	5.82	0.00	6.85
2.1	5.24	7.45	7.41	3.19	3.51	8.65	4.20			4.52	4.25	4.25	9.34	3.17	6.26
2.2	-	-	-	-	-	-	-			-	-	-	-	-	-
2.3	-	-	-	-	-	-	-			-	-	-	-	-	-
2.4	0.68	0.37	0.00	0.50	0.00	0.00	0.00			0.70	0.00	5.96	0.82	0.42	4.02
3.1	2.79	5.21	4.95	2.44	4.89	5.90	3.27			4.56	0.29	0.37	3.11	3.31	3.34
3.2	2.16	0.08	0.00	1.10	0.23	0.72	0.84			0.86	0.58	0.13	0.62	0.48	0.50
3.3	0.00	0.00	0.00	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00	1.76
3.4	8.81	3.40	1.44	0.80	0.00	0.00	2.41			10.00	0.00	1.40	6.89	0.00	0.00
3.5	1.67	2.40	0.00	2.01	0.68	3.33	0.06			2.67	3.22	0.00	2.20	0.00	0.87
4.1	3.12	4.61	1.19	2.62	0.00	2.07	1.22			3.00	2.80	0.00	2.50	1.60	2.58
4.2	0.00	0.00	10.00	10.00	0.00	10.00	0.00			10.00	0.00	0.00	0.00	0.00	0.00
4.3	0.00	0.00	6.33	0.00	10.00	0.00	0.00			10.00	1.00	0.00	4.63	10.00	0.00
4.4	1.64	10.00	0.00	4.37	0.00	0.00	0.26			0.00	0.00	0.00	0.00	0.00	6.43
5.1	0.15	0.10	0.00	0.00	0.00	0.00	0.00			0.65	1.83	0.67	4.58	0.00	0.00
5.2	6.88	6.89	8.20	0.00	7.09	2.22	6.74			7.15	5.00	6.81	1.01	0.00	8.31
6.1	0.03	3.75	8.33	0.10	1.17	0.04	9.21			3.90	0.00	0.00	2.03	0.06	8.52
6.2	6.67	6.67	6.67	6.67	6.67	7.13	0.00			6.67	6.67	6.67	6.70	0.00	6.67
7.1	6.18	0.00	0.00	0.00	0.00	0.00	2.31			10.00	0.00	0.00	0.00	0.00	0.00
7.2	8.33	6.94	6.67	6.39	0.00	9.44	4.72			10.00	7.22	4.44	7.75	0.00	7.78
7.3	9.43	9.70	9.41	9.61	9.50	9.91	8.92			9.82	9.02	8.93	9.47	9.07	9.52

Source: Own source

Figure 7: Map of Good Performance

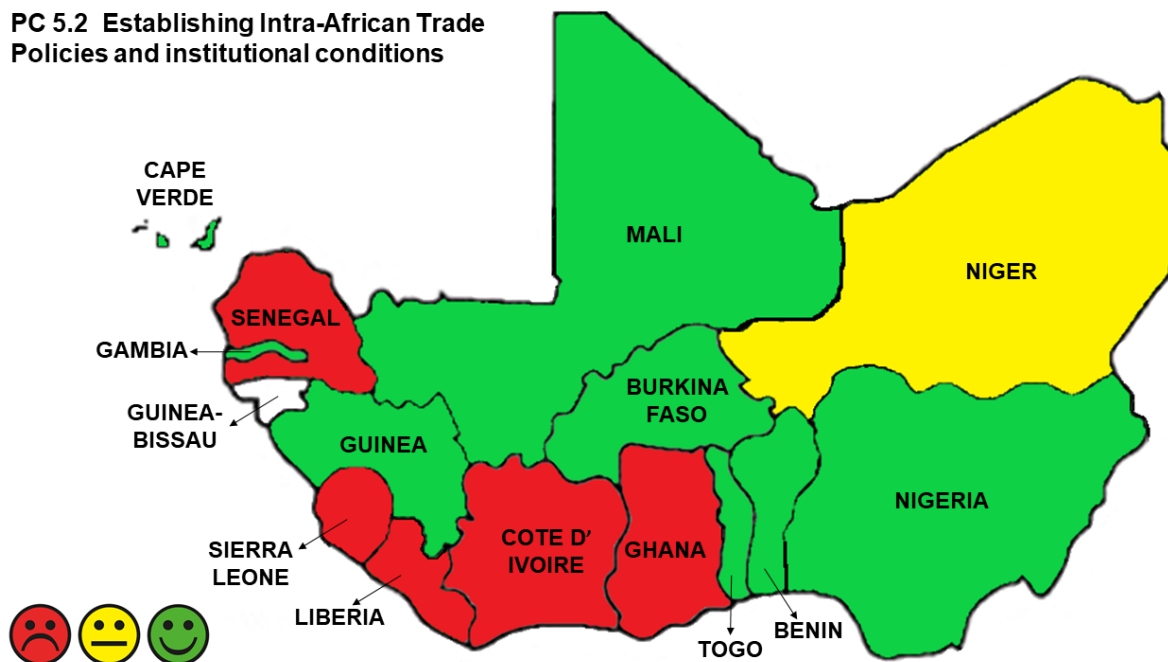
**PC 5.1 Tripling Intra-African Trade for agriculture commodities and services**



Source: Own source

Figure 8: Map of Bad Performance

**PC 5.2 Establishing Intra-African Trade Policies and institutional conditions**



Source: Own source

Table 9: Capture indices for Positive Treatment

<b>Positive Treatment</b>	<b>Round 1</b>	<b>Round 2</b>
Rural vs. Urban	1.3755	1.1970
Women vs. Men	0.8741	0.7779
Old vs. Young	0.9627	1.4624
Educated vs. Uneducated	0.7472	1.2853
Married vs. Other	1.2356	1.2560
Muslim vs. Other	1.2886	0.8142
Farmer vs. Non Farmer	1.1562	1.6415
Saint Louis vs. Other	1.5568	1.4505
Pulaar Toucouleur vs. Other	1.1622	0.7819

Source: Own estimation

Table 10: Capture indices for Negative Treatment

<b>Negative Treatment</b>	<b>Round 1</b>	<b>Round 2</b>
Rural vs. Urban	0.8530	1.1370
Women vs. Men	0.9876	0.9259
Old vs. Young	0.8926	0.9098
Educated vs. Uneducated	0.8291	0.6811
Married vs. Other	1.4227	1.7249
Muslim vs. Other	1.1856	3.0503
Farmer vs. Non Farmer	1.0491	1.0846
Saint Louis vs. Other	0.9502	1.5081
Pulaar Toucouleur vs. Other	0.9513	0.7331

Source: Own estimation



Table 11: Capture indices for Placebo Treatment

<b>Placebo Treatment</b>	<b>Round 1</b>	<b>Round 2</b>
Rural vs. Urban	1.1050	0.9026
Women vs. Men	0.8171	0.7621
Old vs. Young	0.7650	1.1330
Educated vs. Uneducated	0.8635	0.5787
Married vs. Other	0.8676	1.0192
Muslim vs. Other	1.8623	0.8225
Farmer vs. Non Farmer	1.2122	1.1868
Saint Louis vs. Other	1.2382	2.3785
Pulaar Toucouleur vs. Other	1.1395	0.6717

Source: Own estimation

Table 12: Model 1 - Latent Class Model Pre

		AIC = 991.6471	Class 1 (0.7114)		Class 2 (0.2886)		
VARIABLES			Coeff.	z-value	Coeff.	z-value	
Model for Choices	<i>Attributes</i>	Abstention:(intercept)	4.2939	1.7413	0.5885	0.7624	
		BBY:(intercept)	1.6162	0.7055	0.1380	0.1623	
		Niang:(intercept)	-5.2956	-0.5013	-3.1480	-1.2148	
		Pastef:(intercept)	-0.2549	-0.0841	1.6658	2.0877	*
		PUR:(intercept)	-1.3721	-0.4552	-0.3579	-0.2580	
		Rewmi:(intercept)	1.0125	0.2066	1.1136	1.4065	
		PSvsEG	0.0574	0.8937	-0.1728	-2.6754	**
		FoodvsCash	-0.0268	-0.4393	-0.1764	-1.9599	.
		Ideology	0.0854	0.8696	-0.0790	-1.0183	
	Party_ID	14.1557	1.8741	2.5418	4.0494	***	
	<i>Predictors</i>	Abstention:Satisfaction_president	-0.3469	-0.3242	0.3909	1.4573	
		BBY:Satisfaction_president	1.2987	1.2900	0.5141	1.5737	
		Niang:Satisfaction_president	0.6045	0.1412	0.4695	0.5538	
		Pastef:Satisfaction_president	0.2919	0.2431	-0.6343	-1.7181	.
		PUR:Satisfaction_president	0.6432	0.5553	-0.3602	-0.4520	
Rewmi:Satisfaction_president		-2.4913	-0.9271	-0.3801	-1.1145		
Model for Classes	<i>Covariates</i>	classes:intercept	-0.0853	-0.2081	0.0853	0.2081	
		classes:Trust_president	0.2901	3.0131	-0.2901	-3.0131	**
		classes:LPI	-0.1321	-1.3731	0.1321	1.3731	
		classes:factor_char_image	-0.1861	-2.0168	0.1861	2.0168	*

\*\*\*p<0.001, \*\*p<0.01, \*p<0.05, . p<0.10

Source: Own estimation

Table 13: Model 1 - Latent Class Model Post

		AIC = 942.2289	Class 1 (0.8937)		Class 2 (0.1063)		
VARIABLES		Coeff.	z-value	Coeff.	z-value		
Model for Choices	<i>Attributes</i>	Abstention:(intercept)	2.7840	4.7969 ***	-7.8903	-0.4925	
		BBY:(intercept)	1.3270	2.4180 *	-8.0017	-0.4949	
		Niang:(intercept)	-0.9484	-0.5983	-14.5631	-0.1874	
		Pastef:(intercept)	-1.4893	-1.3836	18.4580	1.0726	
		PUR:(intercept)	-1.8763	-1.5180	-6.8607	-0.4228	
		Rewmi:(intercept)	0.2031	0.2230	18.8578	1.0840	
		PSvsEG	0.0388	1.2450	-0.9397	-2.4714 *	
		FoodvsCash	-0.0687	-2.2419 *	-1.3138	-2.2070 *	
		Ideology	-0.0160	-0.4187	-0.1604	-0.6880	
		Party_ID	6.4254	9.1402 ***	-1.0964	-0.8223	
	<i>Predictors</i>	Abstention:Satisfaction_president	-0.3176	-1.4590	4.2837	0.8051	
		BBY:Satisfaction_president	0.7197	3.5303 ***	4.8304	0.8945	
		Niang:Satisfaction_president	-0.4969	-0.6916	4.0698	0.1629	
		Pastef:Satisfaction_president	0.2618	0.7095	-8.2485	-1.3230	
		PUR:Satisfaction_president	0.2811	0.6524	3.4436	0.6300	
	Rewmi:Satisfaction_president	-0.4482	-1.1557	-8.3792	-1.3255		
Model for Classes	<i>Covariates</i>	classes:intercept	1.3636	2.8698 **	-1.3636	-2.8698 **	
		classes:Trust_president	0.2209	2.6619 **	-0.2209	-2.6619 **	
		classes:LPI	-0.3099	-2.5293 *	0.3099	2.5293 *	
		classes:factor_char_image	-0.4391	-3.8899 ***	0.4391	3.8899 ***	

\*\*\*p<0.001, \*\*p<0.01, \*p<0.05, . p<0.10

Source: Own estimation

Table 14: Model 2 - Latent Class Model Pre

		AIC = 975.7887	Class 1 (0.8847)			Class 2 (0.1153)			
VARIABLES			Coeff.	z-value		Coeff.	z-value		
Model for Choices	<i>Attributes</i>	Abstention:(intercept)	3.2017	3.3647	***	-0.0285	-0.0017		
		BBY:(intercept)	1.7758	1.9382	.	-2.3945	-0.1387		
		Niang:(intercept)	-2.4863	-1.1634		-7.5223	-0.0951		
		Pastef:(intercept)	1.1781	0.9903		6.1496	0.3599		
		PUR:(intercept)	0.1619	0.1292		-3.1533	-0.0886		
		Rewmi:(intercept)	-3.8313	-1.3540		6.9489	0.4060		
		PSvsEG	-0.0146	-0.4628		-0.5086	-2.3477	*	
		FoodvsCash	-0.0490	-1.3910		-0.5934	-1.8754	.	
		TPvsAM	0.0117	0.4063		-0.7326	-2.8707	**	
		Ideology	0.0273	0.6288		-0.6641	-2.4915	*	
		Party_ID	8.3664	3.6665	***	-2.8236	-1.6208		
		<i>Predictors</i>	Abstention:Satisfaction_president	-0.3421	-1.1634		0.4012	0.0732	
			BBY:Satisfaction_president	0.5817	2.0271	*	2.4152	0.4350	
Niang:Satisfaction_president	0.1203		0.1637		0.6562	0.0257			
Pastef:Satisfaction_president	-0.6170		-1.4337		-1.4968	-0.2712			
PUR:Satisfaction_president	-0.3053		-0.6867		-0.2693	-0.0242			
Rewmi:Satisfaction_president	0.5624		0.6496		-1.7065	-0.3091			
Model for Classes	<i>Covariates</i>	classes:intercept	0.3536	1.6903	.	-0.3536	-1.6903	.	
		classes:Trust_president	0.2177	2.9032	**	-0.2177	-2.9032	**	

\*\*\*p<0.001, \*\*p<0.01, \*p<0.05, . p<0.10

Source: Own estimation

Table 15: Model 2 - Latent Class Model Post

		AIC = 955.7233	Class 1 (0.8944)			Class 2 (0.1056)		
VARIABLES		Coeff.	z-value		Coeff.	z-value		
Model for Choices	<i>Attributes</i>	Abstention:(intercept)	2.3633	4.3623	***	-6.1072	-0.4201	
		BBY:(intercept)	0.9728	1.9372	.	-4.4858	-0.3084	
		Niang:(intercept)	-1.2332	-0.8080		-11.0318	-0.1549	
		Pastef:(intercept)	-0.2156	-0.2652		7.0703	0.4851	
		PUR:(intercept)	-2.0355	-1.6679	.	-3.4915	-0.2335	
		Rewmi:(intercept)	0.1482	0.1707		18.0459	1.1102	
		PSvsEG	0.0360	1.1228		-1.6544	-2.4979	*
		FoodvsCash	-0.0719	-2.2005	*	-0.4605	-1.6006	
		TPvsAM	0.0023	0.0770		-1.5804	-2.2027	*
		Ideology	-0.0204	-0.5097		-0.0340	-0.1438	
		Party_ID	6.0629	10.3910	***	-1.5263	-0.9699	
		<i>Predictors</i>	Abstention:Satisfaction_president	-0.2357	-1.0940		3.0295	0.6420
			BBY:Satisfaction_president	0.8270	4.2357	***	3.1500	0.6652
Niang:Satisfaction_president	-0.3883		-0.5606		2.7018	0.1190		
Pastef:Satisfaction_president	-0.0985		-0.3111		-2.9431	-0.6082		
PUR:Satisfaction_president	0.3088		0.7186		2.1778	0.4489		
Rewmi:Satisfaction_president	-0.4134		-1.1097		-8.1160	-1.3233		
Model for Classes	<i>Covariates</i>	classes:intercept	0.4224	1.9358	.	-0.4224	-1.9358	.
		classes:Trust_president	0.2113	2.9697	**	-0.2113	-2.9697	**

\*\*\*p<0.001, \*\*p<0.01, \*p<0.05, . p<0.10

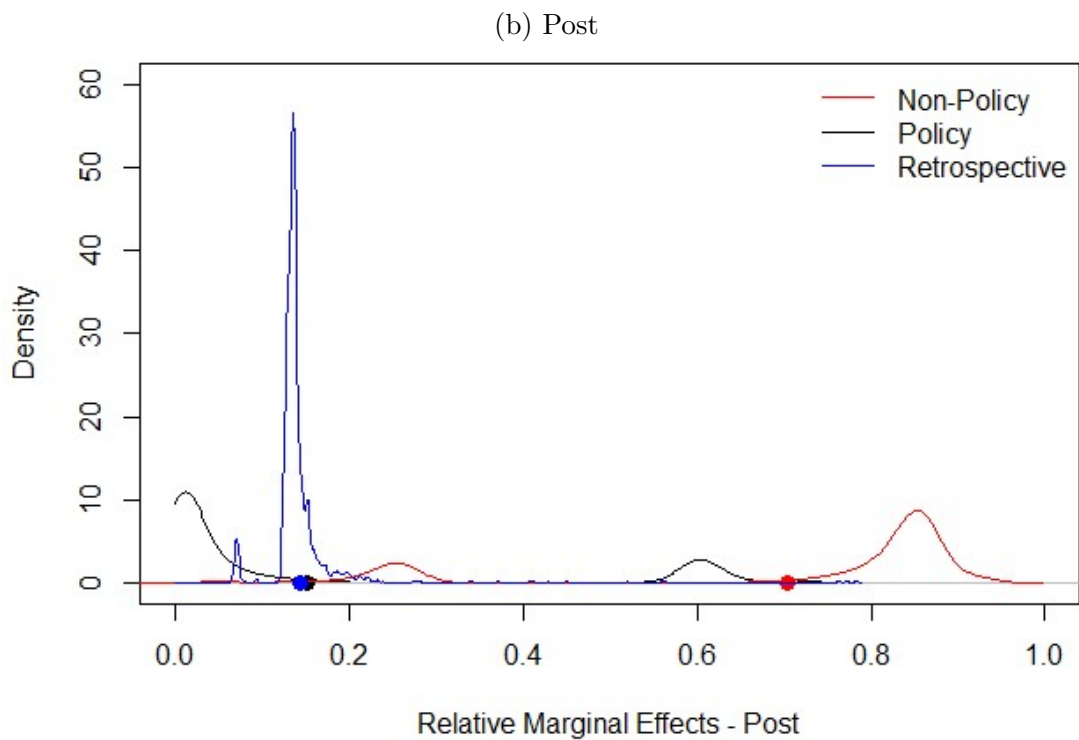
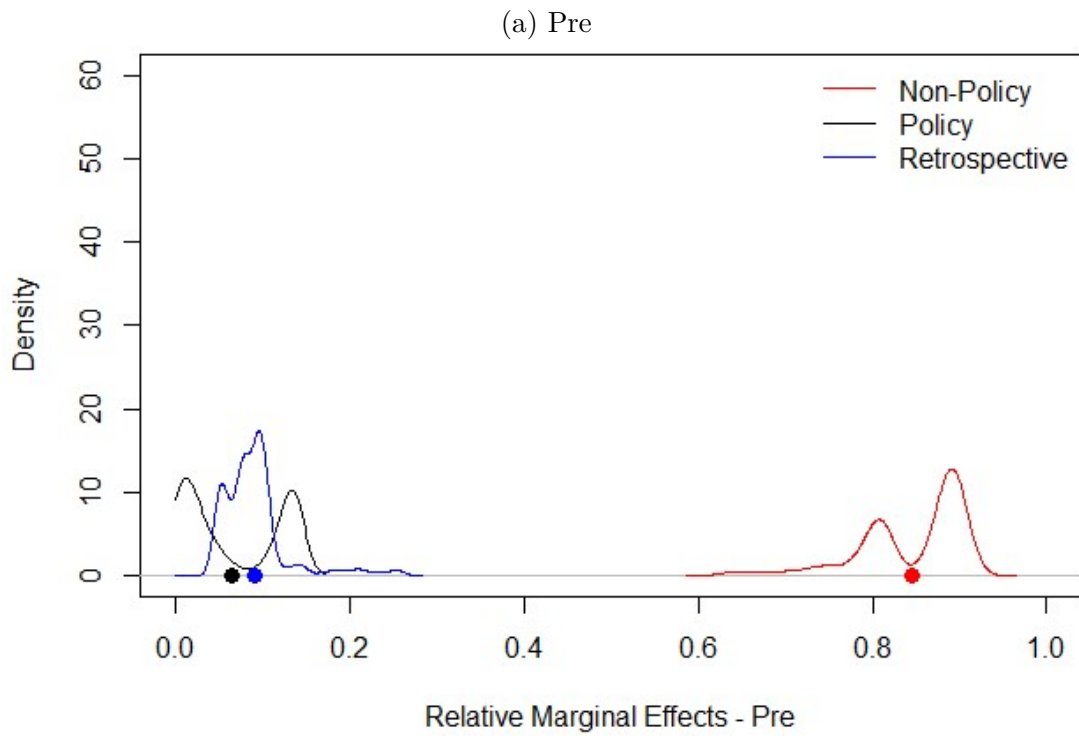
Source: Own estimation

Table 16: Mean Probabilities for Separate Models - Model 1

Alternatives	Pre	Post
Abstention	18.11%	16.32%
BBY	71.89%	73.55%
Niang	0.30%	0.34%
Pastef	4.99%	4.67%
PUR	0.99%	0.89%
Rewmi	3.72%	4.23%

Source: Own estimation

Figure 9: Relative Marginal Effects for Separate Models - Model 1



Source: Own estimation

Table 17: Accountability indices for Separate Models - Model 1

	<b>Pre</b>	<b>Post</b>
Whole sample	15.54%	29.69%
Positive	15.09%	30.89%
Negative	15.98%	30.36%
Placebo	15.54%	27.87%

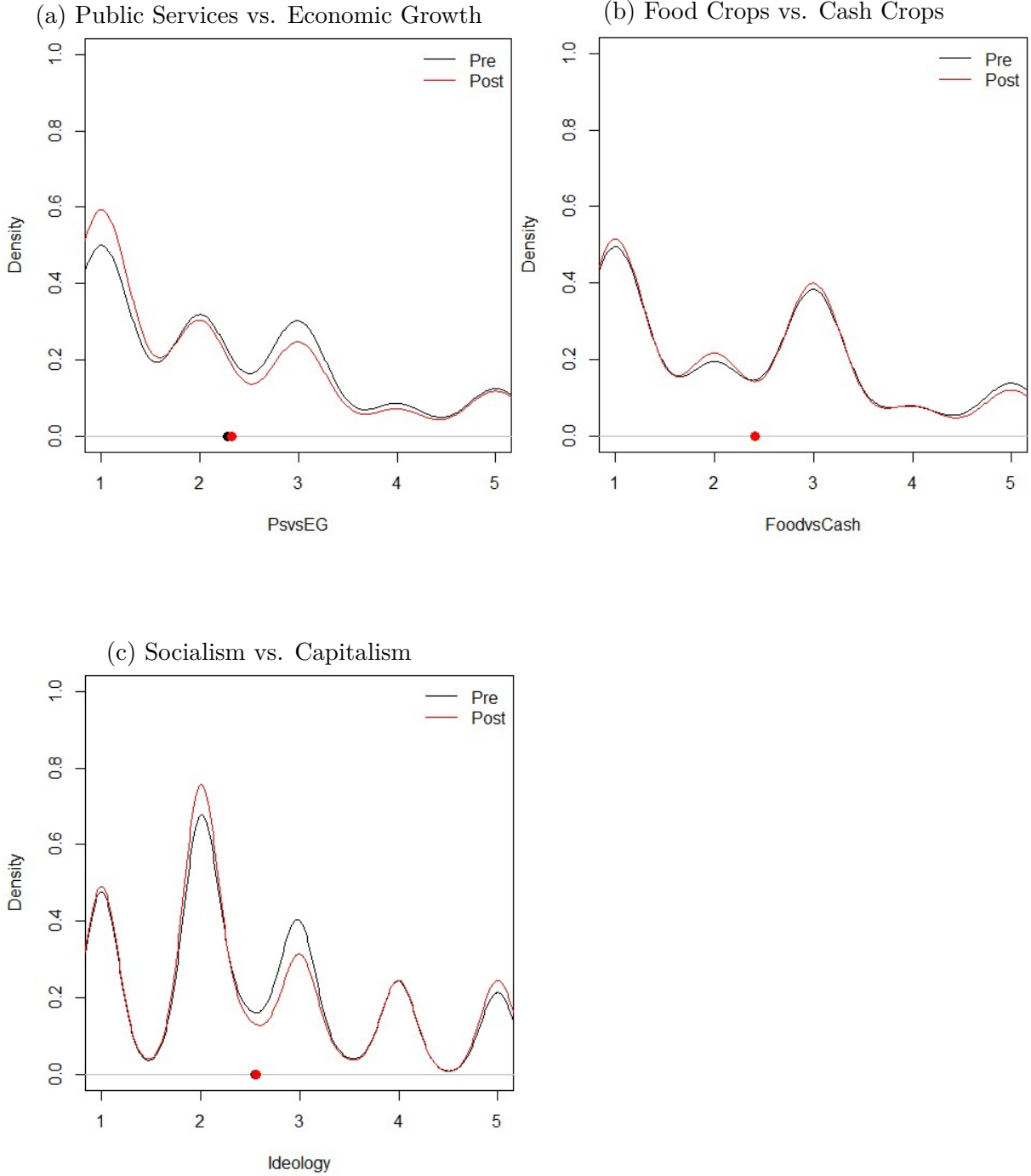
Source: Own estimation

Table 18: Capture for Separate Models - Model 1

	<b>Pre</b>	<b>Post</b>
Rural vs. Urban	0.9829	1.0075
Women vs. Men	1.0079	0.8316
Old vs. Young	1.0695	1.1305
Educated vs. Uneducated	0.9199	0.8265
Married vs. Other	1.0737	1.3266
Muslim vs. Other	0.9771	0.9345
Farmer vs. Non Farmer	1.0703	1.1122
Saint Louis vs. Other	1.1568	1.7804
Pulaar Toucouleur vs. Other	0.9092	0.7085

Source: Own estimation

Figure 11: Optimal Policy Positions of Incumbent Party BBY for Separate Models - Model 1



Source: Own estimation

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