**Abstract nsv**

**Almost all 150 Dutch MPs are active on Twitter. With their tweets they target their electorate and the media but also disproportionally focus on their fellow politicians. They have debates, make friends, advertise accomplishments, share information and form allegiances on Twitter. We will be the first to systematically investigate how the structure of Twitter networks among MPs develop. Are social cleavages present in real-life mitigated by Twitter or is Twitter dividing the Dutch parliament?**

**Our main question is: How can we explain the developments in the structure of Dutch MPs’ Twitter networks, and, more specifically, the degree of ethnicity, sex, age and party segregation therein?**

**We theorize the co-evolution of three Twitter networks: following other MPs, @mentioning them, and retweeting tweets of them. Empirically we investigate how the Twitter networks among Dutch MPs have developed between May 2017 and October 2017. In May 2017 a new, 13-party, parliament was installed following the elections of March 2017. We analyze the co-evolution of the twitter networks via Stochastic Actor-Orientated Models in RSiena.**

**1. Introduction**

Twitter is a popular communication tool among politicians. Twitter is simple and easy to use and it allows politicians to directly communicate and engage with the population and pundits (e.g. Jacobs & Spierings, 2018b; Klinger & Svensson, 2015; Spierings, Jacobs & Linders, 2018; Tromble, 2016). Consequently, Members of Parliament (MPs) have debates, make friends, advertise accomplishments, share information, and form allegiances on Twitter. Being successful on Twitter, as indicated by having many followers, retweets or @-mentions, is considered part of MPs power base by media, party leaders, and selection committees (Jacobs & Spierings, 2018b) and is likely to have consequences for real-life politics in terms of who gets attention, which policy frames become dominant, and what position an MPs attains within the party hierarchy.

When looking at with whom politicians such as MPs actively connect and interact with on Twitter, other politicians are strongly over represented. Although politicians naturally only make up a small part of the pool of possible Twitter ‘friends’, a study on Dutch MPs estimated that over 40 per cent of the accounts MPs follow are other politicians (Spierings, Jacobs & Linders, 2018). Communication and engagement on Twitter by MPs with other MPs may increase general Twitter visibility. Moreover, tweeting with MPs who represent groups one has no contact with offline might facilitate the formation of stronger offline networks and parliamentary collaboration between dissimilar colleagues (REF?). On the other hand, if twitter networks among MPs are divided across party lines or other important social dimensions such as sex, age and ethnicity this could lead to information bubbles, political polarization and, in extremis, harm political functioning.

The current research on politicians’ use of social twitter mainly focuses on politicians’ vertical connections: how they create relations and engage with their electorate, or how they use Twitter contact with journalists to reach potential voters (Jungherr, 2016; Kruikemeier, 2014; Spierings & Jacobs, 2016; Spierings, Jacobs & Linders, 2018). Research into the Twitter networks among MPs is rare. Del Valle and Bravo (2018) demonstrated that the twitter networks among Catalan parliamentarians are segregated along party and ideological lines. According to del Valle and Bravo, in Catalonia, Twitter functions as an ‘ideological echo chamber’ in which MPs are mostly exposed to MPs with consonant views.

In this contribution, we will investigate segregation in Twitter networks among parliamentarians in The Netherlands. More specifically, we will investigate how the three Twitter networks among the 150 Dutch MPs (following MPs, @mentioning MPs, and retweeting tweets of MPs) have evolved after the national elections of 2017. Where the Catalan case is a most likely case to observe party cleavages in MPs’ twitter networks, because of the strong independence movement, the Dutch case could be seen as a least likely case to observe segregation in twitter networks, because of the multiparty system. After the 2017 elections, 13 parties were presented in the House of Parliament (HoP) by 150 MPs. In this political arena, political opponents need to form coalitions, either in order to form a government, or to become an opposition to be reckoned with. In this setting, we might expect less clear division lines running across MPs’ Twitter networks. In other words, if they are still found in the Netherlands, this is a strong confirmation of the prior findings by del Valle and Bravo (2018) and to lesser extent Hsu & Park (2012). We thus present a replication in a different site, which is relevant in itself, but at the same time, we also expand on previous work in several important ways.

*Segregation in Twitter along multiple dimensions.*

Whereas previous authors focused on cleavages along political dimensions alone, we will also investigate socio-demographic segregation within MPs’ Twitter networks along major axis of representation: sex, age and ethnicity (Celis & Mügge 2018). Social interactions are more likely between people who are similar, and this so-called homophily is observed across a wide array of social dimensions and for different type of offline and online social relations (##REFS). The observed degree of homophily is to a large extent the result of the opportunity structure; the availability of contact partners within and outside one’s group. Inbreeding homophily, or choice homophily, is the degree of homophily over and above that of structurally-induced homophily and commonly assumed to be the result of the constrained choices that individuals make with whom to interact (McPherson). Inbreeding homophily will contribute to segregation and social cleavages, that is that interactions are more likely within specific groups and less likely between different groups than could be expected on opportunity structures alone. It is, however, still an open question whether sex-, age- and ethnicity-based inbreeding homophily in Twitter networks among MPs exists, and whether real-life social cleavages are mitigated by Twitter or that Twitter reifies existing social divides in parliament.

As in other countries, Dutch political parties differ in their socio-demographic composition (Jacobs & Spierings, 2016; Table 1). After the 2017 elections, women are underrepresented in parliament (54 MPs, 36%). In most parties, women hold a numerical minority position, although there are exceptions within the political left : Groenlinks (8 MPs, 57%); PvdA (5MPs, 56%); PvdDieren (3MPs, 60%). The mean age of MPs in the HoP does not deviate much from the mean age in the general Dutch population (45 versus 42) but there are striking differences across parties. The MPs of the 50Plus party, a party specifically targeting the elderly, have a mean age of 65 year. The mean age of MPs of the radical left party SP is just over 38. In The Netherlands, the share of MPs with a visible ethnic minority background reflects the group size within the electorate fairly well (Van der Zwan et al., 2018). [note: In this contribution, we make a distinction between MPs with and without a visible ethnic minority background. For more information on how we categorized MPs in (non) visible ethnic minority, see section Data and Methods below.] Although parties across the left-right spectrum have MPs with a visible ethnic minority background, we also observe marked differences across parties. In the 2017 election, a new ethnic minority party DENK entered the arena, focusing in their campain on existing racism and discrimination in Dutch society, and won three seats in parliament. All three MPs have an ethnic minoirty background. But also one MP (5%) of the populist radical right party PVV (Freedom Party) of Geert Wilders has a visibly noticable ethnic minority background. Five parties did not have any visible ethnic minority candidate on their election list: CU, PvdDieren, 50Plus, SGP, FVD.

Considering these differences in social composition across parties, segregation in Twitter networks along party lines could in part be a by-product of social inbreeding homophily, the result of selecting Twitter partners based on attributes other than party membership. In this contribution, we will thus assess the degree of sex, age and ethnicity-based inbreeding homophily in Twitter networks and the extent to which segregation in Twitter networks along party-membership among Dutch MPs is a byproduct of social inbreeding homophily.

**<<< Table 1 >>>**

*Segregation in different layers of the Twitter network*

There are different layers of interaction on Twitter: follow relations, retweets and @mentions. On Twitter, one can follow another account in a non-reciprocal way. Once a connection is made, the tweets of the followee will appear on the timeline of the follower. Following an account could thus indicate that a follower finds the content posted by the followee interesting, regardless of whether one agrees or disagrees with the content of the followee. Forming (reciprocal) following relations can also be used strategically to boost the prominence of an account, because this will increase the likelihood that own tweets are shown in the timelines of others with whom no following relation is formed. In this respect, it should be noted though, that although political parties want their politicians to have and show large numbers of followers, hardly any party seems to actively stimulate that their MPs follow each other on Twitter (see Jacobs & Spierings 2016; Spierings & Jacobs, 2014ROB).

Twitter allows users with the retweet function to basically copy a post of another user and push it to their own followers. Retweeting a message indicates that the original tweet is deemed an interesting enough intervention in the public debate to pass it on to one’s own followers. Although politicians tend to explicitly claim that a retweet is not necessarily an endorsement (see boyd, Golder, & Lotan, 2010; Klinger & Svenson, 2014; Metaxas et al., 2015), particularly among politicians, retweeting a message of another politician one disagrees with is unlikely, because the retweet function is mainly a passing on of content. Retweets are, of the three relationship types, most likely to signal positive affect.

In contrast, the @mention functionality of twitter is of the three most likely to be used by politicians for debating with opponents and to signal negative affect (Spierings & Jacobs, 2018b). There are two ways in which one could @-mentions others. First, a user can write a post and invite others to be aware of, look at, or respond to that post by including the person in the message using the @-mention. If one does so, the @-mentioned account gets a notification, strongly increasing the likelihood that the tweet is noticed by the @-mentioned person. Second, below each tweet, Twitter puts a small speech bubble icon via which users can directly, but publicly, reply to a message. Using this function automatically leads to including the poster of the original message to be @-mentioned in the reply. This way, Twitter facilitates interaction among users. Overall, the @-mention is thus used for ‘calling upon a person’, holding conversations, and debating (Spierings & Jacobs, 2018b).

Given their different functions, and the presumed different emotional valence attached to ties, the network structures present in each layer of Twittersphere do not necessarily need to be similar (del Valle and Borge, 2018) and MPs may hold different structural positions in each network-layer~~. For example, a politician may have a very important structural position in the sense that she or he passes on tweets from one segregated part of the network to another, this is not to say that this politician also holds a central position in the twitter friendship network.~~ So far, it has remained unclear how the different Twitter network types co-evolve. Does debating with opponents makes friendships (i.e. following relations) with opponents more likely, or are MPs more likely to ignore their opponents and prefer to engage in debates with MPs they already follow? In the present contribution we take this so-called multiplexity of Twittersphere into account and will assess how segregation in one layer of the twitter network impacts segregation in another layer.

*Development of segregation in Twitter over time.*

We will also expand on previous work by investigating the (co-)development of the three Twitter networks over time. More concretely, we will investigate how the Twitter networks among Dutch MPs have evolved between May 2017 and October 2017. In May 2017 a new, 13-party, parliament was installed following the elections of March 2017. In October 2017, a new government was formed after more than 200 days of fierce negotiations among different potential coalition partners.

Politicians of the same party who have been elected as MP are likely to have worked together before or during the campaigns leading up to the election. Their shared social contexts (or *foci,*  Feld 1981) will undoubtedly have led to (structurally-induced) homophily in their offline relations and could have translated into their online Twitter relations. Following this line of reasoning and the lead of previous empirical research, we thus expect to see at least some degree of segregation in the Twitter networks based on party-membership shortly after the time when parliament is established.

The degree of segregation is, however, unlikely to be stable. Common structural network dynamics like reciprocity and transitive closure may act as catalyzer and will contribute to the further over-representation of intra-party relations, thereby increasing the degree of segregation. On the other hand, the presumed initial segregation in Twittershpere may be overcome merely because offline contact and exposure to dissimilar MPs in the house increases. This is in line with Brundidge (2010) who found evidence that through inadvertent exposure, the Internet increased the heterogeneity of political discussion networks, and thus people’s exposure to political difference. Also, besides the often alluded to echo chamber effect, interview-based studies have shown that Twitter is actually used as a political instrument to be aware of what opponents think and say (Jacobs & Spierings, 2016; Spierings & Jacobs, 2018), which actually facilitates cross-ideological contacts with those who think differently. Our unique time window enables us to assess the development of segregation in Twittersphere over time, showing how it increases or decreases.

*Research aims*

In sum, the aim of this contribution is to describe and explain political segregation on Twitter among Dutch MPs. We will assess the extent to which segregation between MPs representing different political parties: (a) is a byproduct of social homophily; (b) crosses the three network layers and (c) changes over time.

To reach these aims and to make the steps forward described above – multi-dimensionality, multiplexity, multiple time points – we make use of descriptive statistics complemented with a Stochastic Actor-Orientated Modelling approach as implemented in RSiena (refs). RSiena allows us to assess political segregation among MPs while controlling for structural network effects (e.g. reciprocity, triadic closure, and others) and a wide array of characteristics at the ego, alter and dyad-level that may influence whether relations between MPs are present. Next to MPs sex, age and visible ethnic minority status, we also collected information with respect to the number of preference votes MPs received, their incumbency status, list position on the ballot, online activity (next to Twitter) and seating position within the House.

**Expectations**

Given the rationale outlined above and based on previous research on segregation in Twitter networks (del Valle, Hsu, others?), we expect to observe at least some degree of segregation along the party dimension in all three Twitter networks of Dutch MPs, and thus that MPs are more likely to interact on twitter with same party MPs relative to MPs from different parties, even after we take the opportunity structure into account (Hypothesis 1).

Since political parties have different social compositions and inbreeding homophily has been observed previously across a wide array of social dimensions, among which sex, age and ethnicity, for different type of offline and online networks, we therefore expect to observe social divisions in twitter along these social dimensions as well (Hypothesis 2a), and that political segregation in Twittersphere will in part be a by-product of inbreeding homophily in these social dimensions (Hypothesis 2b).

We expect that segregation will be most pronounced in the retweet layer of the twitter network, as this type of relation is of the three most likely to be formed between MPs who evaluate each other positively (Hypothesis 3a). In a similar vein, the @mention relation will, in contrast, also be formed between political foes when they debate each other on twitter. Hence, of the three layers, we expect to observe here the lowest degree of political segregation (Hypothesis 3b). One may follow MPs on Twitter because of positive reasons (e.g. like the follower, increase visibility of follower) of for negative reasons (e.g. want to be informed what political foe tweets) and hence we expect the degree of political segregation in this layer will fall between the retweet and @mention layer (Hypothesis 3c).

Once you follow someone on twitter or are followed by someone, the tweets of this followee/follower become more visible to you. From previous research, we know that (physical) proximity is a very important determinant for tie formation and maintenance (refs). Hence we expect that the digital proximity that results from a follow relation on twitter will increase opportunities for both MPs to retweet each other’s tweets or to react on tweets via @mentions. Consequently, we expect follow relations to increase retweet and @mention relations and thus that the degree of segregation in the retweet and @mention layer is in part the result of the degree of segregation in the follower layer (Hypothesis 4a and 4b). Similarly, when an MP retweets your tweet or @mentions you, this may be an incentive to become more close to this MP and to start following this MP. Thus we expect that segregation in the friendship network will also be in part the result of segregation in the retweet and @mention network (Hypothesis 4c and 4d).

Initial levels of segregation may deepen, because of inbreeding homophily and structural network dynamics, in line with the idea of the development of political echo chambers. On the other hand, networks may become more integrated over time as a result of the (offline) meeting opportunities with dissimilar MPs in the House. MPs may also form new (strategic) follower relations with dissimilar MPs, because they want to be informed on the Twitter content of these dissimilar MPs. And MPs may enter @mention discussions with political opponents on twitter, either steered by genuine political motives or to strategically increase Twitter visibility. However, we do not have an a priori expectation on whether mechanisms that deepen or ease segregation will dominate and will therefore assess the development of segregation in Twitter over time in an exploratory fashion.

**Data**

The Netherlands is a Twitter frontrunner, with a high adoption rate among MPs (>85% since 2012 [Jacobs & Spierings, 2016]). Before the elections of 15 March 2017, we searched for relevant twitter handles for all persons on election lists. Of those 150 politicians who eventually entered the House of Parliament (HoP) we have 147 twitter handles (not for Tony van Dijck (PVV), Sietse Fitsma (PVV) and Albert van den Bosch (VVD)). For Mark Rutte, the prime minister before and after the 2017 elections, we used his personal twitter account, the one he actually uses. We used the Twitter REST API to map follower and retweet relations and the Twitter SEARCH API to map @mention relations at three time-points (April 2017, June 2017 and September 2017; two time-periods of 85 days).

The sex of MPs is mentioned on the election lists. The age (or more precisely birth year) of the MPs was collected via the official website of the House of Parliament ([www.tweedekamer.nl](http://www.tweedekamer.nl)). For our descriptive analyses we constructed a dummy variable indicating whether the age difference between two MPs was less than 6 years. We coded MPs as having a visible minority background. In a first step we collected information on country of birth of MPs and their parents (e.g. via MPs Twitter profile page, official party websites, personal websites, news paper articles). Based on this information we could follow the official definition of first and second generation western and non-westen minorities of Statistics Netherlands of 2017. Unfortunately, we were unable to collect all necessarry data for all MPs. We subsequently used the available country of birth data, MPs names and profile pictures to classify MPs as yes/no visible minority.

In our multivariate explanatory models, we take into account several control variables at the ego, alter and dyad-level: party-leadership, position on the election list, (difference in) incumbency status of MPs (member of House of Parliament before the 2017 election), total number Twitter followers, and physical proximity within HoP based on the seating positions of MPs in April 2017 (collected via the PRODEMOS smartphone app).

Descriptive statistics at the party-level of our main concepts are summarized in Table 1.

The dataset on all 150 MPs is accessible via our github repository and replication website (\*\*\*). We also refer the interested reader who would like to replicate all reported findings in our manuscript, or who wants to assess how robust our findings are for alternative modelling strategies, to this replication github website.

**<<<Figures 1-3>>>**

**Results**

*Descriptive results*

The networks that existed in April 2017 among the Dutch MPs are summarized in Figures 1-3. It becomes apparent immediately that the density – the number of observed ties divided by all possible ties – is much higher in the follower network (0.25, Table 2) than in the @atmention (0.05, Table 2) or retweet (0.05, Table 2) layer. The nodes in the directed networks of Figure 1-3 are proportional to their outdegree and in each layer of the Twitter network and we observe quite some variation across MPs in outdegree to which we already alluded to in the introduction. It are not necessarily the same MPs who have a relative high outdegree in each network layer. For example, Pieter Heerma, MP for the CDA, follows most other MPs, Peter Kwint, MP for the SP, @mentions most other MPs and Dilan Yesilgöz-Zegerius, MP for VVD, retweets tweets of most other MPs. The Spearman’s rankorder correlation between follower outdegrees and @mention outdegree is .39 and between the outdegree in the @mention and retweet .53. Interestingly, the directed graphs of Figure 2 and 3 also show that some MPs retweet and atmention themselves.

From Figure 1-3, it is difficult to conclude whether there are or are not twitter division lines running across the different political parties in the House of Parliament. The graphical summary of reciprocated relations in the Twittersphere of MPs (Figure 4-6) are more informative in that respect. It seems that, as expected, especially (reciprocated) @mention relations cross party boundaries and that especially (reciprocated) retweet relations predominantly exist between MPs of the same political party. We turn to a more formal description of segregation in these networks next.

In Table 2 we summarized the degree of segregation within the three different layers of the Twittersphere of MPs across the three time points by three indices, (inter- and intra-group) density, Coleman’s Homophily Index and Newman’s assortativity coefficient (ref Newman 2002/3).

If we look at network density, we observe that Twitter relations with MPs of the same political party are substantially more common than with MPs of other parties. This hold true for all network layers within Twitter. Twitter relations with same-sex MPs are not substantially more common than different-sex relations. MPs who have a similar age (i.e. less than a 6 years difference) are more likely to have twitter ties than MPs with a dissimilar age. Follower relations on Twitter between MPs with the same ethnic background are more common.

We already observed that when we classify the MPs in subgroups based on either party, sex or ethnicity, these subgroups clearly differ in size within the HoP, and that the sex, age and ethnic composition differs across political parties (Table 1). How active MPs are on Twitter – as measured by their follower, retweet and @metnion outdegree – also differs within and between parties (see Figure 1-3 and Table 3). Consequently, segregation, as assessed by (intra- and inter-group) densities, will be in part structurally induced; within group densities will also be higher when MPs randomly select an alter.

A measure of segregation that takes relative group sizes and differences in degrees into account is the Coleman’s Homophily Index. In this measure a value of 0 would indicate that the observed number of within-group ties is the same as would be expected under random choice.[note: the marginal effects network model serves as the baseline or null model.]. A value of 1 would indicate maximum segregation and a value of -1 indicates the unlikely case that MPs maximally avoid within group relations. Although originally defined to measure segregation for each subgroup in a population, we will use the network-level version of this measure (ref naar artikel rense corten). With respect to the Twitter friendship network, we observe segregation along party, sex and ethnic division lines. According to the Coleman’s homophily index, segregation is strongest along the party dimension and in the retweet-network. This latter finding supports our conclusion based on a visual inspection of the Twitter networks based on (reciprocated) relations (Figure 4-6) and is in line with our idea that retweets are generally endorsements of the original tweet. Segregation based on sex and ethnic background is not very substantial. Coleman’s homophily index does not measure the level of homophily or segregation along a social dimension that is measured at the interval-scale , such as age. We therefore also briefly describe the segregation patterns based on Newman’s assortativity coefficient.

The Newman’s assortativity coefficient takes the maximum value 1 if all connected dyads are within-group dyads. When the probability to observe a within group dyad among connected dyads is independent from the proportions of connected ties for each involved subgroup it takes the value 0.[Note: under proportionate mixing it takes the value 0. However, a value of 0 does not necessarily imply proportionate mixing if there are more than two subgroups. The minimum value depends on the relative number of connected dyads.] It is defined for both nominal characteristics of the MPs and for continues characteristics like age. The resulting segregation patterns are quite consistent with our previously described results. In general, we observe segregation along all social dimensions; with one exception all values are positive. Age-based segregation seems to be stronger than segregation along sex or ethnicity. Based on Newman’s assortativity coefficient we would also conclude that segregation is most pronounced within the retweet network.

The density of the friendship network increases over time, which is not a real surprise because unfriending someone on Twitter is a rare event. The density of the retweet and @mentioning network decreases over time. This may indicate that after the election and parliament has been established, politicians no longer feel the urge to increase their visibility for their electorate via Twitter. We observe no discernible trend in segregation patterns in our time-window.

In sum, we observe segregation in the Twittersphere of MPs and this main conclusion does not depend on the three different segregation measures we used. Segregation seems to be most pronounced across the party dimension, followed by age-based segregation. Segregation along sex and ethnicity is not verry apparent. If we compare the three-layers of the twitter network, segregation is – according to Coleman’s homophily index and Newman’s assortativity coefficient – most pronounced in the retweet network. We observe no trends in segregation patterns over time.

Naturally our descriptive results do not take into account that whether or not Twitter relations are formed, and broken, may depend on ego and alter characteristics, structural network effects, nor that segregation based on the political dimension may in part be a by-product of segregation observed along the other social dimensions, nor that segregation patterns in one layer of the network may effect segregation in another layer. We therefore turn to our results based on RSiena models next.

**<<<Table 2>>>**

**<<<Table 3>>>**

*RSiena results*

Following the suggestions of the RSiena manual, we started with a preliminary model for the three dependent network-variables (i.e. follower, retweeting, @mention) in which we included (uniplex) structural network effects only: time-period specific rate functions, *out-degree* and *reciprocity* effects, *in-degree popularity* (square root version), *out-degree activity* (square root version), *out-degree popularity* (square root version) and *transitive triplets*. We supplemented this model with the *shared popularity* effect. With this structural-effects-only model we reached an acceptable fit (with an overall maximum convergence ratio of .16; see github replication website here). We subsequently included controls for MPs activity and MPs popularity: *political party*, *party-leadership*, *position on election ballot*, and *incumbency status*. The dyadic control covariates were: MPs *similarity in incumbency status* and the *seating distance* between MPs. Moreover, this model also includes our main variable of interest, namely the dyadic covariate MPs *similarity in party membership* with which we intend to test hypotheses 1. Parameters estimates with a t-value smaller than one were subsequently dropped (in two rounds) in order to obtain an acceptable fit of the model. The parameters of interest of the resulting baseline model (Model 1) are summarized in Table 4. The full model can be found in Appendix 1 and on our replication website here.

To assess the degree of segregation along sex, age and ethnic lines and to assess the extent to which segregation along party division lines is a by-product of online social inbreeding homophily (Hypotheses 2a and 2b) we included in Model 2 the relevant variables at the dyad level (*same sex*, *age difference*, *same visible minority status*). We also included the corresponding variables at the ego and alter level (*sex*, *age*, *visible minority*) to make sure our segregation estimates are not biased by ego and/or alter effects. We subsequently dropped the respective estimates at the ego/alter-level with a t-value smaller than one to obtain an adequate model fit. After we take into account social inbreeding homophily we will compare the remaining degree of segregation along the party dimension across the three dependent variables to test hypothesis 3.

In model 3 we included the structural multiplex effects …. And with this model we investigate whether segregation in one layer of Twittersphere causes segregation in another layer (hypothesis 4).

We tested for trends in segregation across party lines via the time heterogeneity function in RSiena.

Before we will discuss our main results, we briefly describe our structural and covariate control variables. In all three networks we observe positive and significant reciprocity effects and most so in the @mention layer, likely indicating that MPs react to each other in Twitter discussions. Our significant indegree popularity and out-degree activity estimates demonstrate the significant variation across MPs in activity and popularity. Interestingly, more active MPs are significantly less popular. This could indicate that less popular/important MPs either have the task to be active on Twitter or try to use Twitter to gain prominence. All networks show transitive closure. The shared popularity effect was negative in all three layers but only reached significance in the retweet layer. Thus, different MPs have their unique ‘fan base’ which retweets their tweets. Incumbent MPs follow less other MPs and are followed by fewer MPs. Notably, follow relations are more likely within the subgroups of incumbent and non-incumbent MPs than between these subgroups, probably because of the different shared (political) history and meeting opportunities during the previous administration. Incumbent MPs also retweet less and are retweetet less often. MPs with a higher position on the election ballot follow more other MPs but are retweetet and @mentioned less, possibly indicating that MPs with a higher position on the election ballot are less likely to hold important or new viewpoints, at least according to other MPs. Party leaders have significant less discussions on Twitter than non-party leaders as indicated by the negative and significant estimate within the @mention layer. Several party dummy covariates turned out significant. En dus? The larger the distance between the seats of MPs in the house of parliament the less likely they are to follow each other and to retweet each other. Since seating position is in part determined by the position of the MP’s party on the classical left-right dimension, it is hard to say the extent to which this estimate reflects the impact of geographical distance or ideological distance. In an additional model we therefore included an interaction term between our ‘same party’ dyadic covariate and the ‘seating distance’ dyadic covariate. …. Seating distance decreases the likelihood to follow and retweet both same party MPs as different party MPs (albeit the impact was stronger for different party MPs

Next we turn to our variable of main interest, the ‘same party’ dyadic covariate. It is positive and significant in all three layers of the Twitter network. Thus, even if we take into account structural network effects and factors that impact MPs’ activity and popularity, we still observe that relations on Twitter with party members are more likely than relations between MPs of different political parties. We clearly find corroborative evidence for hypothesis 1.

In model 2 we assessed social inbreeding homophily. Female MPs are followed by more MPs than male MPs but at the same time there is a tendency to befriend MPs with the same sex. Older MPs follow less other MPs and are followed by less. Surprisingly, the larger the age difference between MPs, the more likely it is that MPs follow each other. Also in contradiction to our hypothesis, MPs with a different visible ethnic minority status follow each other more often. In the @mention layer we do not observe any social inbreeding homophily. The picture is once again different in the retweet-layer. Female MPs retweet more and are retweeted more. At the same time same sex MPs are more likely to retweet each other tweets. Tweets of older MPs are less often retweeted but there is no age-homophily in the retweet layer. Similarly, we did not observe homophily based on visible minority status in the retweet layer. In sum, we only find weak evidence for social inbreeding homophily, only for sex based homophily and only within the follow and retweet layer. We thus refute hypothesis 3. Our multivariate results are clearly not in line with our bi-variate descriptive results, indicating that structural effects and other characteristics of MPs are the reason why we observed segregation along these social dimensions previously.

A positive interpretation would be that the @mention layer has a clear political function and here social division lines are less important than the political content of the tweets.

Within the follow layer of twitter social division lines are only

all control variables at the ego, alter and dyad-level, as well as our main variable of interest, the dyad-characteristic ‘same-party’. The following uniplex structural effects were included: degree, reciprocity, transitive triplets, 3-cycles, shared popularity, indegree-popularity (sqrt), outdegree-popularity (sqrt), outdegree-activity (sqrt). We subsequently removed estimates of node-characteristics with a T-value smaller than 1, compared the strength of alternative network-effects (e.g. inpossq versus inpop, GWESP versus Transcrip), and re-estimated the resulting baseline model in order to obtain an acceptable fit (maximum overall convergence of … …. ).

To test whether party-segregation is a by-product of segregation in other social dimensions the dyad-characteristics ‘same-sex’, ‘same-ethnicity’ and ‘age difference’ are included in Model 2. Model 3, by which we assess the extent to which segregation in one-layer is the result of segregation in another layer, also includes the following multiplex effects …. .

For reasons of parsimony, we only summarize the estimates of our variables of main interest (Table 3). The full models can be accessed (and re-estimated) via the replication github page (\*\*\*). Before we turn to the results of the variables of main interest, we first briefly discuss findings with respect to the control variables. As also became apparent from the descriptive statistics of Table 1, in- and out-degree varies across political parties. In the friendship network, MPs of the Freedom party send and receive significantly less friendships relations than other parties. MPs of the Liberal Democrats and the GreenLeft @mention significantly more, and MPs of the Freedom party significantly less than other parties. MPs of the Liberal Democrat party retweet less often than members of other parties.

Ego-effects sex, age, ethnicity

party-leadership…

position on the election list…: MPs are less (more) likely to befriend and retweet MPs who are lower (higher) on the ballot list.

incumbency status of MPs…

total number Twitter followers

The further MPs sit from one another in the house, the less likely they are to befriend and retweet each other. The party seating position in the house is determined after the elections by the presidium based on party size and the classical, economic left/right political dimension. The exact seating position of MPs, within the constraints set by the designated seats, is determined by each party-leadership and to a large extent based on list position and preference votes. The seating position is oftentimes heavily debated by MPs (ref?). Not only do MPs want sit close to the microphones (positioned in the front of the house), they also want to sit close to other party members. Our results indicate that seating position also influences Twitter relations among MPs.

Within all networks we observe positive reciprocity effects, most strongly so within the @mention network. This is in line with our idea that @mentions are primarily used as discussions and within a discussion MPs react on one another. In general, we observe that the distribution of out- and indegree is skewed, even after controlling for our node-level characteristics, as indicated by the positive indegree-popularity and outdegree-activity effects. MPs who send relatively many relations, receive relatively little, as indicated by the negative outdegree-popularity effect. The positive transitive triplets and negative 3-cycles effect within the friendship and retweet network indicate these relations may be structured based on hierarchy

Turning to our parameters of interest, in our baseline model we clearly see that twitter relations are segregated along the political party dimension. In line with our expectation, party based segregation is strongest within the retweet network and weakest within the @mention network (Table 3, Model 1). The estimated same party effect for the follower network indicates that a same-party follwer tie is … exp(b) more likely than a different-party friendship tie.

Sex, ethnic and age homophily effects are relatively small in comparison to the same-party effects. @mentions are more likely between MPs who share the same ethnic background, and MPs of the same sex are more likely to retweet each other’s tweets. In contrast to our descriptive results, our multivariate model show that friendships are even more likely to be formed between MPs of different ethnic backgrounds and different ages. Most importantly, however, the estimates of the same-party effects are highly comparable across Model 1 and 2. Hence, we do not find corroborative evidence for the idea that party segregation in Twittersphere would be a by-product of segregation along social dimensions.

We observe party based segregation in all three layers of the Twitter network, which makes testing the idea that segregation in the follower network causes segregation in the @mention and retweet network and vice versa relevant. In Model 3 (Table 3) we therefore include crosprod and recipcross effects to our model.[Including these effects within the friendship network led to convergence issues and were therefore dropped.] Our results show that friendships relations predict retweet and @mention relations; the corresponding crosspod and reciprocrss effects are … and … for retweets and … and … for @mention relations respectively. After taking these cross-network effects into account the positive same-party effect for the @mention network reduced substantially (…%) and somewhat for the retweet network (…%). We therefore conclude that because MPs tend to follow MPs from their own party, Twitter discussions (@mentions) predominantly take place within party boundaries and information flows (i.e. retweets) across parties may be hampered.

In order to understand the Twitter networks among MPs, different types of connections need to be distinguished: friendships, retweets and @-mentions. First, on Twitter one can befriend another account in an non-reciprocal way: MP A can befriend MP B and see MP B’s tweets, without MP B needing to befriend MP A.[[1]](#footnote-1) Once a connection is made the tweets of the followee (MP B in the example) will appear on the timeline of follower (MP A). Befriending an account thus implies that a follower find the content posted by the followee potentially interesting. Forming within-party friendship relations can be used strategically to boost the prominence of an account as well as the rating in Twitter algorithms which determine the likelihood an MPs message are shown in the timelines of others. In this respect, it should be noted though that although political parties want their politicians to have and show large numbers of followers – or at least not very low numbers – hardly any party seems to actively stimulate that MPs befriend each other on Twitter (see Jacobs & Spierings 2016; Spierings & Jacobs, 2014ROB). Twitter friendships are not only created among MP of the same party, twitter friendships may cross party boundaries. Controversial politicians often have many followers, also including opponents of different parties, because the so-called befriending of a person is a way to keep an eye on that person, to receive and possible challenge the tweets [expand]. Thus although twitter friendship relations are likely to signal positive affect this not always needs to be true…

1. The assumption here is that the MP have public accounts. If they use a private account they still do not need to befriend an incoming connection, but they do need to accept it. However, MPs close to exclusively use public settings, because that way they can reach more voters and journalists (see Spierings & Jacobs 2018a). [↑](#footnote-ref-1)