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Abstract

We demonstrate a simple model of opinion diffusion where a local opinion leader acts as the initiator of public discussion. We show the possibility of driving a significant wedge between opinions of two groups that exhibit homophily even though individuals are highly conformist. In particular, we show that there exists an opinion gap between the group which the opinion leader belongs to (referred to as the *residence community*) and the other group; and this opinion gap is increasing in the relative size of the residence community. Using a unique dataset of national referenda in Switzerland from 2008 to 2012, we show that members of parliament (MPs) match referenda outcomes in their residence communities closer than they do in neighboring communities, and this wedge interacts significantly with the relative size of the residence community, thus aligning with our theoretical conjectures. We conclude that observed opinion gaps can actually be overrated to the extent that they are driven by structures that underlie the social web of different groups within the society.

Keywords: *Opinion Leadership; Diffusion; Homophily; Communication in Networks; Voter Preferences; Representation*
JEL Codes: *D72; D85; H79*

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1 Introduction

Should abortion be legalized? Should Scotland be an independent country? Should gay marriage be legalized? Do you accept further austerity to keep the Euro? Various nations went to polls for referenda to seek the majority's answer to these and other questions during previous years. Differences in public opinion on a given topic are not only revealed but they are turned into measurable facts in a referendum, such that x percent of voters agree with the proposal at hand. Thus, referendum decisions can be considered as the ultimate outcome of public discussion, which is not necessarily a consensus but rather a competition where an opinion wins the majority over an alternative opinion.

Is it really safe to assume that all of the observed difference in public opinion is driven by deeply-rooted political/ideological opinion differences across social groups and differences in non-negotiable world views of individuals within the society? Or, is it possible that, to a certain extent, public opinion gap is actually *overrated*? Public opinion on any given topic evolves through public debate, and public debate is nothing but opinion exchange of individuals through mass media, social media, and, above all, face-to-face interaction. Hence, a crucial step in understanding public opinion formation is understanding how individuals' social connections (i.e., *social networks*) are wired, and who is getting exposed to whose opinion. In this paper we demonstrate a simple model of opinion diffusion where a local opinion leader acts as the initiator of public discussion. We theoretically show that significant opinion gap may be observed even within a society with highly susceptible or conformist individuals and with no propaganda for a competing argument.

One well established empirical regularity of social networks is the tendency of *birds of a feather to flock together*, also known as *homophily* in the network literature.[1] Homophily describes the tendency of individuals to have disproportionately more social interaction with people who are like themselves, that is, they have similar background (e.g., same ethnicity, same gender, same education, etc.) or have similar attachments or interests (e.g., same employment, same place of birth, residing in same location, etc.). Currarini et al. (2009) show that social networks with homophily display three characteristics: members of larger groups have on average more connections per capita; larger groups have

[1] Homophily as a term originates from Lazarsfeld and Merton (1954). See McPherson et al. (2001) for a detailed overview and discussion.

also a larger fraction of their links to individuals of their own type; larger groups form own type links at rates greater than their relative fraction in the population. Halberstam and Knight (2014) deliver further empirical evidence by investigating information sharing among Twitter users during the 2012 US presidential election, and they show that individuals are disproportionately exposed to like-minded information. Moreover, members of larger groups are exposed to more tweets (hence more information) per capita than members of smaller groups.

Homophily in social networks has important theoretical implications on public opinion differences: Jackson and Yariv (2007) and Golub and Jackson (2012) establish, in line with the findings of Currarini et al. (2009), that diffusion is faster, and time-to-consensus is shorter among densely-connected individuals. We explore a simple opinion diffusion process where the society is in complete consensus at the beginning, and an opinion leader initiates the diffusion process by communicating her opinion to her peers. It comes as no surprise that the group which the opinion leader belongs to agrees more with the opinion leader than other groups do. We define groups based on their location, namely *communities* and assume geographic homophily such that individuals tend to be linked to other individuals residing in the same community, but this theoretical result can be generalised to any social group exhibiting homophily. We call such an opinion gap in favor of the opinion leader's own group *resident opinion leader bias.* Thus, with biased linking probabilities towards residents of the same community (same-type connections), the opinion leader will be followed more closely by the residents of her own community, which we refer to as the *residence community.*

It is, however, theoretically less obvious how the opinion diffusion interacts with the relative size of communities. The size and sign of the resident opinion leader bias varies with the relative size of the residence community. Members of larger communities get exposed more to the views of their same-type peers, namely residents of their own community, and this finding is also in line with empirical findings of Halberstam and Knight (2014) mentioned above. Summing up, our theoretical investigation leads to two conjectures: first, there exists positive resident opinion leader bias under geographic homophily; and second, the resident opinion leader bias depends on the relative size of the residence community and it is increasing in this variable over most of its domain.

Next, we turn to actual referenda data and present an interesting empirical case exploring these data for empirical regularities that fall in line with our theoretical conjectures. Referendum outcomes are especially valuable for this investigation, because this is where public opinion manifests itself. We use a unique dataset combining community-level outcomes of national referenda on legislative proposals in Switzerland between 2008 and 2012 and votes of each member of the parliament (MP) on these proposals. This allows us to investigate how an MP's votes on various legislative proposals compare to the majority of voters' opinions in the community where the MP resides, which we call *residence community* as in our theoretical discussion, and to the majority of voters' opinions in its neighbor communities. We find that an MP's vote matches the majority opinion in her residence community in 62.4% of all proposals, whereas this ratio falls down to 59.7% for neighbor communities. Thus MPs' roll call behavior match voters' decisions on average by about 2.7 percentage points better in their residence communities than in neighbor communities. This observation repeats itself consistently throughout various subsamples and robustness checks, thus we establish the *resident MP bias* as an empirical regularity. The small size of communities,[2] their very close distance to one another, and the focus on nationally-relevant referenda instead of local referenda allow us to abstract from cases where one specific community could be motivated to rip off most benefits, or the MP would be interested in catering to the interests of a certain community. Hence pork barrel, aggregation effects, and communal differences can be ruled out as possible explanations for our empirical findings. We further investigate size effects and find out that the relative size of the residence community significantly interacts with the resident MP bias in our empirical analysis. These empirical findings fall in line with our theoretical conjectures.

Divergence between voters' and politicians' preferences has received substantial attention in the literature, and it has been discussed in various detail how MPs' roll call behavior do not fully reflect voters' preferences.[3]. We take an alternative stand here and claim that MPs are not merely passive representatives of the median voter's views, but MPs are rather opinion leaders even ideological and political innovators who set the tone

[2]An MP is elected by the whole canton, and local communities within each canton make up only a small portion of an MP's constituency.

[3]There is rich literature documenting and discussing to what extend politicians fail to represent voters preferences, and how this can be explained (see Gerber and Lewis 2004, for example). Ågren et al. (2006), Grofman (2004), Matsusaka (2010), Padovano (2013), Portmann et al. (2012), Giger and Klüver (2015), provide an overview of related literature in economics as well as in political science.

and push for their opinions in the society. An important merit in focusing on Switzerland is that the Swiss MPs reside in their initial residential address and do not need to move to the seat of the parliament,[4] during their tenure. Thus, an MP is in touch with voters in her residence community in close proximity, and these voters are likely to be informed about the opinions of the MP better than voters in other communities in the same electoral district. In the same way, voters interact with MPs and get to know their take on national political issues. This does not eliminate a possible reverse causation that MPs who are well-connected within their residence communities will be better informed about what voters want and hence cater to their will. Nevertheless, the incentives that are needed for the significance of such reverse causation are not apparent in this setting, especially since there is no pork barrel as MPs are elected in electoral districts that comprise their residence and the neighboring communities. Hence, it remains a valid argument that MPs act as opinion leaders in their residence communities.

The contribution of this paper is twofold: first, we show that the structure of social links within and between different groups can drive a significant wedge between public opinions of these groups, although there is no such wedge at the beginning, there are no competing arguments, and every individual no matter in which group she may be is equally susceptible. Second, we establish the *resident MP bias* as an empirical regularity for the case of Swiss MPs and their residence communities.

There can (and will) be a lot of different and complex mechanisms and interactions at play, of course, so that our empirical findings do not necessarily yield a complete and final proof that exactly the same mechanism explored in the theoretical section underlies the observed empirical regularity. Our theoretical discussion shows that it is possible to drive a significant wedge between opinions of two groups that exhibit homophily, where the opinion gap does not result from an underlying deeply-rooted ideological difference, but it is simply driven by how social connections are wired. This is not to say that the structure of social connections is exogenous. This structure can very well be a consequence of a deeply-rooted ideological stance. What we show, however, is that the observed opinion gap embodies not only inherent and deeply-rooted differences but also a pure *echo* of different camps' opinions that get amplified as relative size of these groups differ. As a result, an observed opinion gap between different groups can be driven at least partially

[4] The Swiss National Parliament is located in Bern which can be reached from most parts of the country within two to three hours by train.

by structures that underlie the social web of these groups within the society, and thus the interpretation of an observed opinion gap requires far more attention, if the ultimate aim is to grasp the *fundamental* (i.e. *echo-free*) portion of the opinion gap. The case of Swiss referenda that we investigate in the empirical part of this paper shows clear patterns that align with what is shown in our theoretical discussion.

In the next section we present a model of opinion diffusion. In section 3 we discuss the empirical relevance of the model and present our dataset. We discuss our empirical findings in section 4, and we offer conclusions in the final section.

2 Diffusion of Opinions within and across Groups

In this section we present a basic model of opinion diffusion initiated by an opinion leader in a society that is divided into two groups. Without loss of generality we assume the two groups to be geographically separated and refer to them as *communities*. We further assume that there exists geographic homophily so that individuals in either community have a higher probability to be linked to those residing in the same community than to those residing in the other community. The two groups can as well be assumed to be any division of the society where homophily is present (based on ethnicity, gender, place of birth, etc.).

There exists an *opinion leader* residing in one of the communities. We refer to this community as the *residence community*, and the other community is called the *neighbor community*, denoted by r and n, respectively. The opinion leader acts as the initiator of communication in the society and initiates the opinion diffusion process. Relative sizes of residence and neighbor communities are given by l_r and l_n, respectively, such that $l_r + l_n = 1$.

Our aim is to isolate the effects of linking probabilities and size differences on opinion diffusion within and across groups, and we do not consider diffusion of competing opinions or consensus properties in our setting. Consensus can best be understood as a long run equilibrium of opinion diffusion, and our analysis focuses on systemic differences in opinions prior to reaching consensus.

2.1 Opinion Formation

Individuals update their opinions over time according to the feedback they receive from others. The opinion of individual i on a given subject s at time t is denoted $\alpha_i(s,t) \in [0,1]$, and this can be interpreted as the probability that individual i's opinion on a given subject coincides with that of the opinion leader's at time t, where time is measured as the number of periods elapsed since the initiation of opinion diffusion by the opinion leader.

There are two important ingredients in an individual's opinion formation: first, who her peers are, and second, how much weight she assigns to her peers' opinions. An individual i updates her opinion at time t by taking a weighted average of her peers' opinions according to the following process:[5]

$$\alpha_i(s,t) = \sum_{j \neq i} \theta_{ij} \alpha_j(s, t-1) \tag{1}$$

where $\theta_{ij} \in (0,1)$ and $\sum_{j \neq i} \theta_{ij} = 1$ for all pairs ij such that i and j are directly linked. θ_{ij}s are weights that individual i assigns to her peers' opinions so that i's opinion in period t is a weighted average of her peers' opinions from the previous period.

In order to keep the focus of the subsequent analysis solely on the diffusion process of the opinion leader's opinion (and thus her influence), we assume $\alpha_i(s,0) = \alpha(s,0)$ for every i so that every individual has the same initial opinion on any given subject s – hence perfect consensus – before the opinion leader initiates the opinion diffusion process. We further drop the subject parameter s for brevity and assume without loss of generality that the opinion diffusion process discussed in this section concerns only one certain subject, so that the initial opinion of any individual is denoted $\alpha(0)$.

We further assume that an individual updates her opinion only once,[6] which is to say that opinions do not flow *upstream*, and the timing of the update follows the distance of this individual to the opinion leader: individuals that are directly linked to the opinion leader update their opinions first, then those directly linked to them update, and those linked to the latter follow etc..

[5] Similar variations of social influence models were developed by Friedkin and Johnsen (1990) and analyzed for consensus properties by Hegselmann and Krause (2002).

[6] For purposes of this paper and its empirical application, it is important to isolate the spread of politician's influence from the process of reaching a consensus, because consensus is a more complicated process which goes beyond the scope of this paper. See Golub and Jackson (2012) for a detailed discussion on consensus under homophily.

We refer to each individual whom the opinion leader is directly linked to as an *influential*. Influentials can be understood as intermediaries between the opinion leader and the rest of the society and technically they serve as injection points.[7] We distinguish between four types of individuals in each community: (i) influentials; (ii) individuals that are linked to an influential located in the residence or the neighbor community; (iii) individuals that are linked to someone (not an influential) located in the residence or the neighbor community who is linked to an influential; and (iv) other individuals. The opinion leader initiates a diffusion process by communicating her views to influentials. Influentials have two distinctive features in our model: first, they are able to grasp and then package views of the opinion leader in a convincing and accessible way to the rest of the society. Second, they reach out to many other individuals (compared to a regular individual) through face-to-face communication.

Individuals who are linked to influentials get in touch with views of the opinion leader and are able to pass it on to their peers. Those peers, however, are not able to pass it on, because they are twice remote from influentials, and thus they cannot talk about it as convincingly as those who heard it from the influentials first hand. Hence individuals who are further down the line (including those who are linked to someone twice removed from an influential) do not get any influence and hold on to their initial opinion. As a result, the diffusion process dies out at this point. This assumption is technically equivalent to having a time limit for the diffusion process so that difference in opinions of the two communities can be observed before a consensus can be reached which is relevant for our analysis.

2.2 Geographic Homophily in Linking Probabilities

We denote the linking probability of the opinion leader to an individual in the residence (neighbor) community by π_r^{OL} (π_n^{OL}).[8] Since the opinion leader's peers make up the

[7]Katz and Lazarsfeld (1955) and Merton (1968) put forward influence models where influentials act as intermediaries and they are assumed to have a larger number of connections than an average citizen and their opinions are valued for whatever reason by the public. Although the terms *opinion leader* and *influential* are sometimes used interchangeably, we refer to influentials in our theoretical setting as merely intermediaries between the opinion leader and individuals.

[8]In this context influentials function as injection points for the opinion leader to promote her view. Watts and Dodds (2007) show that the role of influentials is theoretically marginal in generating cascades, but their model makes use of heterogeneity in how easily individuals get convinced, and this approach is beyond the coverage and aim of our paper.

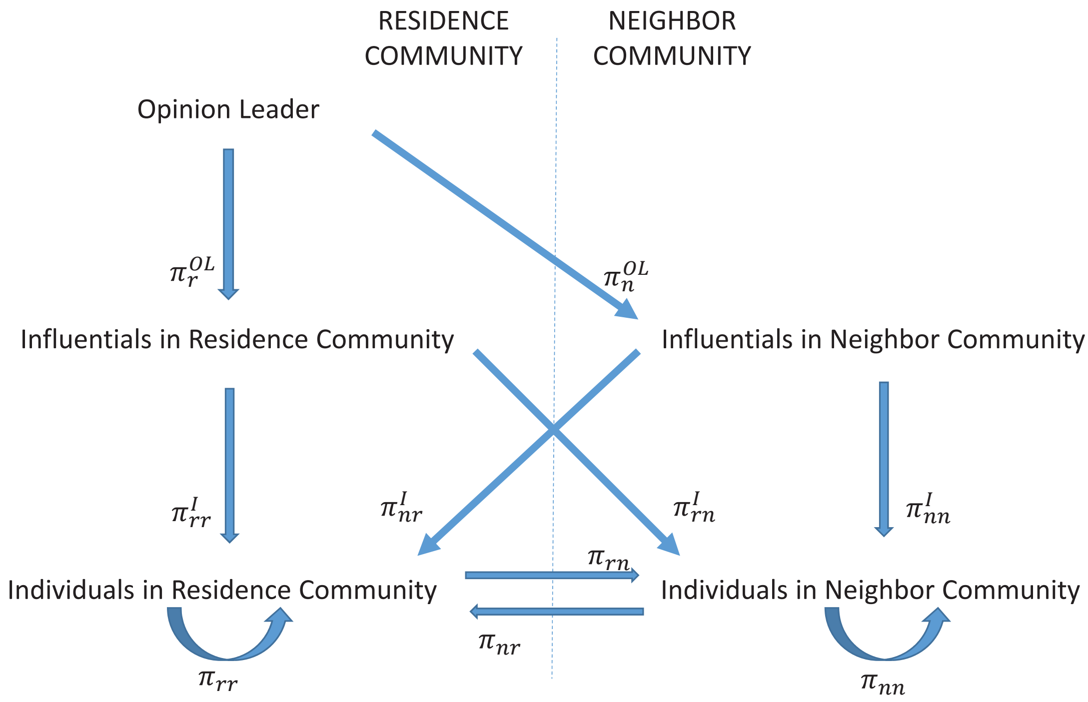
group of *influentials*, π_r^{OL} (π_n^{OL}) denotes at the same time the fraction of individuals in the residence (neighbor) community that are influentials. We further assume that the linking probability of any two randomly chosen individuals is greater if they reside in the same community, thus *geographic homophily* exists.

Since influentials have higher linking probabilities within and across communities compared to regular individuals, we use the following notation to differentiate between different linking probabilities:[9] π_{rr}^I is the linking probability of an influential located in the residence community to a regular individual in the residence community; π_{rn}^I is the linking probability of an influential located in the residence community to a regular individual in the neighbor community; π_{nn}^I is the linking probability of an influential located in the neighbor community to a regular individual in the neighbor community; π_{nr}^I is the linking probability of an influential located in the neighbor community to a regular individual in the residence community; π_{rr} is the linking probability of a regular individual located in the residence community to a regular individual in the residence community; π_{rn} is the linking probability of a regular individual located in the residence community to a regular individual in the neighbor community; π_{nn} is the linking probability of a regular individual located in the neighbor community to a regular individual in the neighbor community; and finally π_{nr} is the linking probability of a regular individual located in the neighbor community to a regular individual in the residence community.

Figure 1 summarizes the diffusion process of the opinion leader's view on any given subject within and across communities by displaying a flow chart displaying linking probabilities between different types of individuals in different communities.

[9] Note that influentials may be linked to each other as well, but since this will not affect their opinion formation in our model, we leave this out for tractability.

Figure 1. Linking Probabilities within and across Communities



Since linking probability of two individuals vary due to their locations, the expected number of peers of an individual in either community can be expressed in a uniform way: let d_{rr} and d_{rn} denote the expected number of peers in residence and neighbor communities, respectively, of a regular individual from the residence community. Similarly, let d_{nn} and d_{nr} denote the expected number of peers in neighbor and residence communities, respectively, of a regular individual from the neighbor community. Hence we have

$$d_{rr} = \pi_r^{OL}\pi_{rr}^I l_r + (1-\pi_r^{OL})\pi_{rr} l_r; \text{ and } d_{rn} = \pi_n^{OL}\pi_{nr}^I l_n + (1-\pi_n^{OL})\pi_{nr} l_n \quad (2)$$

for individuals residing in residence community, and

$$d_{nn} = \pi_n^{OL}\pi_{nn}^I l_n + (1-\pi_n^{OL})\pi_{nn} l_n; \text{ and } d_{nr} = \pi_r^{OL}\pi_{rn}^I l_r + (1-\pi_r^{OL})\pi_{rn} l_r \quad (3)$$

for individuals residing in neighbor community.

Assuming an individual gives equal weights to opinions of her peers, we obtain for every i residing in the residence community $\theta_{ij} = \theta_r$, and for every i residing in the neighbor community $\theta_{ij} = \theta_n$, where

$$\theta_r = \frac{1}{d_{rr} + d_{rn}}; \text{ and } \theta_n = \frac{1}{d_{nn} + d_{nr}} \tag{4}$$

so that the weights an individual assigns to her peers' opinions always add up to one as required by equation (1).

2.3 Opinion Difference and Community Size

The baseline level of public opinion is assumed to be α in the residence and neighbor communities[10], and it remains at this level, if the opinion leader does not initiate the opinion diffusion process by comuunicating her opinion to influentials. We assume that influentials in the residence (neighbor) community reach a given level of opinion α_r^I (α_n^I) immediately upon their contact with the opinion leader where the linking probability is π_r^{OL} (π_n^{OL}). Thus, the expected opinion $E(\alpha_r)$ of a randomly chosen regular individual in the residence community is the weighted average of her peers' opinions and is given by

$$E(\alpha_r) = \theta_r[(\alpha_r^I \pi_r^{OL} \pi_{rr}^I + \alpha(1 - \pi_r^{OL})\pi_{rr})l_r + (\alpha_n^I \pi_n^{OL} \pi_{nr}^I + \alpha(1 - \pi_n^{OL})\pi_{nr})l_n] \tag{5}$$

Similarly, the expected opinion $E(\alpha_n)$ of a randomly chosen regular individual in the neighbor community is given by

$$E(\alpha_n) = \theta_n[(\alpha_n^I \pi_n^{OL} \pi_{nn}^I + \alpha(1 - \pi_n^{OL})\pi_{nn})l_n + (\alpha_r^I \pi_r^{OL} \pi_{rn}^I + \alpha(1 - \pi_r^{OL})\pi_{rn})l_r] \tag{6}$$

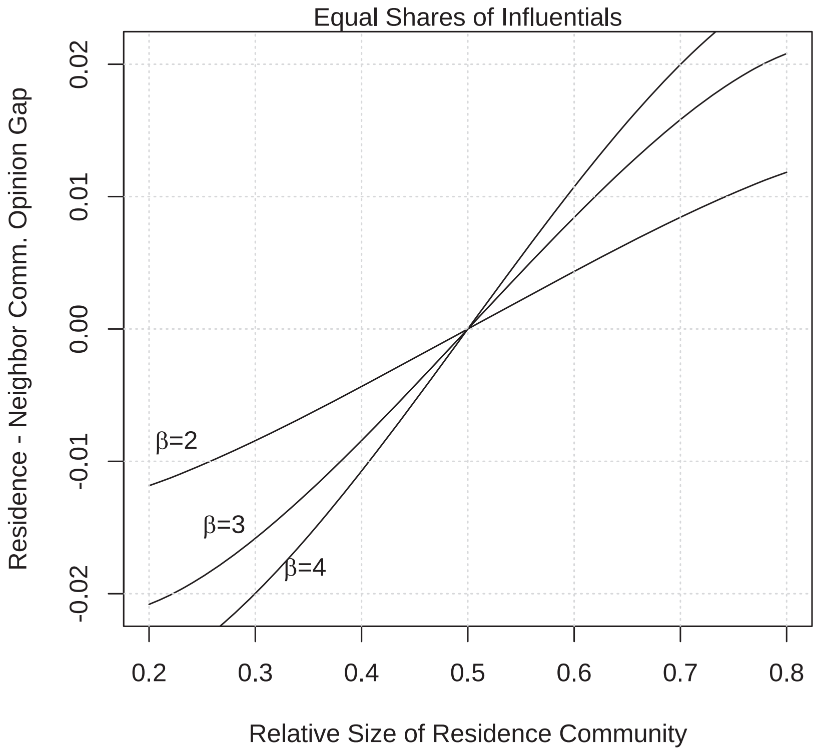
We refer to the difference between expected opinions of regular individuals in both communities, $E(\alpha_r) - E(\alpha_n)$, as the *opinion gap* between the two communities. Size and sign of the opinion gap vary with respect to linking probabilities and relative size of communities, thus it is important to understand how the opinion gap changes for different combinations of these key parameters.

Before the opinion gap can be simulated, linking probabilities need to be discussed. We assume that linking probability of regular individuals in the same community is inversely related to the relative size of that community, and that of regular individuals

[10]This assumption makes sense empirically, as both communities will be equally affected by the national policy proposals that we analyze.

in different communities is only as large as the smallest of linking probabilities in both communities. Based on these assumptions, we define linking probabilities in the following way: $\pi_{rr} = (1 - l_r)^\beta$, $\pi_{nn} = (1 - l_n)^\beta$, and $\pi_{rn} = \pi_{nr} = min(\pi_{rr}, \pi_{nn})$, where $\beta > 1$. We assume that linking probabilities of influentials in either community to the opinion leader are equal, or equivalently, influentials account for the same ratio of the population in both communities (i.e. equal shares of influentials), so that $\pi_r^{OL} = \pi_n^{OL} = max(\pi_{rr}, \pi_{nn})$. Finally, linking probabilities of influentials and regular individuals follow similar patterns as those among regular individuals, but these are necessarily larger so as to reflect the well-connectedness of influentials in the society: $\pi_{rr}^I = \pi_{rr}^{1/\beta}$, $\pi_{nn}^I = \pi_{nn}^{1/\beta}$, and $\pi_{rn}^I = \pi_{nr}^I = \pi_{rn}^{1/\beta}$.

Figure 2. Community Size and Opinion Gap-I



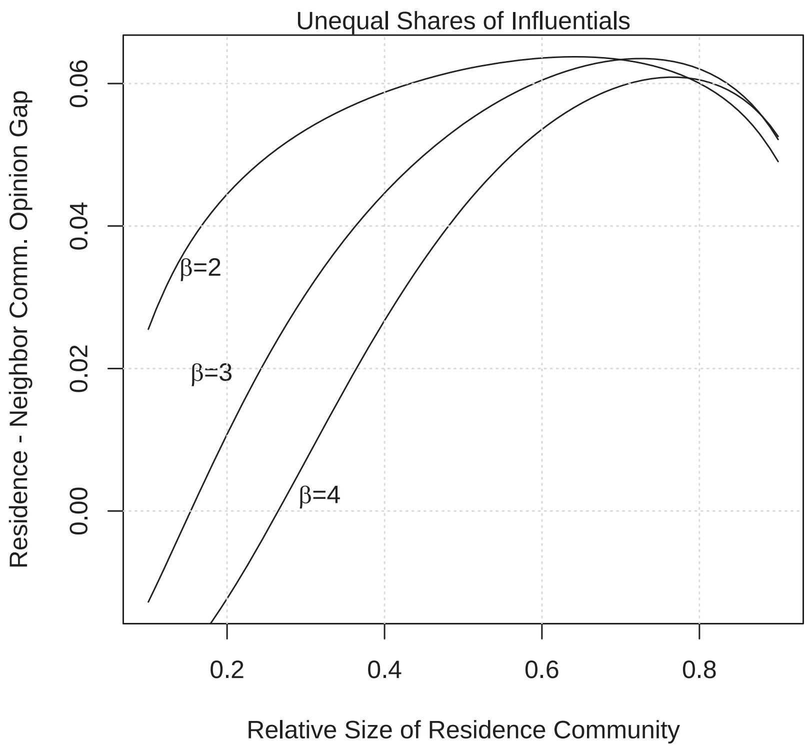
Based on these assumptions and functional forms[11] of linking probabilities, Figure 2 shows how the *opinion gap* changes with the relative size of the residence community supposing equal shares of influentials, that is, influentias make up the same proportion of population in both communities, namely $\pi_n^{OL} = \pi_r^{OL} = max(\pi_{rr}, \pi_{nn})$. We provide simulation results for three different values of β in Figure 2. The three results are qual-

[11]Functional forms of linking probabilities shown here are chosen such that they reflect our assumptions while being as intuitive and simple as possible at the same time. In reality they can be very different or more complicated than what we have here, of course, and this is something we cannot entirely disclose. The aim of this section is not to reveal the exact functional form of linking probabilities but to help visualizing implications of our fundamental assumptions about linking probabilities.

itatively similar: there is no opinion gap when the two communities have the same size. When their sizes are different, then the larger community agrees more with the opinion leader than the smaller community does, and this is independent from where the opinion leader resides.

An alternative scenario is depicted in figure 3 where we abandon the assumption of equal shares of influentials in both communities and assume instead unequal shares of influentials, that is, influentials in the residence community make up a larger proportion of population in that community than influentials in neighbor community do. For this scenario we assume $\pi_r^{OL} = max(\pi_{rr}, \pi_{nn})$ and $\pi_n^{OL} = max(\pi_{nr}, \pi_{rn})$, which is equivalent to assuming that also the opinion leader's links are subject to geographic homophily. Under this assumption we observe that the residence community agrees more with the opinion leader than the neighbor community does, and this is the case except for very low levels of the relative size of the residence community. For larger values of the linking probability parameter β the relative size of the residence community needs to be larger before a positive opinion gap in favor of the residence community can be observed. We refer to the opinion gap, which occurs under unequal share of influentials and turns out to be in favor of the residence community for wide ranges of linking probability parameter and relative community size, as the *resident opinion leader bias*.

Figure 3. Community Size and Opinion Gap-II



With more influentials in the residence community and geographic homophily in linking probability of individuals, it is no surprise that the opinion leader's views diffuse faster and broader in the residence community, so that the residence community tends to agree more with the opinion leader. The interesting finding is that the resident opinion leader bias is increasing as the relative size of the residence community increases, which is true for both cases discussed above, namely for unequal as well as equal shares of influentials. In case of unequal shares of influentials, however, positive resident opinion leader bias is found for smaller relative sizes of the residence community as well.

We summarize the implications of opinion diffusion under geographic homophily with unequal shares of influentials (i.e. homophily in linking probabilities of the opinion leader as well) in the following two conjectures:

Conjecture 1 *There exists positive resident opinion leader bias under geographic homophily, except for very small relative sizes of the residence community.*

Conjecture 2 *The resident opinion leader bias is increasing in relative size of the residence community for most of its domain.*

Theoretically, observed differences in opinions of two groups can be driven by the relative size differences of these groups and not by their initial views, when there is homophily across groups such that individuals are more likely to be linked within their own group. When competing opinions and complicated social network structures exist, it will be more difficult to break down opinion gaps into their components, of course. Nevertheless, a non-trivial opinion gap is observed in our theoretical setting even though the two groups start from a point of full consensus. Thus the main lesson of our theoretical investigation to take home is the following: a non-trivial portion of the opinion gap between different groups can be attributed to the structure of social connections within and between these groups as well as to size differences between them. We discuss the empirical content, relevance, and implications of the theoretical diffusion properties laid out in the next section.

3 Empirical Content of the *Resident Opinion Leader Bias*

A plausible testable hypothesis can be formulated in the jargon of our theoretical discussion above as follows: the probability that a randomly selected individual in the residence community agrees with the opinion leader is greater than that for a randomly selected individual in the neighbor community. Such an observation can be the consequence of many different factors, however a mainly positive opinion gap (namely *resident opinion leader bias*) that increases over some plausible (i.e., empirically relevant) domain of the relative residence community size hints that geographic homophily might underlie the opinion formation process in these communities.

There exist prior studies investigating how opinions diffuse in social networks and especially at what rate different groups get exposed to different opinions (e.g., Halberstam and Knight, 2014; Lerman and Gosh, 2010). Nevertheless, we are interested in a setting where individuals not only get exposed to opinions but also reveal their own opinions and *behave* accordingly. In this respect, focusing on national referenda decisions in Switzerland offers an interesting opportunity for investigation, because of at least five distinct features: first, individuals reveal their preference on policy issues in a referendum, since they get to answer a decisive and clear-cut question with a *yes* or *no* (e.g. Schneider et al., 1981; Frey 1994, Carey and Hix 2013). Second, members of parliament (MPs) vote on precisely the same proposals in the parliament as voters do in referenda such that both decisions are directly comparable (see Stadelmann et al. 2013). Third, MPs vote in the parliament before voters get to vote in referenda so that MPs can credibly be claimed to have sufficient time to initiate the local opinion diffusion process. Fourth, MPs actually reside in communities which they report as their *residence*, so that we have good candidates for local opinion leadership in these communities. Fifth, residence and neighbor communities represent together only a small part of an MP's electoral district, and national policies decided in referenda do not have differential effects on the two communities, so that pork barrel is ruled out as a possible cause for opinion gaps. We describe the details of this interesting setting in the next subsection and discuss how the resident opinion leader bias may show up in this context.

3.1 Data Description and the revealed *Opinion Match*

We use a unique dataset combining votes of members of the Swiss National Council (the Lower House of the Parliament) on legislative proposals and results of national referenda in Switzerland between 2008 and 2012. The Swiss National Council consists of 200 MPs who discuss and vote on legislative proposals. Proposals that are agreed upon in the parliament do not automatically turn into law. If the proposal aims to change the constitution, citizens have to confirm the change in a national referendum. Proposals that are accepted by the parliament may be challenged in a national referendum if citizens demand a *facultative* referendum by collecting 50,000 signatures for this end. Citizens have also the right to propose a constitutional amendment upon collecting 100,000 signatures. In that case, MPs vote on the text of the initiative to announce their formal recommendation for the referendum. However, the power to accept or reject the initiative lies solely in the hands of the citizens. A proposal (whether initiated by the National Council or by citizens) is finally rejected if more than half of the population votes against it[12].

Voting activities of each MP are recorded and kept by the parliamentary services, and we match these data to another dataset containing the community-level outcomes of national referenda. We draw on the official candidates list of the Swiss federal elections to identify each MP's *residence community.* Hence we observe how an MP votes in the parliament for a legislative proposal and how the majority of the community where she is residing votes in the corresponding referendum on the same proposal. We collect also information on birthplaces of MPs and use it in further robustness tests. Voting in the parliament always precedes the popular vote so that the parliamentary vote of each MP about the proposal, which is being discussed, is revealed well in advance of the referendum. The parliamentary vote of an MP is practically her voting recommendation for the corresponding referendum, and this recommendation cannot be altered (at least, not credibly) later on. This fine-grained data structure allows us to identify how closely preferences expressed by voters coincide with MPs' positions.

In particular, we compare how an MP's *residence community* matches this MP's position and how communities that share a common border with this *residence community*

[12] In addition to the majority of citizens, constitutional amendments require a double majority of citizens and cantons (so called *Ständemehr*).

(referred to as *neighbor communities*) match the same MP's position. Thus, we directly measure whether residence and neighbor communities' revealed opinions in a referendum correspond to MPs' decisions revealed in the parliamentary vote prior to that referendum. We use each MP's vote on a proposal and outcome of the corresponding referendum in the MP's residence and neighbor communities to create a binary dependent variable to which we refer to as the *opinion match*: if the majority in a community voted yes in a referendum, we take the revealed preference of that community to be in favor of that proposal. If the majority voted no, then the community does not agree with the proposal. The *opinion match* for an MP-community pair for a given proposal is one, if both, the MP and the community, simultaneously accepted or rejected the proposal. For proposals where the MPs and communities express different positions the *opinion match* is zero[13]. The binary variable *opinion match* is employed as the dependent variable in our empirical analysis, where the unit of observation is an MP-community-referendum triplet, and community refers to either MP's *residence community* or *neighbor communities.* A systematic *opinion gap* between the residence and neighbor communities in favor of the residence community will be what we refer to as the *resident opinion leader bias* in the previous section, and we rename it here as the *resident MP bias* so as to better convey the setting of our empirical analysis.

Each of the 26 Swiss cantons is an electoral district so that the constituency of each MP is made of voters in their respective canton. Communities are subdivisions of cantons, and an MP's residence community as well as neighbor communities make up a rather small fraction of the MP's constituency,[14] since size of most communities is often below 3000 inhabitants. We map in Figure 4 locations of MPs' residence communities and their neighbors.

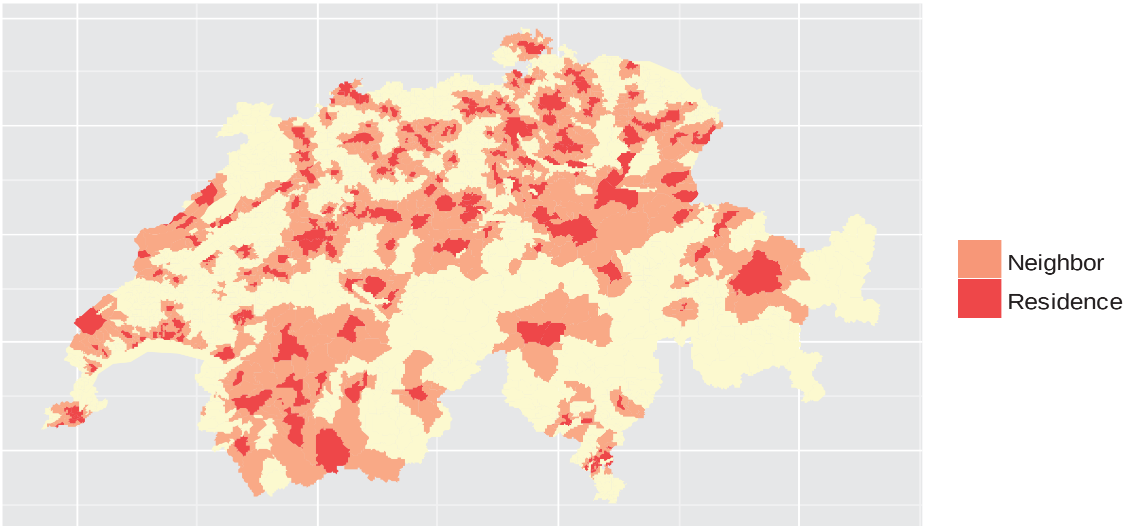
Legislative proposals[15] that are covered in our dataset concern solely national policy with potential differential ramifications at the district (canton) level only but there are no differential ramifications at community level for residence and neighbor communities. As a result of this, an MP's residence community and neighbor communities are expected to be symmetrically affected by the national policy change in question. Since we observe

[13]MPs' abstentions are excluded from the analysis.

[14]Number of communities contained in each canton and distribution of population in communities are documented in figure A1 and table A1 in the appendix.

[15]A complete list of proposals and initiatives taken to referenda between 2008 and 2012 (hence covered in our dataset) is shown in table A2 in the appendix.

Figure 4. Residence Communities of MPs and their Neighbor Communities



Note: Map based on swissBOUNDARIES 2013.

referenda outcomes separately for each community within the same constituency, we are able to investigate the degree of the *opinion match* between MPs and their residence and neighbor communities. Another advantage in focusing on neighbor communities is that we minimize heterogeneity across communities that are being compared to one another for their opinion match with the local MP. It can rightfully be argued that no two neighboring communities are perfect substitutes for one another, of course, but it can very well be expected that variations originating from geographical, cultural, and locational traits (e.g. being close to an important industrial district, or being close to an airport etc.) are minimized in case of two neighboring communities as opposed to two randomly chosen communities. One can also argue that these communities differ in their opinions and preferences, and an MP chooses to reside in the residence community in the first place, because this community better fits her own opinions and preferences. Nevertheless, our methodology to compare residence and immediate neighbor community serves to minimize such differences. Arguing that such differences drive our results would be equivalent to saying that initial opinion and preference differences between the residence community and its neighbor communities must be such severe and rich (going in many different dimensions) that they are carried over to each public debate and reveal themselves in most of the proposals that are being voted on. We find such wide and deep differences between any two communities that share a common border an extreme case, which cannot meaningfully plague our results.[16]

4 Searching for the *Resident MP Bias*: Residence vs. Neighbor Communities

We use a logit model to regress the binary dependent variable *opinion match* on an indicator variable *residence community* that distinguishes MPs' residence from neighbor communities, and on fixed effects for referenda and electoral districts (cantons) or MPs such that

$$\text{Opinion match} = \Lambda(\alpha + \text{Residence Community} + \rho + \mu). \tag{7}$$

The independent variable *residence community* is one if the *opinion match* refers to the MP-community pair where the community at hand is the MP's residence community and it is zero if the *opinion match* refers to pairs of MP and any of the neighbor communities. $\Lambda(.)$ is the logistic function, ρ denotes referendum fixed effect, and μ denotes canton or MP fixed effect.[17]

Our baseline results are presented in table 1. In panel A we consider all MP-community-referendum triplets such that each neighboring community of an MP's residence community enters the regression as a separate observation. Coefficient estimations for the logit model where the dependent variable is the *opinion match* are shown in columns (1) to (4), and columns (5) and (6) show results obtained from the OLS estimations (linear probability models).

Positive and significant coefficients for *residence community* reveal an interesting relation: in every specification across panel A in table 1, *opinion match* of MPs and their residence communities is significantly larger than that of MPs and their neighbor communities. Hence, there exists a significantly higher probability that a community agrees with an MP, if the MP is residing in that community, i.e. the *resident MP bias* exists. Discrete effects of the *residence community* (and its coefficient in case of linear probability models)

[16] We further rule out such explanations in robustness tests be analyzing MPs who were born in their residence community.

[17] Instead of MP fixed effects, we use electoral district fixed (canton) in some estimations. MPs in our sample did not change their electoral district during the time period analyzed.

Table 1. Representation of the Resident Community - Baseline Regressions

Dependent variable: match between MP's vote and referendum outcome

A. Residence Community vs. All Neighbor Communities

	(1)	*(2)*	*(3)*	*(4)*	*(5 OLS)*	*(6 OLS)*
Residence Community	0.148***	0.161***	0.160***	0.154***	0.034***	0.032***
	(0.039)	(0.042)	(0.040)	(0.042)	(0.009)	(0.009)
Intercept	0.375***	0.418	0.287	0.653**	0.574***	0.653***
	(0.037)	(0.261)	(0.293)	(0.261)	(0.069)	(0.059)
Referendum FE	no	yes	yes	yes	yes	yes
Canton FE	no	no	yes	no	yes	no
MP FE	no	no	no	yes	no	yes
Discrete Effect: Neighbor to Residence	0.035***	0.038***	0.039***	0.034***		
(Pseudo) R-squared	0.001	0.133	0.14	0.18	0.095	0.125
Observations	53346	53346	53346	53346	53346	53346

B. Residence Community vs. a Single "Synthetic" Neighbor Community

	(1)	*(2)*	*(3)*	*(4)*	*(5 OLS)*	*(6 OLS)*
Residence Community	0.147***	0.164***	0.165***	0.174***	0.035***	0.035***
	(0.039)	(0.043)	(0.043)	(0.045)	(0.009)	(0.009)
Intercept	0.377***	0.663***	0.523*	1.322***	0.630***	0.783***
	(0.034)	(0.233)	(0.274)	(0.264)	(0.060)	(0.053)
Referendum FE	no	yes	yes	yes	yes	yes
Canton FE	no	no	yes	no	yes	no
MP FE	no	no	no	yes	no	yes
Discrete Effect: Neighbor to Residence	0.035***	0.036***	0.038***	0.027***		
(Pseudo) R-squared	0.002	0.155	0.161	0.216	0.112	0.151
Observations	11908	11908	11908	11908	11908	11908

Note: Dependent var. is the matching between MP's vote and ref. outcome.

Standard errors (in parenthesis) are clustered by residence-neighbor-pair.

****, **, and * denote significance levels p<0.01, p<0.05, and p<0.1, respectively.*

in panel A show that the *resident MP bias* adds between 3.2 to 3.9 percentage points to the probability that an MP's vote and the majority vote of her residence community coincide.[18] These effects are not only statistically significant but also economically relevant, considering that three of the last four US presidential elections were decided by a margin of less than four percentage points.

When all neighbor communities are considered separately for an MP, as we do in panel A of table 1, an important potential problem arises: since there is no control for the size of communities in the calculation of the *opinion match*, majority votes of smaller neighbors will be over-represented in the sample. Hence it is possible that coefficients of the *residence community* are either over-estimated or under-estimated depending on its relative size. A solution to this potential problem and a conservative test for our conjectures is to create *synthetic* neighbor communities. We pool the citizens of all neighbor communities of an MP's residence together and create a single *synthetic* neighbor community which also becomes considerably larger in terms of population size than the residence community in most cases.[19] The *opinion match* of the MP and the newly created *synthetic* neighbor community is one, if the majority of the pooled population voted in the same way as the MP, and zero otherwise.

Table 1's panel B presents regression results using *synthetic* neighbor communities. *Residence community*'s discrete effect and significance in each of the six specifications are very similar to those in panel A: the discrete effect turns out to be between 3.5 and 3.8 percentage points, except for the specification (4) where the discrete effect is 2.7. Thus the *resident MP bias* remains positive and statistically significant even after introducing *synthetic* neighbor communities to take into account any problems related to size difference and aggregation effects.

4.1 Robustness: *Resident MP Bias* across Subsamples

Next we analyze the *resident MP bias* across different subsamples of our dataset to check for robustness of our findings documented in the previous subsection. Results are shown in table 2. *Opinion match* of every single neighbor community with the corresponding MP is used as a separate observation in panel A, and we use a single *synthetic* neighbor

[18]We calculate discrete effects applying the Delta-Method as suggested by Ai et al. (2003).

[19]Synthetic communities as well as matching representative's votes with local referenda outcomes are discussed in depth in Hermann and Leuthold (2007).

community for each residence community in panel B. We restrict our analysis in column (1) to residence communities of MPs that reside in the same community as their birth place. This setting minimizes any possible self-selection of MPs into their residence communities due to differences in preferences, since the cost of moving will still be contained in such a decision process. In column (3) we look at MPs that hold a local (political) office in their residence community. These two columns represent cases where the alignment of the residence community with the MP can be expected to be more likely due to long established personal and political relationships. In column (2) we eliminate neighbor communities in another canton.[20] Coefficients for *residence community* remain statistically significant and positive across these subsamples. Discrete effects when all neighbor communities are included separately are between 3.1 and 3.4 percentage point, and those from the estimation based on synthetic neighbor communities turn out between 2.5 and 2.9 percentage points. Thus, we obtain not only qualitatively but also quantitatively similar results in cases where the MP possibly has strong local connections compared to those in table 1.

Column (4) picks a specific subset of referenda such that the time between when MPs vote in the parliament and voters vote in referenda is above the median of such time for all referenda covered in our dataset. When there is more time between the parliamentary and the popular vote, we obtain still a significant and positive *resident MP bias* where estimations using separate neighbor communities and a single synthetic neighbor yield discrete effects of 2.6 and 2.7 percentage points, respectively. A plausible explanation for the slight decrease in discrete effects is that the convergence process between communities may have kicked in so that the residence and neighbor communities reach later stages of the opinion diffusion process so that they are getting closer to a consensus.

The subsample in column (5) is restricted to residence communities where several MPs reside, and these MPs have voted in the same way for the given legislative proposal, hence they have the same opinion about the subject at hand. The coefficient for *resident community* is very high and highly significant This is an expected outcome, because with several residing MPs sharing the same opinion the resident MP bias is expected to be amplified. Finally, we restrict our analysis in column (6) to a subsample where there is at least one MP residing in the neighbor community and moreover, she has (or

[20]Cantons constitute MPs' electoral districts, and it is quite possible that an MP is more responsive to her residence community if the neighbors lie outside the electoral district.

Table 2. Representation of the Resident Community - Robustness

Dependent variable: match between MP's vote and referendum outcome

A. Residence Community vs. All Neighbor Communities

	Residence is Birthplace	*No Border*	*Local Office*	*Long Time before Voting*	*Resident MPs w/same View*	*Neighbor MPs w/same View*
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Residence Community	0.150**	0.153***	0.134***	0.105***	0.689***	0.172
	(0.060)	(0.043)	(0.039)	(0.037)	(0.149)	(0.134)
Intercept	0.668*	0.629**	0.450	0.292	1.707***	1.205***
	(0.377)	(0.283)	(0.310)	(0.234)	(0.005)	(0.006)
Referendum FE	yes	yes	yes	yes	no	no
Canton FE	no	no	no	no	no	no
MP FE	yes	yes	yes	yes	yes	yes
Discrete Effect: Neighbor to Residence	0.033**	0.034***	0.031***	0.026***	0.070***	0.029
(Pseudo) R-squared	0.195	0.184	0.176	0.120	0.267	0.102
Observations	18202	48148	31317	18028	6265	12445

B. Residence Community vs. a Single "Synthetic" Neighbor Community

	Residence is Birthplace	*No Border*	*Local Office*	*Long Time before Voting*	*Resident MPs w/same View*	*Neighbor MPs w/same View*
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Residence Community	0.191***	0.160***	0.165***	0.128***	1.319***	0.255
	(0.060)	(0.046)	(0.045)	(0.034)	(0.475)	(0.203)
Intercept	1.366***	1.312***	1.173***	0.755***	-0.074	0.543
	(0.419)	(0.261)	(0.287)	(0.238)	(1.579)	(0.855)
Referendum FE	yes	yes	yes	yes	yes	yes
Canton FE	no	no	no	no	no	yes
MP FE	yes	yes	yes	yes	yes	no
Discrete Effect: Neighbor to Residence	0.029**	0.025**	0.029***	0.027***	0.295	0.057
(Pseudo) R-squared	0.226	0.216	0.200	0.170	0.668	0.545
Observations	3528	11970	6840	4014	1082	2344

Note: Dependent var. is the matching between MP's vote and ref. outcome.
Standard errors (in parenthesis) are clustered by residence-neighbor-pair.
****, **, and * denote significance levels p<0.01, p<0.05, and p<0.1, respectively.*

they have) the same opinion as the MP in the residence community. The coefficient of *resident community* turns out insignificant in this case, as expected, because MPs in either community promote the same view, and as a result we do not observe a significant resident MP bias in the residence community. Additional robustness results based on further subsamples are shown in table A3 in the appendix. All these test support the existence of a significant and economically relevant *resident MP bias*.

4.2 Refinements: *Resident MP Bias* and Community Size

We introduce the size difference between residence communities and their neighbors as an additional independent variable and also control for the interaction between the size difference and the indicator variable for the residence community. This allows us to test the empirical relevance of the second conjecture formulated in our theoretical discussion. Regression results are shown in table 3, panel A where each neighbor is considered separately, and panel B where neighbor communities are aggregated into a single *synthetic* community.

The first two columns of table 3 display estimation results based on our complete dataset, and columns (3) to (6) correspond to the same numbered columns in table 2. Residence community remains significant and positive throughout all specifications except for column (6), as expected, where the subsample contains residence communities which have neighbors with an MP of the same opinion as the MP residing in the residence community. The interaction of the relative size difference and resident community have positive and significant coefficients in all of the five columns where resident community is also significant. Hence the resident MP bias is increasing in the relative size difference of residence and neighbor communities: for MPs residing in residence communities with similar size we expect a larger resident MP bias for the residence community that has smaller neighbors. Similarly, for residence communities, which have neighbor communities in comparable size to one another, we expect a larger resident MP bias for the larger residence community.

According to table 3, the probability that a residence community agrees with the resident MP is significantly higher than that for its neighbor community, if these communities are of equal size– this is namely the baseline effect of the variable *residence community*. When the residence community is smaller than its neighbor, then we still expect a positive

Table 3. Resident MP Bias and Size Difference of Resident and Neighbor Communities

Dependent variable: match between MP's vote and referendum outcome

A. Residence Community vs. All Neighbor Communities

	All	*All*	*Local Office*	*Long Time before Voting*	*Resident MPs w/same View*	*Neighbor MPs w/same View*
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Residence Community	0.201***	0.299***	0.246***	0.220***	0.946***	0.264
	(0.066)	(0.057)	(0.059)	(0.060)	(0.313)	(0.212)
Size Difference (Residence-Neighbor)	-0.048	0.059	0.057	0.058	0.0008	-0.021
	(0.053)	(0.053)	(0.061)	(0.055)	(0.356)	(0.076)
*Residence*SizeDifference*	0.222***	0.265***	0.199**	0.186**	1.123***	0.368
	(0.086)	(0.084)	(0.088)	(0.079)	(0.411)	(0.329)
Intercept	0.306	0.594**	0.394	0.235	1.698***	1.218***
	(0.289)	(0.247)	(0.293)	(0.234)	(0.323)	(0.069)
Referendum FE	yes	yes	yes	yes	no	no
Canton FE	yes	no	no	no	no	no
MP FE	no	yes	yes	yes	yes	yes
Discrete Effect: (3rd Quartile)	0.095***	0.109***	0.096***	0.091***	0.130***	0.091
Discrete Effect: (1st Quartile)	0.053***	0.070***	0.067***	0.057***	0.120***	0.058
(Pseudo) R-squared	0.14	0.181	0.176	0.120	0.268	0.102
Observations	53346	53346	31317	18028	6265	12445

B. Residence Comm. vs. a Single "Synthetic" Neighbor Comm.

	All	*All*	*Local Office*	*Long Time before Voting*	*Resident MPs w/same View*	*Neighbor MPs w/same View*
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Residence Community	0.253***	0.267***	0.224***	0.167***	1.538***	0.414
	(0.063)	(0.065)	(0.056)	(0.044)	(0.555)	(0.295)
Size Difference (Residence-Neighbor)	-0.049	-0.513	-0.805*	-0.541	-33.593	-0.161
	(0.092)	(0.417)	(0.425)	(0.675)	(21.460)	(0.269)
*Residence*SizeDifference*	0.231**	0.244**	0.172	0.103	1.028	0.566
	(0.098)	(0.102)	(0.112)	(0.078)	(0.999)	(0.476)
Intercept	0.522*	1.298***	1.184***	0.762***	1.743	0.576
	(0.273)	(0.269)	(0.288)	(0.242)	(1.720)	(0.959)
Referendum FE	yes	yes	yes	yes	yes	yes
Canton FE	yes	no	no	no	no	yes
MP FE	no	yes	yes	yes	yes	no
Discrete Effect: (3rd Quartile)	0.058***	0.042***	0.039***	0.036***	0.332	0.097
Discrete Effect: (1st Quartile)	0.019*	0.011*	0.012	0.016*	0.00004	0.002
(Pseudo) R-squared	0.162	0.216	0.200	0.170	0.673	0.546
Observations	11908	11908	6840	4014	1082	2344

Note: Dependent var. is the matching between MP's vote and ref. outcome.

Standard errors (in parenthesis) are clustered by residence-neighbor-pair.

****, **, and * denote significance levels p<0.01, p<0.05, and p<0.1, respectively.*

resident MP bias but not as large as in the case when the two communities are of equal size. A negative total effect of the *residence community* is possible if the residence community is smaller than one nineth of the neighbor community, according to coefficients listed in column (1), whereas such a negative total effect is impossible according to the specification used in column (2) as well as according to most of the restricted subsamples investigated in columns (3) to (6). We take the existance of a resident MP bias even when the residence community is much smaller than the neighbor to be a hint for the following: if at least some part of these empirical results are driven by the mechanisms described in the theoretical section of this paper, then the *unequal share of influentials* (as depicted in figure 3) across the two communities must be the case and not the *equal share*, thus confirming geographical homophily in inter-community links, including those of the resident MP.

Third quartile and first quartile discrete effects show the level of the resident MP bias when the total effect of the variable *residence community* is evaluated at the third and first quartiles, respectively, of the size difference between residence and neighbor communities. Pairs of residence and neighbor communities are ranked from the largest difference in favor of residence community to the largest difference in favor of neighbor community. Using our complete sample as reported in columns (1) and (2), the discrete effect (i.e. the resident MP bias) evaluated at the third quartile of this ranking is about 9.5 to 10.9 percentage points, whereas that evaulated at the first quartile is about 5.3 to 7 percentage points.

When we consider synthetic neighbor communities, the coefficient of the interaction effect between the relative size and the resident community turns out significant and positive for the whole sample. The corresponding discrete effects in third and first quartile in case of a single synthetic neighbor community range from 4.2 to 5.8 percentage points and from 1.1 to 1.9 percentage points, respectively. No significant interaction effect is obtained for subsamples that we investigate in columns (3) to (6). Relative size variation of residence communities that make up our restricted subsamples in columns (3) to (6) most likely do not vary enough to obtain statistical significance for these interaction effects. Nevertheless, levels of the resident MP bias that are significantly different from zero turn out 3.6 to 3.9 percentage points at the third quartile, and 1.6 percentage points at the first quartile.

Further results about communities' size difference and its interaction with the residence community using various subsamples are shown in table A4 in the appendix, where similar and robust empirical results are obtained.

5 Conclusion

We investigate opinion gaps between groups that are geographically separated and present a simple diffusion process that leads to opinion gaps between these groups under geographic homophily. We consider an opinion leader as the initiator of the diffusion process to spread her opinion, and our theoretical setting gives rise to what we call the *resident opinion leader bias*: the group which the opinion leader belongs to (*residence community*) agrees on average more with the opinion leader than the other group does. Under the homophily assumption, we show that strictly positive resident opinion leader bias is obtained for plausible values of the linking parameter in the network and over most parts of the range of groups' relative sizes. Moreover, the resident opinion leader bias increases in the relative size of the residence community for most of the empirically relevant range of the relative size.

Taking this theory to data requires a highly detailed dataset, where each individual's opinions and their personal connections as well as communications are revealed. Previous studies have focused on diffusion of views and news using data based on social media interactions, however they lack observations on individuals' personal opinions and in particular, whether these opinions translate into actual behavior. We employ a dataset of Swiss referendum decisions between 2008 and 2012 in our empirical analysis where referenda decisions on legislative proposals are recorded at community level, votes of MPs on corresponding proposals are recorded as well, and MPs' residence communities are known. This dataset gives us the unique opportunity to observe individuals' revealed opinions on policy issues. Although it is not straightforward to empirically pinpoint all of the theoretical effects discussed in the theoretical section of this paper, we present a case where we observe patterns that align closely with the conjectures obtained in our theoretical investigation. Hence, the dynamics presented in the theoretical discussion turn out to be the suspect for bringing these observed empirical patterns about.

We consider an MP residing in a community to be the opinion leader in that community. Social interactions within and between communities create a channel for the diffusion of the MP's opinions. Our baseline regressions reveal that the referendum decision in a community where an MP resides tends to agree significantly more with the vote of the MP on the corresponding legislative proposal: the probability that the residence community agrees with the resident MP is about three to four percentage points greater than that of neighbor communities. We refer to this effect as the *resident MP bias*, which is simply the empirical counterpart to what we call the *resident opinion leader bias* in the theoretical part. This finding is statistically robust and economically relevant throughout different subsamples and alternative specifications. An analysis of the interaction between residence community's relative size and the resident MP bias reveals that significant interaction effects exist for the whole sample, although the statistical significance is lost in case of various smaller subsamples. Having data on how individual voters decide and how they communicate via social connections with an MP would be the best of all possible worlds to take our theoretical claims to test. Nevertheless, the empirical patterns that we observe in our dataset are broadly consistent with our theoretical conjectures. Moreover, our dataset has the unique advantage of matching actual decisions of MPs and voters at community level on the same national policy issues for the first time in the literature.

There are two bottom lines drawn in our study: first, a simple diffusion process under homophily assumption drives a significant wedge between opinions of different groups, although there are no competing opinions, individuals are easily influenced, and the process starts from a point where the groups were in perfect consensus—within as well as between each other. Moreover, relative size differences between groups amplify the opinion gap. Second, we find relevant traces of this theoretical process when we empirically investigate referenda outcomes and MPs' votes on legislative proposals.

Thus, observed opinion gaps can be driven at least partially by purely technical artifacts that underlie the social web of different groups within the society. The interpretation of an observed opinion gap requires far more attention, if the aim is to understand how severe the opinion gap really is due to *fundamental* differences in ideas held by different groups. In a world where social connections reveal significant traces of homophily, and assuming that MPs actually act as opinion leaders and not as representative agents that passively confirm to the views of the median voter, MPs need to reach out to the public and promote their opinions, i.e. establish relations to influentials in distant communities as well, if MPs want to create a significant leap in people's opinions and lead the way.

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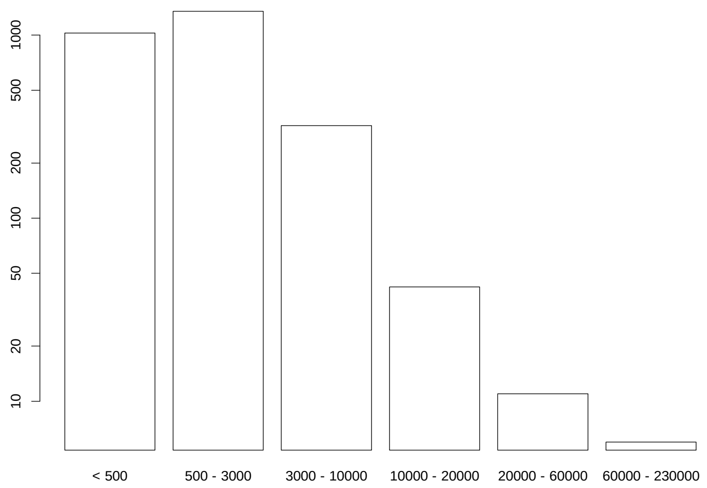
A Appendix

A.1 Background Information: Swiss Cantons, Municipalities, and Referenda

Figure A1. Distribution of Community Size in Switzerland

A. Number of Swiss Communities, grouped according to their Population



B. Number of Observations on Communities (grouped according to their Population) with at least one resident MP

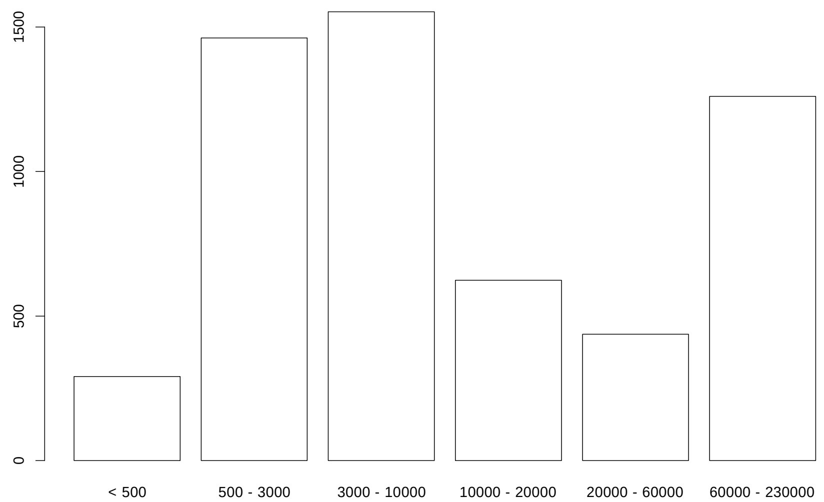


Table A1. Swiss Cantons and Municipalities

Canton	*Number of municipalities*	*Canton*	*Number of municipalities*
Aargau	225	*Nidwalden*	11
Appenzell Innerrhoden	6	*Obwalden*	7
Appenzell Ausserrhoden	20	*St. Gallen*	86
Bern	378	*Schaffhausen*	28
Basel-Landschaft	86	*Solothurn*	123
Basel-Stadt	3	*Schwyz*	30
Fribourg	167	*Thurgau*	80
Geneva	45	*Ticino*	168
Glarus	19	*Uri*	20
Graubünden	186	*Vaud*	364
Jura	67	*Valais*	144
Lucerne	89	*Zug*	11
Neuchâtel	54	*Zurich*	171
		Total	2588

Note: The number of Swiss municipalites has strongly decreased during the last decades due to municipal mergers. The table indicates the average number of muncipalities in the repsective canton within the analyzed sample of referenda from 2008 to 2012.

Table A2. List of Referenda Topics 2008-2012

ID	*Date*	*Proposal / Topic of the Referendum*
530	24.02.2008	*Initiative "against fighter jet noise in tourist regions"*
531	24.02.2008	*Federal law on the improvment of the tax environment for business activities and investments*
532	01.06.2008	*Initiative "for democratic naturalizations"*
533	01.06.2008	*Initiative "Popular sovereignity instead of authority propaganda"*
534	01.06.2008	*Constitutional article "For quality and efficiency in health insurance"*
535	30.11.2008	*Initiative "for the abolition of the statute of limitations regarding pornography offences involving children"*
536	30.11.2008	*Initiative "for a flexible AHV-age"*
537	30.11.2008	*Initiative "Right of appeal for associations: Stop the obstruction policy - More growth for Switzerland!"*
538	30.11.2008	*Initiative "for a reasonable hemp-policy including an effective protection of minors"*
539	30.11.2008	*Federal law on narcotics and psychotropic substances*
540	08.02.2009	*Federal enactment on the approval of the continuation of the Agreement on the Free Movement of Persons between Switzerland and the European community as well as on the approval of the protocol on the extension of the Agreement to Rumania and Bulgaria*
541	17.05.2009	*Constitutional article "Future with complementary medicine" (Counter proposal to the initative "Yes to complementary medicine")*
542	17.05.2009	*Federal enactment on the approval and the implementation of the exchange of notes between Switzerland and the European community relating to the adoption of regulations for biometrics in passports and travel documents*
543	27.09.2009	*Federal enactment on temporary supplementary funding of the invalidity insurance through an increase in the value added tax*
544	27.09.2009	*Federal enactment on the waiving of the introduction of the general people's initiative*
545	29.11.2009	*Federal enactment to create special funding for tasks related to air traffic*
546	29.11.2009	*Initiative "for a ban on the export of war material"*
547	29.11.2009	*Initiative "against the construction of minarets"*
548	07.03.2010	*Constitutional article on research on humans*
549	07.03.2010	*Initative "against animal cruelty and for better legal rights for animals"*
550	07.03.2010	*Federal law on occupational retirement, surviving dependants' and disability pension (BVG) (minimum conversion rate)*
551	26.09.2010	*Federal law on obligatory unemployment insurance and insolvency compensation (unemployment insurance act (AVIG))*
553	28.11.2010	*Federal enactment on the initative "In favor of fair taxes. Stop tax competition abuse (initative for tax justice)" of 18 June 2010*
5521	28.11.2010	*Federal enactment on the initative "for the expulsion of foreign criminals (expulsion initative)"*
5522	28.11.2010	*Federal enactment on the deportation of foreign criminals within the framework of the Federal Constitution (Counter proposal to initative "For the expulsion of foreign criminals (expulsion initative)" of 10 June 2010*
554	13.02.2011	*Initative "Protection against firearms violence"*
555	11.03.2012	*Federal enactment on the initative "Stop the excessive construction of secondary homes"*

Table A2. List of Referenda Topics 2008-2012 (continued)

ID	*Date*	*Proposal / Topic of the Referendum*
556	11.03.2012	*Initative "In favor of tax-supported building society savings for the purchase of owner-occupied residential property and for the financing of constructional energy-saving and environmental measures (building society savings initative)" of 29 September 2008*
557	11.03.2012	*Federal enactment on the initative "6 weeks vacation for everybody"*
558	11.03.2012	*Federal enactment on the regulation of betting games in favor of charitable purposes (Counter proposal to the initative "For betting games serving the common good" of 29 September 2011*
559	11.03.2012	*Fixed Book Price Law (BuPG) of 18 March 2011*
560	17.06.2012	*Initative "Owning a home thanks to building society savings"*
561	17.06.2012	*Initative "Reinforcing popular rights in foreign policy (Let the people decide on treaties!)*
562	17.06.2012	*Amendment to the federal law on health insurance (KVG) (Managed Care)*
563	23.09.2012	*Federal enactment on the promotion of youth music (Counter proposal to the initative "youth + music")*
564	23.09.2012	*Initative "Safe housing for the elderly"*
565	23.09.2012	*Initative "Protection from exposure to tobacco smoke"*
566	25.11.2012	*Amendment of 16. March 2012 to the Law on Epizootic Diseases*

A.2 Further Robustness Tests

We provide additional evidence for robustness using additional subsamples in tables A3 and A4, which complement tables 2 and 3, respectively. First, we briefly describe the content of subsample restrictions in tables A3 and A4. The subsample labeled *tight referendum* is restricted to those referenda that are decided by only a small margin nationwide. Other subsamples are restricted to MPs' residence communities which:

- are birthplace of the resident MP, *residence is birthplace* (to ensure exogeneity of residency);
- talk a different language than some of their neighbor communities, *other language* (to exploit another potential source of homophily);
- are rural, *rural community* (to ensure results are not due to cities);
- contain a resident MP that is a farmer, *MP is farmer* (to ensure exogeneity of residency);
- are also the official correspondance adress of the resident MP, *residence=correspond.* (to ensure that MPs do not only indicate residency in a community);
- have several resident MPs with the same opinion AND there is no MP residing in the neighbor communities, *resident MPs w/same view and no MP in neighbor* (to isolate potential disturbance from MPs in neighbor communities);
- have several resident MPs with the same opinion AND there are MPs residing in the neighbor communities that have the opposite view as the MPs in the residence community, *resident MPs w/same view and MPs in neighbor w/opposite view* (to analyze a situation where strong resident MP bias should be present).

Table A3. Representation of the Resident Community - Further Robustness Tests

A. Residence Community vs. All Neighbor Communities	*Other Language*	*Rural Community*	*MP is Farmer*	*Residence = Correspond.*	*Tight Referendum*	*Resident MPs w/same View and NO MP in Neighbor*	*Resident MPs w/same View and MPs in Neighbor w/opposite View*
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*
Residence Community	0.117	0.105**	0.085	0.102*	0.206*	1.548**	0.944***
	(0.086)	(0.048)	(0.088)	(0.055)	(0.113)	(0.621)	(0.301)
Intercept	-0.645	1.905***	1.872***	0.345	2.059***	9.874***	-1.433***
	(0.575)	(0.431)	(0.527)	(0.347)	(0.168)	(2.198)	(0.036)
Referendum FE	yes	yes	yes	yes	yes	yes	no
Canton FE	no	no	no	no	no	no	no
MP FE	yes	yes	yes	yes	yes	yes	yes
(Pseudo) R-squared	0.25	0.31	0.38	0.19	0.271	0.74	0.26
Observations	3280	11968	6669	18669	6552	1628	1881

B. Residence Community vs. a Single "Synthetic" Neighbor Community	*Other Language*	*Rural Community*	*MP is Farmer*	*Residence = Correspond.*	*Tight Referendum*	*Resident MPs w/same View and NO MP in Neighbor*	*Resident MPs w/same View and MPs in Neighbor w/opposite View*
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*
Residence Community	0.155	0.146**	0.166	0.113*	0.374**	2.829**	1.168**
	(0.112)	(0.065)	(0.110)	(0.063)	(0.155)	(1.227)	(0.460)
Intercept	-0.211	1.309***	1.719***	1.521***	12.802***	9.090***	-1.768***
	(0.640)	(0.472)	(0.616)	(0.361)	(1.030)	(2.418)	(0.298)
Referendum FE	yes	yes	yes	yes	yes	yes	no
Canton FE	no	no	no	no	no	no	no
MP FE	yes	yes	yes	yes	yes	yes	yes
(Pseudo) R-squared	0.30	0.36	0.42	0.24	0.466	0.85	0.42
Observations	780	3174	1666	4138	1466	316	362

Note: Dependent var. is the matching between MP's vote and ref. outcome. Standard errors (in parenthesis) are clustered by residence-neighbor-pair.
****, **, and * denote significance levels p<0.01, p<0.05, and p<0.1, respectively.*

Table A4. Resident MP Bias and Size Difference of Resident and Neighbor Communities- Further Subsamples

A. Residence Community vs. All Neighbor Communities	*Residence is Birthplace* (1)	*Other Language* (2)	*Rural Community* (3)	*MP is Farmer* (4)	*Residence = Correspond.* (5)	*Tight Referendum* (6)	*Resident MPs w/same View and NO MP in Neighbor* (7)	*Resident MPs w/same View and MPs in Neighbor w/opposite View* (8)
Residence community	0.219***	0.274**	0.121	0.732**	0.275***	0.560***	2.711**	1.393**
	(0.067)	(0.129)	(0.119)	(0.368)	(0.104)	(0.198)	(1.079)	(0.589)
Size Difference (Residence-Neighbor)	0.056	0.027	0.048	0.336**	0.081	0.242	0.788	-0.132
	(0.082)	(0.120)	(0.061)	(0.133)	(0.083)	(0.149)	(0.741)	(0.602)
*Residence*SizeDifference*	0.121	0.377*	-0.037	0.541	0.264*	0.417	2.417	1.927***
	(0.125)	(0.205)	(0.182)	(0.585)	(0.149)	(0.295)	(1.507)	(0.581)
Intercept	0.615*	-0.620	1.921***	1.782***	0.254	1.833***	9.012***	-1.400***
	(0.356)	(0.574)	(0.432)	(0.511)	(0.339)	(0.183)	(2.401)	(0.514)
Referendum fixed effects	yes	yes	yes	yes	yes	yes	yes	no
Canton fixed effects	no	no	no	no	no	no	no	no
MP fixed effects	yes	yes	yes	yes	yes	yes	yes	yes
(Pseudo) R-squared	0.20	0.25	0.31	0.39	0.19	0.273	0.74	0.27
Observations	18202	3280	11968	6669	18669	6552	1628	1881

B. Residence Comm. vs. a Single "Synthetic" Neighbor Comm.	*Residence is Birthplace* (1)	*Other Language* (2)	*Rural Community* (3)	*MP is Farmer* (4)	*Residence = Correspond.* (5)	*Tight Referendum* (6)	*Resident MPs w/same View and NO MP in Neighbor* (7)	*Resident MPs w/same View and MPs in Neighbor w/opposite View* (8)
Residence community	0.202***	0.335**	0.220	0.118	0.240**	0.554**	2.471**	1.714***
	(0.072)	(0.156)	(0.145)	(0.551)	(0.104)	(0.237)	(0.995)	(0.475)
Size Difference (Residence-Neighbor)	-1.901	1.877	1.356	-4.822***	1.423	-1.297	0.707	-10.932
	(1.305)	(1.711)	(1.888)	(1.296)	(1.613)	(2.506)	(1.586)	(22.071)
*Residence*SizeDifference*	0.051	0.502*	0.116	-0.073	0.312*	0.458	2.273	1.846**
	(0.118)	(0.297)	(0.246)	(0.828)	(0.168)	(0.406)	(2.229)	(0.865)
Intercept	1.476***	1.629	2.588	-2.071*	0.846	12.782***	1.385	-1.822***
	(0.437)	(1.618)	(1.810)	(1.104)	(0.738)	(1.044)	(2.084)	(0.529)
Referendum fixed effects	yes	yes	yes	yes	yes	yes	yes	no
Canton fixed effects	no	no	no	no	no	no	yes	no
MP fixed effects	yes	yes	yes	yes	yes	yes	no	yes
(Pseudo) R-squared	0.23	0.31	0.36	0.42	0.24	0.468	0.78	0.43
Observations	3528	780	3174	1666	4138	1466	316	362

Note: Dependent var. is the matching between MP's vote and ref. outcome. Standard errors (in parenthesis) are clustered by residence-neighbor-pair.
****, **, and * denote significance levels p<0.01, p<0.05, and p<0.1, respectively.*

Table A5. Resident MP Bias and the Individual Characteristics of MPs

dependent variable: average yearly ARC of MPs

	(1)	*(2)*	*(3)*
Intercept	-0.008	0.018*	-0.04
	(0.011)	(0.01)	(0.025)
Gender		0.051***	0.024
		(0.02)	(0.02)
Residence is same as BirthPlace			0.028*
			(0.015)
Graduate Education			-0.021
			(0.016)
Children			0.008
			(0.02)
Married			-0.003
			(0.02)
Army			0.01
			(0.02)
Interest Groups			0.003**
			(0.001)
PartyLeft	0.119***		0.129***
	(0.02)		(0.02)
PartyRight	0.007		0.017
	(0.016)		(0.017)
R-squared	0,076	0,014	0,091
Observations	1060	1060	1055

Note: Standard errors (in parenthesis) are clustered by residence-neighbor-pair.
****, **, and * denote significance levels p<0.01, p<0.05, and p<0.1, respectively.*

A.3 MPs' Characteristics and the *Resident MP Bias*

For each MP we create a measure of *agreement with her residence community (ARC)*: for each referendum outcome, the MP is assigned 1, if her vote matches with the outcome in her residence community but not that in neighbor communities; assigned -1 if her vote matches neighbor community but not her residence community; and assigned 0 if her vote matches both or neither communities. Taking the average of these values for each MP over all referenda, we create an individual measure for an MP's ARC. Results of regressing ARC on individual characterisctics of MPs are shown in Table A5. Time spent in council has a non-linear effect: up to about eight years it is positively correlated with an MP's ARC. After eight years, more time in the council is correlated with decreasing ARC. MPs associated with left wing parties have higher ARC on average. MPs who did not change their residence since birth have higher ARC on average. This is not a surprising result, since such an individual would be expected to have better established long-term relationships within that community, and this is what we also exploit in our robustness analysis in the paper.

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