ETHNIC FRIENDSHIP SEGREGATION IN THE SCHOOL CLASS

The Role of Homophily Preferences
of Gender, Socioeconomic Status, and Religion in Four
European Countries

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University of Mannheim

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Chapter 1

Introduction

Europe has experienced several migrant crises in recent decades, such as the refugee crisis due to the Balkan conflict, the wars in Iraq and Syria, the ongoing crisis in Afghanistan and, more recently, the Russian-Ukrainian war, not to mention the constant influx from the African continent. The migration crisis lead to xenophobia, which was accompanied with profound changes in the political landscape in favor of right-wing populist parties (Ivarsflaten 2008; Inglehart & Norris 2016). Hence, the question of the integration of migrants has become a key topic across European societies, for politicians and the public debate (Eberl et al. 2018; Koopmans 2015). Gaining insights into the mechanisms that promote or hinder integration is thus a central goal of social research. However, we know comparatively little about how children and adolescents from immigrant backgrounds integrate and what obstacles and challenges they may face.

In this dissertation, I focus on social integration. I analyze the formation of friendships between young migrants and natives in school classes across Germany, the Netherlands, the United Kingdom and Sweden. My research centers around the social conditions that promote or hinder the formation of inter-ethnic friendships, hence the interest is in inter-ethnic boundaries within school classes. I address three specific research questions. First, does gender availability within ethnic categories change ethnic friendship selection? Second, does native-migrant friendship occur according to the principle of status-caste exchange? Third, does homophily in sexual liberalization attitudes mediate Muslim homophily?

The introductory chapter lays out the common framework of the analyses. Section 1.1 explains the motivation of my research, drawing on theories and existing research on

social integration of migrants. The three research questions outlined above are elaborated in Section 1.2. Section 1.3 introduces the research design, in particular, the data and analytical framework of the empirical analyses. The main findings of the analyses are summarized in Section 1.4. Section 1.4.4 concludes.

1.1 Migration in Europe

Migration is an almost universal process in human history that can be assumed to be of lasting significance (Nielsen et al. 2017). International migration[1] increased by 69% between 1990 and 2017, with an estimated 258 million migrants in 2017 and rising to about 281 million in 2020, with migration increasingly concentrated in highly developed countries (Castles et al. 2014, p. 8).[2] In 2020, Europe was counted to have about 87 million migrants, followed by North America with 59 million migrants (UN DESA 2017;IOM 2021). Although migration may not always be intended long-term, recent history shows - as for example in the case of the labor migration of the 1950s and 1960s to Western Europe or the asylum seekers from the former Yugoslavia in the 1990s - short-term migration can lead to permanent residence in the host country. The various waves of migration that have come to Europe so far have led to increasing ethnic and cultural diversity in European countries (Castles et al. 2014; Geddes & Scholten 2016; van Mol & de Valk 2016). For the countries analyzed in this dissertation, the estimated percentage of foreign-born population in 2021 according to OECD data is as follows: United Kingdom 14%, Germany 16%, the Netherlands 14%, and Sweden 20% (OECD 2022). Looking at the younger population and increasing the range towards those with a migration background[3] the numbers seem even stronger, the estimated share of young people (aged 15-34 years) with an immigrant background in 2017 EU-wide was 21% with 28% in the United Kingdom, 29% in Germany, 26% in the Netherlands, and 34% in Sweden (OECD/EU 2018). One in four in this age group thus has roots outside its host country.

[1] The international migrant stock is defined as *"a mid-year estimate of the number of people living in a country or area other than the one in which they were born or, in the absence of such data, the number of people of foreign citizenship."* (UN DESA 2017, p. 11).

[2] North America, Europe, and Australia are named as such. The results are based on United Nations Population Division data.

[3] This includes foreign born, native born with two foreign born parents, or mixed background (OECD/EU 2018, p. 294).

Problems With Migration

Once settled, the adaption of the migrants to the host society does not simply follow an unconditional law of assimilation (Kalter 2008b; FitzGerald 2014). For OECD countries it shows, that migrants have higher unemployment rates on average than natives and are more likely to work in low and medium skilled employment (OECD 2018b, pp. 88,100). Even generations later, the migrants' descendants may still be left behind. While there is indication that some second generation migrants tend to assimilate (Algan et al. 2010; Drouhot & Nee 2019) or even outperform their native counterparts (e.g., Feliciano & Lanuza 2017)[4] – when originating from less developed countries or when having a low status family background, second generation migrants in Western Europe and the US fall behind natives in education, access to the labor market, or occupational attainment (Heath et al. 2008; Algan et al. 2010; Thiede & Brooks 2018).

Furthermore, migration often leads to socially rooted problems such as xenophobia and ethnic tensions (Koopmans 2015; Bansak et al. 2016; Esses 2021). For example, the inter-ethnic climate can worsen if natives fear economic disadvantages due to competition on the labor market or overall social tax burdens facing lows skill levels or high unemployment rates of immigrants (Hainmueller & Hopkins 2014). Additionally, faced with the cultural otherness of migrants, locals may see their national identity, culture, and values at risk (Esses 2021). Anti-migrant attitudes may subsequently lead to lower life chances for migrants, which could further worsen the inter-ethnic situation. It has been shown that migrants are discriminated against in various areas, such as ethnic profiling in policing and justice system (van der Leun & van der Woude 2011, UN-FRA 2017), access to the labor market (e.g., Zschirnt & Ruedin 2016; Di Stasio et al. 2021; Quillian & Midtbøen 2021), or the rental housing market (Ahmed & Hammarstedt 2008; Flage 2018; Auspurg et al. 2019), and to health care (Gil-Salmerón et al. 2021).

Motivation for Research on Social Integration of Migrants

Recognizing the problems and consequences that migration could bring, the question of how to integrate migrants is of great importance. Hereby social integration is seen as an important factor improving the life chances of migrants and their acceptance in the host population: Research grounding on the contact thesis shows that contact improves

[4] Feliciano & Lanuza (2017) aptly use the term migration paradox, as a common interpretation was that migrants' offspring naturally do worse than the natives. This doesn't seem to be true in general.

intergroup relations by reducing stereotypical perceptions (Feddes et al. 2009; Davies et al. 2011; Pettigrew et al. 2011; Weber 2019). Moreover, according to the concept of social capital, contact to the native population can provide access to embedded resources that are otherwise scarce, such as information, advice, or trust (Portes 1995; N. Lin 1999). Thus, contacts with natives were found to improve migrants' chances in the labor market, which tends to focus on natives (Lancee 2012c,b; Moroşanu 2016). In addition, contact with the host population can promote language acquisition (Espinosa & Massey 1997; Chiswick & Miller 2001), which is key to the integration of migrants in general (Esser 2006).

Relevance of Inter-Ethnic Friendship Research

In this context, research on the social integration of children and adolescents is of particular importance. It can be argued that early friendships lay the foundation for later friendships, either because they last for years or because friendships between ethnic groups lower barriers to inter-ethnic contact later in life. Since children and adolescents spend a large part of their lives at school and in the classroom, school is an important environment in which friendships are formed. Research in school classrooms has shown that inter-ethnic friendships improve the emotional state of immigrant youth, such as feelings of safety (Munniksma & Juvonen 2012), or reduce anxiety about group differences (Page-Gould et al. 2008).

1.2 Research Questions

The approach most commonly used in the literature to explain ethnic segregation in friendships is the combination of the concept of third-party influence and the preference-opportunity framework (Figure 1.1) (e.g., Wimmer & Lewis 2010, p. 146). Third party influence relates to significant others that influence the friendship selection behavior. Influential persons among adolescents are, for example, parents, partners, teachers, and people from the circle of friends themselves.

This dissertation's theoretical core, however, is the preference-opportunity framework. The first factor of *opportunity* relates to the potential to meet and befriend (Blau 1977). In the school class setting the availability of the different ethnic groups determines ethnic friendship formation. In addition, opportunities outside of school,

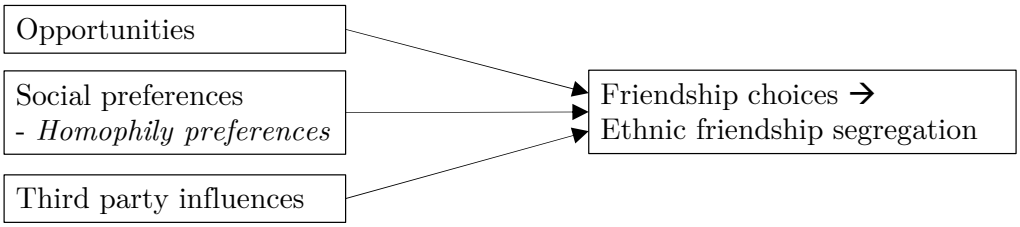


Figure 1.1: Common theoretical framework in explaining friendship formation.

such as the immediate neighborhood or places of shared activities (e.g., sport clubs), influence friendship choices. The second factor of social *preferences* refers to the preferences individuals have when making friends. One of the most well-known assumptions about social preferences, which forms the core of many arguments in friendship research, is the similarity-attraction paradigm, which states that individuals with similar characteristics are more attracted to each other than those with different characteristics (homophily preferences) (Byrne 1971; McPherson et al. 2001). Interaction with alikes is thought to provide several benefits, including facilitation of shared activities, less fear of rejection, less stress due to cognitive dissonance, or self-affirmation through peer validation. In explaining ethnic segregation, it can be assumed that members of the same ethnic group are more similar in aspects such as values, norms, social codes, customs, language use, etc., aspects that make interaction within an ethnic group less costly and more pleasant than outside, which consequently promotes intra-ethnic ties. Another branch of explanation explains ethnic homophily preferences in light of social identity and social categorization theory (Tajfel & Turner 1979), which posits that awareness of one's own and other ethnic categories reinforces ethnic in-group preferences as a function of the degree of personal national identification (e.g., Leszczensky 2013; Leszczensky et al. 2019). Given the strong evidence of attribute similarity for other traits such as age or education, which comparatively do not require strong self-categorization, I focus more on homophily preference in terms of benefits and reduced costs in this dissertation. A number of articles explaining ethnic and racial segregation have advanced hypotheses based on the popular concept of similarity attraction (e.g., Shrum et al. 1988; Mouw 2006; Wimmer & Lewis 2010; Leszczensky & Pink 2015; Windzio 2015; S. Smith et al. 2016; Kruse & Kroneberg 2019). Thus, the use of similarity preferences in the study of inter-ethnic relations seems fruitful.

However, in reviewing the research literature on inter-ethnic friendships, I have re-

peatedly been struck by the fact that the constant reference to similarity, however productive, neglects the focus on the conditions for "inter"-ethnic relationships. According to the ideas of social capital, thoughts on small world theory, or structural holes in productivity, and creativity, bridging social circles should be beneficial for both the individual and the group as a whole (Watts 1999; Burt 2004; N. Lin 2004; Uzzi & Spiro 2005). Moreover, ethnic segregation does not appear to be perfect, although inter-ethnic ties are arguably less common, they do exist, for example, in the form of inter-ethnic relationships or marriages and, of course, in the form of inter-ethnic friendships (e.g., Kalmijn & van Tubergen 2006; van Tubergen & Smith 2018). Consequently, research on the social integration of migrants should not only address segregation (i.e., homophily), but could continue to expand knowledge of the bases for majority-minority contact (i.e., heterophily). This viewpoint was the inspiration for the first two articles of this dissertation and thus the guiding question: *Under which conditions - in which social constellations do inter-ethnic friendships between natives and migrants arise?*

In developing the research question of my *first article*, I encountered a second aspect that seems to be rather underdeveloped. So far the consideration not only of coexistence (in the sense of statistical control) but of the interplay of social preferences appears underdeveloped. One aspect to consider is that different attributes can have different attraction strengths. For example, it is quite plausible that having the same gender is more important for the formation of friendships than sharing the same zodiac sign in Western astrology. Another issue is the interaction of attributes - it might be more attractive to be similar in gender "and" ethnicity than to have only one of the two characteristics. Does gender, one of the strongest, perhaps even the strongest, social attractors in youth friendships, contribute in one way or another to the formation of ethnic friendships? According to opportunity structure arguments, the size of one's preferred group should influence the friendship selection within one's group (Blau 1977). With decreasing within-availability, the number of friendship nominations within decreases, while it increases with higher availability. I extend existing research by investigating the interplay of availability of the two attributes of gender and ethnicity (Figure 1.2). A similarity preference can be assumed for both of these attributes, and the availability of both changes their selection as described earlier. The hypothetical relationship

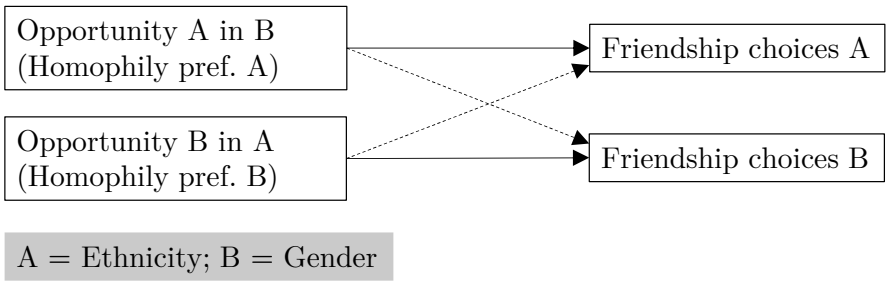


Figure 1.2: Theoretical relationship of first article - gender induced inter-ethnic friendship (dotted lines indicate hypothesized relationships).

in the interaction of the attributes is the following: In abstract terms, increasing the availability of a preferred attribute within a non-preferred attribute should increase the selection of the second attribute as a byproduct of preferences for the first attribute. More specifically, changes in the number of one's gender within the ethnic outgroup should change nominations for the ethnic outgroup, even if it is not preferred. My first research question can thus be summarized as follows:

> **Research Question 1:** Does gender availability within ethnic categories change ethnic friendship selection?

For my *second* research question, I again head towards the conditions under which inter-ethnic contact occurs. As mentioned earlier, most research on inter-ethnic friendship builds hypotheses on the similarity attraction paradigm. In another branch of interpersonal relationship research, partnership and marriage research, there is a recurring debate about whether couple relationships develop according to the exchange thesis (e.g., see Kalmijn 2010 and Rosenfeld 2010). The status-caste exchange (SCE) thesis proposes that migrant status is exchanged for socioeconomic status. For couples and marriages, this predicts that the likelihood of marriage between natives and migrants is higher if the migrant outperforms the native's socioeconomic status. This builds on the assumption that migrants have a lower social status within society than natives, which can be compensated for by a high socioeconomic status. It has not been tested before whether this thesis holds for inter-ethnic friendship formation (see Figure 1.3). One advantage of testing the SCE thesis in the classroom is that, unlike in couples research, not only one particular dyad can be observed, but several potential friendship dyads with different status differences are available at the same time. Applied to the cases of adolescent students in the classroom, the status-caste exchange thesis assumes that

Figure 1.3: Theoretical relationship of second article - status-caste exchange (dotted line indicates hypothesized relationship).

migrants with higher status than their native classmates are preferred for friendships than migrants with the same status. This contradicts the predictions of the similarity attraction paradigm, according to which the highest friendship probabilities are to be expected in relationships between natives and migrants with the same social status. The research question of the second paper is thus:

> **Research Question 2:** Does native-migrant friendship occur according to the principle of status-caste exchange?

The *third* research question of this dissertation again raises a point about the homophily principle. This time, the focus is not on the possible deviation from homophily, but on the underlying mechanisms that are presumed. In this regard, I focus on the group of Muslims, which, as a religious group in traditionally Christian Western Europe, almost always has a migration background and is considered particularly segregated from the majority cultures (e.g., Carol 2016; van Tubergen & Smith 2018).

Muslim homophily, like ethnic homophily, is often explained in terms of deeper similarity preferences, assuming that similarity preferences exist in values or attitudes. This shifts the explanation of one type of homophily to a another type of homophily. Fittingly, in some public and academic debates in Western Europe, the view has developed that Islam is culturally incompatible with the Western world and therefore hinders the integration of Muslims. Following the prominent example of Huntington's general thesis of increasing cultural and religious division (Huntington 1993), Inglehart & Norris (2003b) have shifted the explanation of division to gender equality and attitudes toward sexual liberalization. In fact, Muslim migrants appear to be more conservative than the native population on these attitudinal dimensions, presumably because of the imprint of their conservative Muslim countries and cultures of origin. However, the claim that can be derived from the thesis of Inglehart & Norris (2003b), that is, that different attitudes toward sexual liberalization are a cause of Muslim seg-

regation, has not yet been tested. To this end, I test whether attitudes toward sexual liberalization are a mechanism for Muslim homophily by comparing the coefficients of models without (1) and with (2) controlling for attitudes (see Figure 1.4). The research

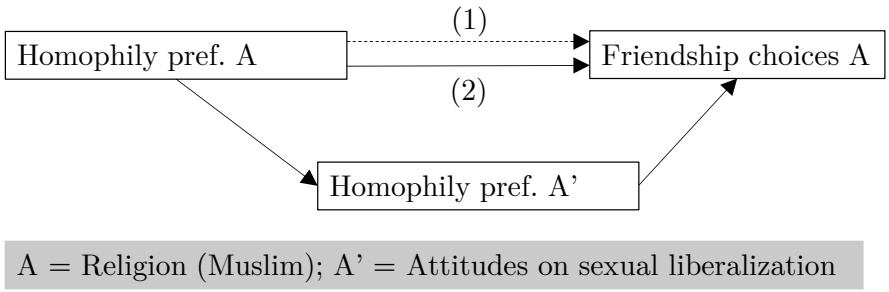


Figure 1.4: Theoretical relationship of third article - Muslim homophily by sexual liberalization homophily.

question is formulated as follows:

> **Research Question 3:** Does homophily in sexual liberalization attitudes mediate Muslim homophily?

1.3 Research Design

This section provides an overview of the research design, in particular, the data and analytical framework of the empirical analyses. As detailed below, the analyses of Chapters 2 to 4 are all based on the same data set collected from students in school classes within randomly selected schools across four European countries. The data thus reflect the multilevel nature of the research context. Strictly speaking, there are five levels of analysis. On the lowest level, the unit of analyses is the single student. On a second level, students and each of their classmates (potentially) form a friendship dyad. The set of realized friendships within each school class then constitute a school class social network on the third level. Because school classes are nested within schools by survey design, the school context provides for a fourth level of analysis. Fifth, each school is located in one of the four countries analyzed.

The central aim of this research is to gain insights into the general mechanisms of homophily that set the boundaries for friendship formation among students. Therefore, as detailed further below, the focus of the analyses will be on levels one to three, that is on friendship selection of individual students, on directed friendship dyads, and on the network structure of school classes.

Even though the empirical design of my research basically fits the framework of a comparative case study, I will not develop or test hypotheses about the effects of specific national institutions of the school system, immigration policies or compositional structure of migrants across countries. The countries covered with the analyses - England, Germany, the Netherlands, and Sweden - differ on key institutional dimensions that are supposed to influence integration outcomes (see Koopmans 2010 for the following).

On the one hand, the United Kingdom is an example of less generous ("liberal") welfare state while Germany and the Netherlands ("conservative welfare states"), and especially Sweden ("sociodemocratic welfare state") provide for a high level of social security. On the other hand, Germany has a long tradition of immigration policy guided by the aim of assimilation of migrants, while the other three countries follow a multiculturalist approach towards migrants. Koopmans (2010) argues that integration yields the least favorable outcomes for migrants in countries that combine a multiculturalist policy approach with a generous welfare system, such as the Netherlands and Sweden, because migrant's incentives for integration are weak under these conditions. In addition to this larger institutional framework governing integration, differences in national school systems can be plausibly assumed to influence the inter-ethnic friendship choice of adolescents. According to comparative research, the countries differ strongly on the degree of stratification between students. Notably, school systems that rely on strong tracking (early differentiation between several distinct school types), such as the German system, and to lesser extent, the English system are well-known to produce strong effects of social background on children's school performance. The reason is that early and strong selection produces rather homogeneous groups of students within school types, which magnifies initial differences in ability between students from different social background (Hanushek & Wößmann 2006; Bol & van de Werfhorst, Herman G. 2013). Due to the strong association of migration and social status, it is natural to assume that stratified school systems sort migrants into lower school tracks. Hence, there may be stronger segregation and ethnic boundaries between students in Germany and England compared to the Netherlands and Sweden.

Given the multidimensionality of institutional settings, the small number of countries analyzed in this dissertation certainly does not allow for formal testing of hypotheses regarding country context (Lieberson 1991; Gerring 2009). Nevertheless, investigating the processes of friendship formation within school networks across four countries that

cover such a wide range of institutional arrangements clearly provides the potential to draw conclusions that are not only valid for a specific country context, but that hold more generally.

1.3.1 Data and Central Indicator

Previous research on ethnic and racial segregation in friendships, alongside a growing number of studies on online connectedness in social media systems (Mayer & Puller 2008; Wimmer & Lewis 2010; K. Lewis et al. 2012; Hofstra et al. 2017), has mostly relied on survey data. Using survey data collected in school classes has become a standard for analyzing adolescent friendships. The main advantage of collecting intra-class friendship information over less informative approaches such as egocentric network information is that ego and alter information are available simultaneously, information about all potential friendship relationships within the class environment is accessible, and the opportunity structure (class composition) can be controlled. Furthermore, it has been shown, that the use of ego-centered data can be problematic for suffering on interviewer effects (e.g., Brüderl et al. 2013; Marsden & Hollstein 2023).

A well-known survey study that has collected full friendship data on the school class and whose analyses have yielded important results on the social integration of immigrants is the National Longitudinal Study of Adolescent Health (Add Health, K. M. Harris 2013). In the case of the Add Health study, which was conducted in a school context in the United States in the 1990s, the previous results are not directly transferable to the European context because the focus of the study is mainly on race, whereas in Europe the focus is on ethnicity (Moody 2001; Mouw 2006; Currarini et al. 2010; Cheadle & Schwadel 2012).

All analyses in this dissertation use the first wave of the large-scale multi-purpose study *Children of Immigrants Longitudinal Survey in Four European Countries* (CILS4EU) (Kalter et al. 2016b,a).[5] Data of the fist wave were collected in England, Germany, the Netherlands, and Sweden in 2010/11. The raw sample includes over 500 schools with over 18,000 adolescent students surveyed (average age 14), supplemented by a parent and a teacher questionnaire (multi-actor design).[6]

A main advantage of CILS4EU is that the design, sampling, fieldwork, and question-

[5] Article one is based on CILS4EU version 1.2.0 and articles two and three use version 2.3.0, both of which are reduced versions for off-site use.

[6] A detailed exposition of the design and sampling of the survey is given by Kalter et al. (2019).

naires have been harmonized across the participating countries in a strict and consistent way (Kalter et al. 2019). Furthermore, the study's sampling design provided for an oversampling of schools with a high share of migrants, which is a good starting point for inter-ethnic research. Moreover, the multi-actor design of the survey arguably improves data quality. For example, information about parents need not be based on children's proxy reports, which avoids measurement error and nonresponse due to informational gaps or recall errors.

In CILS4EU, ethnic status is available as a generated "country of origin" variable (Dollmann et al. 2014). This variable is based on information about the countries of birth of seven individuals, the adolescent himself, the parents, and the four grandparents. To condense these seven sources to one single country of origin, various decision rules are applied, including a majority principle and a hierarchy principle, starting with the countries of birth of the grandparents, through the parents, and ending with the adolescents themselves. In this respect, it is an approach that provides more information about ethnic heritage and its potential influences than focusing solely on the youth's country of birth. Throughout the empirical analyses, migrant students will thus include children belonging to the first, second, and third generation of immigrants (Dollmann et al. 2014).

Friendship relationships in CILS4EU were surveyed with an in-class questionnaire in which each student was asked to name the five best friends in the school class. CILS4EU provides extended flag-variables for quality control of the analytical sample, e.g., out of sample nominations like nominations of the parallel class or absent students (Kruse & Jacob 2016). Given these possibilities of quality control, in each article of this dissertation a detailed description (graph) of the sample selection of the analyses is shown.

Using a dyadic approach offers a wide range for comparison in inter-ethnic research. Figure 1.5 shows potential ways to operationalize ethnic homophily and inter-ethnic relationships in the case of directed friendship ties. For example, homophily typically is captured by focusing on the within nominations for natives and/or migrants S_N and S_M. Within my first article on gender availability, I focus on D_{NM}, D_{MN}. For my second article on status-caste exchange, it is essential to differentiate effects of D_{NM} against D_{MN}. Thinking of M as the Muslim group, in the third article on Muslim homophily it is central to look at S_M.

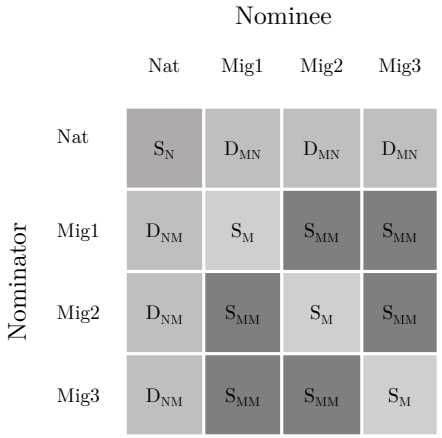


Figure 1.5: Potential dyadic combinations of regrading ethnicity for directed friendship data (exemplary for three different migrant groups).
Source: Own illustration.
Notes: Nat= native, Mig= migrant, where the numbers indicate the different migrant groups. S= both native or both (any) migrant, D= between native and migrant.

To get a first impression of what an intra-class friendship network looks like, for a single class a network diagram with the attributes ethnicity (native, migrant) and gender is shown in Figure 1.6. The software that created the diagram arranges the network nodes (students) according to their degree of connectedness through friendship nominations. Within the diagram, clear patterns of segregation by gender (node shape) and ethnicity (node color) can be seen. The central approach in this dissertation is the statistical prediction of friendship nominations from which hypothetical patterns can be inferred (e.g., homophily). In the following section, I describe the methods of analysis used in this dissertation.

1.3.2 Analytical Techniques

In the context of the analyses in this dissertation, the central analytic goal is to predict the friendship formation of schoolchildren, which has been conceptualized in different ways. In the CILS4EU data, all students could name up to five best friends within their school class.

The most basic method for capturing friendship formation is to take the adolescent as the unit of analysis and then count the number of outgoing nominations towards the different groups. This then can be predicted using pooled OLS regression. For example, for each ethnic combination (e.g., native-migrant, or migrant-native) separate pooled OLS can be estimated.

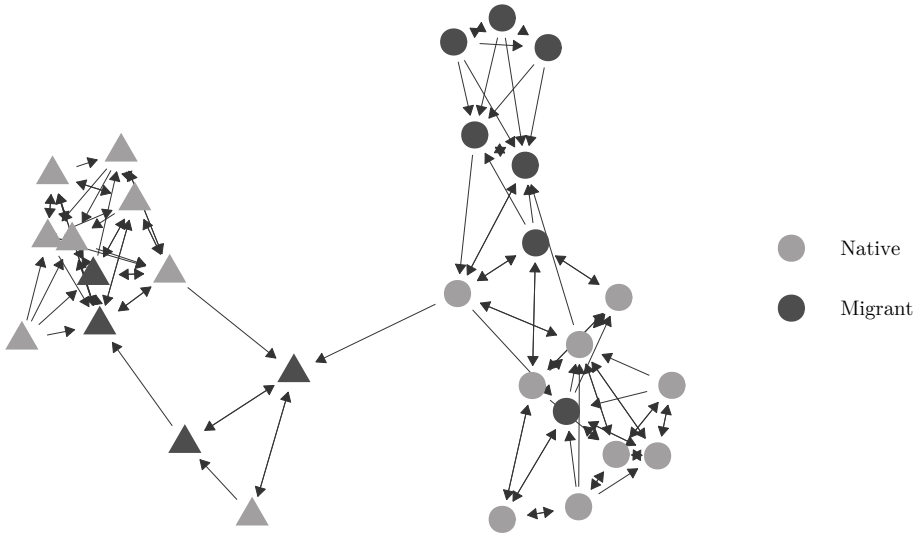


Figure 1.6: Example network diagram of friendships within the school class in CILS4EU (wave 1).
Source: Own illustration.
Notes: Circles represent girls, and triangles boys. Arrows indicate friendship nominations. The classid was 408602. The network arrangement is based on the Fruchterman-Reingold force-directed algorithm. The graph was created with the R-package `GGally` (version 2.1.2).

A second analytical approach is to use the dyadic format of friendship data. For this purpose, the friendship nomination information is restructured for each school class in such a way that the dyad becomes the unit of observation. With i being the friendship nominator and j the nominee, the binary dependent variable indicating friendship nomination is defined as

$$y_{ij} := \begin{cases} 1, & \text{if } i \text{ nominates } j \\ 0, & \text{otherwise.} \end{cases} \tag{1.1}$$

This means a class of size N gets a dataset that contains $N \cdot (N-1)$ analytical units. The usefulness of this data structure is that it allows simultaneous consideration of sender and receiver attributes for each dyad, so that both homophily and deviations from homophily can be detected. A logit model is used to predict the edges, i.e., the realized friendship nominations of a dyad. In addition, I use as a variant of logit regression, namely firthlogit regression, which is used for smaller samples and rare case events (Firth 1993). The use of firthlogit is a solution to the problem of separation that is common in small samples (Heinze & Schemper 2002).

The third method of analysis belongs to the family of exponential random graph models (ERGMs) (Lusher, Koskinen, & Robins 2013). ERGMs describe a network on the global level and estimates are count statistics of specific network properties like for example reciprocated ties or ties of the same categories of an attribute (compare Table C.1 in the Appendix). The application of ERGMs has several benefits: First, it does not have to relax the assumptions of dyadic independence as on a dyadic logit model. Second, if included in the model, it is a more appropriate control of meso-level amplifiers, i.e., local network structure effects such as reciprocity of triadic closure. The benefits are not without cost, however. Due to the large sample space, estimation cannot be solved analytically, as a consequence the underlying estimation procedure is based on MCMC simulations (Metropolis-Hastings algorithm), which makes the estimation suffer from potential model degeneracy.[7] This therefore means a compromise between model complexity and user-friendliness.

Similar to logistic regression, it is argued that ERGMs face the problem of scaling, which could lead to biases in the direction, magnitude, and significance assessment of ERGM coefficients (Duxbury 2021b). Direct comparison of coefficients between models should therefore be avoided, and one proposed solution is to calculate average marginal effects (AMEs) before model comparison (cf. Mood 2010). Duxbury and colleagues argue that this problem has not been considered in most applications of network analytical tools including ERGMs or SOAMs (Duxbury 2021b).[8] They therefore propose a solution for computing AMEs for the case of ERGMs, which I apply in parts of my analyses.

As mentioned earlier, students only indicated friends within their school class. In order to account for this nesting structure, two modes of analysis are possible. An integrated approach, where the analysis method already takes nesting into account, or a two-step approach, where models are estimated separately for each class and these results are then summarized using a meta-analysis (Snijders & Baerveldt 2003; Snijders 2016). For logistic regression, integrated approaches are an established analytical tool (compare Snijders & Bosker 2012). For firthlogit no integrated solution is available, yet. Therefore when using firthlogit, a two-step approach is used, which also allows for capturing cross-level interactions (i.e., dyadic effects can vary by the school class). In network analysis the two-step approach has been common in the last years, with inte-

[7] MCMC= Markov chain monte carlo.

[8] In a later section, I will briefly discuss stochastic actor-oriented models (SOAMs).

grated methods still under development (Lazega & Snijders 2016). One recent solution for ERGMs which I use in one chapter of my dissertation is the multilevel exponential random graph model (MLERGM) approach by Stewart et al. (2019).

Alternative Models

Finally, a few words about possible analytical tools of social network analysis that can be used to predict friendship relationships, but were not selected in the context of this dissertation. Analysis tools for inferential network analysis are still under development, and there are a number of methods that have been made available in the last few years in the most widely used environment for newly developed tools, namely R: One is the p2 model, that is available in as a multilevel model (Zijlstra et al. 2006; Zijlstra 2022). In addition to the disadvantage that meso-amplifiers such as triadic closure cannot be estimated with p2, comparison between models is somewhat difficult and can only be done using predicted probabilities, which are relatively unintuitive to calculate and compare. Hereby the author proposes the j2 model, that is still under development (Zijlstra 2017). Peter Hoff's additive and multiplicative effect network (AMEN) model (Hoff 2018), which provides controls for triadic closure, has the particular advantage that convergence is much easier to achieve than with ERGMs. However, it requires a two-step approach, which again faces the problems of comparability between the estimates.

One of the very elaborated and maintained methods are the stochastic actor oriented models (SOAM, also known as SIENA) (Snijders 2001, 2017).[9] A strength of SOAMs is its application to longitudinal network data and the disentanglement of influence and selection effects; in addition, an integrated multilevel model has recently been introduced (Koskinen & Snijders 2022). Although longitudinal versions of SOAM are already applicable for the case of two waves, a minimum of three waves is preferable as it allows the inclusion of additional time-varying covariates. In Chapter 4 examining attitudes and Muslim homophily, a SOAM approach using a network co-evolution and a behavioral model would allow disentangling selection and influence effects (Steglich et al. 2010), but there are some reasons not to do so. First, in addition to the first wave of CILS4EU, the relevant factor of attitudes toward sexual liberalization is only available in the third wave, while only for the Netherlands information on the class

[9]SIENA= Simulation investigation for empirical network analysis.

network is available in the third wave - for England, Germany and the Netherlands only the first two waves are available. In addition, after the first wave, CILS4EU encounters some limitations in the information about the school class networks. With the exception of Germany, there are a large number of out-of-sample cases for waves two and three, which in turn makes the data quality for the Netherlands less reliable (CILS4EU 2016a,b; Kruse, Weißmann, & Jacob 2016). For these reasons, a cross-sectional analysis was chosen, which has the advantage of including all four countries covered by CILS4EU. However, the results must be interpreted in light of possible influence effects.

1.4 Summary of Findings

1.4.1 Chapter 2: Gender-Availability and Inter-Ethnic Friendship

In Chapter 2, I look at friendships between natives and migrants and examine the interplay of gender (male, female) and ethnicity (native, migrant) availability within the school class. I derive my hypotheses from the framework of opportunity preferences and the concept of homophilious preferences on gender and ethnicity. While previous research on availability structure and social preferences for ethnicity or gender has found confirmation, there has been limited previous research on how cross-availability relates within the categories of gender and ethnicity. My research question is the following.

> **Research Question 1:** Does gender availability within ethnic categories change ethnic friendship selection?

My main hypotheses on *Compensation* are that if adolescents find few same gender peers within their ethnic group they compensate by befriending same gender peers in the ethnic outgroup, and that the same holds if gender and ethnicity switch roles. My secondary hypotheses on *Attraction* are that when the size of the same gender within the ethnic outgroup increases, cross-ethnic friendship towards this group increase, and again this is hypothesized with switching roles of gender and ethnicity. Finally, my hypothesis of *Gender Dominance* is that compensation and attraction effects are stronger for gender than for ethnicity.

Results on the ego-level show effects that are consistent with compensation and attraction for gender, but corresponding effects for ethnicity are comparatively negligi-

ble, which confirms the gender dominance hypothesis. For the compensation case, this means that with lower availability of same-sex peers in the ethnic ingroup, adolescents increase their friendship mentions toward same-sex peers in the ethnic outgroup, but do not switch to befriending the opposite sex in the ethnic ingroup. It remains to be determined whether this pattern is due to the fact that the opposite sex is a strong social boundary, or whether the same sex is the more attractive characteristic for adolescents' friendship choices. For both viewpoint arguments can be found. On the one hand, friendship with the opposite sex could come with more costs for students at school, as sexual attraction could become important in the observed age range, which could lead to bullying and teasing as a result (McDougall & Hymel 2007). On the other hand, same-sex friends may simply seem more attractive because, according to two-culture theory, boys and girls live in different life worlds, making same-sex interactions clearly more beneficial (Martin et al. 2013). At older ages, these effects might be less pronounced; adults might find cross-gender friendships less irritating and embarrassing.

One important avenue for future research is to test whether the low effect on ethnicity availability within gender is due the broad distinction into natives and migrants. The lower availability for migrants only partially reduces the availability of adolescents' own ethnicity, as the migrant category includes many different ethnicities. However, no effect was found among the natives either, which tends to invalidate the statement. Nevertheless, this remains to be tested empirically. Thus, one could measure whether specific effects are found for the main migrant groups within the four countries. This could be used to indirectly measure the attractiveness or ethnic boundaries between natives and these groups in an alternative way. If certain groups show preferences for strong intergroup avoidance, then the availability effects of gender should be smaller than between popular groups, i.e., gender availability should be smaller for cross-ethnic friendships than for other ethnic groups with more "likeability." In practical school settings, application of the findings could help to connect specific groups through class composition, but the results of future research for individual ethnic groups remain to be seen.

Results on the dyad-level show consistent effects with compensation for gender, but not for attraction. Contrary to expectations, and in contrast to the ego-level results, increased gender availability in the ethnic outgroup is associated with a lower probability of inter-ethnic friendship. This can be explained by the disproportional increase

of potential ties and realized ties. In other words, a constant amount of friendship nominators facing an increase in friendship targets makes ties less probable which adds to the compensation effects and overshadows the attraction effect. Further research could use methods that take into account the size of the network and subgroup when analyzing multiple networks.

Further research could also employ inferential methods of network analysis, allowing us to control for reinforcing meso-level effects such as reciprocity or triadic closure. In this sense, the observed effects of this article might be smaller when controlling for meso effects. Moreover, the research idea of this article could be applied in the future to other areas where the availability of two social preferences is important. For example, it might be investigated whether educational homophily preferences are influence by gender availability. In principle, it can be applied to any two other social preferences in any type of tie formation. It is a simple idea that is already implicitly evident, for example, in the policy on the shortage of skilled workers. Too few skilled workers in the own population lead to changing the regulations in favor of accepting foreign skilled workers. Here, too, the ethnic boundary is crossed in favor of a preferred good.

There is also a methodological note for future research. Previous research that aimed at identifying social preferences with survey data relied on statistical control of availability structure. Regarding the results from the current article, I propose to carefully consider whether availability within subgroups (i.e., within categories) should be controlled for.

Finally, one result should be noted that was not part of the hypotheses. The compensation and attraction effects of gender availability were stronger for migrants than for natives, which raises the question of whether crossing ethnic boundaries is less attractive or more difficult for natives than for migrants. This question relates to Chapter 3, where, referring to the status exchange thesis, it is argued that natives might be considered more socially attractive than migrants.

1.4.2 Chapter 3: Status-Caste Exchange in Inter-Ethnic Friendship

In Chapter 3 I tested the status-caste exchange (SCE) thesis on native-migrant friendship in terms of occupational and educational status. Previous research on the relationship between socioeconomic status and inter-ethnic contact had difficulties finding consistent empirical support for their approaches. One example is the open world the-

sis, which states that higher education leads to more inter-ethnic contacts (Martinović 2013). Among natives, higher education was associated with fewer inter-ethnic contacts, while the opposite was true for migrants. Another example is the byproduct hypothesis, which states that similarity in socioeconomic status mediates ethnic homophily, but this could not be confirmed empirically (S. Smith et al. 2014). A final example is a hypothesis linking socioeconomic status to encounter opportunities, for which no consistent support was found. Here, the negative association between higher education of natives and inter-ethnic contacts could not be explained by the lower contact opportunities of high status natives (Damen et al. 2021). Following previous research, particularly from research on inter-ethnic couple relationships, I adapt the status-caste exchange thesis from research on inter-ethnic couple relationships to the field of inter-ethnic friendships within schools. My guiding research question is:

> **Research Question 2:** Does native-migrant friendship occur according to the principle of status-caste exchange?

First, my hypothesis of *Ego Status* hypothesizes that higher status leads to fewer inter-ethnic friendships among natives and more among migrants when tested on the student level (ego-level). Second, according to my hypothesis of *Growing Differences* I turn to the dyadic level and test whether the higher relative socioeconomic status of migrants compared to natives leads to inter-ethnic friendships (and vice versa). Third, in a *Hybrid* hypothesis, I argue that homophily and status-caste exchange may operate simultaneously. All these hypotheses are tested for parents' education and occupational status separately for each of the four countries within the first wave of CILS4EU. Next to ego-level regression analysis, dyadic ML-logit is used. For the dyadic models, with the help of predicted probabilities the inter-ethnic friendship tendencies are predicted. To assess differences in predicted probabilities, differentials in predicted probabilities are constructed, i.e., the differences in predicted probabilities between native-migrant dyads and migrant-native dyads are compared.

The first hypothesis (ego level) finds weak support for migrants. With increasing parental socioeconomic status (occupational status and education) of the parents the migrant adolescents increase their friendship nominations towards natives. Country specific analyses for occupational status show, this finding holds in England, Germany, and Sweden, but not in the Netherlands. For education, the hypothesis is supported for England, Sweden and the Netherlands, but not for the German case. The first

hypothesis finds no support for the group of natives (occupational status or education).

The second hypothesis (Growing Differences) finds little empirical support for occupational status. It shows that the greater the status gap in favor of migrants, the more likely inter-ethnic friendship is to occur. This tendency can be found in all countries (except of England), but is partly not significant (AMEs).

The third hypothesis (Hybrid) shows some weak effects for occupational status on the pooled data. There is indication that the highest friendship probability can be found not for equal but for unequal status, i.e., migrants having higher status than natives. Though the direction of the effect is as expected for country specific analyses, the results are insignificant. For education the patterns is weak but insignificant on the pooled data and, while country specific results are consistent only for Sweden.

In summary, there seems to be weak tendency in line with the status-caste thesis for occupational status, however different than expected the effects are rather small. For education, the status-caste exchange thesis has to be rejected. This leads to the conclusion that status preferences of natives for higher status migrants might be the reason for the results. However, there is no guarantee that alternative factors such as opportunity structure are at work. Migrants face discrimination in the housing market, so it may be that only the "wealthier" migrants make it into the native neighborhoods, which then promotes friendship at school. Future analyses could account for these tendencies of self-selection into native neighborhoods. In addition, reinforcing network effects such as reciprocity or triadic association could be causal for the observed effects. Future analyses with advanced network methods could control for this. Moreover, it is quite plausible that there is effect heterogeneity, as natives' preference for different immigrant groups could vary. For example, the status-caste exchange thesis could be tested specifically for groups with greater cultural differences from the native population (e.g., Muslim migrants).

1.4.3 Chapter 4: Muslim Homophily and Sexual Liberalization Attitudes

As part of Chapter 4, I tested whether homophily of Muslim friendship is a byproduct of homophily of attitudes toward sexual liberalization. While Muslim migrants have been shown to have more conservative attitudes on the dimensions of unmarried cohabitation, divorce, homosexuality, and abortion in European societies, attitudinal homophily on

these dimensions may explain the segregation of friendships among Muslims. The research question is:

> **Research Question 3:** Does homophily in sexual liberalization attitudes mediate Muslim homophily?

My first hypothesis is that *Muslim friendship homophily decreases* after accounting for homophily in attitudes toward sexual liberalization. The second hypothesis is that *Muslim-non-Muslim friendship increases* after consideration of attitude homophily. This is tested using the first wave of CILS4EU with country-specific analyses on adolescent friendships in the school classroom. Two recently developed tools for network analysis are combined. First, the multilevel exponential random graph models (MLERGMs), and second, the calculation of marginal effects for the comparison between MLERGMs, which has been a common problem in mediation analyses in social network analysis in previous studies.

The results of my study show that Muslim youth are more likely to befriend Muslim peers than those of other faiths. Consistently across all four countries, the tendency for Muslim homophily becomes less pronounced when their attitudes toward sexual liberalization are taken into account, supporting the first hypothesis. The second hypothesis is supported only for Germany and Sweden, where Muslim-non-Muslim friendship becomes more pronounced after including homophily measures of sexual liberalization attitudes. In England, the effects are consistent in direction, but not significant. For the Netherlands, the hypothesis is confirmed only for the dyads of non-Muslims nominating Muslims, but not for Muslims nominating non-Muslims. In summary, the results suggest that social preferences for similarity in views on sexual liberalization may lead to a division between Muslim and non-Muslim classmates.

While this study is one of the few to address the issue of scaling in mediation using network analysis, it is only a starting point and further research is needed to confirm or more accurately categorize the findings. On the technical side, future analyses could improve the goodness of fits and refine the estimates in terms of convergence (more computing power would be beneficial for this endeavor). In addition, longitudinal analyses could disentangle selection from influence effects, as it can be assumed that friends conform to their peers in their attitudes toward sexual liberalization. Another research objective is to consider the fact that migrants tend to adapt to their host societies. Since Muslims usually have a migrant background, the degree of adaptation

could be further investigated. The question would be whether the mediating effect of attitudes toward sexual liberalization decreases for "older" Muslim generations.

Analyses could be extend to other attributes where Muslim adolescents are perceived to have different attitudes and show different behavior than natives. For example, Muslim religion prohibits drinking behavior, and within the Australian context a qualitative study indicates that drinking behavior is a social barrier towards natives (Yilmaz & Bashirov 2022). However, for the European context this could be tested empirically.

1.4.4 Conclusion and Outlook

Europe faced large migration inflows over the last decades and there are good arguments that the inflow into Europe might be even strengthened considering potential push an pull factors (E. S. Lee 1966). Distances are shrinking - while the organizational possibilities have been massively improved by technological development, not only through mobility in the form of mobility in terms of faster travel speeds, but also in terms of the flow of information that makes it possible to travel. Another common reason for migration is the perception abroad that life opportunities are better in the Western world. First, threats to human security due to violent conflict or persecution in home countries can lead to mass migration. Recent examples of such inflow into Western Europe are the refugee flows from Afghanistan, Syria and Ukraine. Second, the economic attractiveness of Europe compared to the countries of origin may lead to migration, as people expect better job opportunities or higher income. Third, influx of foreign labor may even be intentional, given the aging of Europe's population, declining demographics, and widespread labor and skills shortages (Brunello & Wruuck 2021; Brucker Juricic et al. 2021). Labor shortages, due in part to internal EU labor migration from poor to rich, must in turn be absorbed by non-EU members in poorer countries. Fourth, living conditions in countries could deteriorate due to climate change. Non-Western countries may be more negatively affected by change because they have fewer resources to adapt to the new conditions (Black et al. 2011; Kaczan & Orgill-Meyer 2020; Helbling & Meierrieks 2021).

As migrants and refugees tend to stay in their host countries, ethnic diversity will increase, suggesting that research on immigrant integration will remain important or even grow in importance. Understanding how integration works across generations and how young people in particular can be integrated is therefore vital. Adolescent friendships

are a burning glass for what happens to integration dynamics - which can also be very subtle. The contribution of this dissertation is the investigation of the conditions and prerequisites for inter-ethnic friendships of adolescents. In doing so, existing assumptions and hypotheses are critically questioned and tested with sophisticated methods and theoretically developed in order to better understand which factors are crucial for good coexistence and good integration.

Chapter 2

Gender-Availability and Inter-Ethnic Friendship

Abstract

How do friendships form among adolescents? Previous research in the school context have shown that friendships tend to be segregated by ethnicity and gender. These patterns are explained by homphilious preferences (individual level) and opportunities (school class level).

To date, little research has examined how gender availability might affect inter-ethnic friendship selection. Since gender is one of the strongest attractors in the formation of friendships, the availability of gender within the ethnic majority (native) and minority (migrant) groups could influence the extent of friendships between these two groups. This is tested by analyzing friendship networks in school classes (N=345 classes) of the first wave of the Children of Immigrants Longitudinal Survey in Four European Countries (CILS4EU).

Analyses on the ego-level (pooled OLS) and the dyad-level (2-step approach on firthlogit and multilevel logit) yield the following picture: Lower gender availability within the own ethnic group (majority or minority) is associated with a higher likelihood of cross-group friendships. In other words: In situations where students encounter few same-sex classmates within the own ethnic group, crossing the ethnic barrier appears to be an option to satisfy their need for same-gender peers. Further analysis shows that ethnicity does not play the same role as gender. Lower ethnic availability (majority or minority) within one's gender group is not related to cross-gender friendships. This leads to the conclusion that gender, compared to ethnic status (majority or minority), is the more important characteristic for the social segregation of youth in the school context. In summary, the results point to the importance of opportunity structure for the interplay of *multiple* social preferences.

2.1 Introduction

Since 1945, Europe has been confronted with large migration inflows which have caused a growing ethnic and cultural diversity in Europe (Castles et al. 2014). This led to societal and scholarly concerns about social cohesion and raised questions about the difficulties of integrating migrants (Koopmans et al. 2015). Consequently, much of

migration research focuses not only on understanding the consequences of migration, but also on identifying the conditions for migrant integration in its various dimensions (Kalter 2022). *Social integration*, understood as contact between the majority (natives) and the minority (migrant origin) group, has been one important focus of this research. Although a social divide between natives and migrants seems to be partially diminishing, as for example in the case of spatial segregation (Drouhot & Nee 2019), or inter-ethnic marriage patterns (ibid.), there is still evidence for segregation (Kalmijn 1998; Z. Qian & Lichter 2007; Iceland & Scopilliti 2008; Drouhot & Nee 2019).

It can be argued that humans are more adaptive at a young age (see Power & Schlaggar 2017; Zwart et al. 2019). In keeping with the adage *a tree must be bent while it is young*, one research focus is the study of inter-ethnic contact in childhood. This age group spends a large part of their time within the formative school environment, so inter-ethnic contact at school is an appropriate indicator of the social integration of migrant children. In addition to the general benefits predicted in light of the contact hypothesis (Pettigrew 1998; Pettigrew et al. 2011), research shows the potential of inter-ethnic contact for children:[1] more inter-ethnic friendship ties of school children lead to less negative stereotyping towards immigrants (Feddes et al. 2009; Davies et al. 2011) and at the same time positive change in acquired attitudes seems to buffer the decline in inter-ethnic contact for the majority group over time (Wölfer & Hewstone 2018).

Previous research on adolescent friendship patterns shows segregation along the lines of ethnicity and gender (e.g., Shrum et al. 1988; Baerveldt et al. 2004; Windzio & Bicer 2013; S. Smith et al. 2014).[2] Besides individual preferences for others that resemble oneself, e.g., in gender and ethnicity, structural conditions such as availability appear to influence children's friendship selection behavior (Hallinan & Smith 1985; Quillian & Campbell 2003). For example, in classes with more same-ethnic/same-sex others, it is easier to follow one's same-ethnic/same-sex preference.

This article builds on these findings and raises a new question: *How does the availability of gender influence ethnic friendship patterns*? Theoretical arguments point to two main implications: First, when pupils have limited opportunities to make same-sex

[1] According to the contact thesis, cross-group contact is expected to reduce negative stereotypes (Pettigrew et al. 2011) and its harmful consequences like aggression between the groups (Schmid et al. 2014), and it facilitates inter-group trust (Paolini et al. 2007).

[2] I use the word gender in this article solely in the sense of biological sex and not in the sense of socially defined gender roles.

friends within their ethnic group, they then tend to look for same-sex friends in the ethnic out-group. Second, as same-sex availability increases in the ethnic out-group, more same-sex cross-group ties should result.

For testing these hypothesized relationships, I analyze the full class friendship network data of the study Children of Immigrants Longitudinal Survey in Four European Countries (CILS4EU). These data are well-suited for investigating the current research question. Firstly, the project's raw data set covers more than 800 schools, thereby having enough variation on the relevant variables on the class level. Secondly, previous research on the effect of availability on friendship selection behavior often relied on US data, namely the Add Health data set.[3] CILS4EU extends the potential scope of research to Europe, as it covers data on school classes in the countries of Germany, Sweden, the Netherlands, and England.

2.2 Theory

The theoretical section that follows begins with some helpful definitions that highlight the distinction between friendship formation based on social preferences on the one hand and availability on the other. Since my research idea is based on the two assumed preferences for same ethnicity and same gender, I then review the most common theoretical explanations for these preferences. Finally, I explain the presumed interplay of gender-availability and ethnic friendship choice.

2.2.1 Homophily: Word Usage and Explanations

The tendency for similar individuals to be related more often than dissimilar individuals is commonly referred to as *homophily* (Lazarsfeld & Merton 1964, p. 23; McPherson et al. 2001, p. 416).[4] Two main sources of homophily can be distinguished: *choice homophily*, the amount of homophily that is due to individual's choice of similar alters based on social preferences, and *induced homophily*, the proportion of homophily that can be attributed to structural conditions like group composition (McPherson & Smith-

[3]The National Longitudinal Study of Adolescent to Adult Health (Add Health) is a longitudinal study on adolescents covering US in-school friendship data between 1994-1996 (K. M. Harris et al. 2019).

[4]The opposite pattern of *heterophily* then relates to the tendency that ties between individuals of dissimilar individuals are more frequent (Lazarsfeld & Merton 1964, p. 23).

Lovin 1987, p. 371; Kossinets & Watts 2009, p. 407).[5]

2.2.2 Ethnic Homophily

Ethnic homophily, often referred to as ethnic segregation, is one of the best-studied areas of social network research in sociology (McPherson et al. 2001). Along with gender, ethnicity is cited as one of the strongest factors shaping social ties (ibid.). Ethnic segregation has been found in many different contexts, such as occupational networks (Ruef et al. 2003; McDonald et al. 2009), partnership and marriage (Kalmijn 1998; Z. Qian & Lichter 2007), regular everyday interaction (Martinović 2013), online social networks (Hofstra et al. 2017), and friendship (Goodreau et al. 2009). Because school is an important habitat for the development of children and (not to be underestimated) school classes offer many advantages for data collection and analysis (e.g., complete networks), much research has been conducted on friendship relationships in the school context. There is much indication for within class ethnic homophily for friendships in the US (Moody 2001; Quillian & Campbell 2003; Mouw & Entwisle 2006; Goodreau et al. 2009), Canada (Aboud et al. 2003; B. H. Schneider et al. 2007), or Europe (Verkuyten & Thijs 2002; S. Smith et al. 2014; Munniksma et al. 2017), suggesting that ethnic segregation in schools is a phenomenon that occurs in a variety of cultures and societies.

2.2.3 Explaining Ethnic Choice Homophily

When it comes to explaining ethnic homophily social preferences are an important factor contributing to ethnic segregation in schools. In explaining ethnic choice homophily, the literature refers to two main theories. One focuses on group membership and group identification (in-group bias), the other explains attraction by the possession of identical or similar characteristics (similarity attraction paradigm and rational choice perspective).

The theory of within-group bias explains ethnically homogeneous preferences as a special case of preference based on mere group membership. From this theoretical

[5]Within the literature on social networks, different concepts of homophily can be found. These can best be understood if one takes a closer look at each of its indices for measurement. For example, the often cited work by Lazarsfeld & Merton (1964, p. 27) presented an index for homophily that already included a statistical control for availability. Their definition insofar differs from this article's definitions of homophily and choice homophily. For a brief overview on other word use, see for example the summary by Wimmer & Lewis (2010, pp. 590-591).

perspective, a law-like preference for the in-group leads to liking. In other words, the mere awareness of belonging to a group would lead to a selective preference for that group. The characteristics (real or stereotypical) of group members are not part of the explanation for social decisions. The similarity-attraction theory emphasizes the importance of inter individual similarity on characteristics that correlate or are expected to correlate with group membership, rather than group membership per se.

Group Membership and Identification

The argument of in-group bias is rooted in social identity theory (SIT) (Tajfel & Turner 1979) and social categorization theory (Turner et al. 1987). In-group bias means that categorization into groups ("we" – in-group and "they" – out-group) leads to a cognitively based bias in perception and resulting behavior concerning the group members. Differences with members of the in-group are perceived as less relevant, while differences with the out-group are amplified. Furthermore, bias in evaluating the groups occurs. The in-group is evaluated more positively (in-group favoritism), while the opposite is true for the out-group. These tendencies are explained by the individual's need for positive self-worth. When individuals identify strongly with the in-group, positive self-worth is achieved by enhancing the value of their own group. In-group bias was detected even in the so-called minimal group design when influencing factors could excluded, i.e., when group membership was randomly assigned and there was no interaction, shared history, or influence of one's identity (Tajfel et al. 1971). In other words, classification into groups that have no further meaning can lead to activation of in-group bias. Applied to ethnicity, group affiliation based on ethnicity causes all members of the same ethnicity to be evaluated more positively than members of other ethnicities, which consequently leads to being more likely to befriend one's own group than the out-group.

A key factor for cognitive activation of group membership in an ethnic group is national identification. Cross-sectional analyses provide evidence of the relationship between national identification and negative evaluation of outgroup (Verkuyten 2001) or anti-immigrant prejudice (Pehrson et al. 2009). Some longitudinal studies find that change in national identification is positively associated with out-group prejudice (Meeus et al. 2010) and negatively with inter-ethnic contact (Wölfer & Hewstone 2018). More recent research that takes a relational approach which allows to control

for social influence, refines the SIT-perspective and suggests that own and others' identification must be both accounted for (Leszczensky & Pink 2019).[6]

Attribute Similarity Attraction

The similarity-attraction paradigm rests on the idea that sharing similar characteristics is an important source of attraction. Due to prior experiences in the country of origin, previous or still ongoing socialization and social influence (parents, peers, or cultural context), it is likely that persons of the same ethnic origin share the same values, norms, beliefs, attitudes, perceptions, knowledge, or language. Ethnic choice homophily emerges, if these attributes are distinct to an ethnicity, stable, and at the same time are exclusively likable attributes for the corresponding ethnic group.[7] The similarity attraction paradigm, and a rational choice approach in the following aim at explaining why such ethnic-specific attributes are experienced as likable.[8]

The similarity-attraction paradigm by Byrne (1961) is closely related to dissonance (Festinger 1968) and balance theory (Heider 1958). Originally having the focus on attitudes (Byrne 1997), it states that perceived similarity in attributes (and attitudes) leads to liking (Byrne 1961; Byrne et al. 1986).[9] Others of similar attributes are liked for they confirm the value of one's own attributes. As a result, contact and friendship between individuals with similar attributes are promoted.[10] As for example Montoya & Horton (2013) or Collisson & Howell (2014) summarize, there is a lot research suggesting such 'law of similarity' to be at work on a range of attributes like attitudes, values, personality traits, and even arbitrary characteristics like having the same dates of birth (J. T. Jones et al. 2004).[11]

[6] Their results support the view that, within same-ethnic peers, high identifiers reject low identifiers, while preferring those with high ethnic identification. At the same time high identifiers seem to prefer other high identifiers of another ethnicity. The results do not distinguish for natives and non-natives, further research seems necessary.

[7] Note that there is a large body of research that devotes disentangling peer selection from peer influence on time-varying attributes. For an introduction see Snijders et al. (2010) and Steglich & Knecht (2010).

[8] These two explanations of general similarity-attraction is derived from ongoing research in social psychology. Therein it is referred to as the reinforcement model and the information processing perspective (Montoya & Horton 2013).

[9] There is some ongoing investigation that suggest that the perception of similarity (an not actual similarity) is a necessary condition for liking (e.g., Montoya et al. 2008, or Sprecher 2014).

[10] Labelled under the meaningful name 'repulsion hypothesis', there is an opposite line of argumentation that states that dissimilarity leads to disliking and rejection (Rosenbaum 1986). However, the results are mixed and an according to newer research, it seems that the similarity attraction paradigm is the stronger of the two forces (Sprecher 2019).

[11] Newer research explains these effects via implicit egotism, a general preference for everything that is associated with the self (B. W. Pelham et al. 2002; B. Pelham & Mauricio 2015).

However, a rational choice framework helps to provide a more specific explanation for choosing ethnically homogeneous friendship. As Newcomb (1956, p. 577) has already argued, the assumption that similarity in attributes leads to attraction in general is not plausible. Rather, people's preference for same-ethnic contact must make sense, and through the lens of the basic rational choice paradigm (Goldthorpe 1998; Braun & Gautschi 2011) and especially the framework of social exchange theory (Homans 1961; Thibaut & Kelley 1959; R. M. Emerson 1976), it is necessary to identify the costs and benefits of intra- and inter-ethnic communication and communication and contact.

Theoretically, in-group contact should have several benefits. It can be argued that communication between similar individuals (or same language speakers) is more effective and efficient (of higher precision) (Runkel 1956; E. M. Rogers & Bhowmik 1970). In line with cognitive dissonance theory (Festinger 1968) and cognitive balance theory (Heider 1958), it should be experienced as rewarding to be in contact with others that confirm one's own beliefs, values, knowledge, or perspectives.[12] For some ethnic groups religion plays a significant role for friendship ties (Leszczensky & Pink 2017). Other research proposes cultural homophily to be at work (Erickson 1996; Lizardo 2006). Indeed there is some empirical indication that children's ethnic friendship selection behavior follows a rational choice logic (i.e., more segregation in high cost situations) when it comes to having friends in parallel classes (Leszczensky & Pink 2015), or when different levels of friendship intimacy (multiplex networks) are considered (Windzio & Bicer 2013).

2.2.4 Gender Homophily

How can we explain gender homophily and homophilious gender preferences? How could ethnic segregation be influenced by gender-availability? These questions are addressed in the following.

The tendency that networks tend to be homogeneous in terms of gender – often termed gender homophily in its sociological usage, or gender segregation in psychology – is a well-known phenomenon (for a summary see Maccoby 1988 and McPherson et al. 2001).[13] As Mehta and Strough's (2009) review of research on the development of gender homophily shows, gender segregation in communication already begins early at

[12] This line of argumentation is inspired by Kalmijn (1998) where it is applied to homophilious preferences in partner choice.

[13] For the word use see for example McPherson et al. (2001) and Mehta & Strough (2009).

the age of toddlers, could be detected in selection of play partners at four year old children (Martin et al. 2013), in form of gender homophily for friendships increases until preadolescence, and decreases but still persists during adolescence (Shrum et al. 1988; Poulin & Pedersen 2007; Berger & Rodkin 2012; Rubin et al. 2015) when cross-gender contacts slowly begin to get more important and gender attitudes become more flexible.[14] Even throughout the later phases of life there is still remarkable empirical support for gender homophily in friendships. It could be detected in friendship in early adulthood of college students (D. C. Jones et al. 1990; Reeder 2003; Mehta et al. 2017), and could be identified in older ages for friendship (Galupo 2009), or online contacts (Gillespie et al. 2015) and online communication (Laniado et al. 2016). In summary, this indicates gender homophily to be one of the most persistent factors in non-sexual relationships.

2.2.5 Explaining Gender Choice Homophily

In explaining why adolescents prefer same gender friends, the literature draws on various theoretical approaches (see for example Mehta & Strough 2009 or Mehta & Strough 2010).[15]

The first explanatory approach is in-group favoritism (Tajfel & Turner 1979; Turner et al. 1987). Parallel to the line of argumentation for ethnic choice homophily (see above), it is assumed that children are highly aware of gender categories and that this social categorization makes them prefer their own gender category over the other (see Powlishta 2004). Adapted to the sexes, recognizing the own gender category is accompanied by biased perceptions and evaluations. Similarities to the own group are experienced stronger, while the same happens for differences to the out-group. Parallel to this, differences between members within the groups are perceived less – i.e., the groups are experienced as more homogeneous.

The second explanation, the compatibility thesis (sometimes 'two-world' thesis) hypothesizes that children connect with same-sex others because of compatibility in behavior and communication.[16] This perspective assumes that girls and boys have distinct cultures of behavior and communication which hinder cross-sex and facilitated same-

[14] Additionally see Maccoby (1988) and Martin & Ruble (2010).

[15] Research mostly comes from developmental and psychological research fields, sociology here seems under-represented (compare Kalmijn 2002).

[16] As Monsour (2002) reports, the 'behavior compatibility thesis' goes back to Goodenough (1934) and Parten (1932).

gender interaction. For example, girls have been observed to have a communication style that is rather emotional, and happens within dyads. In comparison, boys show a rough play style with a tendency for hierarchies, contact is rather activity oriented, and it often takes place in larger groups (e.g, see Monsour 2002).

The origins of these two gender worlds rather remain unclear (e.g., Martin et al. 2013). What is important however is to recognize that gender is one of the most important, if not the most important social attractor in human life.

2.2.6 Hierarchy and Interplay of Preferences

Previous research supports the assumption that contacts that fit on multiple attractive attributes are preferred over matches on a single trait only (Sagar et al. 1983; L. Lee et al. 2007; Schaefer 2010; Block & Grund 2014).[17] Furthermore, hierarchies in social preferences can be expected. Because gender is a much more salient attribute than ethnicity, I expect gender to be a stronger attractor than ethnicity. Ethnic barriers will appear as more permeable than gender barriers especially when differentiating for native-migrant, i.e., majority-minority relations. Few research can be found that allows to compare the social permeability of ethnic and gender barriers in the context of the EU. Evidence on the comparison of gender and racial barriers (predominantly from US data) is less partly inconsistent (Shrum et al. 1988; Galupo 2009; L. O. Rogers & Meltzoff 2017). However, transferring the results is difficult because race is much more salient in the U.S. than ethnicity is in the EU. Building on the assumption of the higher salience of gender compared to ethnicity, I expect a hierarchy in the interaction of gender and ethnicity that should results in the following decreasing order of attraction: same-gender-same-ethnicity, same gender only, same ethnic only, and different-gender-different-ethnicity ties.

2.2.7 Interplay of Gender Availability and Ethnic Homophily

A second important factor influencing the process of social selection, in addition to social preferences, is the social composition of meeting contexts. Sometimes referred to as opportunity thesis (e.g., Hallinan 1982), the idea is that without assuming spe-

[17] Although Block & Grund (2014) interpret their results as if similarity on two attributes at once is avoided, their empirical results albeit weakly speak for a highest preference of similarity on two attributes.

cial social preferences meeting and befriending depends on the *chance* of meeting and befriending.[18] As a consequence, the composition of social networks should represent the overall composition of meeting contexts like the neighborhood or the school. For example, in school classes with different distributions of two social groups and assuming students having no social preferences for either group, the overall likelihood of contact and friendship with the first group should be greater in classes where the relative size of that first group is higher (compare Blau 1977, p. 35 or Hallinan 1982). Various research supports this finding for example for inter-racial friendships of blacks in US school classes (Hallinan 1982; Hallinan & Smith 1985), in the case of school heterogeneity on inter-racial friendship (Fischer 2008; Joyner & Kao 2000), or on school class ethnic composition in the context of the EU (S. Smith et al. 2016).

However, previous research has not yet examined the interplay between gender availability and inter-ethnic friendship, with the exception of Kroneberg et al. (2021) study, which hypothesizes similar findings and uses the same empirical data.[19] In the discussion section, I will respond to the paper.

Combining the perspectives of social composition and social preference for friendship formation, the basic assumption in the following is that the easier selection criteria (preferences) can be met, the more likely social ties become. Hence, the more difficult the selection criteria are to meet, the less likely such ties become, which could lead to social compensation, i.e., compromise by moving to less ideal friendships.

Accordingly, my hypothesis is that the probability of inter-ethnic friendships increases with decreasing availability of same-sex contacts within one's own ethnic group. Without loss of generality, this can be explained with the example of native boys. Figure 2.1 visualizes three potential situations that exemplify my predictions for native boys' inter-ethnic contact that is due to availability of same-gender natives in class (ceteris paribus). In the graph, outgoing arrows from native boys represent the degree of outgoing friendship nominations. Let's begin with the case of gender saturation within the native boys (surplus). Here the native boys easily can satisfy their first choice (other native boys), thus second and third choice contacts (i.e., to migrants or girls) are relatively unattractive and thus will be seldom. Take the same class and imagine a

[18] This perspective does not necessarily assume a change in social preferences as it would be the case according to social contact thesis.

[19] Note that I began developing my research idea for Chapter 2 in 2018 and was unaware of their research until the time of publication.

somewhat lower availability of males among the natives (medium). Now, the potential for making ideal friends is lower, the probability for friendship to native boys should be smaller than in the surplus situation. It gets more difficult to find friends in the now smaller pool of ideal others, and alternatively some second choice alternatives are selected. Finally, imagine that boys can find only few same-gender others among natives (scarcity). First choice selection now becomes very hard, therefore, mostly second choice alternatives will be the dominant pattern, and the native boys should increasingly befriend native girls and migrant boys. As those of opposite attributes are the least attractive, few to non change concerning this third choice contacts, i.e., towards migrant girls, can be expected.

The principle that can be derived from this is that out-group contact gets promoted if an attractive feature in the outgroup gets relatively more available. In this sense, only the availability of the friendship nominators was looked at. However, the availability of an interesting attribute might also increase in an outgroup, i.e., the friendship nominees. Here it can be expected, that with increasing count of same-gender members in an ethnic group, the nominations from same-gender members from the outgroup increases. Similarly, but lower, if the count of same-ethnic members in a gender group increases, the nominations from same-ethnic members from the gender outgroup might increase. According to the assumed hierarchy in preferences, this effect should be smaller for ethnicity, than for gender. These hypotheses are visualized as the ingoing arrows towards the exemplary case of male natives in Figure 2.1.

In summary, a reduction in first priority members in class should be compensated by increases in cross-ethnic and cross-gender friendships. Increases in a specific gender-ethnic group should increase their nominations by same-gender members of the ethnic outgroup as well as by same-ethnic members of the opposite sex. These postulated relationships are to happen even under statistical control of the availability of the other gender-ethnic groups and under control of diversity within the migrant group (more on this in the section that explains the models for testing). I expect the relationships to be the same for natives as well as migrants irrespective of their gender. Consequential, the following hypotheses for within-school-class friendships can be formulated.

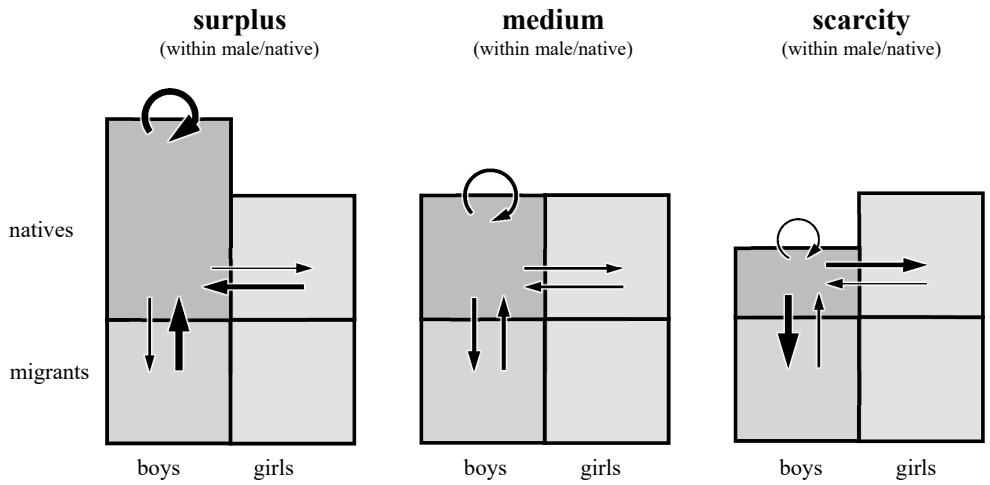


Figure 2.1: Illustration of expected rates of friendship nominations as a function of the availability of native males in the class, as assumed by homophilious preferences for gender and ethnicity.

Source: Own illustration.

Note: Exemplary for male natives, accordingly for the other three gender-ethnic groups. The surface of the native-male rectangle visualizes the count of male natives in class. The arrows indicate the expected probability (arrows' thickness) and direction of the friendship nominations regarding the availability of male natives. For simplicity, all arrows within the other groups, or to and from female migrants are omitted. These are left out as the relations are not included in my hypotheses. Furthermore, the availability of native males should have no influence here, as no preferences for simultaneous cross-gender and cross-ethnic choice are expected.

Hypotheses

Hypothesis 1a: "Compensation with Gender"

When pupils face decreasing availability of first priority members (i.e., same-gender and same-ethnicity), they increase their friendship nominations towards same-gender pupils in the ethnic outgroup (ceteris paribus).

Hypothesis 1b: "Gender Attraction"

With an increase in the size of a gender-ethnic group, the rate of ingoing friendship nominations from same-gender members of the ethnic outgroup rises (ceteris paribus).

Hypothesis 2a: "Compensation with Ethnicity"

When pupils face decreasing availability of first priority members, they increase their friendship nominations towards opposite-gender pupils in the ethnic ingroup (ceteris paribus).

Hypothesis 2b: "Ethnic Attraction"

With an increase in the size of a gender-ethnic group, the rate of ingoing friendship nominations from same-ethnic members of the opposite gender rises (ceteris paribus).

Hypothesis 3: "Compensation/Attraction with Gender over Ethnicity"

Since gender is the stronger social barrier than ethnicity, I expect stronger effects on the availability on the same gender than on the same ethnicity. *The compensation effect and the attraction effect of gender is stronger than the one for ethnicity.*

2.3 Data

The following analyses use the first wave of the study *Children of Immigrants Longitudinal Survey in Four European Countries* (CILS4EU) that was collected in Germany, the Netherlands, Sweden, and England in 2010/11 (Kalter et al. 2016a). CILS4EU is a large scale multi-purpose study that surveyed school children and their parents while having one of its major analysis potentials on social integration. It oversamples schools with a high share of migrants and contains information of full friendship networks within the school class.

The original sample of N= 952 school classes was stepwise reduced to finally N= 352 classes (*working sample*) in order to satisfy criteria of quality (steps 1-5) and to guarantee a minimum requirement of choice homophily given the group composition of school classes (step 6).[20] Figure 4.2 shows the following steps of data reduction:

1. Only schools with a match between the survey unit and the corresponding classroom are allowed.
2. At least 75% of the gross sample of the class are to participate in the sociometric survey.[21] Additionally, exclude the pupils that were not part of the sociometric survey (i.e., they did not nominate, or could be nominated). Not more than three non-participants in the network module are allowed. At the same time classes with more than 20% non-participants in the sociometric module are excluded.

[20] For more information, see the sociometric fieldwork report of CILS4EU in wave 1 (Kruse & Jacob 2016).

[21] The "sociometric gross samples consist of all participants in the sociometric survey as well as those students who either refused to participate or who were absent at the date of the survey."(Kruse & Jacob 2016, p.10).

3. At maximum 10% invalid friendship nominations in class are tolerated.[22]
4. Only classes are selected that have a minimum class size of 10 students.
5. Exclude classes with a large share of missing information on migration background (at least 75% valid information).
6. Within each class, at least one potential homophilious dyad is required that could be formed within each of the following four groups: native-male, native-female, migrant-male, migrant-female. Classes that do not fulfill this minimum requirement are excluded from the working sample, as the friendship choice on the relevant gender-ethnicity characteristics are limited.

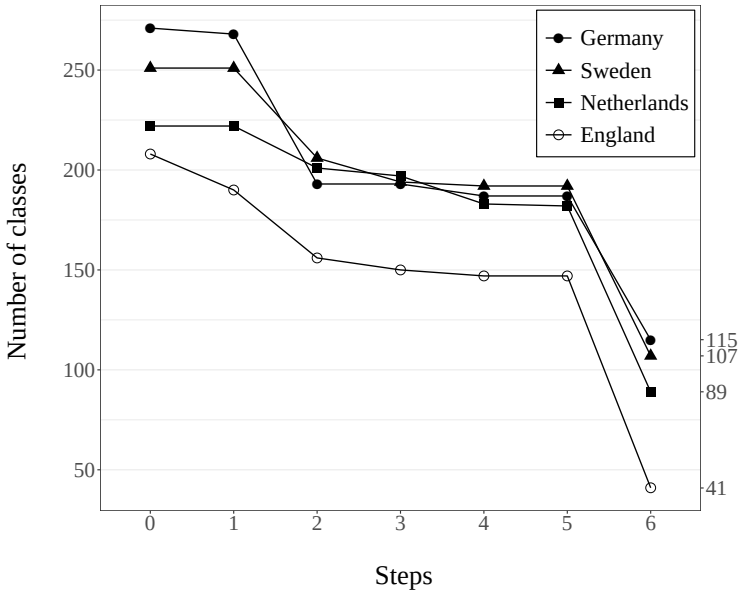


Figure 2.2: Reduction of data for working sample of the first wave of CILS4EU.
Source: CILS4EU, wave 1, own calculations.

2.3.1 Friendship Network Data

CILS4EU captured the friendship relations by asking every child to nominate up to five best friends in class. The mean age of the pooled working sample (over all classes and countries) of wave 1 is 14.5 years. Although the data represent a snapshot in the evolution of the friendship networks within class, it can be interpreted that, until this age, the class mates went through phases of getting to know each other, i.e., first

[22]This includes self-nominations or double nominations.

Table 2.1: Descriptives of reduced sample, (CILS4EU, wave 1).

	GE		SW		NL		EN		ALL	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Min	Max
Pupil-level										
Age (yrs.)	14.71	(.73)	14.15	(.39)	14.54	(.65)	14.58	(.51)	13.00	18.00
Male	.51	(.50)	.51	(.50)	.48	(.50)	.52	(.50)	.00	1.00
Native	.48	(.50)	.52	(.50)	.60	(.49)	.54	(.50)	.00	1.00
Class-level										
Class size	23.26	(3.72)	21.95	(3.57)	23.68	(3.69)	24.07	(4.77)	11.00	35.00
Share native	.48	(.16)	.52	(.15)	.60	(.15)	.54	(.16)	.15	.87
Share male	.51	(.12)	.51	(.11)	.48	(.12)	.52	(.09)	.22	.79
Count of male natives	5.70	(2.63)	5.80	(2.54)	6.95	(2.79)	6.58	(2.71)	2.00	14.00
Count of female natives	5.39	(2.85)	5.57	(2.66)	7.25	(3.31)	6.52	(3.40)	2.00	19.00
Count of male migrants	6.12	(2.92)	5.38	(2.39)	4.41	(2.21)	5.84	(2.66)	2.00	14.00
Count of female migrants	6.03	(2.67)	5.19	(2.20)	5.07	(2.67)	5.12	(2.59)	2.00	14.00
Migrant diversity[1]	.75	(.11)	.85	(.11)	.78	(.09)	.75	(.14)	.00	.98
Density	.18	(.03)	.17	(.03)	.16	(.03)	.13	(.03)	.04	.36
Observations										
N_{pupils}	2,597		2,283		2,051		948		7,879	
$N_{classes}$	115		107		89		41		352	
$N_{schools}$	81		77		55		30		243	

[1] Diversity index on the migrant group (inverse-Herfindahl index).

awareness, repeated interaction, friendship, and even breaking ties, may already have happened to a certain extent.

2.3.2 Attribute Information

The final sample consists of 7,879 pupils in 352 classes that spread over 243 schools. Table 2.1 summarizes the information of attributes on the micro-level (pupil) and on the macro-level (class) for the working sample.

Micro-Level

The categorization of each child's ethnicity is based on the country of birth concept provided with CILS4EU. It combines the birth countries of the grandparents, the parents, and the child itself (Dollmann et al. 2014). For simplicity, these ethnic categories are summarized so that only *native* and *migrant* (= non-native) ethnicity is distinguished.

This means, all non-natives (including the category "Unknown country of origin") are categorized as migrants.[23] For a full overview of the ethnic makeup of the working sample, see Tables B.10 and B.11 in the Appendix.

Macro-Level

On the class level (macro level) for each gender-ethnic combination a separate count variable is generated. This leads to the four variables for counting native-male, native-female, migrant-male, and migrant-female pupils in the school class. For controlling ethnic diversity within the class, the inverse Herfindahl–Hirschman Index for migrants is generated. The larger this index, the more heterogeneous (i.e., fragmented) is the group of migrants.

2.3.3 Missings

Attributes

In order not to loose classes according to item-non-response on the variables, multivariate imputation was conducted. Similar to the procedure described by S. Smith et al. (2014), chained imputation was run using variables such a parental education, inter-ethnic attitudes, count of books at home. The imputation models were run 40 times, and from the resulting different values the modes were used for filling missing information on migrant status (i.e., unknown immigrant background).[24]

Network

For missing network information, imputation by reconstruction (Stork & Richards 1992) was conducted. Assuming reciprocity, this imputation method imputes missing outgoing friendship information by mirroring the ingoing nominations. By design of CILS4EU, at most five outgoing nominations are possible, consequently the imputation was limited to five pupils. In cases of more than five incoming nominations, five pupils were randomly selected for imputation. This reconstruction procedure does not lead to substantial bias for networks of high reciprocity that have moderate (20–30%)

[23] Children within this category could be categorized (by CILS4EU) as having an immigrant background, however no country of origin could be identified (Dollmann et al. 2014, p.39).

[24] See Tables B.10 and B.11 in the Appendix for the amount of missing information on ethnicity. Note that "Unknown country of origin" counts as migrant, only "Unknown immigrant background" was imputed.

amounts of missing data (Huisman 2009, 2018). As the working sample only allows classes with up to 20% invalid friendship nominations, this should not result in biased results.

2.4 On Model Selection

This article's analyses start with a basic testing of the additive effect of gender and ethnic homophily as described earlier (multidimensional homophily). Thereafter, I present the main analyses that aim to test the central hypothesis.

Note that, in contrast to other studies (e.g., Wimmer & Lewis 2010), it is not intended to estimate the change in ethnic friendship preferences. Such studies often use a residual approach that requires control variables on the micro- (individual) and meso-level (network), and finally interpret the remaining covariation as the individuals' mean ethnic preference. Consequently, the following analyses do not include controls for status homophily (micro), *mutuality* (meso), or *triadic closure* (meso).[25] Nonetheless, the subsequent analyses allow to identify the observable amount of homophily.

Multidimensional Homophily (Dyadic-Perspective)

For testing the assumption of multidimensional homophily of gender and ethnicity, I used pooled firthlogit regression. All classes are taken together (pooled) and rearranged to dyadic format. The unit of observation is the directed friendship-dyad between two pupils. For a class of N pupils, the dyadic form consists of all $N \cdot (N-1)$ possible sender-receiver-dyads.[26] In the following, the dependent variable for dyadic analyses is the binary variable indicating whether there is a friendship nomination from the sender to the receiver (1= nomination) or not (0= no nomination).

School class friendship networks in dyadic format are small samples, with realizations of actual dyads being rare events. In order to account for this special data structure, firthlogit (Firth 1993; Heinze & Schemper 2002) over standard logit regression is preferred.[27]

[25] Mutuality or *reciprocity* controls for the tendency that friendships are often symmetric. Triadic closure accounts for the fact, two persons sharing a common friend, are often friends themselves.

[26] $(N-1)$, as self-nominations are not allowed.

[27] As Heinze & Schemper (2002) note, maximum likelihood estimation methods in rare event data may produce no (in case of prefect prediction), or biased estimators. This can be solved using firthlogit regression. The alternative of using exact logistic regression should be avoided in cases where the number of cases is greater than 200 (Leitgöb 2013). It seems as if the development of the statistical estimation methods around firhtlogit are still in progress and discussion (Puhr et al. 2017). However,

Central hypothesis

The strategy of the main analyses (central hypothesis) is to look at the four major ethnic-gender groups (native boys/girls, and migrant boys/girls) and to evaluate whether their ethnic friendship selection pattern can be predicted by their in-group gender-availability. Two analytical strategies, are pursued, each providing their own specific advantages.

Ego-Perspective

In a first set of analyses, several separate pooled OLS-regressions on the child-level are estimated. For every sender-receiver combination (that result from the different gender-ethnicity-groups) a separate regression is run. The common concept of these analyses is to predict the count of outgoing friendship nominations with the central independent class level variable (e.g., count of male natives), ceteris paribus. The main advantage of this conceptualization is to get an overall picture how the different groups are affected by changes in gender availability. The dependent variable here is in its original scale, the number of outgoing nominations. This allows to get a first impression of the influence of the independent variables.

Dyadic-Perspective

In the second set of analyses, data format is the dyadic level with a dummy indicator of friendship as the dependent variable. The hypotheses of the article are tested using a two-step approach in which, in a first step, for each school class separate firthlogit regressions are estimated, from which predicted probabilities are calculated. In a second step – by using meta-regression analysis – the resulting probabilities are predicted by macro variables.

The dyadic format requires special treatment of the relationship between class size and tie probability. The maximum number of friendship nominations with CILS4EU is limited to five nominations. Consequentially, the tie probabilities are a function of class size, as the number of potential dyads increases disproportionately. Due to survey design, the maximum number of realized friendships in the data for a class of N is

at the time the models were estimated, firthlogit appeared to be the optimal method in terms of user-friendliness and bias-reduction. Firthlogit was estimated with the Stata module `firthlogit`, that is available in version 1.2 by Coveney (2021).

$5 \cdot N$. However, the theoretical maximum of potential ties is $N \cdot (N-1)$, which leads to $\frac{ties(max)}{ties(potential)} = \frac{5}{N-1}$ as the maximum tie probability. This means that the maximum tie probability decreases with increasing class size, i.e., small classes have higher probabilities than large classes. Similar to the case of maximum dyad probability, the predicted probabilities are a function of class size, too. To account for this relationship the regression analyses on the second level include the class specific density measure of the friendship network which is calculated by the fraction of empirically realized ties divided by the number of potential ties, i.e., $density = \frac{ties}{N \cdot (N-1)}$.[28]

The second approach is a multilevel logit regression, where the dyad is the first level and the class the second level.[29] To test the effect of the macro level onto the hypothesized selection pattern on the micro level, a cross-level interaction is included. This is similar to the first mentioned approach, but has the advantage of multilevel-analysis (it captures between class variation), however, not accounting for rare cases as firthlogit does. A second benefit of the multi-level approach is to capture variation in ethnic groups. Friendship preferences between natives and migrants might differ for the different ethnic groups within the migrants, for example due to cultural differences. In order to control for this, the multilevel analyses control for the different ethnic groups by adding dummies for native-migrant tie combinations (for example in the case of England: Native -> India, India -> Native, Native -> Ireland, Ireland -> Native, etc.).

Controls

In order to hold other factors of availability structure constant, the macro-level-modeling in the next chapter contains the following class-level control variables: count of male natives, count of female natives, count of male migrants, count of female migrants, the diversity within the migrant group *migDiv*, and dummies for each of the four countries. As S. Smith et al. (2016) show, migrant diversity may have an effect on ethnic selection

[28] Simply adding class size as a control variable in the second step of the two-step approach is not feasible because the main independent variables at the second step are collinear with class size.

[29] Comment on ERGM: At this point, the relatively new developed technique of exponential random graph models (ERGMs) has to be mentioned. Although ERGMs are elaborated and have several benefits (e.g., potential for controlling triadic closure[30] and lower assumptions of unit independence) for analyzing network data (Lusher, Koskinen, & Robbins 2013; J. K. Harris 2014), there is one major obstacle: achieving convergence for the estimations. For example, a quite similar analysis – compared to this article – by S. Smith et al. (2016) failed to achieve convergence for about 50% of their working sample (CILS4EU, wave 1). The problem of convergence was mainly due to small case numbers for ethnic subgroups. This problem may be similar when differentiation for gender is required. Therefore, the more traditional approach of dyadic modeling was used for this article.

patterns.

2.5 Results

2.5.1 Multidimensional Homophily of Gender and Ethnicity

Before the main results, I test whether there is an interaction effect of gender and ethnic homophily. Figure 2.3 shows the predicted probabilities transformed to average adjusted probabilities (Ps) of a pooled dyadic firthlogit model.[31] The regression table for the underlying pooled dyadic firthlogit model can be found in the Appendix (Table A.3). Note that same-ethnic and same gender dyads are indicated by two dummy variables (1 for same attribute dyad, 0 otherwise). For example, *same-ethnic* hereby means that the ends of the dyads are both natives or both non-natives.[32] In order to test the interplay with gender homophily an interaction effect was added to the model. The Figure shows a probability of about 30 percent for the formation of same-gender, same-ethnic friendships (group 3), and about 26 percent for same-gender inter-ethnic ties (group 2). Compared to this, the probability for different-gender ties is much lower, at about 4 percent within and across ethnic groups (groups 0 and 1, respectively).

For the comparison of the predicted probabilities I conducted a contrast analysis (pairwise comparison) with bonferroni correction. The corresponding Table A.4 can be found in the Appendix. Comparing the gender and ethnic homophily with the baseline (no similarity), it shows that both homophily effects are positive and significant (ΔP_{2-0}=.219, p<.0001; ΔP_{1-0}=.004, p<.05). For the case of gender homophily this is much in line with our theoretical assumptions. The effect of ethnic homophily, however, is weaker than expected. A direct comparison shows that gender homophily appears to be much stronger than that of ethnicity (ΔP_{2-1}=.216, p<.0001). Although ethnicity is weak for cross-gender dyads, there seems to be an additional effect for similarity on both attributes (interaction effect) that is higher than similarity on gender alone (ΔP_{3-2}=.044, p<.0001). The results support the assumption that the ideal friendship tie is one that satisfies both gender and ethnic similarity at the same time. Furthermore, the effect of ethnic homophily seems to be dependent on gender homophily.

[31] By average adjusted predictions, I mean calculating the predicted probabilities by fixing (adjusting) one variable to a particular value and using the observed values in the remaining covariates, and finally calculating the mean of these probabilities.

[32] It is not differentiated whether the migrants have contact to other migrants of their concrete same ethnic group.

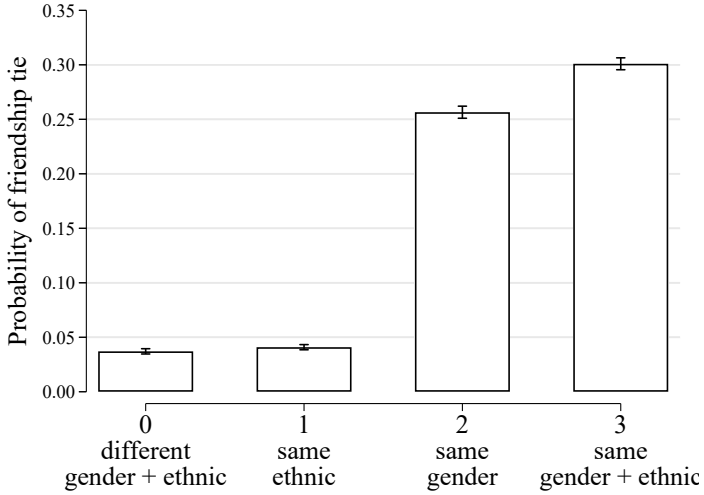


Figure 2.3: Pooled firthlogit – interaction of gender and ethnic homophily. Predicted probabilities with CIs on 99% (dyad level).
Source: CILS4EU, Wave 1, working sample, own calculations.
Notes: Same ethnic means both natives or both non-natives. The pooled firthlogit regression contains class-level controls for class size, gender share, ethnic share, diversity within migrants, and for the four countries. Find the full Table A.3 in den Appendix.

Building on this, the basic idea, that a growing scarcity of this ideal pool of pupils within class will lead to increasing inter-ethnic contact, is tested in more detail in the following analyses.

2.5.2 Ego-Perspective

In order to measure the effect of changing gender-ethnic availability on inter-ethnic friendship selection, separate pooled OLS-regressions on the ego-level are estimated. The number of friendship nominations towards the different groups are the dependent variables. The central independent variables reflecting the variation in availability are number of pupils belonging to each of the four gender-ethnic subgroups within a given class. The friendship nominator groups are the different units of observations. A complete list of regression tables (i.e., beyond the hypothesized relations) can be found in the Appendix in Tables A.5-A.8. Table 2.2 shows the selected results for hypotheses 1a and 1b.

In line with hypothesis 1a ("Compensation with Gender") decreasing availability of first priority others is associated with more friendship nominations towards same-gender members of the ethnic outgroup. For example, the higher the number of male natives in a class, the lower the number of nominations of male natives towards male

Table 2.2: Prediction of number of cross-group same-gender friendship nominations by within group gender availability in the school class.

	A Male natives → Male migrants	B Male migrants → Male natives	C Female natives → Female migrants	D Female migrants → Female natives
Count of male natives (α_1)	$-.08^{***}$	$.20^{***}$	$-.00$	$-.01$
	(.01)	(.01)	(.01)	(.01)
Count of male migrants (α_2)	$.13^{***}$	$-.11^{***}$	.01	$-.01$
	(.01)	(.01)	(.01)	(.01)
Count of female natives (α_3)	$-.01$	$-.00$	$-.06^{***}$	$.17^{***}$
	(.01)	(.01)	(.01)	(.01)
Count of female migrants (α_4)	.00	$-.01$	$.12^{***}$	$-.11^{***}$
	(.01)	(.01)	(.01)	(.01)
Migrant diversity	$-.10$	.47	$-.08$	$.82^{***}$
	(.19)	(.26)	(.20)	(.24)
England (ref.)				
- Germany	$.44^{***}$	$.27^{**}$	$.35^{***}$	$.37^{***}$
	(.07)	(.08)	(.07)	(.08)
- The Netherlands	$.30^{***}$	$.26^{**}$	$.26^{***}$	$.32^{***}$
	(.07)	(.09)	(.07)	(.09)
- Sweden	$-.08$	$.36^{***}$	$-.15^{*}$	$.23^{*}$
	(.07)	(.09)	(.08)	(.09)
Constant	1.10^{***}	$.55^{*}$	$.80^{***}$	.31
	(.18)	(.24)	(.18)	(.22)
N	2,102	1,869	2,050	1,858
adj. R2	.221	.275	.200	.251

Source: CILS4EU, wave 1, own calculations.

Notes: Pooled OLS with clustered standard errors (by class) in parentheses.

In model titles: *Above arrow* friendship nominators (= units of observation),

below arrow count of friendship nominations (= dependent variables).

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

migrants. In fact, as Table 2.2 shows, the coefficients of the hypothesized relations all are negative and significant with $p < 0.001$: The effects of the two gender groups are stronger for migrants ($\alpha_{2B} = \alpha_{4D} = -0.11$) than for male natives ($\alpha_{1A} = -0.08$), and the smallest effect is for female natives ($\alpha_{3C} = -0.06$). According to hypothesis 1b ("Gender Attraction") increasing availability of a gender-ethnic group should increase the nominations from same-gender members of the outgroup. The analyses support hypothesis 1b. For example, the higher number of male migrants in a class, the higher the number of nominations of male natives towards male migrants. All the coefficients ($\alpha_{2A,1B,4C,3D}$) in Table 2.2 are positive and significant ($p < 0.001$), ranging within the interval $[0.12, 0.20]$. It is noteworthy, that - similar to the compensation effect of hypothesis 1a - the effects for migrant nominators are stronger than for native ones. Assuming no differences in gender preferences for migrants and natives, one way of interpreting these results is to assume that in gender-scarcity situations the minority group of migrants is more willing to cross the ethnic barrier than the majority group of natives.

In the next step I present results for hypotheses 2a and 2b. Hypothesis 2a ("Compensation with Ethnicity") finds only weak support. The coefficients indicating changes in cross-gender same-ethnic contacts in Table 2.3 ($\beta_{1A,2B,3C,4D}$) are rather small, ranging between $[-0.02, 0.01]$ and are significant for native males ($p < 0.01$) and female natives ($p < 0.001$). They are only weakly significant for female migrants and not significant for male migrants. Hypothesis 2b ("Ethnic Attraction") can be supported with the analyses, however effects are weak like in the case of hypothesis 2a. All the coefficients ($\beta_{3A,4B,1C,2D}$) of Table 2.3 range within the interval $[0.02, 0.04]$ and are significant ($p < 0.001$).

When comparing the "compensation-effects" and the "attraction-effects" for gender and ethnicity by looking at the effects in the coefficient plots of Figures 2.4 and Figure 2.5, the effects of gender appear stronger than for ethnicity. This supports hypothesis 3 "Compensation/Attraction with Gender over Ethnicity". While the compensation effects for gender ranged within $[-0.11, -0.06]$, for ethnicity they ranged within $[-0.02, 0.01]$. Comparing the attraction effects of gender within ethnicity, the range for gender was $[0.13, 0.20]$, while for ethnicity it is only $[0.02, 0.04]$.

Finally, a brief look at cross-gender and cross-ethnic friendship nominations rounds out the picture gained so far. It shows that a decrease in first-priority members in class

Table 2.3: Prediction of number of within-group cross-gender friendship nominations by within group gender availability in the school class.

	A Male natives → Female natives	B Male migrants → Female migrants	C Female natives → Male natives	D Female migrants → Male migrants
Count of male natives (β_1)	$-.01^{**}$	$-.01$	$.04^{***}$	$-.00$
	(.01)	(.01)	(.01)	(.01)
Count of male migrants (β_2)	$-.01$	$-.01$	$-.00$	$.02^{***}$
	(.01)	(.01)	(.01)	(.01)
Count of female natives (β_3)	$.03^{***}$	$-.00$	$-.02^{***}$	$-.00$
	(.00)	(.01)	(.00)	(.00)
Count of female migrants (β_4)	.00	$.02^{***}$	$-.00$	$-.01^{*}$
	(.01)	(.01)	(.01)	(.01)
Migrant diversity	$-.13$	$-.41^{**}$	$-.12$	$-.25^{*}$
	(.12)	(.13)	(.12)	(.12)
England (ref.)				
- Germany	$-.02$	$-.02$	$-.02$	.01
	(.04)	(.04)	(.04)	(.04)
- The Netherlands	$-.13^{**}$	$-.01$	$-.04$	$-.03$
	(.04)	(.05)	(.04)	(.04)
- Sweden	$-.14^{**}$	$-.10^{*}$	$-.10^{*}$	$-.09^{*}$
	(.04)	(.04)	(.04)	(.04)
Constant	$.37^{***}$	$.56^{***}$	$.31^{**}$	$.42^{***}$
	(.11)	(.12)	(.11)	(.11)
N	2,102	1,869	2,050	1,858
adj. R2	.038	.026	.042	.027

Source: CILS4EU, wave 1, own calculations.

Notes: Pooled OLS with clustered standard errors (by class) in parentheses.

In model titles: *Above arrow* friendship nominators (= units of observation),

below arrow count of friendship nominations (= dependent variables).

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

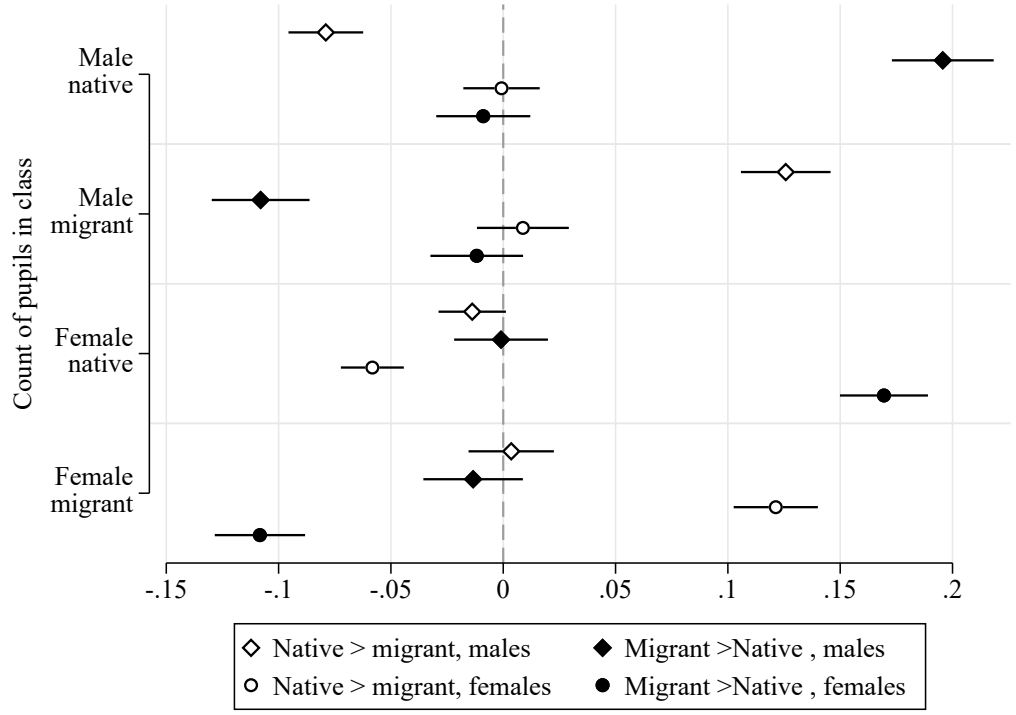


Figure 2.4: Coefplot on OLS-regression predicting inter-ethnic same-gender friendship nominations by class composition.

Source: CILS4EU, wave 1, working sample, own calculations.

Note: The legend shows the combination of independent and dependent variables. For example, "Native > migrant, males" means, the dependent variable is the count of friendship nominations towards male migrants, the group of native males is the unit of observation. The coefficients (y-axis) are the class counts of the specific group. All regression models control for ethnic diversity and country. Clustered standard errors by school class. For details on regression see Table 2.2.

leads to only small increases in friendship nominations towards outgroup members in gender and ethnicity. The "Compensation"-coefficients $\beta_{I:1D,II:3C,III:2B,IV:4A} = -0.01$ are significant only for male migrants ($p < 0.01$) and female natives ($p < 0.05$).[33] Somewhat different is the picture of an increase in cross-gender and cross-ethnic availability. Here the coefficients $\beta_{I:4D,II:2C,III:3B,IV:1A}$ all range within $[0.02, 0.03]$ and are significant ($p < 0.001$).[34] In light of this, and assuming that crossing the social barrier twice to be least attractive, the attraction effect of gender within ethnicity appears to be somewhat small.

In summary, there are two main results from the ego-perspective. Firstly, when children face fewer ideal (matching on gender and ethnicity) potential friends in the

[33] Find the corresponding table in the Appendix in Tables A.5-A.8.

[34] See Tables A.5-A.8.

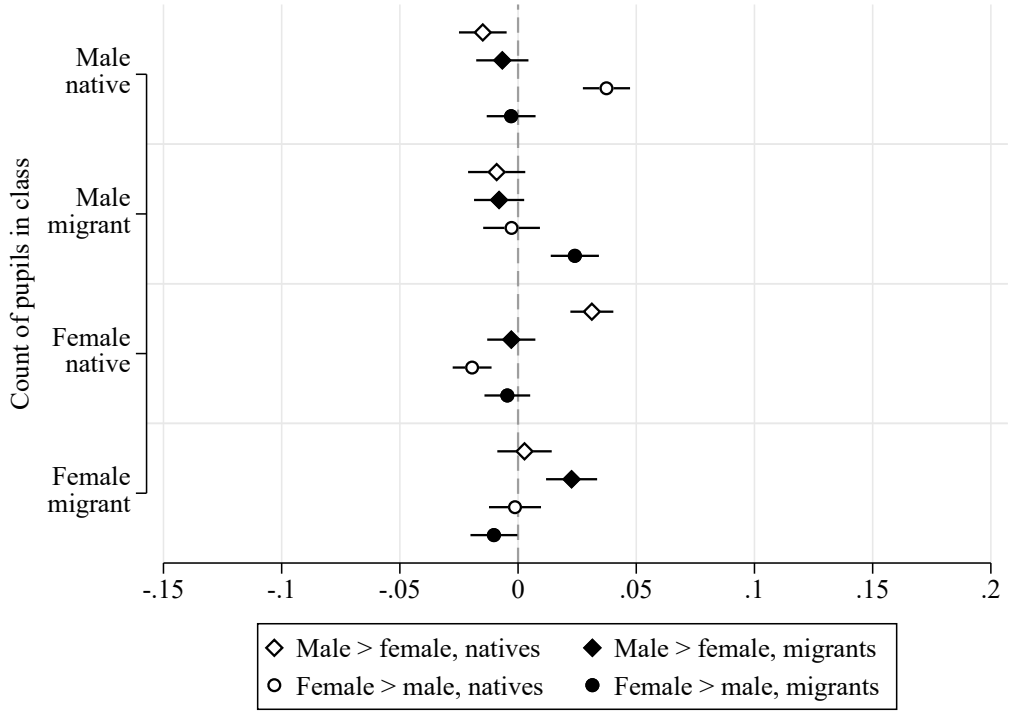


Figure 2.5: Coefplot on OLS-regression predicting same-ethnic cross-gender friendship nominations by class composition.

Source: CILS4EU, wave 1, working sample, own calculations.

Note: The legend shows the combination of independent and dependent variables. For example, "Male > female, natives" means, the dependent variable is the count of friendship nominations towards female natives, the group of native males is the unit of observation. The coefficients (y-axis) are the class counts of the specific group. All regression models control for ethnic diversity and country. Clustered standard errors by school class. For details on regression see Table 2.3.

school class, the dominant strategy is to compensate this by befriending same-gender children in the ethnic outgroup. Secondly, the growing scarcity in ideal others does not affect cross-gender friendships irrespective of ethnic status. Similarly, an increase of a gender-ethnic group increases the nominations predominantly from same-gender pupils of the ethnic outgroup. According to these results, for adolescents' friendship selection in school gender is more important than ethnicity differentiated by native and migrant status. Furthermore, for same gender, cross-ethnic friendship is a function of availability of same-gender pupils within the ethnic ingroup, but also the outgroup. Compared to the combined group of migrants, natives seem to be less affected by this type of availability, suggesting that they are less willing to cross the ethnic boundary.

2.5.3 Dyadic-Perspective

Two-Step Approach

In a first step of the 'two-step approach', for each class a firthlogit model (FLM) is estimated. For each class data are structured into dyadic format (as explained earlier), i.e., the dependent variable y_{ij} is a binary dummy, indicating friendship nomination from pupil i to pupil j. The FLM follows the equation $Pr(y_{ij} = 1) = (1 + (exp(-X_{ij}\boldsymbol{\beta}))^{-1}$. The central model's definition of $X_{ij}\boldsymbol{\beta}$ is the following equation[35]

$$:=\beta_0 + \beta_{\text{NatMig,M}} \cdot x_1 + \beta_{\text{NatMig,F}} \cdot x_2 + \beta_{\text{MigNat,M}} \cdot x_3 + \beta_{\text{MigNat,F}} \cdot x_4. \tag{2.1}$$

Table 2.4 explains the coding of the independent variables $x_1, ..., x_4$.

Table 2.4: Definitions of dyadic variables.

Variable	Definition
$x_1, ..., x_4$	Dummy variables indicating the corresponding group, where
	Nat:= native, Mig:= migrant, M:= male, F:= female.
x_1	is 1, if i is a *native male* and j a *migrant male*, 0, otherwise.
x_2	is 1, if i is a *native female* and j a *migrant female*, 0, otherwise.
x_3	is 1, if i is a *migrant male* and j a *native male*, 0, otherwise.
x_4	is 1, if i is a *migrant female* and j a *native female*, 0, otherwise.

As explained above (see Section 2.4), I present the predicted probabilities in terms of average adjusted predictions to ease interpretation. Figure 2.6 shows the distribution of these probabilities (FLM-Ps) that result from FL-models with the Equation 2.1. Every class represents one observation. As can be intuitively seen from the boxplots, the predicted probabilities vary greatly between classes.

In the second step of the 'two-step-approach', the variation of the FLM-Ps is tried to trace back to the gender-ethnic availability (e.g., the count of male natives) in class. The covariation of the FLM-Ps and within-group availability is analyzed with meta-regression. The meta-regression assigns weights to the probabilities for each class according to the inverse of the variance of the probabilities. In other words, it puts less weight on probabilities (i.e., classes) with a lower precision of the estimator. For theses analyses, the predicted probabilities are the dependent variables in the separate

[35] Statistical controlling will be done in the meta-analysis part thereafter.

analyses for the four gender/ethnic groups.

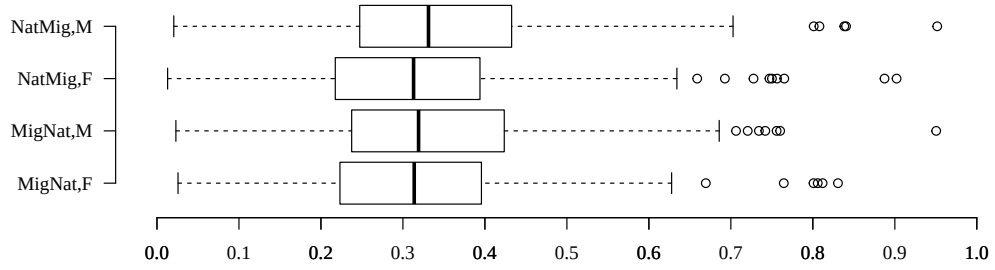


Figure 2.6: Distributions of predicted probabilities from firthlogit regression via boxplots, Equation 2.1, N=352.
Source: CILS4EU, wave 1, working sample, own calculations.
Notes: Data not weighted.

Figure 2.7 summarizes the second-step results in four coefficient-plots.[36] Regarding the hypothesis 1a "Compensation with Gender", in all four cases of the third model (M3), the hypothesized coefficients are negative, and with the exception of female natives the results are significant[37]: In [1] count of male natives ($B_{\text{Male natives}} = -.014$, $p < 0.01$), in [2] count of female natives ($B_{\text{Female natives}} = -.004$, $n.s.$), in [3] count of male migrants ($B_{\text{Male migrants}} = -.016$, $p < 0.001$), and in [4] count of female migrants ($B_{\text{Female migrants}} = -.015$, $p < 0.05$).[38] Except for female natives, these results support hypothesis 1a. Across school classes of four European countries, the probabilities of inter-ethnic same-gender friendship ties increase as the availability of same-gender contacts decreases within children's own ethnic group.

Hypothesis 1b "Gender Attraction" does not find confirmation on the dyadic level. Different than expected, the probabilities of cross-ethnic ties decrease if the size of the same gender ethnic outgroup increases. The coefficients [1] $B_{\text{Male migrants}}$, [2] $B_{\text{Female migrants}}$, [3] $B_{\text{Male natives}}$, and [4] $B_{\text{Female natives}}$ all are negative and with the exception of [3] are significant.

Multi-Level Model

Finally, the analyses of hypothesis 1a "Compensation with Gender" and hypothesis 2a: "Compensation with Ethnicity" are repeated with multilevel logistic regression

[36] The detailed regression Tables A.9-A.12 can be found in the Appendix.
[37] As the prediction happens on the macro level, the large Greek character of beta B instead of β is used.
[38] Note that the effects in Figure 2.7 are rescaled by factor 7. For example, the original effect of male natives in [1] -0.014 is depicted as $7 \cdot (-0.014) = -0.098$.

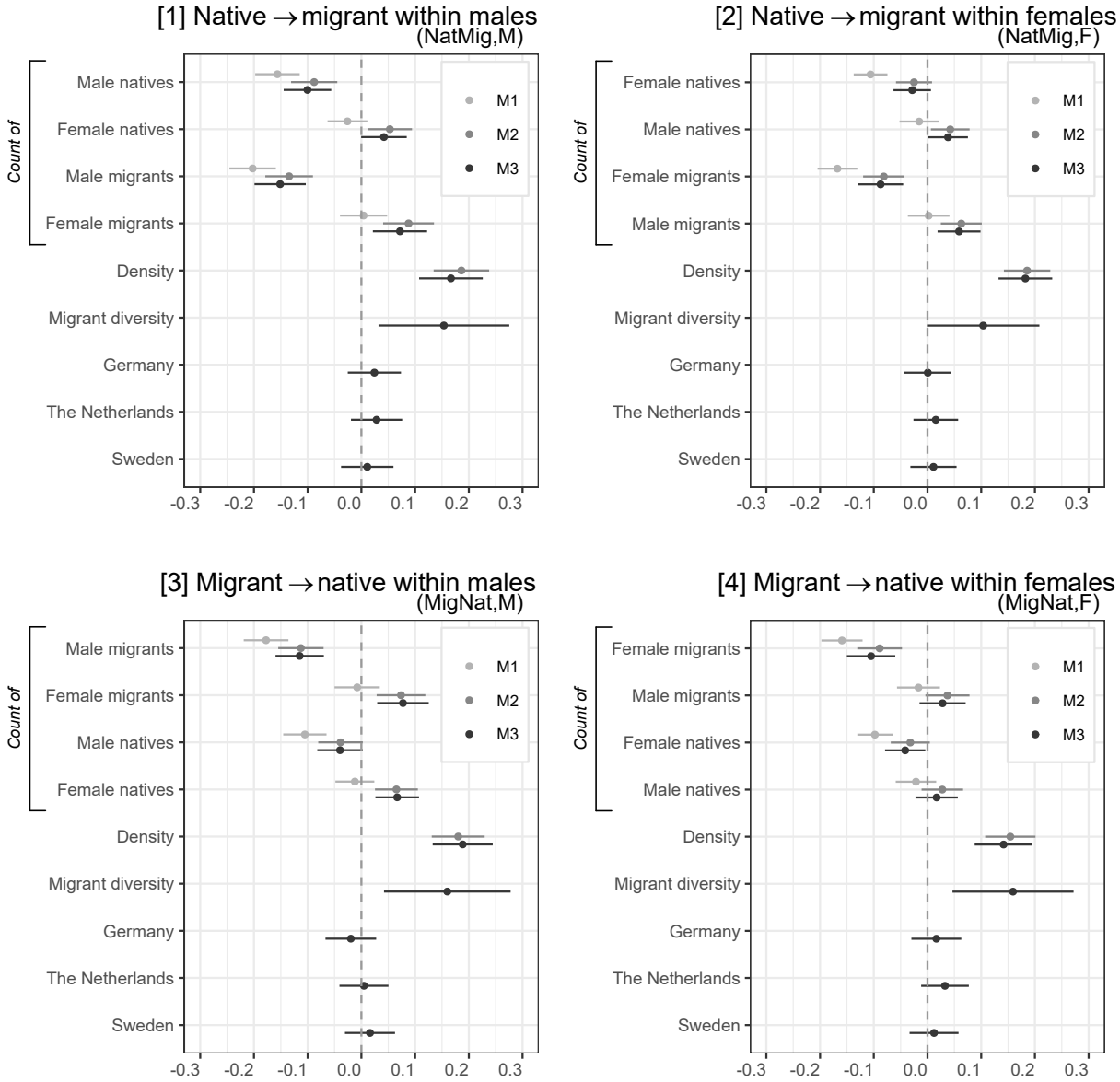


Figure 2.7: Coefficient-plots of meta-regressions on the predicted probabilities for $NatMig, M$, $NatMig, F$, $MigNat, M$, and $MigNat, F$.

Source: CILS4EU, wave 1, working sample, own calculations.
Note: Constant left out in plot. The variables "Count of" are the counts of pupils in class. Count variables are rescaled by factor 7 (half maximum range [2;14]). Density is rescaled by factor 0.1. Models: M1 is the basic model w/o control variables; M2 controls for density; M3 controls for density, migrant diversity (Herfindahl index), and country dummies (reference category: England). CIs on 95%. Meta-regression weighted on variance.

allowing random intercepts and random slopes.[39] For each sender perspective (all four gender-ethnicity groups), I estimated a separate model, for each country. Different than the meta-regression approach, I did not include full cross level interaction, i.e., of

[39] Find the regression Tables A.13-A.20 in the Appendix.

all class level variables. Only the central within-group gender share variable moderates the micro-level effect. The predicted plots with predicted probabilities are presented in Figure 2.8. The picture from the two-step approach tends to repeat itself. Again, as in-group availability of one's own gender decreases, the probability of forming friendships with same-sex students of the ethnic outgroup increases (some exceptions from this pattern are migrant nominators in England).

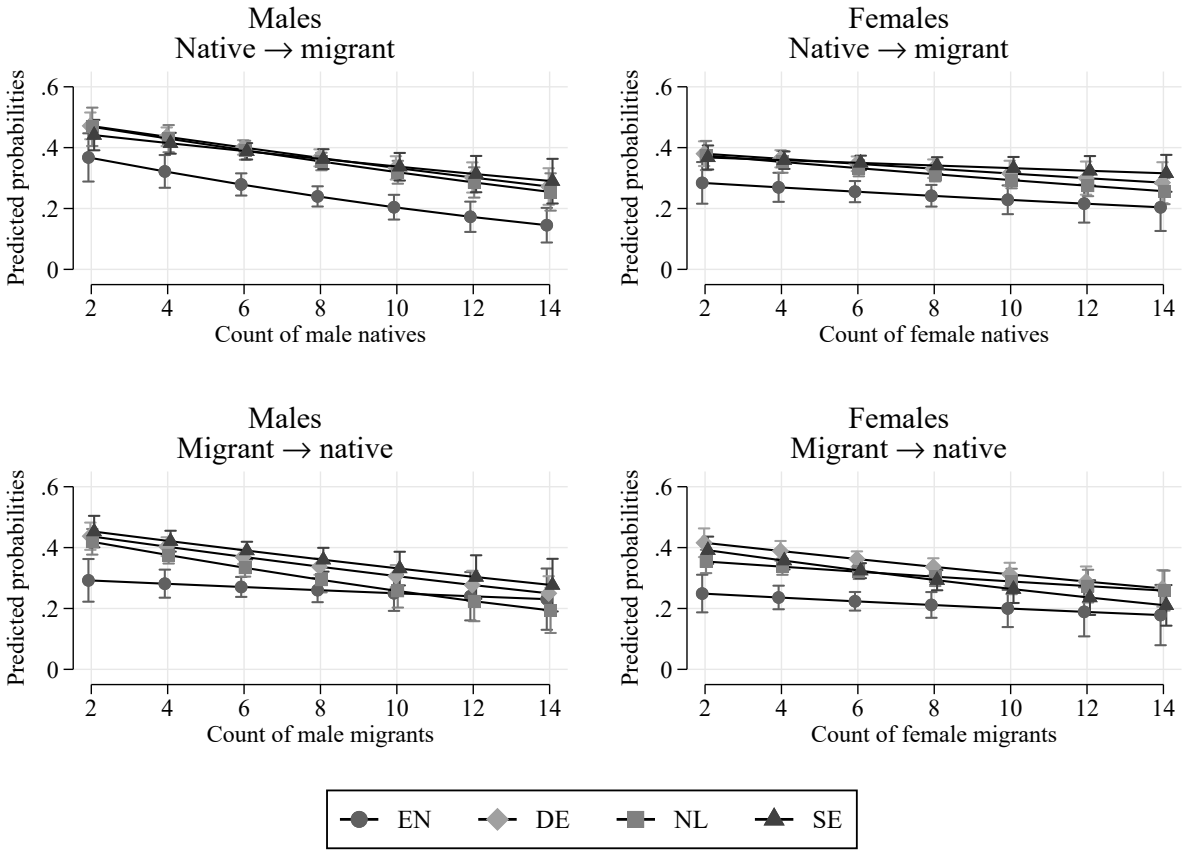


Figure 2.8: Effects of gender availability on inter-ethnic friendship nominations (compensation effect). Predicted probability plots of dyadic ML-logit models. Predicting same-gender inter-ethnic friendship by within-availability of same gender for the four gender-ethnicity combinations.

Source: CILS4EU, wave 1, working sample, own calculations.

Notes: EN = England, GE = Germany, NL = The Netherlands, SE = Sweden. Friendship dyads at level 1 and school classes at level 2. All models control for: Remaining group sizes, e.g., the model in the upper left graph additionally controls for count of female natives, male migrants, and female migrants. Class level variables density (also quadratic) and migrant diversity. For regression information, see Tables A.13-A.16 in the Appendix. Graphs are jittered.

Looking at the same effects but with the roles of gender and ethnicity reversed, Figure 2.9 shows no change in cross-gender friendship nominations in any case. This supports the results from the ego-perspective, where crossing gender boundaries does not seem

to be an option given the reduced availability of same gender-ethnicity others.

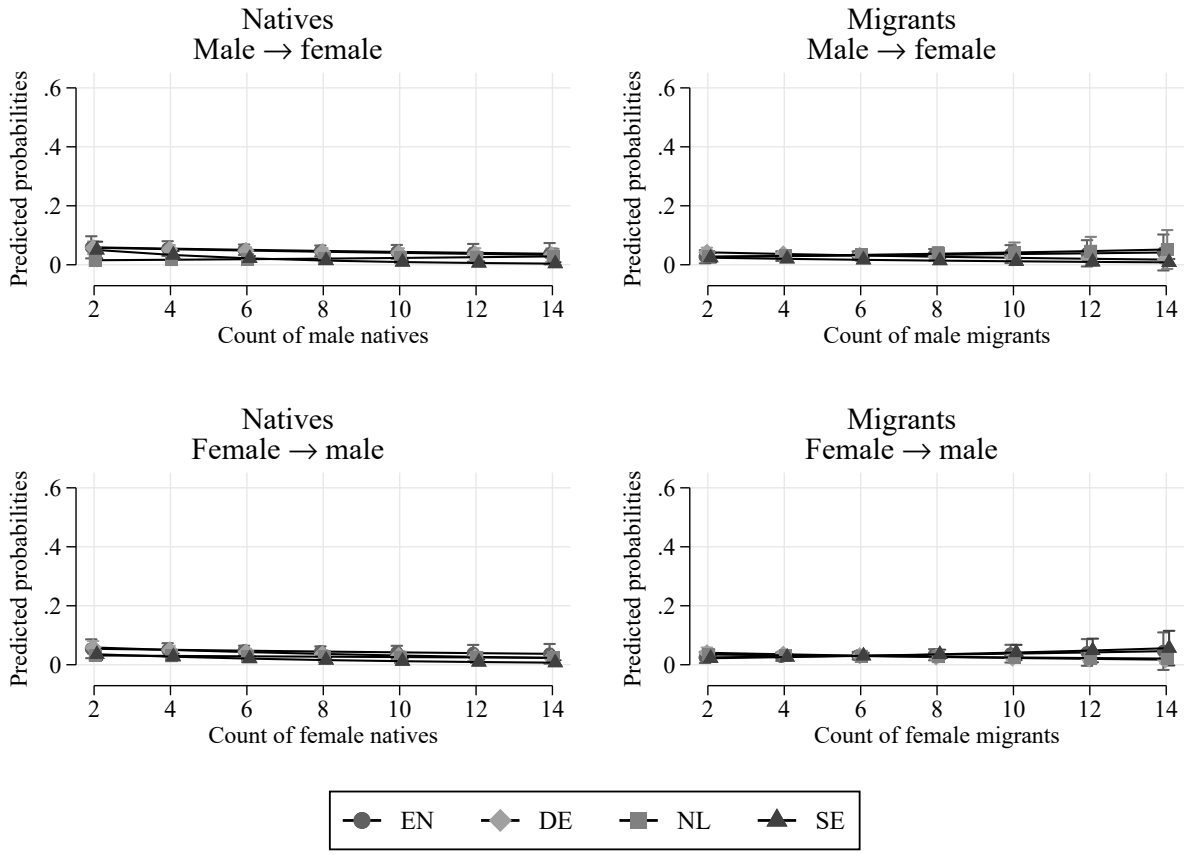


Figure 2.9: Effect of ethnic availability on cross-gender friendship nominations (compensation effect). Predicted probability plots of dyadic ML-logit models. Predicting same-ethnic inter-gender friendship by within-availability of same ethnicity for the four gender-ethnicity combinations.

Source: CILS4EU, wave 1, own calculations.

Notes: Friendship dyads at level 1 and school classes at level 2. All class count effects and migrant heterogeneity as quadratic terms. The migrant models control for country specific migrant-migrant ethnic tie combinations (e.g., in England: Pakistan->India, India->Pakistan, etc.) For regression information, see Tables A.17-A.20 in the Appendix.

2.6 Summary and Conclusion

A well-documented finding of previous research on the formation of inter-ethnic friendships is that, in addition to social preferences, opportunity structures such as the ethnic composition of the neighborhood or classroom influence children's choice of friends. However, there is limited research on the interaction between the availability of two preferred traits, particularly in relation to gender and ethnicity. In this sense, I posited a compensation hypothesis that when natives and migrants face lower availability of their own gender in their ethnic ingroup (native or migrant), they tend to satisfy their need for the same gender in the ethnic outgroup. In addition, I tested an attraction hypothesis, which states that increased availability of the same gender within the ethnic outgroup will lead adolescents to cross the ethnic boundary. Furthermore, both hypotheses are tested with switched roles of gender and ethnicity. To test this, I used data on student friendships from about 300 school classes in four European countries (CILS4EU) and conducted egocentric and dyadic regression analyses.

The results of gender availability with the ego-level analyses are consistent with both compensation and attraction hypotheses. Reduced gender availability within the ethnic ingroup leads befriending more those of the same gender within the ethnic outgroup. Increased gender availability within the ethnic outgroup leads befriending more those of the same gender within the ethnic outgroup. However, when the roles of gender and ethnicity are reversed, there is no empirical evidence of compensation or attraction with the gender outgroup. Interpreting these results leads to the following potential conclusions for adolescents' in-class friendship. Either gender appears to be a much stronger social barrier than ethnicity, or the attraction of gender is stronger than that of ethnicity, or most likely it is a mixture of both.

In summary, these ego-level results are consistent with Kroneberg et al. (2021), who found an increase in same-ethnicity friendships with increasing gender and ethnicity alignment in the classroom. Unlike this article, their definition of ethnic outgroup included other migrant ethnicities. Their analysis distinguished between ethnic groups but not between compensation and attraction effects, using the intersection of ethnicity and gender as the central independent variable in measuring Cramer's V. Nevertheless, given the results of both studies, the hypothesized relationships appear to be very robust, regardless of whether the distinction is made in two categories (native vs. im-

migrant) or for the different ethnic groups.

While the dyadic results also support the compensation thesis, the findings on the attraction thesis contradict the confirmation at the egocentric level. This contradictory finding could be explained as follows. The dependent variable at the ego level was the number of nominations, while at the dyadic level it was the probability of friendship ties. Consider male friendship nominations from natives to migrants in the dyadic case. If we increase the number of potential nominees (male migrants) while holding the number of nominators (male natives) constant, ties from natives to migrants become less likely. Although the number of outgoing ties to the outgroup increases, as shown by the ego-level analysis, the effect does not appear to be strong enough to offset the increase in nominees. In other words, the number of potential ties between natives and migrants increases faster than the number of ties from natives to migrants. This is because the number of outgoing nominations is limited to five. However, it can also be generally assumed that the number of close friendships between people is limited because friendships are costly, e.g., in terms of time and cognitive resources. Similar patterns of network size effects can even be observed for more advanced analytical methods such as the group of exponential random graph models (ERGM), where Goodreau et al. (2009) show that triadic closure is a function of network size.[40] As discussed by Koskinen & Snijders (2022), adjustments in newly developed network models could improve the handling of varying network size when analyzing multiple networks, which is also likely to improve the handling of subgroup size effects.

In addition to methodological improvements, the analyses could be extended in the following directions. While the current analyses suggest stronger barriers for gender than for ethnicity, it remains for future research to show whether specific inter-ethnic barriers to cross-ethnic friendships exist for particular immigrant groups. Immigrant groups differ in their degree of ethnic segregation. For example, compared to other migrant groups, groups of Pakistanis in England or Turkish migrants in Germany show relatively strong tendencies toward friendship segregation (van Tubergen & Smith 2018). By repeating the analyses in these groups, one could indirectly identify ethnic boundaries.

Moreover, because this article uses European data, it remains to be seen whether the results are generalizable to other contexts. Changing the context to the United States,

[40] They call this the "small town" effect, everyone knows each other, unlike in big cities.

where racial categories are more salient than ethnicity in Europe, might be a worthwhile test. Whether the findings generalize to older age groups is also an open question. In childhood and adolescence, the ethnic barrier in friendships can be particularly strong because it affects sexual attraction and the shyness associated with it. Older age groups may be more experienced with cross-gender situations and therefore less reluctant to develop cross-gender friendships, so the effect of compensation and attraction should be smaller. In addition, it might be possible to test whether homophily preferences in education are influenced by the availability of gender. In principle, these analyses from Chapter 2 could be applied to any set of two attributes for which homophily preferences exist.

Finally, some words on availability as a control in analyses that attempt to identify social preferences using survey data. When identifying preferences, a net approach is typically used, taking into account all potential influences on friendship choice, including availability patterns. The remaining effect typically is seen as a result of social selection, i.e., driven by social preferences. In such cases, careful consideration should be made whether to control for the presence of gender within the social categories to which the hypothesis refers to.

Chapter 3

Status-Caste Exchange in Inter-Ethnic Friendship

Abstract

Based on exchange theory, previous research has investigated whether social exchange related to socioeconomic status and immigrant status plays a role in the formation of romantic partnerships and marriages (*status-caste exchange thesis*). Using the first wave of CILS4EU (Children of Immigrants Longitudinal Survey in Four European Countries), I adapt this idea to the field of inter-ethnic friendship formation. I test whether an exchange of parental socioeconomic status (bonus) for immigrant status (malus) contributes to intergroup friendships between native and migrant adolescents in school classes in England, the Netherlands, Germany, and Sweden.

Analyses on the ego-level (OLS) support the thesis for migrants but not for natives: Rising socioeconomic (occupational or education) status for migrants is associated with more inter-group friendship, however different than expected, for natives no decreased intergroup nominations was found. The more direct tests at the dyad level (multi level logit) mostly provide support for the thesis of status-caste exchange: As the occupational status difference of $migrant - native$ increases, the friendship probability between the groups increases. With the exception of native friendship nominators in England, the direction of the effect (AMEs) is consistently positive across countries, although it is insignificant in some countries. Finally, analyses on a hybrid thesis combining the status-caste exchange and a similarity attraction perspective show inconsistent results. Status differences in occupation follow an a shaped pattern (similarity attraction) that show an expected shift towards heightened friendship probabilities of dyads where migrants have higher status than natives (status exchange). Comparable effects for educational status can be found for the Netherlands and Sweden, but not for England and Germany.

The results suggest that friendships between native and immigrant youth with respect to parents' socioeconomic status represent a mixture of status exchange social preferences and status similarity preferences, with preferences for status similarity clearly representing the stronger force.

3.1 Introduction

A central goal of migration research is to better understand the process of migrant integration. Among the other dimensions of integration, research points to the importance

of the social dimension of integration.[1] One prominent argument poses that bridging social capital (i.e., connections to the native group) improves migrants' access to host country-specific resources (Putnam 2000; Lancee 2012c). Empirical research shows that contact between migrants and natives is beneficial in the following ways: First, it improves migrants' labor market outcomes, such as employment and occupational status (Kanas et al. 2012; Lancee 2012a, 2016; Moroşanu 2016). Second, migrants' language skills improve through contact with natives (Espinosa & Massey 1997). Successful acquisition of host country language skills is an essential feature of integration and has been shown to have far-reaching positive effects on the economic and social integration of immigrants (Dustmann & Fabbri 2003; van Tubergen et al. 2004). Third, according to contact theory (Allport 1954; Pettigrew 1998), contact between groups under certain conditions can help overcome prejudice. This can subsequently reduce negative attitudes and increase trust between groups (Pettigrew et al. 2011), potentially leading to less between-group conflict.

However, the inter-ethnic boundaries between migrants and natives has been observed in many contexts and in various types of social relationships, as for example for contact at the workplace in Sweden (Åslund & Skans 2010), romantic relationships and marriage in many countries worldwide (e.g., Kalmijn 1998; Clark-Ibáñez & Felmlee 2004; Z. Qian & Lichter 2007; Lichter et al. 2011), online social networks (Wimmer & Lewis 2010; Hofstra et al. 2017), and for personal friendship ties (Quillian & Campbell 2003; Vermeij et al. 2009; Goodreau et al. 2009; Martinovic et al. 2011; Leszczensky & Pink 2015; S. Smith et al. 2016) in Northern America and Europe.

Inter-ethnic friendship segregation in early life plays an important role in this regard, as it influences social integration such as friendships (Ellison & Powers 1994; Sigelman et al. 1996; Fong & Isajiw 2000; M. O. Emerson et al. 2002) and romantic relationships (Merlino et al. 2019) later in life.

Aside from differences in social integration, migrants often differ in their structural integration. For example, PISA (Programme for International Student Assessment) data show that on average, migrant students have a lower socio-economic background than natives in OECD countries (OECD 2018b, p.155). This is particularly true for first generation migrants and within countries that previously attracted low-skilled immigrants.

[1] In addition to the social dimension: *structural*, *cognitive cultural* and *emotional* (Kalter 2008a).

Inter-ethnic friendship is often explained within the preference-opportunity framework that differentiates potential influences of social preferences and social structure on inter-ethnic friendship (e.g., see McPherson et al. 2001 or Zeng & Xie 2008).[2] While opportunity structures such as neighborhood or school context, influence the availability and, thus, the likelihood of choosing friends, social preferences are said to influence individual friendship choices beyond network composition and structure.

Considering the socioeconomic differences of migrants and natives, the question arises as to whether and how social preferences for socioeconomic status contribute to the social friendship segregation of migrants in the host society.

Explanations of intergroup friendships by status preferences such as the *open world-view thesis* (Kalmijn 1998), or theories with reference to the similarity attraction (Byrne 1961; Byrne et al. 1986), like the byproduct thesis, or meeting opportunity related theses, have not yet found consistent empirical support (Martinović 2013; Hamm et al. 2005; Mouw & Entwisle 2006; S. Smith et al. 2014; Damen et al. 2021). While these theories assume identical status preferences of migrants and natives, this paper builds on social exchange theory to assume a differential effect for the two groups. Adapting a social exchange approach from inter-racial marriage and partnership research (e.g., see Rosenfeld 2005; Kalmijn 2010; Gullickson & Fu 2010), I propose a *status exchange thesis* for intergroup friendship. Adjusted to the inter-ethnic research question, this approach is based on the two assumptions: 1) immigrant background is perceived as a malus in society, while 2) a high socioeconomic status is perceived as a bonus. Moreover, in accordance with exchange theory, the central idea of this approach is that immigration background (malus) can be offset by higher socioeconomic status (bonus). The resulting prediction is that intergroup friendship between natives and migrants is more frequent when migrants have a *high*, and natives have a *low* socioeconomic status. Thus, the formation of inter-ethnic friendship is explained by relative status, and inter-ethnic boundaries arise from different status preferences of migrants and natives.

The first wave of Children of Immigrants Longitudinal Survey in Four European Countries (CILS4EU, Kalter et al. 2016b) data is used to test this hypothesis. The original sample contains more than 900 school classes with within-class full friendship network information of 14-year-old children in Europe. The unique potential of the CILS4EU data allows for four main contributions to the current understanding of the

[2]The origin of preference-opportunity framework can be rooted within inter-ethnic marriage and partnership research, see Kalmijn (1998).

effects of socioeconomic status on ethnic segregation.

1) The postulated relationship is tested here in the context of friendships between *school children*, focusing on children's family background (i.e., the parents' status). As the formative years of childhood are ideal for research on friendship development, understanding friendship formation at this early stage in life contributes to understanding and developing the prerequisites for strengthening inter-ethnic contact and, by default, its beneficial consequences. The school environment has at least two favorable properties. Firstly, it is a setting in which children spent a significant amount of their time, making school one of the most important places for friendships to develop at this age. Secondly, the school is a well-defined unit with the number of classmates known and the opportunity structure (e.g., class size, composition) can be controlled for, making it easier to monitor the development of friendships.

2) Parental occupational and educational status are used here as measures of socioeconomic status. Most comparable studies include only one measure, and thus do not allow for comparison within the same sample. Separate analyses for each indicator is conducted here.

3) Much previous research that assesses the observable effects of the status exchange thesis on inter-ethnic friendships refer only to data at the ego level. However, to adequately test this thesis, the status differences of potential friendship dyads must be considered. The CILS4EU data contain complete information on the school class friendship network, allowing for predictions at the dyadic level. This provides a more comprehensive test of the theoretical predictions of the exchange thesis. The hybrid model tested here is also novel in that it unites the two perspectives of the status-exchange thesis and the similarity attraction paradigm.

4) Previous research on ethnic segregation of school classrooms are frequently based on Add Health data for US schools. In using CILS4EU data, this research will be extended to four European countries with broadly varying cultural and institutional context. Although the small number of countries does not allow for a test of hypotheses regarding country context, investigating the dyadic processes of friendships formed within school networks across countries clearly provides the potential to draw conclusions that are not only valid for a specific country context, but that hold more generally.

3.2 Theory

Before turning to the central theoretical concept of status exchange, the first part of this section introduces the most common theoretical framework for explaining friendship and the prominent concept of (choice) homophily, from which I later develop a hybrid thesis in combination with status exchange theory. Within a basic framework of opportunity and preferences, friendships can be explained by structural constraints that determine the pool of potential individuals to befriend, and by social preferences that determine the choice and maintenance of friendships within the pool of available individuals (Kalmijn 1998).[3]

Structural opportunities depend on the context that brings individuals together to participate in "joint activities" more or less exclusively together.[4] For children this is predominantly the family, the neighborhood, and the school context, where a large amount of times is spent. In terms of ethnic inter-group friendship, the basic idea that mere group size shapes potential choices (Blau 1977) theoretically suggests that the higher the share of the own ethnic ingroup, the higher the probability of befriending within.

Various research empirically supports the effect of availability on friendship choice at the school and the class level (Joyner & Kao 2000; Moody 2001; S. Smith et al. 2016) as well as within the neighborhood (Vermeij et al. 2009; Vervoort et al. 2011; Kruse, Smith, et al. 2016).

As children do not choose their friends randomly, social-psychological preferences can be assumed. The most common assumption is the similarity-attraction paradigm, which assumes that generally, individuals exhibit a preference for others with the same or similar characteristics to their own (Byrne 1961; Byrne et al. 1986). This phenomenon is sometimes referred to as *choice homophily*, while *homophily* refers to the observable pattern of similar individuals bonding at a higher than normal rate, and *induced homophily* describes homophily as a consequence of opportunities (McPherson & Smith-Lovin 1987; McPherson et al. 2001; Kossinets & Watts 2009).

Previous attempts to explain ethnic friendship segregation by socioeconomic homophilious preferences have failed. The byproduct thesis, for example, explains ethnic

[3]The literature also differentiates third party influences (e.g., parents, partners), meso-network structure influences such as reciprocity, or triadic closure (Feld 1981; Rivera et al. 2010; Wimmer & Lewis 2010).

[4]Herby, I refer to the focus definition by Feld (1981, p.1016).

segregation by choice homophily in socioeconomic status, but has failed to find empirical support (Hamm et al. 2005; Mouw 2006; S. Smith et al. 2014). For all the strength of the homophily theory, one of its shortcoming may be twofold: First, the explanatory focus of homophily theory is directed solely towards friendships within the group, thereby neglecting friendships between groups. Second, it is based on the assumption that the social preferences of natives and migrants are the same, both with a preference for other ingroup members. In contrast, this analysis assumes that natives and migrants have asymmetric social preferences for each other. In other words, groups could be unequally attractive for the formation of friendships. Such a differentiated hypothesis follows from social exchange theory (Homans 1961; Thibaut & Kelley 1959; R. M. Emerson 1976), which provides the theoretical basis of the current analysis.

Status-Caste Exchange

This paper's central theoretical approach is the *status-caste exchange* (SCE) thesis adapted for inter-ethnic friendship formation. In its original formulation by Davis (1941) and Merton (1941), which was repeatedly tested in inter-racial black-white marriage and partnership research on US data (e.g., Z. Qian 1997; Rosenfeld 2005, 2010; Kalmijn 1993, 2010; Hou & Myles 2013), the SCE thesis predicts that inter-racial partnership selection is more frequent if a black person's socioeconomic status exceeds that of the white counterpart. The core argument is that black individuals are less favored in the partnership market compared to white individuals, and that this can be compensated for by the blacks having a higher socioeconomic status. The general explanatory principle for this can be rooted in the cost-benefit perspective of the social exchange theory (Homans 1961; Thibaut & Kelley 1959; R. M. Emerson 1976), but with an emphasis on the exchangeable-compensatory aspect of attributes, meaning that specific attributes can be compensated by others. In other words, though a person has a low valued attribute A, a high-scoring trait B may make him or her attractive as a partner.

Adapting the status-caste exchange thesis to inter-ethnic friendship selection of school children translates to the following: inter-ethnic friendship between natives and migrants is more frequent if the migrant child originates from a family of higher socioeconomic status than the native child. This direct reading of status-caste exchange thesis is based on two implicit assumptions: Firstly, children have a higher friendship preference for native children compared to migrant children (*migrant malus* assumption).

Secondly, the higher the socioeconomic status of a child, the more they are preferred when making friends (*status bonus* assumption). In the following, a deeper examination of the two implicit assumptions of status-caste exchange thesis will be presented.

The *migrant malus* assumption implies that natives have a lower social preference for migrants than the latter do for the former. The early authors of the SCE thesis argue that racial preferences could be attributed to the social status that specific racial groups have, meaning that in the case of black/white comparison, black individuals tend to have a lower social status compared to white individuals and are therefore less popular potential matches for inter-group marriage. This idea of a "racial hierarchy" was derived from the Hindu caste system or the society of estates (German "Ständegesellschaft", see Davis 1941, p. 376). Consequently, the early authors provide no further arguments. More recent contributors of SCE research argue that a status differential of white and black individuals might be strongly related to the degree of prejudice and discrimination against black individuals (Rosenfeld 2005; Kalmijn 2010). Applied to the relationship between natives and migrants, such ethnic prejudices and evaluations could be explained by the fact that the majority group (natives) defines the standards against which members of the minority group (migrants) are measured. For example, there is evidence that US and European natives show preferences for highly skilled, educated, and host-language proficient migrants (Hainmueller & Hopkins 2015; Bansak et al. 2016; Wright et al. 2016; Zhang et al. 2019; de Coninck 2020). At the same time, most migrants have a lower degree of adaptation to the host country in these important dimensions, some of which prevail in later generations. Second generation migrants in the EU show lower levels of education, especially if originating form less developed countries (Heath et al. 2008), have lower socioeconomic status (OECD 2018a, p.156), and have weaker reading abilities in the host language (OECD 2019) than do natives. Furthermore, they fall behind on other important dimensions related to successful and healthy living conditions in the host country. Within the areas of social inclusion (less contact to natives and its beneficial social capital, e.g., see Lancee 2012c), or system knowledge of, for example, the welfare state (Karoly & Gonzalez 2011; Seibel 2020) or the educational system (Horn et al. 2003; Kretschmer 2019), migrants show a lag. All of this could lead to a generalized stereotypical perception that migrants are less valuable compared to natives, and this perception could even negatively shape the

self-perception of migrant groups.

If these stereotypical perceptions are in fact authentic, they should translate directly into social preferences. However, research on racial and ethnic preferences initially points to a general preference for one's own in-group (in-group favoritism). Strong ingroup preferences would lead to segregation between the majority and the different minority groups. If this point of view were taken to the extreme, inter-ethnic contacts would be impossible. However, research findings on out-group evaluations reveal a more nuanced picture. Research on ethnic/racial "hierarchy" and implicit racial/ethnic bias for majority and minority groups suggest differences in out-group evaluation:[5] First, the majority group appears to be the most popular out-group for ethnic minorities (Aboud & Skerry 1984; Hagendoorn 1993; Verkuyten et al. 1996; Hagendoorn et al. 1998).[6] Secondly, members of the majority group appear to be less open to out-group members than vice versa (Nosek et al. 2002; Jost et al. 2002; Dunham et al. 2007; Newheiser & Olson 2012; Dunham et al. 2013, 2014; Newheiser et al. 2014; M. K. Qian et al. 2019).

A first conclusion is that inter-ethnic preferences between the majority and the minority group as a whole are asymmetric and favor the majority group. This is consistent with the first assumption of the SCE thesis. It should be noted here that this does not necessarily contradict the frequently observed pattern of ethnic homophily. As friendship is a reciprocal process, one can therefore assume that one-sided, asymmetrical friendships are unsatisfactory (for at least) one of the parties, and thus dissolve over time, and ethnic homophily would still be an observable outcome. Further, ethnic choice homophily, i.e., the preference for one's own ethnic in-group, says nothing about preferences among minority groups for other ethnic minority groups. In an ethnically diverse environment of different migrant groups, migrants might prefer members of their own group, but at the same time, other migrants might be less preferred compared to the majority native group.

Before going into detail about the status bonus assumption, it is necessary to explain

[5] In contrast to explicit attitude tests, implicit tests such as the *implicit association test* are said to be preferable as they measure automated, unconscious, evaluative processes that are less influenced by social desirability and, consequently, are more directly related to behavior than explicit self-report measures (Greenwald et al. 2009). However, the empirical evidence on the relationship of explicit and implicit attitudes and evaluations to behavior is not without contradictions and is part of an ongoing research process (see Gawronski & Brannon 2018; Gawronski 2019).

[6] With European data for online partnership selection a similar pattern favoring Europeans over other groups was found (Potârcă & Mills 2015). Furthermore, an indication of racial hierarchies was found for the US context (K.-H. Lin & Lundquist 2013).

what is meant by "status". Status, or more explicitly, social status, can be defined as the "perceived or actual standing of an individual relative to others on a dimension of social relevance (e.g., traits, economic standing, abilities)" (Rose & Vogel 2020, p.4754). Status is thus a vertical category that reflects a social hierarchy, with high-status individuals in a favorable position.

The *status bonus* assumption refers to a preference for higher status others. An early researcher on status-caste exchange, van den Berghe (1960) attributes this preference to an essential human need for status maximization (see also Anderson et al. 2015). High status is generally understood as being associated with a range of benefits such as privilege and/or access to resources (Yu & Xie 2017). Therefore, contact with higher status others can be beneficial in gaining access to these resources. Additionally, one can benefit from the popularity (i.e., the social prestige) of the higher status individual. According to research on the social psychological concept of "*basking in reflected glory*" (Cialdini et al. 1976), connecting with high-status individuals can increase one's own status and popularity within a group, both in the context of ethnographic research (von Rueden et al. 2019) and school children's peer contact (Dijkstra et al. 2010, 2013). Finally, contact to higher status others can facilitate access to otherwise exclusive groups and their embedded resources as information and trust-related resources like support (N. Lin 1999).[7] Evidence for such status asymmetry has been found for friendship choice in an online field experiment (Yu & Xie 2017) and for friendships in school classrooms on the status dimension of school grades and socioeconomic status (Zeng & Xie 2008).

It is important to understand how the mechanisms behind the migrant malus and status bonus presumptions might work among school children. Here, in addition to peers, parents are assumed to have an important influence on their children's prejudices against migrants (Aboud 2005) and that these internalized attitudes lead to social preferences. For example, longitudinal data analyses indicate that children's out-group attitudes are affected by their parental out-group evaluation (Gniewosz & Noack 2015; Miklikowska 2016). S. Smith (2015) show that the number of parents' out-group friends

[7] Compared to the definition of social capital as "the aggregate of the actual or potential resources which are linked to possession of a durable network of more or less institutionalized relationships of mutual acquaintance and recognition — or in other words, to membership in a group" (Bourdieu 1986, p.251).

is related to the number of native and immigrant friends their children have within the school class, mediated in part by children's attitudes toward the out-group.

3.2.1 Previous Research

No research to date directly addresses the SCE thesis for inter-ethnic friendships on a dyadic level. Nevertheless, some research which allows for the evaluation of the predicted implications of exchange thesis at the ego-level. Only studies that use concepts to control the opportunity structure are referenced here.

The most consistent pattern can be found with ego-level network data on *migrants'* intergroup relations. As expected, rising education is associated with rising inter-group contact for migrant adults in many studies: in Dutch discussion networks (Völker et al. 2008), in Dutch contact studies (Martinovic et al. 2009; Vervoort et al. 2011; Martinović 2013), and on friendship data from Canada (Martinovic et al. 2011) and the Netherlands (Damen et al. 2021). Another Canadian study on the inter-ethnic friendships of migrants found no effect (Fong & Isajiw 2000). Occupational status for migrants was also found to be associated with higher intergroup relations in Dutch contact studies (Vervoort et al. 2011; Martinović 2013), for friendships in Canada (Fong & Isajiw 2000), the Netherlands (Damen et al. 2021), and the US (Briggs 2007).

Fewer studies are available from a native perspective. An increase in education of natives was be found to be associated with less inter-group contacts and friendships in Dutch discussion networks (Völker et al. 2008; Martinović 2013; Damen et al. 2021). Evidence is least convincing for occupational status: While a negative but insignificant effect was found for Dutch friendships (Damen et al. 2021). J. A. Smith et al. (2017) found no support for within-group friendships in England, Germany, the Netherlands, or Sweden. A contradicting association was found in two studies for increasing inter-group associations in the Netherlands and the US (Briggs 2007; Martinović 2013).

In summary, migrants' absolute socioeconomic status appears to increase intergroup contact, whereas the opposite trend is observed for natives (although less conclusively). However, the question of how relative status, i.e., status differences between ethnic groups, affects contact between migrants and natives remains to be answered. For this purpose, analyses which consider both ends of a friendship dyad are necessary. In

the current paper, I therefore present analyses on the level of friendship dyads to test the SCE hypothesis. The approach allows to estimate effects of relative status on the probability of a friendship tie between migrants and natives.

3.2.2 Hypotheses

Figure 3.1 facilitates an intuitive understanding of the following three hypotheses. A summary of the theoretical considerations discussed above leads to the first hypothesis on the ego perspective.

Hypothesis 1 : "Ego Status" (ego level, linear): *The higher the status for natives (migrants), the less (more) contact they have to the group of migrants (natives).*

The second hypothesis extends to the dyadic level with a comparison of the status levels of natives and migrants.

Hypothesis 2 : "Growing Differences" (dyadic level, linear): *The higher (lower) the status of natives compared to migrants, the less (more) probable contact to migrants (natives) becomes.*

In a final extension, a hybrid model integrates elements of SCE thesis and the concept of homophilious status preferences. According to the idea of status choice homophily, friendship probability is highest for equal status and decreases with increasing status differences. The effect of hypothesis 2 in this sense is limited for higher differences in status. Additionally, an exchange of migrant status and socioeconomic status is expected. This tendency of status-exchange is reflected as an expression of the shifted high points. The highest friendship probabilities are expected for migrants with a higher status compared to natives. Consequently, native→migrant dyads should reflect a maximum to the left of the zero-difference X-axis (see Figure 3.1), and to the right for migrant→native dyads.

Hypothesis 3 : "Hybrid" (dyadic level, quadratic): As *hypothesis 2, but with the assumption that for rising differences in status, the majority-minority friendship probability decreases.*

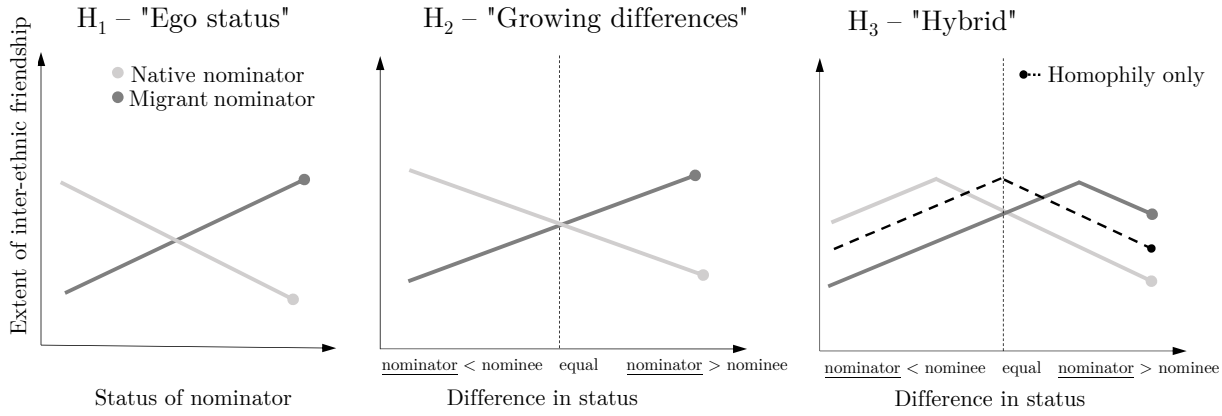


Figure 3.1: Schematic visualization of hypotheses 1-3.
Note: In all cases, the Y-axis signifies the extent of inter-ethnic friendship: native (migrant) nominator implies a migrant (native) nominee. For hypothesis 3, the dashed line denotes status choice homophily without consideration of ethnic status. That is, the Y-axis reflects the extent of friendship and not of inter-ethnic friendship.

3.3 Data

The analyses in the following use the first wave of the Children of Immigrants Longitudinal Survey in Four European Countries (CILS4EU) collected in Germany, the Netherlands, Sweden, and England in 2010/11 (Kalter et al. 2016b). CILS4EU is a large-scale multi-purpose study that interviewed school children (at age 14) and their parents. With an oversampling of schools with a high share of migrant students, and rich information of full friendship networks, one of its important analysis potentials is on questions regarding social integration.

3.3.1 Sample

In order to satisfy data quality criteria (steps 1-6) and to guarantee choice within the major ethnic subgroups (step 7), the original sample of N= 952 school classes was stepwise reduced to a final total of N= 505 classes (working sample).[8] Figure 4.2 shows the stepwise reduction: (1) The survey was made to match the school class. (2) At least 75% of the "gross sample" participating in survey. Additionally, a maximum of three non-participants in the network module were allowed, resulting in a tolerated maximum of 20% missing network participants. Non-participants of the network module (i.e., those that neither nominated nor could be nominated) were excluded. (3) Not more

[8] In order to maintain sufficient data quality, suggestions from the CILS4EU data team were followed closely (Kruse & Jacob 2016). Other studies on inter-ethnic friendships using network data from the CILS4EU used comparable limitations (e.g., S. Smith et al. 2016; Kruse, Smith, et al. 2016).

than 10% of invalid nominations were allowed. (4) Only classes with at least 10 pupils were included. (5) Classes with a missing share of ethnic information of more than 15% were excluded. (6) Classes with a missing share of over 10% of parental socioeconomic status or education were excluded. (7) Only classes with at least one possible potential friendship dyad within the group of natives and migrants.

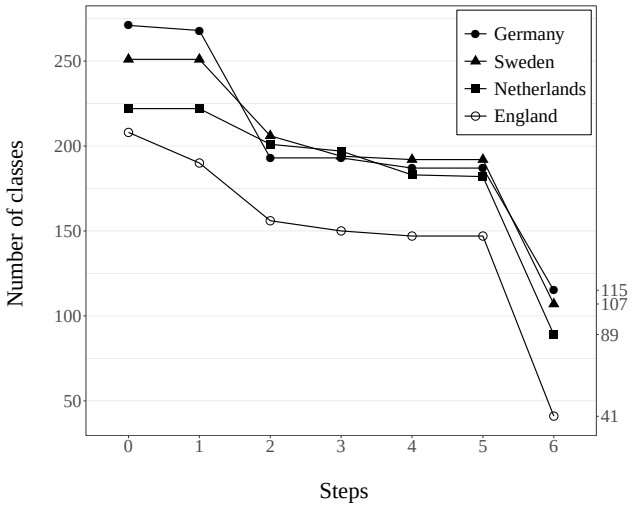


Figure 3.2: Reduction of participating classes for final working sample (CILS4EU, wave 1).

The final working sample consists of 10,738 pupils from 505 classes spread over 324 schools. Table 3.1 summarizes attributes at the micro level (pupil) and the macro levels (class and school) for the working sample. Please note that the data structure and the final sample size differ for the ego level and the dyad level analyses. On the ego level, I analyze the data for the 10,738 pupils summarized in Table 3.1. On the dyad level, however, the sample is extended to include all possible $n \cdot (n-1)$ friendship ties within each school class. The analytic sample thus contains a total of 228,070 potential dyads.

3.3.2 Operationalization

The data analysis is based on variables measured at the individual level (ego level) and at the friendship tie level (dyad level). At the (directed) dyad level, survey information reported by the two students involved in a given potential connection is used to construct measures of sender and nominee characteristics. In addition, variables measured at the school class (and school) level are used in the analyses to control for the effects

Table 3.1: Descriptive statistics of reduced sample, (CILS4EU, wave 1).

	EN		GE		NL		SW		ALL	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Min	Max
Pupils										
Male	.48	(.50)	.51	(.50)	.49	(.50)	.50	(.50)	0.00	1.00
Native	.56	(.50)	.48	(.50)	.68	(.47)	.52	(.50)	0.00	1.00
SES	57.82	(20.63)	46.55	(20.14)	53.26	(19.85)	55.53	(20.36)	11.56	88.96
Education[1]	2.99	(.88)	2.67	(.80)	3.61	(.56)	3.30	(.69)	1.00	4.00
2nd generation	.35	(.48)	.43	(.49)	.28	(.45)	.40	(.49)	0.00	1.00
Classes										
Class size	22.23	(5.12)	22.52	(4.16)	22.56	(4.51)	21.51	(3.73)	10.00	35.00
NW density	.15	(.05)	.18	(.04)	.17	(.04)	.17	(.03)	0.04	0.40
Share natives	.56	(.26)	.48	(.20)	.68	(.17)	.52	(.21)	0.04	0.96
Migrant diversity	.69	(.21)	.74	(.13)	.70	(.20)	.84	(.13)	0.00	1.00
School										
Share of migrants[1]	2.55	(1.34)	2.39	(.96)	2.24	(.89)	2.22	(.88)	1.00	5.00
Observations										
N_{pupils}	1,652		3,312		3,156		2,618		10,738	
$N_{classes}$	79		153		147		126		505	
$N_{schools}$	56		104		79		85		324	

[1] Four-category variable, see operationalization in Subsection 3.3.2.

of network structure (and school context).

Friendship Network Ties

Within the CILS4EU data friendship relations are captured by asking every child to nominate up to five best friends in their class. Using this information, I generated two count variables for outgoing friendship nominations towards natives and migrants, respectively. These two variables are the dependent variables for the ego level analyses. The outcome used for the dyadic analyses is a dummy variable that indicates, for all $n \cdot (n-1)$ possible directed dyads, whether a particular potential friendship actually exists (also see Chapter 3.23).

Ego and Dyad Level Variables

Child Ethnicity & Migrant Generation

The country specific generated variable *countorigG* generated by the CILS4EU-team is

used to represent the ethnicity of each child. This variable contains the child's country of origin, as well as the origins of their two parents and four grandparents. Combining this information resulted in one ethnicity per child. For a detailed description of this procedure, see Dollmann et al. (2014). Accordingly, for the main analyses, this generated ethnicity variable was used to create a binary variable indicating natives or migrants.

Parental Status Background: Education & Socioeconomic Status

Children's socioeconomic status background is measured by International Socio-Economic Index of Occupational Status (ISEI) of their parents and their parents' highest attained level of education. Parents' education is measured as the highest degree received and ranges from 1: "no school leaving certificate", 2: "below upper secondary", 3: "upper secondary", to 4: "university degree". In the case of missing parental information, parents' partner information and children's reports of their parents' status are substituted. Generally, the highest available value is used.

Evaluation of Ethnic Groups

The evaluation of ethnic groups within the CILS4EU data was measured with the following question: "Please rate how you feel about the following <survey country> groups on a scale that runs from 0 to 100. The higher the number, the more positive you feel, and the lower the number, the more negative you feel towards this group." Children's response range from 0 "Negative", over 50 "Neutral", to 100 "Positive" (11-item scale). To compare between group attitudes, evaluations towards natives, migrants, and migrants (within) are summarized.

Reports of feelings are not available for all possible ethnic groups within the corresponding countries of the working sample. In Germany, migrant groups include Italians, Poles, Russians, and Turks. In the Netherlands, these groups comprise Antilleans, Moroccans, Surinamese, and Turks. In Sweden, the main migrant groups include American, Bosnian, Finnish, German, Iranian, Polish, Roma, Sami, Serbian, Somali, and Turkish migrants. In England, the distinction between groups runs along racial lines and includes White British, Black or Black British, and Asian or Asian British. Due to this particular approach, the results in England must be interpreted with caution.

Context Level Control Variables

Class and School Composition: Migrant Diversity, Migrant Share, and Class Size

As a measure of migrant diversity, I use the inverse Herfindahl–Hirschman Index.[9] The index ranges from 0 to 1, where higher values indicate more diversity. The more heterogeneous the immigrant group in the class (i.e., more different ethnic groups), the larger the index. For a school class c with N_c different migrant groups and the share p_k of a migrant group k, the class specific diversity index I_c is defined as

$$I_c := 1 - \sum_{k=1}^{N_c} p_k^2. \tag{3.1}$$

The share of natives for each class was calculated by dividing the count of native children by class size. Previous studies propose non-linear effects of ethnic class composition, e.g., Moody (2001) or S. Smith et al. (2016). Therefore, additional quadratic terms of the variables diversity, migrant share, and class size were included in the models.

Additionally, CILS4EU delivers a variable capturing the share of migrants within school differentiated by four categories summarizing for the intervals 1: $[0\%, 10\%[$, 2: $[10\%, 30\%[$, 3: $[30\%, 60\%[$, and 4: $[60\%, 100\%]$.

Network Density in Class

Given a class of class size n, the class-specific friendship network density was calculated by dividing the number of realized friendship ties by the number of possible friendship ties in the class: $density = t_{realized}/(n^2 - n)$.

3.3.3 Imputation of Missing Values

Attributes

In order to retain classes with item-non-response for any variable, multivariate imputation was conducted. Similar to the procedure described by S. Smith et al. (2014), chained imputation was run using variables such a parental education, inter-ethnic attitudes, and the number of books at home. Imputation models were run a total of 40

[9] The Herfindahl–Hirschman Index was presented by Herfindahl (1950) and Hirschman (1980).

times, and the modes from the resulting values were used to fill in missing information for migrant status (i.e., unknown immigration background).

Network

For missing network information, imputation by reconstruction (Stork & Richards 1992) was conducted. Assuming reciprocity, this imputation method imputes missing outgoing friendship information by mirroring incoming nominations. By design the CILS4EU data include at most five outgoing nominations. Consequently, the imputation was limited to five pupils. This means, in cases of more than five incoming nominations, five pupils were randomly selected for imputation. This reconstruction procedure does not lead to substantial bias for networks of high reciprocity that have small (20–30%) amounts of missing data (Huisman 2009, 2018). As the reduced working sample only allows classes with up to 20% of invalid friendship nominations, this method should not result in biased results.

3.4 Model Selection

Before presenting the main analyses, data compliance with the migrant-malus assumption is tested. For a first descriptive impression of social preferences among different ethnic groups, mean sympathy scores (feelings toward groups) are compared for the main ethnic groups in each country context. In addition to the four possible sender-receiver relationships of natives and migrants, I additionally distinguish, when possible[10], for migrants evaluating their own ethnic group (e.g., Italians evaluating Italians) referred to as "migrants (within)" in the following. To identify differences at the country level, separate mean comparisons by country are calculated (see Figure 3.3).

For the main analyses, OLS regression models at the ego-level (H1) and ML-regression at the dyadic level (H2 + H3) are used.

The two dependent variables for the ego-level analyses (H1) are the number of outgoing friendships towards natives and towards migrant. The key independent variables are occupational status and education. Due to the high correlation of these variables, separate models are estimated for each independent variable. Separate estimations are presented for all four sender-receiver combinations (see Figure 3.4).

[10]Within the CILS4EU data, not all non-native groups where asked sympathy scores towards their own ethnic group.

Pooled multilevel logit regression (MLogit) models are used for the dyadic analyses, with school classes as the second level. Data for each class are rearranged into a dyadic format. A class of n pupils, therefore leads to $n \cdot (n-1)$ possible sender-receiver-dyads.[11] In a final step, these data are combined into one data set with the directed friendship-dyad between two pupils as the observational unit of analysis. For nominator i and nominee j, the binary dependent variable indicating whether friendship exists is defined as

$$y_{ij} := \begin{cases} 1, & \text{if } i \text{ nominates } j \\ 0, & \text{otherwise.} \end{cases} \tag{3.2}$$

The difference in occupational and education scores (sender - receiver) are calculated as the main independent variables for each potential dyad.[12] To detect whether status affects friendship depending on group membership, interaction effects between the status difference and a categorical indicator variable that captures the four types of dyad (i.e., native-native, native-migrant, migrant-native, and migrant-migrant) is also included. Finally, adjusted predicted probability plots summarize the multilevel regressions. Initially, only predictions for between-group connections (i.e., native to migrant, and vice versa) are presented. Status effect differentials are calculated to test whether the predicted probabilities differ between the two groups. The second part then refers to within-group connections (i.e., native to native and migrant to migrant). The pattern predicted in the hypotheses is not expected for these combinations.

In a first set of analyses, socioeconomic status differences are modeled in linear form (H2) (see Figures 3.8 and 3.9). Thereafter, results from quadratic modeling (H3) are presented (Figures 3.11 and 3.12). Additionally, cubic modeling was tested.[13] Finally, results for education as a categorical independent variable (H2+H3) are shown (Figures 3.13 and 3.14).

Control Variables

The following control variables are used in all the regression analyses (both ego and dyadic level): class size, diversity within the migrant group (inverse Herfindahl index),

[11] As self-nominations are not permitted, the second factor is $(n-1)$ and not n.
[12] To better identify possible asymmetric relationships, I do not use absolute differences.
[13] Based on a cubic function $y = ax^3 + bx^2 + cx + d$.

and country. These variables additionally control for the in-class opportunity structure (induced homophily) that might shape inter-ethnic friendships.

At the dyadic level, the number of potential dyads increases disproportionately with class size, as the number of dyads d is a function of class size n, which follows the form: $d(n) = n^2 - n$. At the same time, the number of outgoing nominations cannot be expected to increase according to this rule, in particular when possible friendship nominations are limited to a fixed number, which is the cases in many network studies. This would inevitably lead to an inflationary increase of zeros in larger classes, which would bias the likelihood prediction. Therefore, to control for this difference, a class-specific network density variable was added to all dyadic models. Moreover, it can be assumed that older migrant generations (compared to younger migrant generations) have a higher socioeconomic status and at the same time are better adapted to the host society in the dimensions that influence inter-ethnic friendships, such as language or social contacts with natives. Therefore, the migrant status (2nd generation) of the friendship nominator and the nominee is controlled for.

3.5 Results

3.5.1 Assumption: Lower Popularity of Migrants

Figure 3.3 gives a first impression of popularity perceptions between the different major ethnic groups of the pupils within the working sample. As England only differentiates between three broad categories, the results are difficult to compare. However, they are included for completeness.

Comparing the mean values (white diamonds) of evaluations towards natives and migrants (white vs. light gray), the reported attitudes towards natives in all cases are significantly more positive than towards migrants. Migrant students also prefer native students over other migrants. Thus, in all four countries, there is first-hand evidence suggesting the existence of inter-ethnic boundaries associated with status differences between migrants and natives. Consistent with the migrant malus assumption, both migrants and natives have stronger positive feelings toward natives (the higher status group). A more detailed examination of the status-caste exchange hypothesis using the following multivariate regression models (below) will show whether friendships across ethnic lines are indeed more likely for migrants with higher (parental) status

and whether friendships between migrants and natives are more likely when there is a relative status advantage for the migrant.

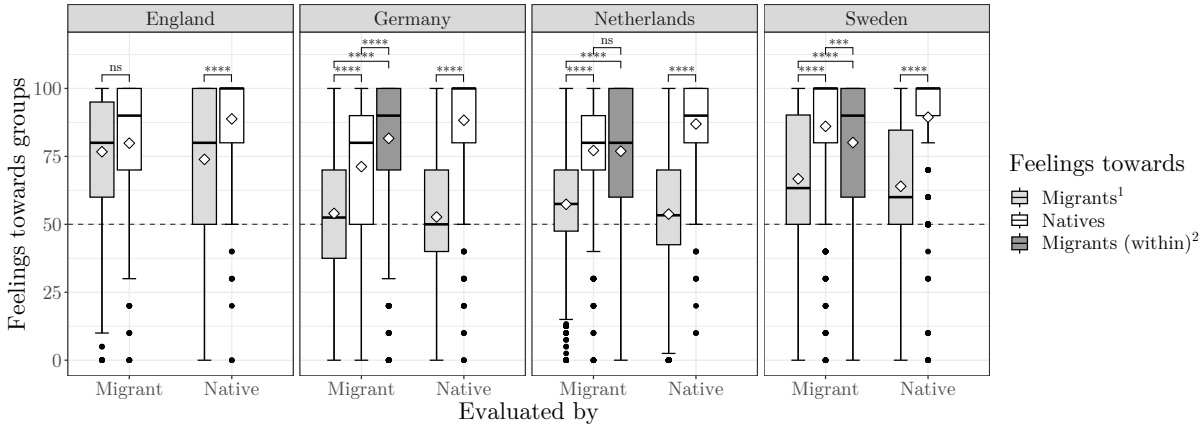


Figure 3.3: Boxplots of the distribution of feelings towards major ethnic groups, by native and migrant status (CILS4EU, wave 1, working sample).

Notes: 0= most negative, 50= neutral, and 100= most positive. White diamonds indicate group means. Bonferroni corrected two-sided t-tests of mean differences between feelings towards migrants, natives, and same migrants (within).

ns = not significant, $^{***}p < 0.001$, $^{****}p < 0.0001$.

[1]Reports of feelings within CILS4EU are not available towards all ethnic groups within the corresponding countries of the working sample, see operationalization.

[2]Reports of migrant only towards own ethnic group (if available).

A comparison of the evaluation of migrants of natives and their own ethnic group (white vs. dark gray diamonds) for Germany shows that migrants evaluate their own groups significantly better than they do natives. In the Netherlands, however, there is no significant difference, and in Sweden the reverse is true: Natives are clearly preferred over migrants' own ethnic group. This may point to stronger preference/prejudice-based boundaries for inter-ethnic friendship ties among students in Germany, compared to the Netherlands or Sweden. In summary, this descriptive view supports the assumption of a migrant malus for the combined categorization of migrants, although the picture is less clear-cut when differentiating between migrants' ethnic groups. Preferences for high status may shape feelings towards different groups.

As mentioned above, CILS4EU data does not provide useful direct measures for the status bonus assumption. However, these descriptive results on the migrant-malus assumption at least partially support the status-caste exchange hypothesis.

3.5.2 Ego-Level Results

Figure 3.4 shows the predictions of OLS regression models of counts of nominations towards migrants and natives by an interaction of migrant status and socioeconomic (left side) and educational status (right side), under controls including opportunity structure. The full regression tables can be found in the Appendix (Tables B.1 and B.3).

Supplementary Figure 3.5 shows the corresponding coefficient plots, with and without control variables.

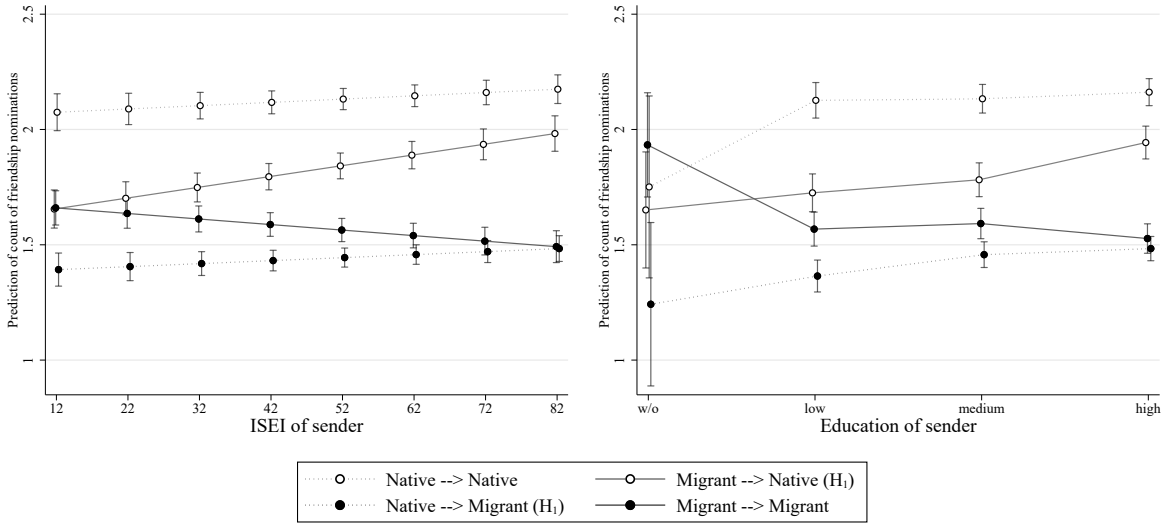


Figure 3.4: Prediction (OLS) of *count of friendship nominations* to different receiver groups by sender's occupational status (left) and education (right) over ethnic sender-receiver combinations, countries pooled (CILS4EU, wave 1, working sample, ego-level perspective).

Notes: Lines indicate the friendship nominator (sender) with *dotted*:= native and *solid*:= migrant. Symbols indicate friendship nominee (receiver) with *white*:= native and *black*:= migrant. All models control for the pupil level variable *2nd generation of migrant*, the class level variables *class size, share of natives, diversity within the migrant group*, the school level variable *migrant share*, and *country*.

First, the prediction curve for *occupational status* shows that changes within the range of ISEI are associated with changes in friendship nominations of no more than 0.5 friendship counts. With a maximum of five possible nominations all potential effects are within a variation of a maximum 10% of the dependent variable.

As expected from hypothesis 1, the coefficient plot reveals that an increase in occupational status is associated with more between-group nominations for migrants ($\beta = 0.0047, p < 0.001$). However an increase in ISEI for natives does not decrease their friendship nominations towards migrants ($\beta = 0.0013, ns$) which contradicts hy-

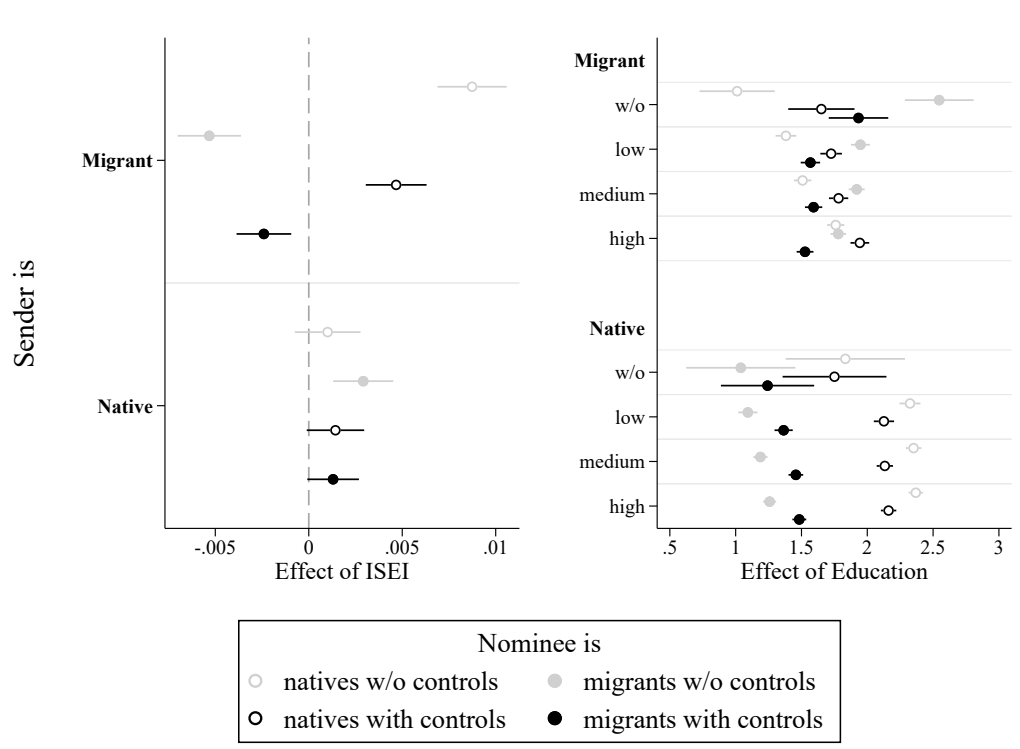


Figure 3.5: Coefficient plots of prediction (OLS) of *count of friendship nominations* to different receiver groups by sender's ISEI (left) and education (right) over ethnic sender-receiver combinations, countries pooled (CILS4EU, wave 1, working sample, ego-level perspective).

Notes: The models without controls, only include the central independent variable of SES or education. The models with controls include the pupil level variable *2nd generation of migrant*, the class level variables *class size, share of natives, diversity within the migrant group*, the school level variable *migrant share*, and *country*.

pothesis 1.[14] Looking at the results for nominations within the own ethnic group, one could interpret that migrants turn away from other migrants with increasing ISEI and instead choose more natives as friends. Natives on the other hand, do not significantly change their friendship choice to other natives. All presented effects are rather small, varying between -0.0024 and 0.0047. Regarding the effect of 0.0047, a difference of 20 ISEI points, which is about one standard deviation, amounts to less than 2% of the range of friendship nominations (0-5). Figure 3.5 also reveals that the ISEI effects of migrants would be stronger without control variables which was presumably due to availability structure. This supports the view that higher inter-ethnic friendship rates among migrants are due to the fact that high-status migrants are more likely to be exposed to natives at school or in their neighborhood.

Returning to hypothesis 1, Figure 3.6 shows that the association between ISEI and

[14]See Table B.2 in the Appendix for the conditional slopes.

inter-group friendship nominations is positive and significant for migrants in all countries (except the Netherlands). Natives, on the other hand, do not show consistent cross-group selection behavior, which again does not support hypothesis 1 for this group.

Second, the prediction curve for *education* in Figure 3.4 and the corresponding coefficient plot (Figure 3.5) show that an increase in education seems to increase inter-group nominations for migrants, while the is no negative association for natives. Similar to the case of ISEI in the pooled data, hypothesis 1 seems to hold for migrants but not for natives. Including the within-group results, migrants appear to change from within to between-group nominations, while no such picture emerges for natives.

Differentiating the analyses for the four countries (Figure 3.7) shows that an increase in migrants' education only heightens inter-group nominations for the Netherlands and Sweden, and is only significant for Sweden. No consistent pattern for natives is found.

Summarizing the analyses of the ego-centered network perspective, hypothesis 1 finds only weak support for migrants, and none for natives: With rising SES (ISEI or education), and controlling for migrant generation and opportunity structure within class and school, migrants seem to increase their nominations toward natives, while natives do not decrease their nominations toward migrants. In addition, country context appears to play an important role in inter-group friendship, as the effects of ISEI and education in particular vary greatly across countries.

The ego level analyses presented here, are deficient, as they are limited to effect estimates of pupils' absolute status. In order to be able to test the status-caste exchange hypothesis, however, it is necessary to model the effect of pupils' relative status, that is status differences between senders and nominees of potential friendship ties. Therefore, in the following, I present my analysis on the dyad level.

3.5.3 Dyadic Level: Multi-Level Model

The following analyses turn to the dyadic data format, which allows the status of the friendship nominator and recipient to be taken into account. All models are multilevel logit models (two levels) with the pupil dyad as the basic unit of analysis and school

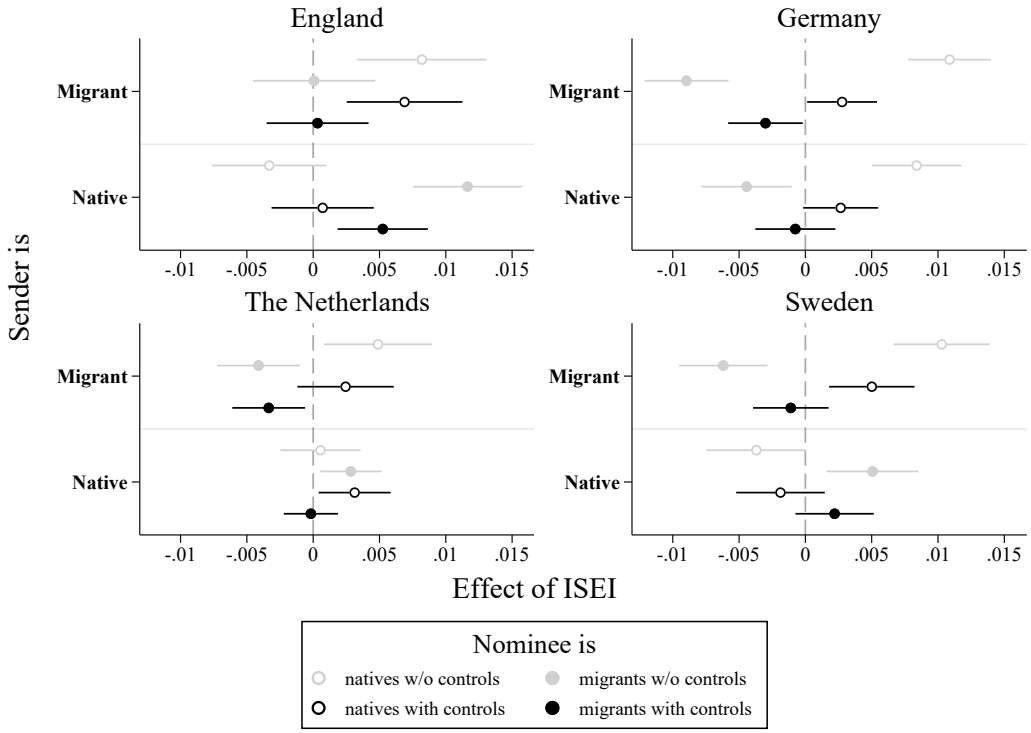


Figure 3.6: Coefficient plots of prediction (OLS) of *count of friendship nominations* to different receiver groups by sender's ISEI over ethnic sender-receiver combinations, by country (CILS4EU, wave 1, working sample, ego-level perspective).
Notes: Controls for opportunity structure are the class level variables *class size, share of natives, diversity within the migrant group*, and the school level variable *migrant share*. Class size, native share, and diversity are additionally included as quadratic variables.

classes as the second level.

ISEI - Linear

The left side of Figure 3.8 shows that while increasing the relative status of natives leads to a lower probability of inter-group nominations, for migrants, higher relative status increases the likelihood of inter-group friendship nominations. The right side of Figure 3.8 summarizes this finding and reveals that the difference in predictive margins is significant. Reviewing these between-group results in terms of country robustness, the coefficient plot (average marginal effects) in Figure 3.10 shows that the direction of the linear effect for between-group contact is positive in all countries; however in most cases not significant (see also Figures B.2-B.5 in the Appendix).

For completeness, a potential within-group effect in Figure 3.9 is shown to be non-existent, meaning that increasing status differences do not consistently change within-group friendship probabilities for natives or migrants. This is repeated within countries,

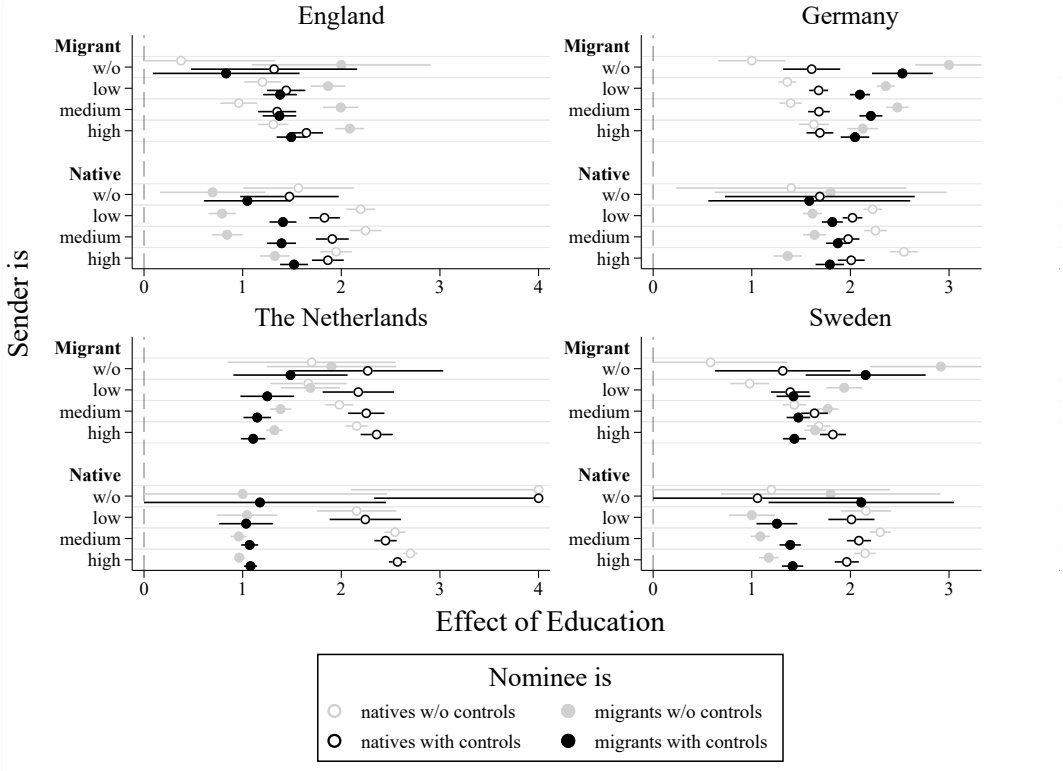


Figure 3.7: Coefficient plots of prediction (OLS) of *count of friendship nominations* to different receiver groups by sender's educational background over ethnic sender-receiver combinations, by country (CILS4EU, wave 1, working sample, ego-level perspective).
Notes: Controls for opportunity structure are the class level variables *class size, share of natives, diversity within the migrant group*, and the school level variable *migrant share*. Class size, native share, and diversity are additionally included as quadratic variables.

the AMEs are of different directions and, with the exception of migrants in Germany, all are insignificant.

In summary, hypothesis 2 receives only weak support. This can be interpreted as follows: the higher the socioeconomic level of migrants compared to natives, the higher the probability of friendship between the two groups.

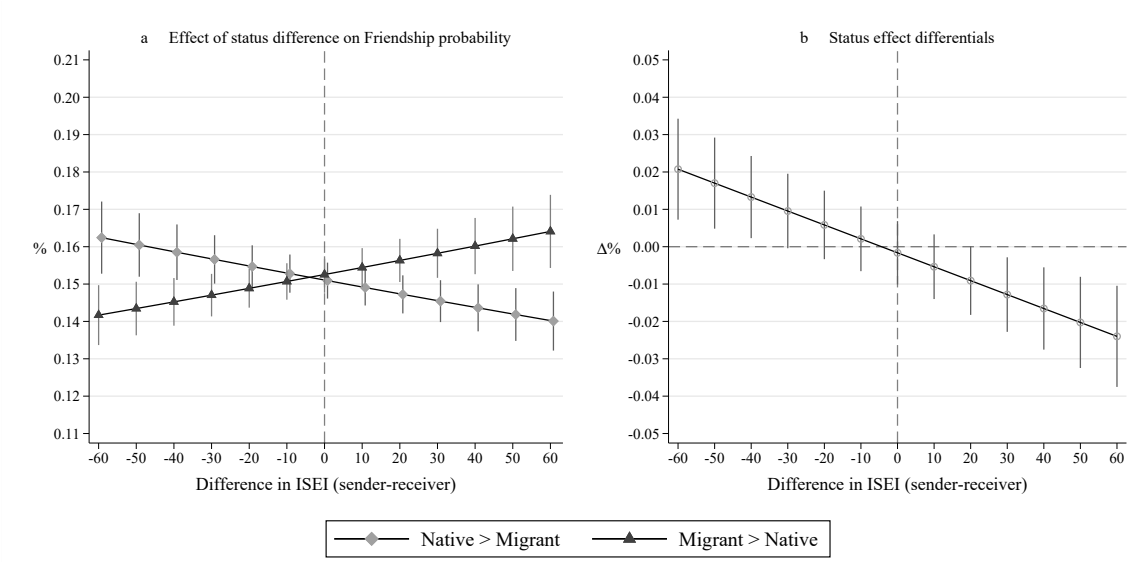


Figure 3.8: Predictions of between-group contact by ISEI-difference (linear), dyadic ML-logit-model, countries pooled (CILS4EU, wave 1).

Notes: Dependent variable is the directed friendship nomination with 1: nomination, and 0: no nomination. The left part of the figure shows predictive margins of SES-differences. The right side shows the difference of the predictive margins ("native > migrant" - "migrant > native"). All effects show confidence intervals (95%). The controls included are the class level variables class size, network density, share of natives, diversity within the migrant group, the school level variable migrant share, and country. Class size, native share, and diversity are additionally included as quadratic variables.

ISEI - Quadratic

Finally, the status difference is modeled quadratically. A likelihood ratio test shows that the quadratic modeling has a better fit (LR(p)$<$ 0.0001, see Table B.4).[15] Figure 3.11 shows the predicted probability plots for between-group friendships for native and migrant senders. As expected by hypothesis 3, inverted U-shaped curves can be detected. The peak of the curve for natives is to the left of the x-axis, where natives have a lower status than migrant.[16] The peak of the curve for migrants is in the positive area, where migrants have a higher status than natives. Although the shift appears to be rather small, the difference between the predictions is partly significant (see right side of Figure 3.11). In summary, the highest friendship probabilities can be found when migrants have a higher status than natives. Furthermore, for rising differences in status a decrease in friendship probability can be detected, as expected by homophily theory.

[15] A cubic modeling did not improve the quadratic models further, as the minimum p-value of the likelihood ratio tests is $\min_{\text{pooled,EN,GE,NL,SE}}(\text{LR(p)})=0.7256$, see Tables B.4-B.8.

[16] For additional information on the relationships without controls, compare the lowess curves in the Appendix Section B.2.

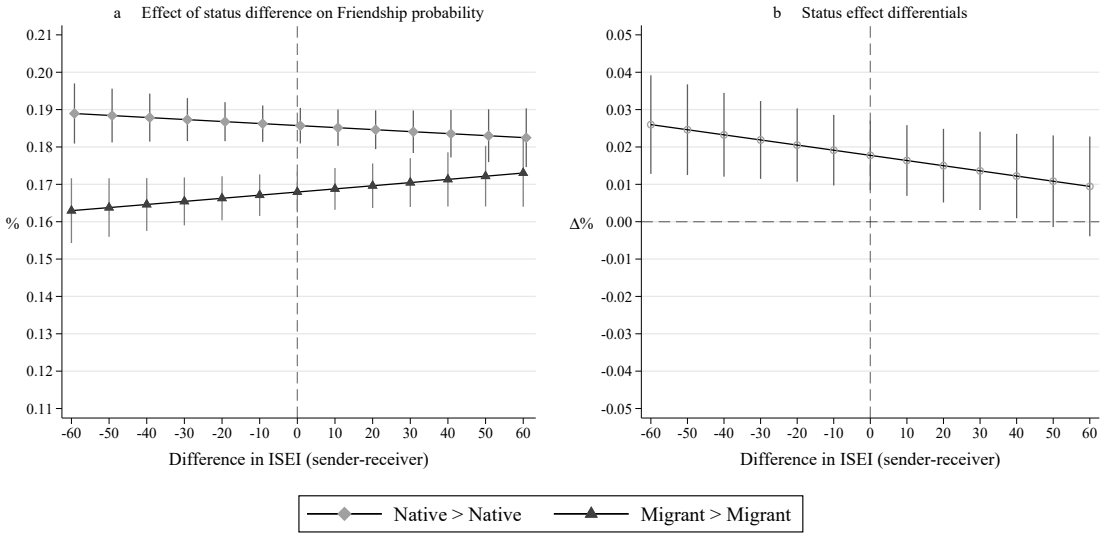


Figure 3.9: Predictions of within-group contact by ISEI-difference (linear), dyadic ML-logit-model, countries pooled (CILS4EU, wave 1).

Notes: Dependent variable is the directed friendship nomination with 1: nomination, and 0: no nomination. The left part of the figure shows predictive margins of SES-differences . The right side shows the difference of the predictive margins ("native > native" - "migrant > migrant"). All effects show confidence intervals (95%). The controls included are the class level variables class size, network density, share of natives, diversity within the migrant group, the school level variable migrant share, and country. Class size, native share, and diversity are additionally included as quadratic variables.

Robustness checks by country (see Figures B.6-B.9) show a similar pattern. All quadratic models have a better fit than the linear versions ($\max_{EN,GE,NL,SE}(LR(p))= 0.0033$, see Tables B.5-B.8). Shifted peaks of the prediction curves are observed in all countries, to the left of the x-axis for natives and to the right for migrants. Only in Germany and Sweden are the differences in predicted values (partly) significantly different from zero.

Turning the focus to within-group nominations in Figure 3.12, another inverted U-shaped form appears. However, no greater shift and no significant differences for natives and migrants are indicated, and no monotonically decreasing prediction for the difference appears.

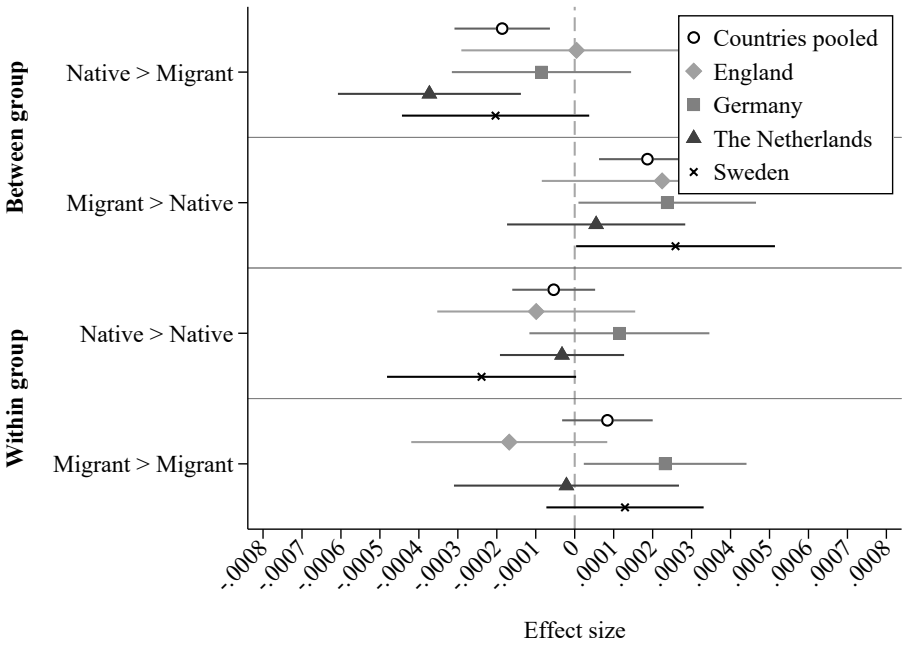


Figure 3.10: AMEs of ISEI, linear dyadic ML-logit-model, (CILS4EU, wave 1).
Notes: The figure shows AMEs of ISEI with confidence intervals (95%). The controls included are dyad-level variables 2nd generation of migrant as sender/receiver, the class level variables class size, share of natives, diversity within the migrant group, the school level variable migrant share, and country. Class size, native share, and diversity are additionally included as quadratic variables. For details on the regression analysis, see column "(1) linear" in Tables B.4-B.8 in the Appendix.

Education - Dummy Variable

Figure 3.13 shows the predictions for between-group friendships for native and migrant senders. Full regression tables can be found in the Appendix in Table B.9. No clear linear trends can be found for native and migrant nominators, rejecting hypothesis 2 for educational status.

An inverted U-shaped relationship can be observed for natives, but not for migrants, although it is not symmetrical. Each prediction for the negative values is higher than its corresponding positive value. For migrants, the prediction curve has no inverted U-shape, but each prediction for the negative values is lower than its corresponding positive value. When comparing the differences of the predictions, a linear negative monotone trend can be shown. In sum, relative (reference: natives) higher status migrants tend to have a higher inter-group friendship probability than those of low relative status.

No consistent pattern in line with hypothesis 3 is found within countries. For England and Germany, no pattern favoring dyads with migrants' educational surplus can

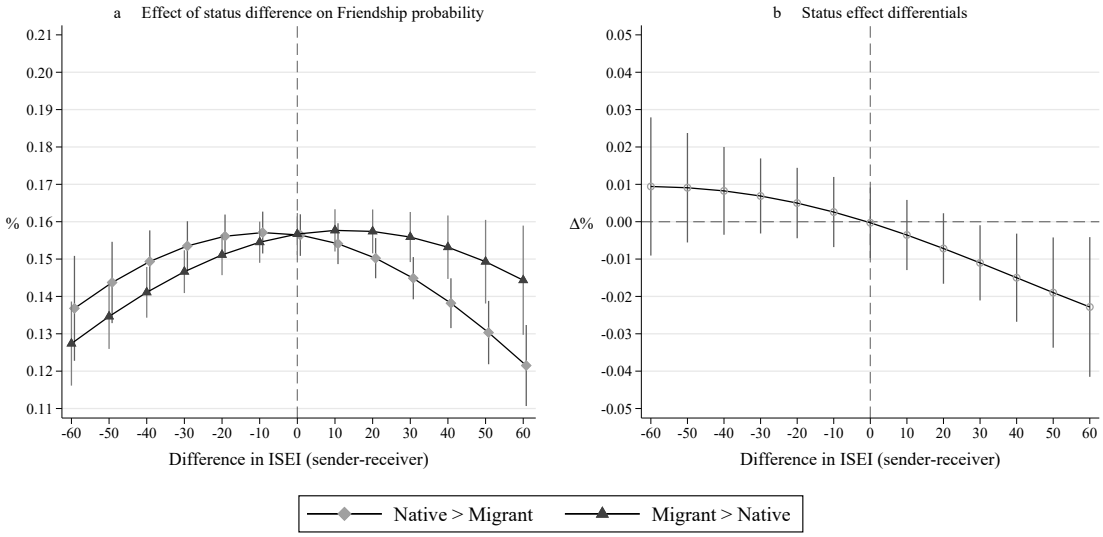


Figure 3.11: Predictions of between-group contact by ISEI-difference (quadratic), dyadic ML-logit-model, countries pooled (CILS4EU, wave 1).

Notes: The figure shows predictive margins by ISEI-differences with confidence intervals (95%). The controls included are dyad-level variables 2nd generation of migrant as sender/receiver, the class level variables class size, network density, share of natives, diversity within the migrant group, the school level variable migrant share, and country. Class size, native share, and diversity are additionally included as quadratic variables. For details on the regression analysis, see column "(3) cubic" in Tables B.4-B.8 in the Appendix.

be observed. For the Netherlands and Sweden, dyads where migrants have higher educational levels all have higher probabilities, however not significantly. Regarding the differences in predictions, only Sweden shows a continuously decreasing pattern. The within group predictions in Figure 3.14 also reveal no special pattern.

In summary, hypothesis 2 must be rejected for educational differences. As for hypothesis 3, a consistent pattern can be observed only for the pooled data, for Sweden and less clearly for the Netherlands, but not for England and Germany.

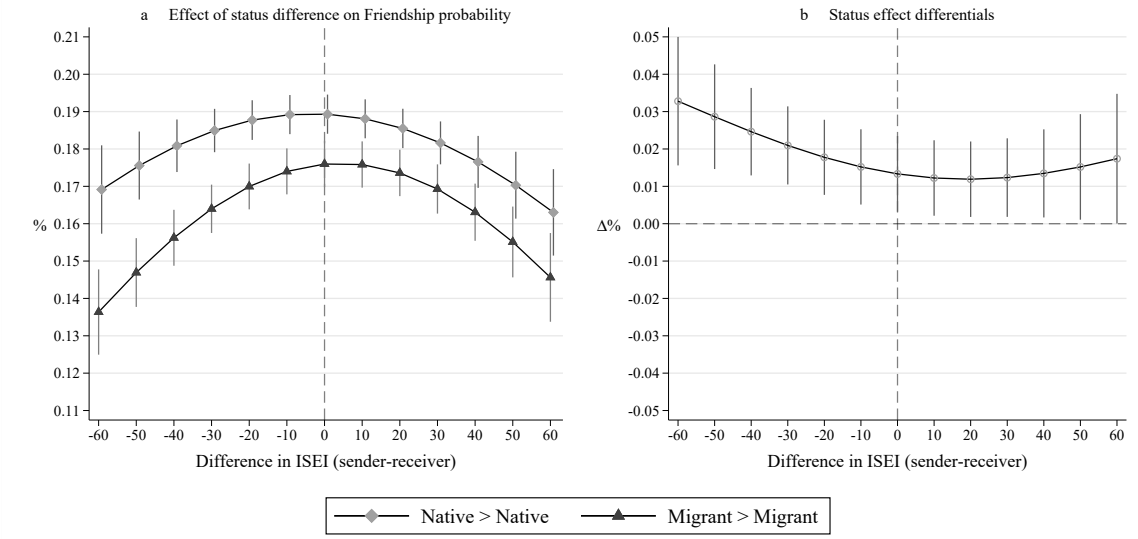


Figure 3.12: Predictions of within-group contact by ISEI-difference (quadratic), dyadic ML-logit-model, countries pooled (CILS4EU, wave 1).

Notes: The figure shows predictive margins by ISEI-differences with confidence intervals (95%). The controls included are dyad-level variables 2nd generation of migrant as sender/receiver, class size, network density, share of natives, diversity within the migrant group, the school level variable migrant share, and country. Class size, native share, and diversity are additionally included as quadratic variables. For details on the regression analysis, see column "(3) cubic" in Tables B.4-B.8 in the Appendix.

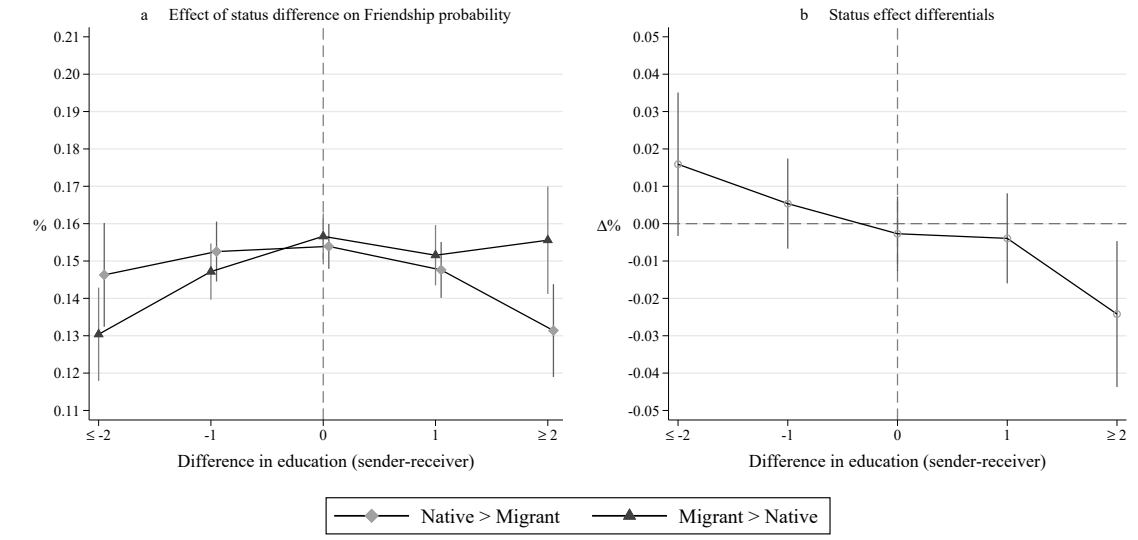


Figure 3.13: Effect of difference in parental education on between-group contact, ML-model, countries pooled (CILS4EU, wave 1).

Notes: The controls included are dyad-level variables 2nd generation of migrant as sender/receiver, the class level variables class size, network density, share of natives, diversity within the migrant group, the school level variable migrant share, and country. Class size, native share, and diversity are additionally included as quadratic variables.

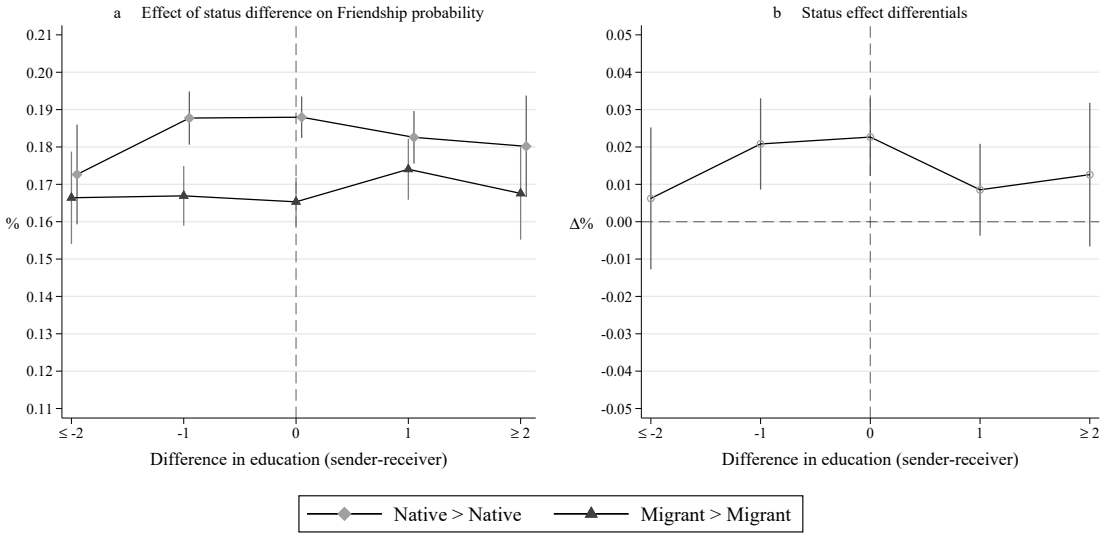


Figure 3.14: Effect of difference in parental education on within-group contact, ML-model, countries pooled (CILS4EU, wave 1).

Notes: The controls included are dyad-level variables 2nd generation of migrant as sender/receiver, the class level variables class size, network density, share of natives, diversity within the migrant group, the school level variable migrant share, and country. Class size, native share, and diversity are additionally included as quadratic variables.

3.6 Summary and Conclusion

This article examines how status in terms of parental socioeconomic status defined by occupation and education is related to school children's friendship selection (between-group friendship of natives and migrants) in 505 school classes in England, Germany, the Netherlands, and Sweden using the CILS4EU data.

In addition to opportunity structure, previous studies explaining ethnic intergroup friendships (between natives and migrants) by social preferences related to socioeconomic status failed to find empirical support. Such theoretical perspectives such as the open-worldview thesis or the byproduct thesis make no differentiated predictions for the groups of natives and migrants. This article extends previous research by applying the status-caste exchange (SCE) thesis from research on interracial marriages and partnerships to the realm of inter-ethnic friendships among school children, suggesting asymmetric effects of socioeconomic status for the majority (native) and minority (migrant) groups. Including information such as school and class-level share of migrants allows models to control for potential opportunity effects that might influence friendships between groups. In addition to reviewing the observable implications at the ego

level, which is partially comparable to previous research, testing on the dyadic data level provides more promising evidence for the thesis presented here than previous research. Furthermore an integrated perspective including the perspective of homophily (similarity attraction paradigm) is tested here.

Results with pooled data at the ego-level support the "Ego-Status" hypothesis for migrants, increased parental occupational and educational status is associated with an increased number of friendship with natives. In contrast to the pooled data, the country-specific results support the hypothesis for occupational status in England, Germany, and Sweden, but not in the Netherlands. Not all countries fit the predictions for education: England, Sweden and the Netherlands find support, while this is not the case in Germany. The hypothesis finds no support for native friendship nominators, which partially rejects the hypothesis.

The dyadic analyses show that native-migrant friendships get more probable with growing "migrant"-status difference (migrants minus natives). Although the effects are partly insignificant (AMEs), the direction of the effect fits the "Growing Differences" hypothesis. One exception is England, where the effect is close to zero.

The "Hybrid" hypothesis for occupational status shows weak support with the pooled data and within countries. However, the criteria of effect differentials (i.e., difference in predicted probabilities: "native>migrant" - "migrant>native") does not monotonously decrease for Sweden and England. The pattern finds weak support for this hypothesis in the pooled data and for Sweden for education. In all cases, the hybrid model shows better model fits than the analyses from the linear conception of the "growing differences" hypothesis, suggesting homophilious preferences are an important factor in friendship formation.

In summary, the results suggest that in inter-ethnic friendships, status exchange processes between migrant status and socioeconomic background are more consistent for parental occupational status than for parental education. This suggests that natives and migrants are valued differently in terms of friendships, which could be an indicator of friendship selection based on prejudice. Future research should not rely on non-differentiated theses when exploring ethnic friendship segregation. The results suggest, however, that homophily in parental socioeconomic status is a strong predictor of friendship, which should also be considered when adopting exchange processes.

The analyses here face some limitations. It cannot be guaranteed that opportunity

structure is fully accounted for, as neighborhood composition is not part of the analyses. This should be influential is self selection not only of high, but of "higher" (i.e., higher than the natives) status migrants into native neighborhoods is present in the data. As migrants face discrimination on the rental housing market, it might be that only the wealthy migrants make it into native neighborhoods (Ahmed & Hammarstedt 2008; Flage 2018; Auspurg et al. 2019).

Furthermore, amplifying meso-network mechanisms such as reciprocity or triadic closure may also contribute to the results. More advanced estimation methods like the p* models (ERGM) could get closer to an identification of true social preferences.[17]

Derived from the partly varying results within countries, context also seems to play an important role in the relation of socioeconomic status and inter-ethnic friendship selection. This leads to the idea that the effect of status-exchange varies for different ethnic groups in different countries. Previous research suggest that ethnic groups differ by their degree of group closure, for example Pakistani migrants in England, Turkish migrants in Germany, or Moroccan migrants in the Netherlands show considerably higher values of friendship segregation in school classes than other groups (van Tubergen & Smith 2018). Translated to an exchange perspective, for these higher segregated groups, the malus might be higher than for other migrants that are perceived to be better socially integrated. Consequently, it would be interesting to investigate whether individual migration history (i.e., migration generation) or the cultural distance to the native group (e.g., originating from a predominantly Muslim culture in a predominantly Catholic region) influences the malus perception which, as a consequence, would make inter-ethnic friendship more costly and would require higher socioeconomic levels to compensate.

[17] ERGM= Exponential family random graph model (Lusher, Koskinen, & Robbins 2013; J. K. Harris 2014).

Chapter 4

Muslim Homophily and Sexual Liberalization Attitudes

Abstract

In the debate on the integration of Muslim migrants in Western countries, cultural incongruence in relation to gender equality and sexual liberalization is raised as a critical issue. One frequently cited reason is the more conservative attitude of Muslim migrants toward these aspects compared to the native population. This article addresses whether similar attitudes toward sexual liberalization are a source of social segregation among Muslim immigrants on the dimension of friendship between youth in the context of the school classroom.

The results of a mediation analysis with multilevel exponential graph models (MLERGMs) on the first wave of CILS4EU (Children of Immigrants Longitudinal Survey in Four European Countries) data controlling for attitude similarity on the attributes of unmarried cohabitation, divorce, homosexuality, and abortion show that: Controlling for attitudes toward sexual liberalization reduces the tendency for Muslim migrants to become friends with their own denomination (religious homophily), while no significant change in religious homophily was found for the Christian, other faith, and non-believers groups. Further analyses on friendship between Muslims and non-Muslims shows an increase in inter-religion friendship after controlling for similarity in attitudes.

The results suggest that Muslim segregation is partly due to attitudes toward sexual liberalization, but the large share of religious segregation remains to be explained.

4.1 Introduction

Over the past decades, migration has led to increasing ethnic diversity in European countries. Within this process, the proportion of Muslims in the European population has approximately risen from about 2% to 5% between 1950 and 2015 (Kettani 2010; Hackett et al. 2019), which was accompanied by great societal attention to Islam in Europe (Brubaker 2013; Fleischmann 2022). In public and academic debates, religion was discussed as one crucial factor inhibiting the integration of the Islamic population

(Foner & Alba 2008; Casanova 2009; Leiken 2012; Foner 2015; Drouhot & Nee 2019).

There is significant evidence of an integration gap among Muslims in Europe, particularly concerning labor market integration (Connor & Koenig 2015; Di Stasio et al. 2021; Thijssen et al. 2022). Additionally, Islamophobia is widespread across Europe (Strabac & Listhaug 2008; Voas & Fleischmann 2012; Helbling 2014; Simonsen & Bonikowski 2020; Verkuyten 2022).

Coming from predominantly Islamic countries with high religiosity and moving to traditionally Christian countries that tend to be more secular and often much less religious, religion-associated cultural differences of Muslims and natives are a focus of research. For example, a widespread claim is that Islam is incompatible with the *values* of Western Europe (e.g., Inglehart & Norris 2003b). As described by Foner & Alba (2008), within social science there are even extreme viewpoints, that Islam would be "threatening the liberal values of European states". Narrowing Samuel Huntington's famous thesis down to the realm of gender, Inglehart & Norris (2003b) posit that values related to gender and sexual liberalization represent a crucial social divide.[1] In fact, in many European countries, Muslims compared to other non-Muslim groups often have more conservative, illiberal values and attitudes in terms of gender equality (Inglehart & Norris 2003a), patriarchal values (Alexander & Welzel 2011), or homosexuality (Röder 2015; Soehl 2017). However, the question whether and to what degree such attitudinal differences hinder integration remains to be answered.

A key dimension of integration is "social integration", which is the focus of the current article. Specifically, this study looks at intergroup friendships at school, where Muslims tend to be separated from their non-Muslim peers (Leszczensky & Pink 2017; Windzio & Wingens 2014; Simsek et al. 2022). The research question of this article is whether social segregation between Muslims and non-Muslims can be explained by differences in sexual liberalization attitudes.

Friendships in general can be explained within the opportunity-preference framework (Zeng & Xie 2008; Wimmer & Lewis 2010). Besides the mere possibility of meeting and making friends (opportunity), social preferences determine social contacts. A regular pattern observed for existing friendships is homophily, that is, that friendships between similar individuals occur more often than between dissimilar ones (McPherson et al. 2001). Within this article, I test if and to what degree attitude homophily on the

[1] Huntington argues that the crucial divisions of conflict are moving away from nation-states toward large civilization systems along cultural and religious lines (Huntington 1993).

dimensions of unmarried cohabitation, divorce, abortion, and homosexuality account for Muslim friendships homophily.

While there is existing literature on the mediating role of attribute homophily in explaining ethnic homophily (e.g., Marmaros & Sacerdote 2006; Mayer & Puller 2008; Wimmer & Lewis 2010; J. A. Smith et al. 2014), research focusing on homophily in Muslim friendships has not yet examined mediation through attitudes (S. Smith et al. 2014; Leszczensky & Pink 2017; Windzio & Wingens 2014; Kretschmer & Leszczensky 2022; Leszczensky & Kretschmer 2022; Simsek et al. 2022). In addition, previous research on inter-group friendship faced the methodological problem of scaling when doing model comparisons on logit-based analysis techniques.[2] By combining exponential random graph models (ERGMs) in a multi level version (Stewart et al. 2019) with a novel approach of calculating average marginal effects (AMEs) on ERGM estimates (Duxbury 2021b), I aim for a more appropriate way of doing mediation analysis with ERGMs. Analyses are applied to school class friendship data in four European countries using the first wave of the Children of Immigrants Longitudinal Survey (CILS4EU).

4.2 Theory

According to the principle of homophily, similar people are more likely to be bonded than those who are not similar (Lazarsfeld & Merton 1954; McPherson et al. 2001). In addition to dimensions such as gender, ethnicity, or age this pattern is also evident for religion (McPherson et al. 2001). The correlation that individuals of the same religious denomination are more likely to have strong personal ties (religion homophily) was found on marriage (Blackwell & Lichter 2004; Fieder & Huber 2016), discussion networks (Louch 2000), and friendship (Louch 2000; Cheadle & Schwadel 2012; Windzio & Wingens 2014; J. A. Smith et al. 2014). One striking finding, based primarily on data from school classrooms in Western countries, is that Muslim adolescents exhibit particularly strong patterns of friendship segregation compared with other major religious groups (Leszczensky & Pink 2017; Simsek et al. 2022; Kretschmer & Leszczensky 2022; Leszczensky & Kretschmer 2022). However, the mechanisms that lead to homophily in Muslim youth friendships have not been adequately explored.

In general, homophilious friendships can be explained by the preference-opportunity

[2] Compare the article on the general problem of scaling with logit regression by Mood (2010).

framework, in which the chance to make friends (opportunity) and social tastes (preferences) are assumed to be the main causes of friendships (Zeng & Xie 2008; Wimmer & Lewis 2010). With regard to opportunity, it is assumed that a higher availability of similar people increases the likelihood of relationships between them (Blau 1977; McPherson & Smith-Lovin 1987). The distribution of peers in the neighborhood, school, and classroom are considered the most important opportunity factors in youth.

Apart from these structural conditions, social preferences for similar people can be explained in three ways. First, third party individuals like the family or friends might influence ones preferences and thus one's friendship choices (Kalmijn 1998; Munniksma & Juvonen 2012; S. Smith 2017). Second, according to social identity and social categorization theory, shared group membership and group identity increase preferences for one's own kind (Tajfel & Turner 1979; Turner et al. 1987; Leszczensky & Pink 2019). Third, homophily preferences are explained in terms of the benefits derived from interacting with similar individuals, such as facilitated communication or shared interests (e.g., McPherson et al. 2001; Wimmer & Lewis 2010).

Directly related to the benefits of similarity, previous studies explained religious homophily, and by extension Muslim homophily, largely by assuming social preferences based on similarities in behaviors, beliefs, and values, but without specifically examining the influence of these factors (Leszczensky & Pink 2017; Simsek et al. 2022; Kretschmer & Leszczensky 2022; Leszczensky & Kretschmer 2022). This article extends previous research by examining the impact of attitudes towards sexual liberalization in explaining Muslim homophily in the case of Migrants in western societies.

Muslims' Conservatism on Sexual Liberalization

From a functionalist perspective, most world religions formulate moral rules for social life including the realm of sexuality. However, the extent to which these rules are accepted and followed varies considerably across countries. In the past, secularization and individualization tendencies could be observed in Western European societies, where the importance of religion for the lives of the population declined sharply (Casanova 2009).[3] In most Muslim-majority societies, on the other hand, religion continues to play a major role in people's lives. In the majority of European societies traditional norms of sexuality and family changed fundamentally (Inglehart 1997).

[3]This does not seem to be true for Western countries in general, as there exist retrograde liberalization trends, for example, on abortion rights in the U.S. or on sexual liberalization in Poland.

Empirical studies of attitudinal data show an increase in liberal value orientations in Western societies (Thornton & Young-DeMarco 2001; Treas et al. 2014), while Muslim societies remain more traditional (Inglehart & Norris 2002), leading to a growing cultural divide that even affects Muslim migrants in Western countries (Norris & Inglehart 2012).

In most Muslim countries, the political and religious systems have rigid rules governing the sexual sphere. For example, Muslim societies show stricter laws on sexual orientation (Rehman & Polymenopoulou 2013; ILGA 2020), and abortion (Center for Reproductive Rights 2022). Within the Muslim religion that grounds on *Shari'ah* law, stricter rules on premarital sex, or cohabitation (I. Schneider 2019), homosexuality (Gerhards 2010, p.16), divorce (at least on the side of the woman) (Mir-Hosseini 2019), and abortion (Shapiro 2014) are formulated. These secular and spiritual rules are reflected in attitudes. Empirical studies show that people in Muslim societies are on average less open to premarital sex (Adamczyk & Hayes 2012; Pew Research Center 2013), homosexuality (Inglehart & Norris 2002, 2003a; Pew Research Center 2013), divorce (Inglehart & Norris 2002, 2003a), and abortion (Inglehart & Norris 2002, 2003a; Jelen 2014; Pew Research Center 2013) than people in Western societies.

Bringing their traditional cultural heritage with them, Muslims do not easily assimilate to the liberal societies of the host countries. Though gradually adapting to the host countries (Norris & Inglehart 2012; Maliepaard & Alba 2016), Muslim migrants in Western Europe still hold more conservative attitudes than non-Muslims or natives on unmarried cohabitation (V. A. Lewis & Kashyap 2013), homosexuality (Gerhards 2010; Hooghe et al. 2010; van den Akker et al. 2013; Röder 2015; Koopmans 2015), abortion (Adamczyk 2013; Carol & Milewski 2018), and divorce (Adamczyk 2013).

Attitude Homophily as a Source of Muslim Segregation

Regarding the differences in liberal attitudes between Muslims and non-Muslims, the question is whether and to what extent this contributes to religion homophily or religion friendship segregation among Muslims. As described above, the literature argues hat similarity of attitudes is an important mechanism driving religion homophily. Research focusing on attitudes predicts that similarity in attitudes leads to liking (Byrne 1961, 1969, 1997; Byrne et al. 1986; Montoya et al. 2008; Montoya & Horton 2013). Interactions with others who have similar attitudes are expected to be beneficial because,

first, it confirms one's own beliefs, which improves and does not fear self-worth, second, it facilitates interactions , and third, enhances trust and has health benefits (Montoya et al. 2008; Singh et al. 2015, 2017). At the same time, according to *repulsion hypothesis* this could mean that those of dissimilar attitudes are more likely to be rejected (Rosenbaum 1986).

Assuming, on the one hand, that there are differences in attitudes towards sexual liberation between Muslims and non-Muslims and, on the other hand, that both Muslims and non-Muslims prefer to form friendships with similar others, this could be an explanation for the segregation of Muslim friendships as schematically shown in Figure 4.1.

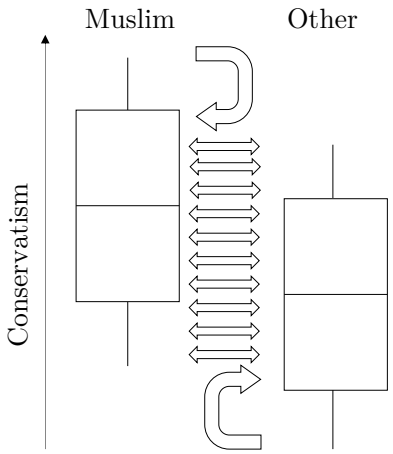


Figure 4.1: Expected distributions (hypothetical boxplots) of attitude values and friendship nominations for Muslims and non-Muslims ('Other').
Source: Own illustration.
Notes: Conservatism on Y-axis, with higher conservatism meaning less liberal attitudes on sexual liberalization. Arrows indicate tendency of friendship nominations as expected by attitudinal homophily.

Attitudes serve as mediating variables between shared denomination and friendship, a concept referred to as the byproduct thesis. Hence, I test two hypotheses in the empirical analyses. First, *Muslim friendship homophily is mediated by similarity in liberalization attitudes.* Second, *Muslim to non-Muslim friendship is mediated by similarity in liberalization attitudes.*

4.3 Data

The analyses in the following use the first wave of the Children of Immigrants Longitudinal Survey in Four European Countries (CILS4EU) collected in Germany, the

Netherlands, Sweden, and England in 2010/11 (Kalter et al. 2016b). CILS4EU is a large-scale multi-purpose study that interviewed school children (at age 14) and their parents. With an oversampling of schools with a high share of migrant students, and rich information of full friendship networks, one of its important analysis potentials is on questions regarding social integration.

Working Sample

Figure 4.2 shows the stepwise reduction of the raw data to arrive at the final analytical sample: (1) The survey was made to match the school class. (2) At least 75% of the "gross sample" participating in survey. Additionally, a maximum of three non-participants in the network module were allowed, resulting in a tolerated maximum of 20% missing network participants. Non-participants of the network module (i.e., those that neither nominated nor could be nominated) were excluded. (3) Not more than 10% of invalid nominations were allowed. (4) Only classes with at least 10 pupils were included. (5) Classes with a missing share of ethnic information and religious information of more than 10% and were excluded. (6) Classes with a missing share of over 10% of parental socioeconomic status or education were excluded. (7) Only school classes that contained at least one potential friendship dyad within the following groups were allowed: natives, non-natives, males, females, Muslim, and non-Muslims. Finally, this leads to 4'034 pupils in 182 classes.

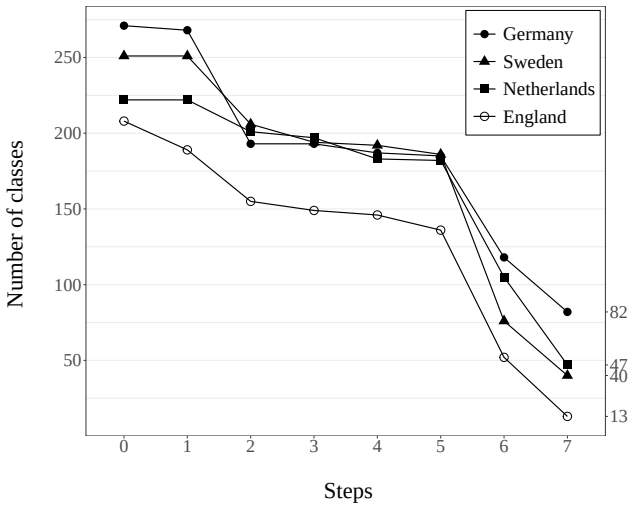


Figure 4.2: Reduction of participating classes for final working sample (CILS4EU, wave 1).

4.4 Model Selection

For analyzing the school class friendship networks, I used a multi level version of exponential random graph models (MLERGMs). The exponential random graph models (ERGMs) belong to a tie focused family of network models, that allows modeling social selection processes (Robins et al. 2007; Lusher, Koskinen, & Robbins 2013; J. K. Harris 2014). ERGMs describe a network graph as a whole, from which conclusions can then be drawn about the underlying mechanisms of tie formation. What the independent variables are in standard regression analysis, the so-called count statistics are in ERGMs. As the name implies, count statistics are constructs that count the occurrence of certain patterns within the observed network, such as the number of reciprocal ties, the number of same-gender ties, or the number of outgoing nominations of natives (see Table C.1 for an overview of count statistics used in this article). The strength of ERGMs, as opposed to just standard regression methods, is that they relax assumptions about dyadic independence. This allows modeling of concepts such as triadic closure (a friend of a friend is also a friend), which would not be possible when logit regression is applied to dyadic data where each dyad is independent of the other. Using meso-level network configurations such as reciprocity or forms of triadic closure allows us to distinguish tie mechanisms at the dyadic level and even at higher levels from other mechanisms such as homophily.

Multi-Level ERGM

While similar studies on multiple school class networks used a two-step approach[4] with ERGM (e.g., Kruse & Jacob 2016; S. Smith et al. 2016), this study uses an integrated multilevel ERGM building on the `mlergm` package by (Stewart et al. 2019).[5] The two-stage approach has the advantage of specifying complete interaction models, i.e., all estimates can vary across school classes. However, it has two potential drawbacks: First, from a technical perspective, ERGMs often face the problem of model degeneracy, i.e., estimation convergence is not achieved. Using a multilevel approach facilitates model convergence (Stewart et al. 2019). Second, the two-step approach assumes coefficients can be compared across models, however, as Duxbury (2021b) elaborated, similar to

[4] For a summary on multilevel network approaches including the two-step approach see Lazega & Snijders (2016).

[5] A pre-release version of the `mlergm` package in R building on version 0.8 (Stewart 2021) was used.

the case of logit regression (Mood 2010), ERGM suffers from the problem of scaling and thus direct comparison of ERGM coefficients or their exponentiated coefficients can be misleading. The use of an integrated multilevel approach addresses both of these drawbacks.

Unlike basic ERGMs, the current state of development of MLERGM packages does not allow for the inclusion of constraints such as limiting the number of outgoing nominations. In weighing the benefits of the MLERGM approach, this is accepted in this article.

Mediation Analysis

The goal of this paper is conducting mediation analyses by the "difference method" which grounds on subtracting the direct (model with mediators) from the total effect (model without mediators) estimates. As mentioned above, the magnitude of ERGM coefficients is not comparable between models, therefore average marginal effects (AMEs) for ERGMs as proposed by Duxbury (2021b) are calculated.[6]

The procedure of estimation was the following. First, nested models (MLERGMs) were estimated, without and with including the mediation variables of interest, namely homophily measures on tolerance. For each case, the estimated average marginal effects (AMEs) on the main independent variables regarding religion homophily were calculated. The explanatory contribution of the mediation variables was evaluated by 1) the proportion that the indirect effect represents relative to the total effect (p-delta), and by 2) statistical tests of an indirect effect that is different from zero. For capturing potential country level differences all analyses were conducted separately for each country.

Controls

Gender is one of the strongest factors shaping friendship of adolescents (McPherson et al. 2001, and see Chapter 2). Therefore, all four gender-combinations are added to the models. Note that this controls for possible gender effects of homophily (similarity), activity (sender effect) and popularity (receiver). Socioeconomic status is included

[6] A pre-release version of `ergMargins` package in R building on version 0.1.3 (Duxbury 2021a) was used. This new version and the pre-release of `mlergm` (see above) made the packages compatible for the first time. I would like to take this opportunity to thank *Jonathan Stewart* and *Scott Duxbury* for a very productive collaboration. After much correspondence and testing, they had the expertise and patience to make the idea of computing mediation analyses in multilevel ERGMs a reality. Thank you very much!

as an homophily effect (dyad difference in socioeconomic status) and as sender and receiver effects (compare Chapter 3). To account for availability in terms of gender and religion, similar to the study by Simsek et al. (2022), class-specific opportunity structure was controlled for by including the sender- and receiver-specific proportion of one's gender and the proportion of one's religion. That is, four effects were included, two activity effects and two receiver effects. However, when testing the estimation, the four effects were problematic, so the best and final solution was to include only the two sender effects. For considering potential structural factors on the network level (compare Wimmer & Lewis 2010, p. 589), which I refer to as the meso level, additional controls are added: To account for reciprocity an effect on the count of mutual ties was included in all models. Different versions of higher order controls were tested in the models. For capturing tendencies of triadic closure the count statistic of geometrically weighted edgewise shared partners for incoming two-paths (GWESP-ITP) and outgoing two-paths (GWESP-OTP) were included. These count statistics have the additional important benefit of helping to address the problem of model degeneracy, i.e., helping to improve the estimability of the model. Only including a term for incoming twopaths led to problems in the estimation process. Within the combination of MLERGM and the package for building AMEs (`ergMargins`), currently only fixed decay parameters for GWESP terms are possible. Future developments might allow to include curved models when combining MLERGM and AMEs.

4.5 Variables

Friendship within the school classes in CILS4EU was captured by asking "Who are your best friends in class?". At maximum five nominations were allowed. The *Religious denominations* of the adolescents are summarized into the four categories of *No religion*, *Christian*, *Muslim*, and *Other religion*. Christianity includes all varieties of Christian subgroups such as Catholics, Protestants or Free Christians. Due to low case numbers, 'Other religion' includes Hinduism, Judaism, Sikhism, and all open answers on religion. *Tolerance attitudes* were asked by "Do you think the following are" 1 "always OK", 2 "often OK", 3 "sometimes OK", or 4 "never OK"? The four items on sexual liberalization were "Living together as a couple without being married", "Divorce", "Abortion", and "Homosexuality." Note that this categorical variable is interpreted as a metric variable

in the ERGM analyses (e.g., to form attitude differences in dyads). *Ethnicity* used the country of birth concept that was provided within CILS4EU (Dollmann et al. 2014). This is a combination of the countries of birth on the grand-parental, the parental and the child level. For *Education* the parents' highest education was taken. This included the categories 1: "no school leaving certificate", 2: "below upper secondary", 3: "upper secondary", and 4: "university degree". In the case of missing information, children's reports about their parents were used as a proxy. In ERGMs, this variable is interpreted as metric, for example, when considering educational differences for the dyads. The *Socioeconomic Status* for each child is assessed using the International Socio- Economic Index of Occupational Status (ISEI) of their parents. As in the case of education, missing information was filled in using children's reports about their parents. Within each class, the *Shares of own sex/religion* were generated. This imlies that classmates belonging to different categories (e.g., male vs. female) may have different values for these opportunity variables. The Table 4.1 shows the descriptives separately for each country.

Missings

Missing network information resulting from non-participation in the sociometric questionnaire was reconstructed by randomly mirroring the incoming friendship nominations (Stork & Richards 1992).[7] The friendship questionnaire in CILS4EU limits the number of nominations to five, consequently a maximum of five outgoing nominations were reconstructed. This procedure is expected not do lead to substantial bias for networks of high reciprocity (i.e., friendships) that have small (20–30%) amounts of missing data (Huisman 2009, 2018).

Missing values for adolescents' attributes resulting from item non-response were handled as follows. If available, missing information was filled using information from CILS4EU waves two and three. For parental socioeconomic status (ISEI and education), children's information on their parents was used. The remaining missing values were filled by using multiple imputation by chained equations for each country separately (MICE). This includes regression methods (OLS and logit) and predictive mean matching. Additionally information enriched the estimation procedure (e.g., attitudes towards ethnic groups, religiosity measures). After MICE was run for ten times, the modal values of the predicted values were selected to fill in the missings.

[7] The approach to handling data from friendship networks has been used previously (S. Smith et al. 2014).

Table 4.1: Descriptives statistics of reduced sample, (CILS4EU, wave 1).

	EN		GE		NL		SW		ALL	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Min	Max
Pupils										
No religion	.35	(.48)	.11	(.31)	.60	(.49)	.38	(.49)	0.00	1.00
Christ	.35	(.48)	.63	(.48)	.25	(.43)	.44	(.50)	0.00	1.00
Islam	.17	(.38)	.22	(.41)	.09	(.29)	.14	(.35)	0.00	1.00
Other religion	.13	(.34)	.05	(.21)	.06	(.24)	.04	(.19)	0.00	1.00
Male	.50	(.50)	.52	(.50)	.48	(.50)	.51	(.50)	0.00	1.00
Native	.43	(.50)	.42	(.49)	.64	(.48)	.45	(.50)	0.00	1.00
ISEI	61.07	(20.49)	45.86	(19.90)	54.71	(19.73)	56.91	(21.09)	11.56	88.96
Education	3.11	(.90)	2.66	(.79)	3.63	(.55)	3.36	(.71)	1.00	4.00
Cohabitation	1.91	(1.00)	1.91	(1.00)	1.62	(.85)	1.31	(.69)	1.00	4.00
Divorce	2.59	(.97)	3.05	(.86)	2.86	(.90)	1.97	(.99)	1.00	4.00
Abortion	2.94	(.90)	3.43	(.79)	2.91	(.93)	2.23	(1.08)	1.00	4.00
Homosexuality	2.22	(1.27)	2.46	(1.28)	2.01	(1.13)	1.75	(1.12)	1.00	4.00
Classes										
Class size	23.28	(5.05)	22.70	(3.44)	23.81	(3.62)	21.87	(3.67)	11.00	30.00
Share - no religion	.35	(.16)	.11	(.10)	.60	(.16)	.38	(.15)	0.00	0.95
Share - Christ	.35	(.13)	.63	(.18)	.25	(.17)	.44	(.14)	0.00	0.95
Share - Islam	.17	(.17)	.22	(.16)	.09	(.05)	.14	(.09)	0.03	0.71
Share - other religion	.13	(.08)	.05	(.05)	.06	(.06)	.04	(.04)	0.00	0.31
Observations										
N_{pupils}	285		1,810		1,091		848		4,034	
$N_{classes}$	13		82		47		40		182	
$N_{schools}$	10		61		38		33		142	

4.6 Results

4.6.1 Distribution of Attitudes

The hypothesis that homophily of sexual liberality mediates homophily of Muslim friendship is based on the assumption of comparatively stronger conservatism among Muslims. The following Figure 4.3 shows the distributions of responses to the four questions on sexual liberalization (unmarried cohabitation, divorce, abortion, and homosexuality) by denomination separately for each country. It can be seen that in all countries of the working sample, Muslims have the strongest tendency towards conservatism in terms of sexual liberalization, while people of other denominations and Christians are more liberal, and people without a denomination have the most liberal

Table 4.2: Rounded percentages of school classes showing a significance value of p<0.1 on a chi-squared test for the relationship between attitude and Muslim denomination.

	EN	DE	NL	SE	ALL
Unmarried cohabitation	72	61	70	45	61
Divorce	26	16	10	20	16
Abortion	60	9	16	34	20
Homosexuality	39	31	40	46	37
At least one attitude measure	87	76	79	75	77
$N_{classes}$	13	82	47	40	182

Source: CILS4EU, wave 1, working sample, own calculations.
Notes: EN = England, DE = Germany, NL = The Netherlands, SE = Sweden.

orientation. Two-sided t-tests for mean comparison additionally show, that Muslims have the least liberal attitudes in direct comparison to each other religion category. The only three exceptions without significant differences are the groups 'Other religion' in the Netherlands and Sweden, and Christianity in the Netherlands.

To determine the relationship between Muslim denomination and conservative attitudes at the class level, separate chi-squared tests were conducted for the four attitudinal attributes for each class (see Table 4.2). Because the school classes each represent small sample sizes, a significance threshold of $p < .1$ was chosen instead of $p < .05$. In summary, in three-quarters of the classes, there is a significant relationship on at least one attitudinal measure. The four countries do not differ much in this respect, with only England showing a slightly higher proportion. It turns out that unmarried cohabitation is the attitudinal characteristic that most often shows a separation between Muslims and non-Muslims, followed by homosexuality, and further behind abortion and finally divorce. In view of these results, it can be assumed that the expected differences in attitudes between Muslims and non-Muslims are also found within school classes.

4.6.2 MLERGM Results

Before presenting the results of the multilevel ERGM estimates, I briefly review the process that led to the final models. To obtain the final models, different model variants were tested beforehand. While many models did not converge at all, for those with convergence the combination with the best model fit (lowest BIC value) was selected.[8]

[8] Bayesian information criterion (BIC).

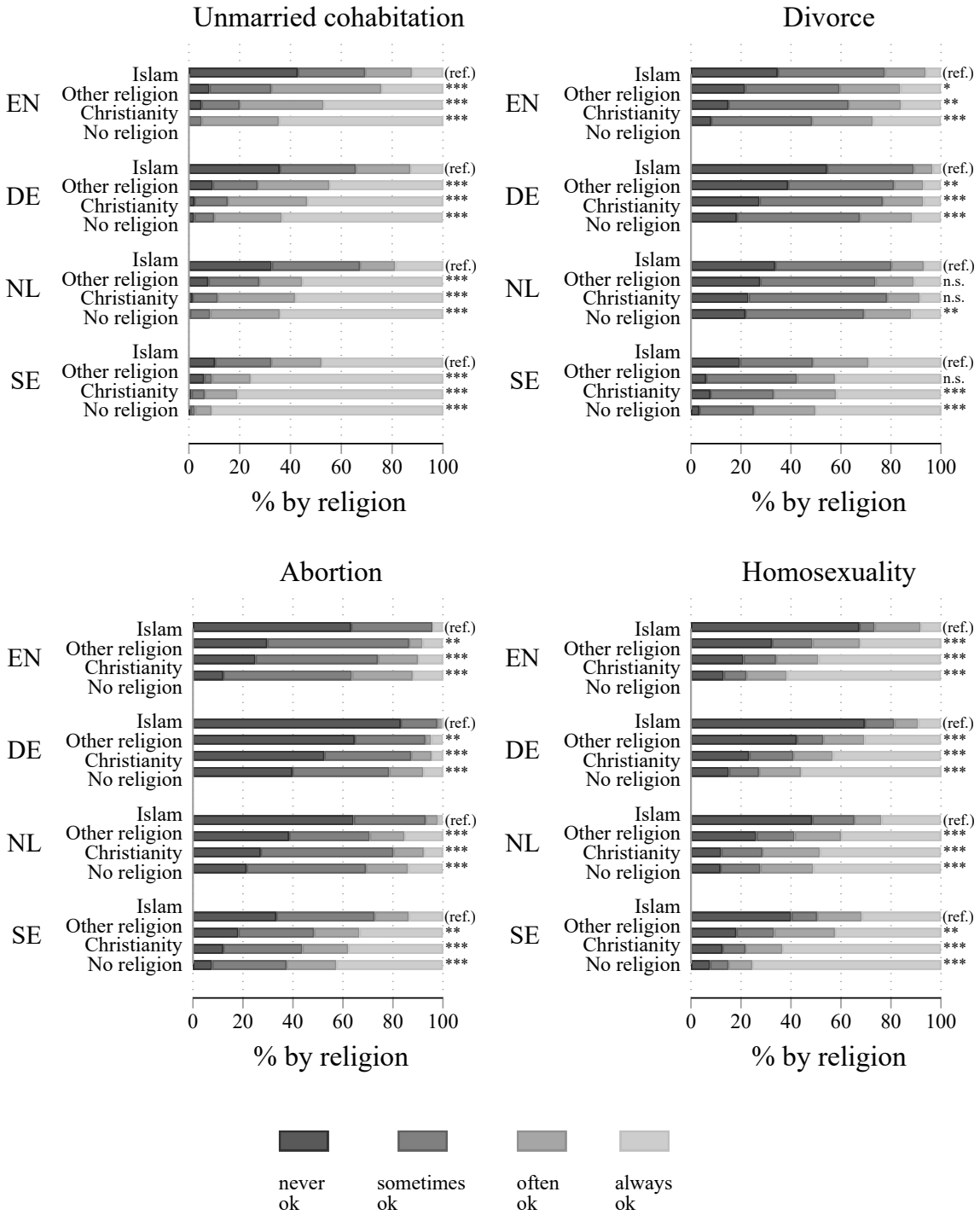


Figure 4.3: Distributions of tolerance attitudes by religion, countrywise.
Source: CILS4EU, wave 1, working sample, own calculations.
Notes: EN = England, DE = Germany, NL = The Netherlands, SE = Sweden.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ symbolize significance of two-sided t-tests of mean difference towards group of Muslims.

For assessing the goodness of fit (GOF), I viewed the GOF-plots from the `mlergm`

package.[9] Since the GOF graphs for the different models were very similar, I will limit myself to the example for a base model (m0) on the within comparison for England (see Appendix Section C.2).[10] A good GOF is characterized by a small deviation between the distributions generated by the prediction and the actual observed network features. In other words, the observed features should be centrally located within the distributions generated by the model simulations. It appears that the models fit well for edgewise shared partner (esp), dyadwise shared partners (dsp), and the number of triangles. In this sense triadic closure is well captured. However, perfect fit could not be obtained for the measures of minimum geodesic distance (geo), and the in- and the out-degree. As noted earlier, other model variants that integrated other combinations of the geometric terms did not improve this or even did not converge. A general problem could be that classes are relatively heterogeneous in their evolution (e.g., due to path dependencies) and therefore require different modeling. While in a two-step approach the failing classes can be excluded from the analyses, this is not possible with `mlergm`, since one cannot identify problematic classes during the estimation procedure. Outdegree shows the highest deviation from the data. As can be seen in the GOF plot, the number of low degree bonds is limited to a maximum of five in CILS4EU, but the model is based on a quadratic function. Unfortunately, this cannot be fixed with ERGM-constraints either, because unlike in simply ERGM, constraints cannot be modeled in the current version of `mlergm`. Similar to the maintainers of the `mlergm` package, I evaluated the MCMC convergence by showing that there is no evidence of autocorrelation in the trace plots showing that the process has reached stationarity (Stewart et al. 2019, p. 105). None of the traceplots show signs of autocorrelation (see Appendix Section C.4).[11]

Table 4.3 shows the MLERGM coefficients for *religion homophily* for each country. In each case, M0 is the base model and M1 is the model that additionally includes the mediation variables of sexual liberation attitudes. In the majority of cases the religion homophily coefficients are positive and significant. Exceptions are found in England,

[9] Goodness of fit examines the extent to which the model reproduces features that are not directly modeled, but are indirectly influenced by the model.

[10] The solid lines show the empirical properties, and the distributions generated by the model are represented by box plots and histograms.

[11] In addition, specific autocorrelation (ACF) plots were created that repeated the patterns of the trace plots and are therefore not shown here.

here the only religion homophily can be found for Muslims, the Netherlands for the case of Christians, and in Sweden for those of other religion. Looking at the corresponding average marginal effects (AMEs), as shown in Figure 4.5, this picture repeats (find the corresponding Tables of the AMEs in Table 4.4).

This general trend suggests that students are more willing to form friendships with people of the same denomination than with people of other denominations. In addition, the coefficients on religious homophily are highest for Muslims in all models and are consistently significant, suggesting that being of the same religion is more important in forming friendships for Muslims than for other religions. Within the base models the Muslim homophily AMEs range form 0.0024 to 0.0108, thus the probability of a friendship tie between two Muslims students on average is 0.24 to 1.08 percentage points higher than between dyads of mixed religions.

Table 4.4 additionally shows the changes in AMEs from baseline models M0 and M1, which include the factor of attitudinal differences. In all four countries, religion homophily among Muslims decreases significantly when the count statistics on sexual liberalization are added. No significant change is observed for all other denominations. The decrease for Muslims' AMEs ranges from 3% in England to about 12% to 17% in Germany, the Netherlands, and Sweden. This supports the first hypothesis that *Muslim friendship homophily is mediated by similarity in liberalization attitudes.*

The next question is whether interfaith friendship, i.e., friendship of Muslims towards non-Muslims is influenced by attitudes on sexual liberalization. Table 4.5 and the corresponding AMEs in Figure 4.5 show, interfaith friendships tend to be less common than friendships within Muslims or non-Muslims, with the exception of Muslim to non-Muslim friendship nominations in the Netherlands where non-Muslim to Muslim nominations are more common than within non-Muslims. For Germany and Sweden the tendency for friendship separation gets smaller after accounting for sexual liberalization attitudes. The effects here range from 16% to 44%. In most cases adding the factor for sexual liberalization attitudes significantly increases the coefficient for friendships between Muslims and non-Muslims. Thus, this supports the second hypothesis *Between religion friendship is mediated by similarity in liberalization attitudes.*

Table 4.3: Results of predicting friendship ties with MLERGM for *within religious denominations* (by country).

	EN		DE		NL		SE	
	M0	M1	M0	M1	M0	M1	M0	M1
Edges	-3.11***	-3.04***	-2.60***	-2.45***	-3.05***	-2.99***	-2.86***	-2.72***
Mutual	3.49***	3.49***	2.94***	2.94***	3.46***	3.46***	3.24***	3.24***
GWESP-ITP (0.5)	-0.61***	-0.61***	-0.44***	-0.44***	-0.57***	-0.57***	-0.57***	-0.57***
GWESP-OTP (0.5)	1.12***	1.12***	0.99***	0.99***	1.23***	1.23***	1.22***	1.21***
Female-> male	-1.02***	-1.03***	-1.11***	-1.11***	-0.99***	-0.98***	-1.20***	-1.18***
Male -> female	-0.84***	-0.84***	-1.11***	-1.11***	-0.97***	-0.96***	-1.08***	-1.06***
Male -> male	0.09*	0.08^{+}	0.03^{+}	0.03*	0.02	0.04*	0.02	0.05*
Share of own religion (S)	-0.00**	-0.00**	-0.00***	-0.00***	-0.00	-0.00	-0.00^{+}	-0.00^{+}
Share of own sex (S)	-0.00***	-0.00***	-0.00***	-0.00***	-0.00***	-0.00***	-0.00***	-0.00***
Same ethnicity	0.21**	0.21**	0.23***	0.22***	0.10*	0.10*	0.19***	0.18***
Native (S)	-0.11	-0.12	-0.05	-0.05	-0.09^{+}	-0.09^{+}	0.01	0.01
Native (R)	-0.25**	-0.26**	-0.15***	-0.15***	-0.07	-0.07	-0.15**	-0.16**
Education difference	-0.00	-0.01	-0.02	-0.02	0.02	0.02	-0.02	-0.01
ISEI difference	0.00	0.00	-0.00*	-0.00*	-0.00^{+}	-0.00^{+}	-0.00*	-0.00*
ISEI (S)	-0.00	-0.00	0.00^{+}	0.00^{+}	-0.00	-0.00	-0.00^{+}	-0.00*
ISEI (R)	0.00	0.00	-0.00**	-0.00**	-0.00	-0.00	0.00	-0.00
Both no religion	0.09	0.10	0.15***	0.15***	0.10**	0.10**	0.12**	0.13***
Both Christ	-0.01	-0.01	0.09**	0.09**	0.04	0.04	0.13***	0.13***
Both Muslim	0.40***	0.38***	0.22***	0.19***	0.11**	0.10*	0.23***	0.19***
Both other religion	0.07	0.07	0.14***	0.14***	0.08*	0.08^{+}	0.10^{+}	0.09^{+}
Mediators: Tolerance								
- cohab couple difference		-0.03		-0.05***		-0.00		-0.02
- divorce difference		-0.06^{+}		-0.02^{+}		-0.00		-0.03
- abortion difference		0.02		0.00		-0.04*		-0.01
- homosexuality difference		0.01		-0.03***		-0.02		-0.05**
BIC	3'936	3'956	25'727	25'725	14'321	14'352	10'621	10'632
$N_{students}$	285	285	1'810	1'810	1'091	1'091	848	848
$N_{classes}$	13	13	82	82	47	47	40	40

Source: CILS4EU, wave 1, working sample, own calculations.
Notes: EN = England, DE = Germany, NL = The Netherlands, SE = Sweden.
BIC= Bayesian information criterion, based on the within-block model.
$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

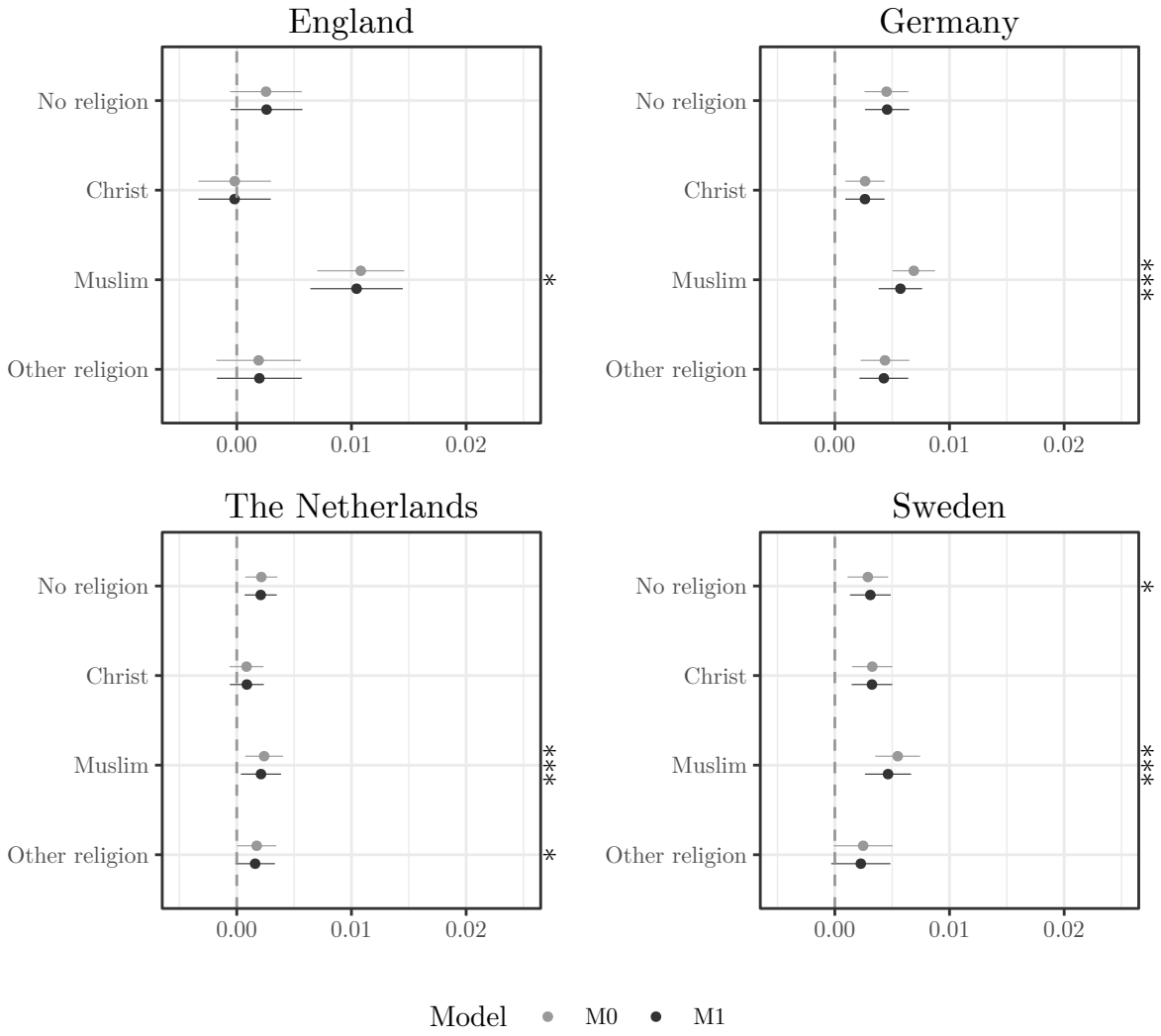


Figure 4.4: Coefficient plot of AMEs from MLERGM, within religion (by country).
Source: CILS4EU, wave 1, working sample, own calculations.
Notes: Models: M0 is model without and M1 with tolerance attitudes. CIs on 95%.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ signify significance of differences between AMEs (M0 vs. M1).

Table 4.4: AMEs for MLERGM for *within religious denominations* (by country).

	EN			GE		
	AME0	AME1	delta	AME0	AME1	delta
No religion	0.0026	0.0026	-0.02	0.0045***	0.0046***	-0.01
Christ	-0.0002	-0.0002	-0.07	0.0026**	0.0026**	0.01
Muslim	0.0108***	0.0104***	0.03*	0.0069***	0.0057***	0.17***
Other religion	0.0019	0.0020	-0.03	0.0044***	0.0043***	0.02
	NL			SE		
	AME0	AME1	delta	AME0	AME1	delta
No religion	0.0021**	0.0021**	0.03	0.0029**	0.0031***	-0.08*
Christ	0.0009	0.0009	-0.03	0.0033***	0.0032***	0.01
Muslim	0.0024**	0.0021*	0.12***	0.0055***	0.0046***	0.15***
Other religion	0.0017*	0.0016^{+}	0.08*	0.0025^{+}	0.0023^{+}	0.08

Source: CILS4EU, wave 1, working sample, own calculations.
Notes: EN = England, DE = Germany, NL = The Netherlands, SE = Sweden.
BIC= Bayesian information criterion, based on the within-block model.
delta= effect change of AMEs in percentages from M0 to M1.
$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

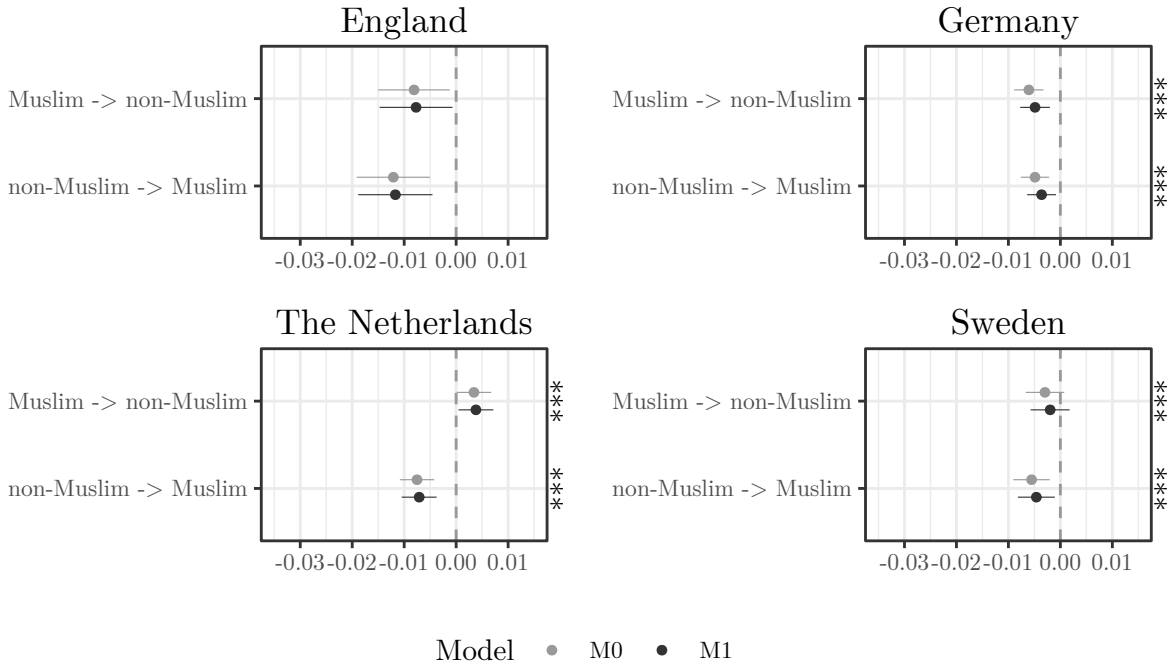


Figure 4.5: Coefficient plot of AMEs from MLERGM, between Muslim vs. non-Muslim (by country).

Source: CILS4EU, wave 1, working sample, own calculations.
Notes: Models: M0 is model without and M1 with tolerance attitudes. CIs on 95%.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ signify significance of differences between AMEs (M0 vs. M1).

Table 4.5: Results of predicting friendship ties with MLERGM for *Muslim vs. non-Muslim* (by country).

	EN		GE		NL		SE	
	M0	M1	M0	M1	M0	M1	M0	M1
Edges	-2.66***	-2.60***	-2.25***	-2.14***	-2.94***	-2.88***	-2.58***	-2.49***
Mutual	3.50***	3.49***	2.94***	2.94***	3.46***	3.46***	3.25***	3.25***
GWESP-ITP (0.5)	-0.61***	-0.61***	-0.44***	-0.44***	-0.56***	-0.56***	-0.57***	-0.57***
GWESP-OTP (0.5)	1.11***	1.11***	0.99***	0.99***	1.23***	1.23***	1.21***	1.21***
Female-> male	-1.02***	-1.02***	-1.12***	-1.12***	-0.99***	-0.98***	-1.19***	-1.18***
Male -> female	-0.84***	-0.85***	-1.11***	-1.11***	-0.97***	-0.96***	-1.08***	-1.06***
Male -> male	0.08^{+}	0.08^{+}	0.03*	0.03*	0.03	0.04*	0.02	0.05*
Share of own religion (S)	-0.00*	-0.00*	-0.00**	-0.00***	0.00**	0.00**	0.00	0.00
Share of own sex (S)	-0.00***	-0.00***	-0.00***	-0.00***	-0.00***	-0.00***	-0.00***	-0.00***
Same ethnicity	0.22**	0.23**	0.20***	0.19***	0.07	0.07	0.18***	0.17***
Native (S)	-0.09	-0.10	-0.05	-0.05	-0.02	-0.02	0.02	0.02
Native (R)	-0.26**	-0.27**	-0.11**	-0.11**	-0.08	-0.08	-0.14**	-0.14**
Education difference	-0.00	-0.00	-0.02	-0.02	0.02	0.02	-0.02	-0.01
ISEI difference	0.00	0.00	-0.00*	-0.00*	-0.00^{+}	-0.00^{+}	-0.00*	-0.00*
ISEI (S)	-0.00	-0.00	0.00	0.00	0.00	-0.00	-0.00^{+}	-0.00*
ISEI (R)	0.00	0.00	-0.00**	-0.00**	-0.00	-0.00	0.00	-0.00
Muslim -> non-Muslim	-0.30*	-0.28*	-0.19***	-0.16***	0.16*	0.18*	-0.12	-0.08
non-Muslim -> Muslim	-0.44***	-0.43**	-0.16***	-0.12*	-0.35***	-0.33***	-0.23**	-0.19*
Muslim -> Muslim	0.04	0.04	0.19***	0.19***	0.61***	0.61***	0.35***	0.39***
Mediators: Tolerance								
- cohab couple difference		-0.03		-0.05***		-0.01		-0.03
- divorce difference		-0.06^{+}		-0.02^{+}		-0.00		-0.03
- abortion difference		0.02		0.00		-0.04*		-0.00
- homosexuality difference		0.01		-0.03**		-0.02^{+}		-0.05**
BIC	3'925	3'952	25'754	25'763	14'304	14'330	10'632	10'642
$N_{students}$	285	285	1'810	1'810	1'091	1'091	848	848
$N_{classes}$	13	13	82	82	47	47	40	40

Source: CILS4EU, wave 1, working sample, own calculations.
Notes: EN = England, DE = Germany, NL = The Netherlands, SE = Sweden.
BIC= Bayesian information criterion, based on the within-block model.
$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 4.6: AMEs for MLERGM, *between Muslims and non-Muslims* (by country).

	EN			GE		
	AME0	AME1	delta	AME0	AME1	delta
Muslim > NonMuslim[1]	-0.0081*	-0.0077*	0.05	-0.0061***	-0.0049***	0.20***
NonMuslim > Muslim	-0.0121***	-0.0117**	0.03	-0.0049***	-0.0036*	0.26***
Muslim > Muslim	0.0010	0.0011	-0.04	0.0058***	0.0059***	-0.02
	NL			SE		
	AME0	AME1	delta	AME0	AME1	delta
Muslim > NonMuslim	0.0034*	0.0038*	-0.11***	-0.0030	-0.0020	0.34***
NonMuslim > Muslim	-0.0075***	-0.0071***	0.06***	-0.0055**	-0.0046*	0.17***
Muslim > Muslim	0.0130***	0.0129***	0.01	0.0086***	0.0096***	-0.13***

Source: CILS4EU, wave 1, working sample, own calculations.
Notes: EN = England, DE = Germany, NL = The Netherlands, SE = Sweden.
BIC= Bayesian information criterion, based on the within-block model.
delta= effect change of AMEs in percentages from M0 to M1.
$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

4.7 Summary and Conclusion

Previous research has shown significant social segregation of Muslims in European societies. At the same time, cultural inconsistencies, such as Muslim conservatism regarding sexual liberalization, have been discussed as a possible cause. Within this article I aimed at testing whether attitude homophily on sexual liberalization attitudes accounts for in-school friendship segregation of adolescents by using the first wave of the CILS4EU. The analyses take advantage of recently developed tools for hierarchical network models and the ability to estimate marginal effects as in standard regression toolkits, improving model comparability, which has been problematic in previous studies. Using country-specific mediation analyses with multilevel exponential random graph models and calculating average marginal effects, I tested whether similarity in attitudes toward the characteristics of unmarried cohabitation, divorce, homosexuality, and abortion alters friendship segregation among Muslim youth.

The results show that Muslims in all four countries consistently exhibit religious homophily in their friendships, which decreases significantly (about 3% to 17%) after the four measures of attitudinal homophily are included. In addition, it shows that the tendency for friendship avoidance between Muslims and non-Muslims decrease by

17% (Germany) to 34% (Sweden), while the pattern for England and the Netherlands is less consistent with the hypothesis. One first reading is that similarity on sexual liberalization attitudes partly divides Muslim students from their classmates.

However, the results are only a start, further research is needed to conclude that social preferences are a cause, as the analyses do not separate social choice from social influence (cf. Cook et al. 2017 on the case of selection and influence on religiosity and religious homophily.). Thus, it is quite plausible that Muslim students will adjust their attitudes to each other after becoming friends. In this sense, the strengths of the measured mediation effects can rather be seen as an upper bounds for possible social preferences. Longitudinal data would be needed to distinguish between selection and influence, and the timing of the first measurement is of particular importance. While the first wave of CILS4EU represents a snapshot of the friendship process, the use of longitudinal data also needs to take into account that selection and influence processes have already taken place within classes if the survey was conducted at a large time lag from the first time students met.

The analyses did not yield perfect goodness of fit, e.g., in-degree and out-degree, which could bias the remaining estimators due to interdependencies in the network analysis calculations. Possible solutions for future analyses could be to further develop the `mlergm` package to allow the integration of degree constraints. Another option would be to refine the models, for example in the case of outdegree, to include separate count statistics for each level. However, this would change the implications of estimating triadic closure, and finding new stable parameter values or even using curved models would require more computational resources. In addition, convergence was diagnosed visually by testing for stationarity. More computational resources could also help improve estimation convergence.

Moreover, it can be argued that Muslims adapt to the more secular European host societies over generations, which could reduce the importance of religiosity in their lives. This raises the question of whether the mediating effect of attitudes toward sexual liberality diminishes over generations, or whether there are even tendencies toward retraditionalization that then reinforce social segregation.

In addition, the role of religiosity in the interplay between sexual liberal attitudes and Muslim friendship segregation could be further investigated. It has been shown that religious people have more conservative attitudes towards sexual liberalization

(Kogan & Weißmann 2020), which should then lead to social segregation. On the other hand, belonging is not the same as believing. Belonging to a Muslim faith community goes hand in hand with other habits and culturally determined behaviors and norms that can make social contact with the host society in Western Europe difficult. In this way, for example, it could be investigated whether alcohol consumption is an obstacle in friendship between Muslims and non-Muslims. Qualitative analyses have shown that Australian Muslim migrants' drinking behavior is a social barrier (Yilmaz & Bashirov 2022); it is worth examining whether this also applies to the European context. Moreover, religious affiliation could be an identity-forming factor for Muslims in Europe. In this sense, it is not faith per se, but identity as a Muslim that would be crucial for the development of friendships.

Finally, in this article, as described above, only a moderate percentage of Muslim friendship homophily could be associated with attitudinal homophily toward sexual liberalization. In general, future research could further disentangle the various mechanisms that lead to the social segregation of Muslims.

Appendix A

Appendix Chapter 2

A.1 Ethnic Makeup of Working Sample

Table A.1: Ethnic makeup of the working sample in Germany (left) and Sweden (right), students-level.

	Percent	Country	Percent	Country
1	47.48	**Germany**	51.29	**Sweden**
2	13.36	Turkey	8.10	Finland
3	6.24	Poland	5.04	Unknown country of origin
4	5.97	Former Soviet Union	4.69	Former Yugoslavia
5	4.00	Former Yugoslavia	2.58	Turkey
6	2.81	Eastern Europe	2.19	Other Europe
7	2.77	Other Europe	1.97	Iraq
8	2.73	Italy	1.97	Germany
9	2.50	Unknown country of origin	1.75	Latin America and the Caribbean
10	1.89	Southern Asia	1.75	Eastern Europe
11	1.77	Southern Europe	1.71	South Eastern Asia
12	1.42	Other Asia	1.66	Denmark
13	1.39	Other Africa	1.66	Southern Europe
14	1.31	Latin America and the Caribbean	1.45	Norway
15	1.16	Northern Africa	1.36	Islamic Republic of Iran
16	0.89	Western Asia	1.31	Other Asia
17	0.85	Greece	1.23	Poland
18	0.85	Northern America and Oceania	1.14	Southern Asia
19	0.46	Lebanon	1.05	Eastern Africa
20	0.15	Unknown immigrant background	0.96	Lebanon
21			0.96	Northern America and Oceania
22			0.92	Other Africa
23			0.83	Unknown immigrant background
24			0.79	Syrian Arab Republic
25			0.70	Western Asia
26			0.66	Northern Africa
27			0.26	Somalia

Table A.2: Ethnic makeup of the working sample in the Netherlands (left) and England (right), students-level.

	Percent	Country	Percent	Country
1	59.68	**Netherlands**	53.16	**UK**
2	5.27	Suriname	7.91	Unknown country of origin
3	5.27	Indonesia	6.54	India
4	3.46	Turkey	4.43	Ireland
5	3.46	Morocco	3.90	Pakistan
6	2.78	Netherlands Antilles	2.95	Other Europe
7	2.78	Unknown country of origin	2.74	Unknown immigrant background
8	2.29	Southern Europe	2.64	Jamaica
9	2.15	Germany	2.43	Southern Europe
10	2.00	Other Europe	2.00	Other Asia
11	1.95	Africa	1.79	Eastern Africa
12	1.90	Southern Asia	1.58	Eastern Europe
13	1.85	Other Asia	1.37	Nigeria
14	1.76	Western Europe	1.37	Other Africa
15	1.17	Northern America and Oceania	1.37	Eastern Asia
16	1.12	Latin America and the Caribbean	1.27	Northern America and Oceania
17	1.02	Western Asia	0.95	Latin America and the Caribbean
18	0.10	Unknown immigrant background	0.53	Bangladesh
19			0.53	Western Africa
20			0.53	Southern Asia

A.2 Visualization of Ego-Level Results

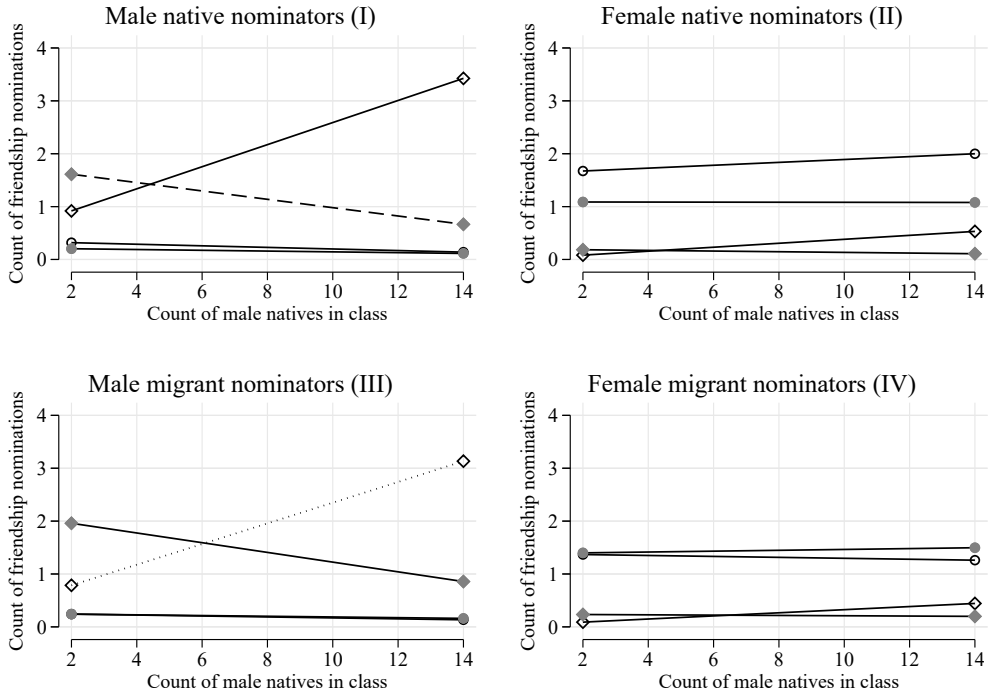


Figure A.1: OLS-prediction of count of friendship nominations on *count of male natives* for different groups of nominators (I-IV).

Source: CILS4EU, wave 1, own calculations.

Note: Circle= female friendship nominees (to females), Diamond= to males, Hollow= to natives, Filled gray= to migrants. Data are pooled over country and school classes. Regressions contain class-level controls for counts for male natives, male migrant, female natives, female migrants, diversity within migrants, and the four countries with England as a reference category. Dashed line indicates "compensation", dotted line indicates "attraction".

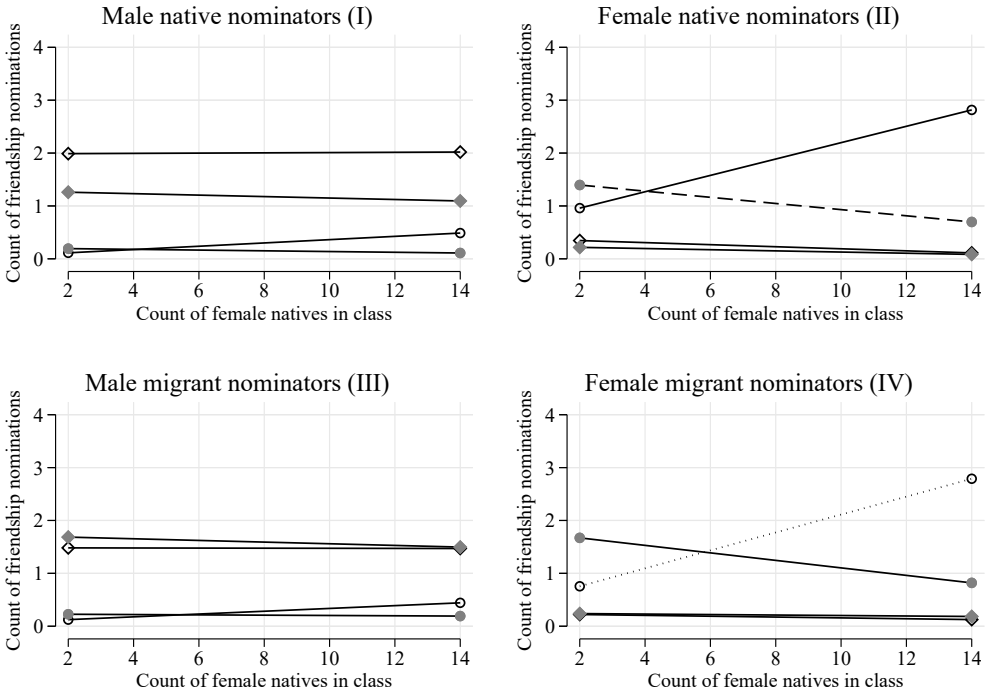


Figure A.2: OLS-prediction of count of friendship nominations on *count of female natives* for different groups of nominators (I-IV).

Source: CILS4EU, wave 1, own calculations.

Note: Circle= female friendship nominees (to females), Diamond= to males, Hollow= to natives, Filled gray= to migrants. Data are pooled over country and school classes. Regressions contain class-level controls for counts for male natives, male migrant, female natives, female migrants, diversity within migrants, and the four countries with England as a reference category. Dashed line indicates "compensation", dotted line indicates "attraction".

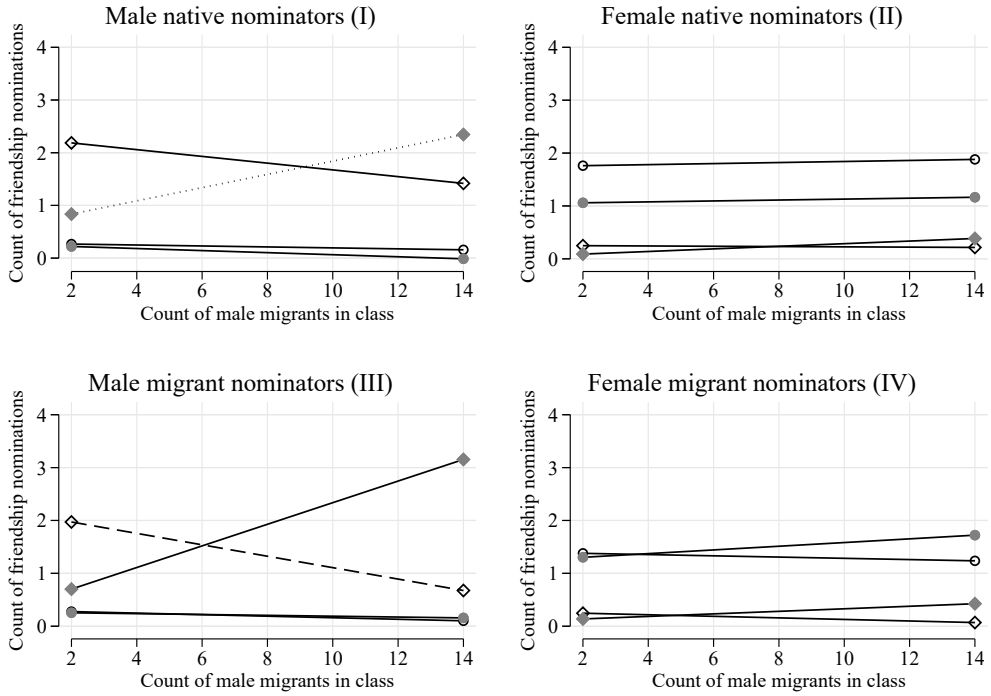


Figure A.3: OLS-prediction of count of friendship nominations on *count of male migrants* for different groups of nominators (I-IV).

Source: CILS4EU, wave 1, own calculations.

Note: Circle= female friendship nominees (to females), Diamond= to males, Hollow= to natives, Filled gray= to migrants. Data are pooled over country and school classes. Regressions contain class-level controls for counts for male natives, male migrant, female natives, female migrants, diversity within migrants, and the four countries with England as a reference category. Dashed line indicates "compensation", dotted line indicates "attraction".

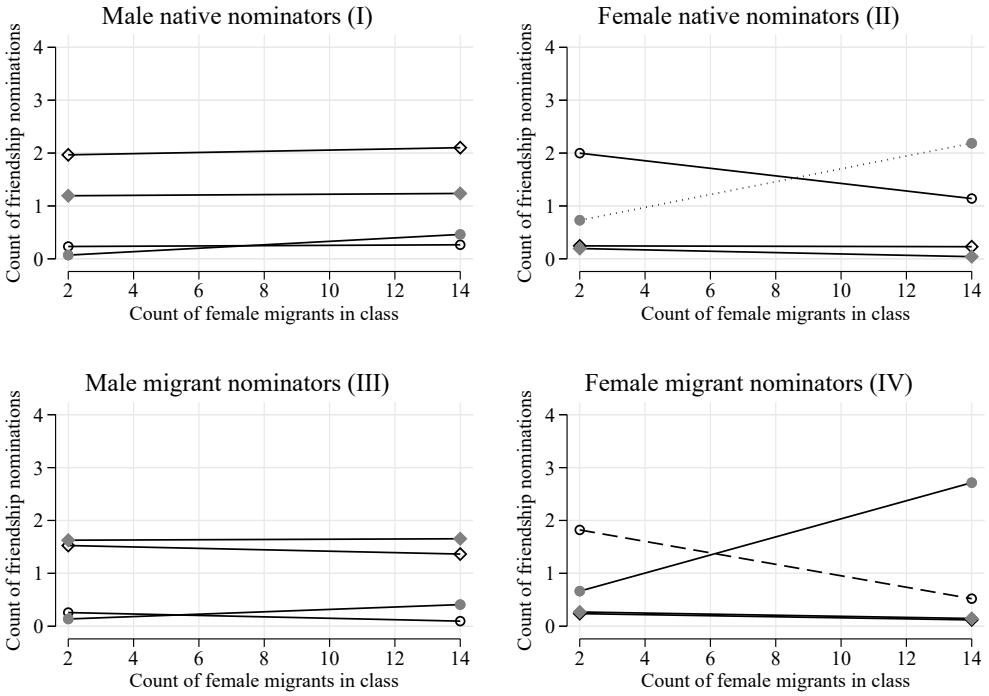


Figure A.4: OLS-prediction of count of friendship nominations on *count of female migrants* for different groups of nominators (I-IV).

Source: CILS4EU, wave 1, own calculations.

Note: Circle= female friendship nominees (to females), Diamond= to males, Hollow= to natives, Filled gray= to migrants. Data are pooled over country and school classes. Regressions contain class-level controls for counts for male natives, male migrant, female natives, female migrants, diversity within migrants, and the four countries with England as a reference category. Dashed line indicates "compensation", dotted line indicates "attraction".

A.3 Firthlogit – Testing Multidimensional Homophily

Table A.3: Firthlogit regression predicting friendship tie (pooled, dyad-level) .

Same gender	2.20***
	(.03)
Same ethnic	.10**
	(.04)
Same gender × Same ethnic	.12**
	(.04)
Share of males	.29***
	(.06)
Share of natives	.15**
	(.05)
Migrant diversity	.05
	(.07)
Class size	−.05***
	(.00)
England (ref.)	
- Germany	.33***
	(.02)
- The Netherlands	.21***
	(.03)
- Sweden	.24***
	(.03)
Constant	−2.68***
	(.08)
N	174,016

Source: CILS4EU, wave 1, own calculations.

Notes: Data in dyad format.

Standard errors in parentheses.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table A.4: Contrasts of predicted probabilities for gender-ethnicity combinations.

	b	se	z	pvalue
(0 1) vs (0 0)	.004	.001	2.907	.0219
(1 0) vs (0 0)	.219	.002	93.537	.0000
(1 1) vs (0 0)	.264	.002	113.863	.0000
(1 0) vs (0 1)	.216	.002	92.185	.0000
(1 1) vs (0 1)	.260	.002	112.600	.0000
(1 1) vs (1 0)	.044	.003	14.716	.0000

Source: CILS4EU, wave 1, own calculations

Note: The double (X Y) represents two dummy indicators. X for same gender and Y for same ethnicity. For example, (0 1) means different gender, but same ethnicity. Multiple comparisons are bonferroni-corrected (two-sided test).

A.4 OLS – Predicting Count of Outgoing Ties

Table A.5: Pooled OLS predicting (I) male natives' count of friendship nominations towards different groups A-D.

	A Male natives	B Female natives	C Male migrants	D Female migrants
Count of male natives (β_1)	.21***	−.01*	−.08***	−.01
	(.01)	(.01)	(.01)	(.01)
Count of male migrants (β_2)	−.06***	−.01	.13***	−.02**
	(.01)	(.01)	(.01)	(.01)
Count of female natives (β_3)	.00	.03***	−.01	−.01
	(.01)	(.01)	(.01)	(.00)
Count of female migrants (β_4)	.01	.00	.00	.03***
	(.02)	(.01)	(.01)	(.01)
Migrant diversity	−.16	−.13	−.10	.15
	(.34)	(.13)	(.30)	(.10)
England (ref.)				
- Germany	.36***	−.02	.44***	.01
	(.10)	(.06)	(.09)	(.04)
- The Netherlands	.27*	−.13*	.30***	−.03
	(.11)	(.06)	(.08)	(.03)
- Sweden	.59***	−.14*	−.08	−.12**
	(.11)	(.06)	(.09)	(.04)
Constant	.51	.37**	1.10***	.11
	(.31)	(.13)	(.26)	(.10)
N	2,102	2,102	2,102	2,102
adj. R2	.239	.038	.221	.044

Source: CILS4EU, wave 1, own calculations.

Notes: Pooled OLS with clustered standard errors (by class) in parentheses.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table A.6: Pooled OLS predicting (II) female natives' count of friendship nominations towards different groups A-D.

	A Male natives	B Female natives	C Male migrants	D Female migrants
Count of male natives (β_1)	.04***	.03*	−.01	−.00
	(.01)	(.01)	(.00)	(.01)
Count of male migrants (β_2)	−.00	.01	.02***	.01
	(.01)	(.01)	(.01)	(.01)
Count of female natives (β_3)	−.02***	.15***	−.01**	−.06***
	(.01)	(.02)	(.00)	(.01)
Count of female migrants (β_4)	−.00	−.07***	−.01*	.12***
	(.01)	(.01)	(.01)	(.01)
Migrant diversity	−.12	−.09	.10	−.08
	(.15)	(.34)	(.08)	(.26)
England (ref.)				
- Germany	−.02	.83***	.00	.35***
	(.05)	(.17)	(.04)	(.08)
- The Netherlands	−.04	.74***	−.01	.26***
	(.05)	(.19)	(.04)	(.07)
- Sweden	−.10	.73***	−.13***	−.15
	(.05)	(.16)	(.04)	(.08)
Constant	.31*	.19	.19*	.80***
	(.13)	(.29)	(.09)	(.21)
N	2,050	2,050	2,050	2,050
adj. R2	.042	.255	.040	.200

Source: CILS4EU, wave 1, own calculations.

Notes: Pooled OLS with clustered standard errors (by class) in parentheses.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table A.7: Pooled OLS predicting (III) male migrants' count of friendship nominations towards different groups A-D.

	A Male natives	B Female natives	C Male migrants	D Female migrants
Count of male natives (β_1)	.20***	−.01	−.09***	−.01
	(.01)	(.01)	(.02)	(.01)
Count of male migrants (β_2)	−.11***	−.01*	.20***	−.01
	(.01)	(.01)	(.02)	(.01)
Count of female natives (β_3)	−.00	.03***	−.02	−.00
	(.01)	(.01)	(.01)	(.01)
Count of female migrants (β_4)	−.01	−.01*	.00	.02***
	(.01)	(.01)	(.02)	(.01)
Migrant diversity	.47	.08	−.71*	−.41*
	(.34)	(.13)	(.32)	(.21)
England (ref.)				
- Germany	.27**	−.05	.49**	−.02
	(.09)	(.05)	(.15)	(.05)
- The Netherlands	.26*	−.04	.13	−.01
	(.11)	(.05)	(.16)	(.06)
- Sweden	.36**	−.13*	−.09	−.10
	(.11)	(.05)	(.16)	(.06)
Constant	.55	.29*	1.26***	.56**
	(.29)	(.14)	(.33)	(.18)
N	1,869	1,869	1,869	1,869
adj. R2	.275	.041	.332	.026

Source: CILS4EU, wave 1, own calculations.

Notes: Pooled OLS with clustered standard errors (by class) in parentheses.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table A.8: Pooled OLS predicting (IV) female migrants' count of friendship nominations towards different groups A-D.

	A Male natives	B Female natives	C Male migrants	D Female migrants
Count of male natives (β_1)	.03***	−.01	−.00	.01
	(.01)	(.01)	(.01)	(.02)
Count of male migrants (β_2)	−.01**	−.01	.02***	.03*
	(.01)	(.01)	(.01)	(.02)
Count of female natives (β_3)	−.01	.17***	−.00	−.07***
	(.01)	(.01)	(.01)	(.01)
Count of female migrants (β_4)	−.01	−.11***	−.01	.17***
	(.01)	(.01)	(.01)	(.02)
Migrant diversity	.26**	.82***	−.25	−1.10***
	(.10)	(.24)	(.14)	(.32)
England (ref.)				
- Germany	.01	.37***	.01	.68***
	(.04)	(.10)	(.05)	(.12)
- The Netherlands	−.06	.32**	−.03	.51***
	(.05)	(.11)	(.05)	(.12)
- Sweden	−.09	.23*	−.09	.23
	(.05)	(.11)	(.05)	(.13)
Constant	.05	.31	.42**	.91**
	(.10)	(.22)	(.14)	(.31)
N	1,858	1,858	1,858	1,858
adj. R2	.036	.251	.027	.261

Source: CILS4EU, wave 1, own calculations.

Notes: Pooled OLS with clustered standard errors (by class) in parentheses.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

A.5 Metaregression

Table A.9: Metaregression, predicting P(NatMigMM=1), Equation 1.

	M1	M2	M3
Count of male natives	−.022***	−.013***	−.014***
	(.003)	(.003)	(.003)
Count of female natives	−.004	.008*	.006
	(.003)	(.003)	(.003)
Count of male migrants	−.029***	−.019***	−.022***
	(.003)	(.003)	(.003)
Count of female migrants	.001	.013***	.010**
	(.003)	(.003)	(.004)
Density		1.861***	1.667***
		(.264)	(.302)
Migrant diversity			.154*
			(.062)
- Germany			.024
			(.025)
- The Netherlands			.028
			(.024)
- Sweden			.011
			(.025)
Constant	.642***	.090	.029
	(.043)	(.088)	(.096)
I2	64.433	58.795	58.046
R2	29.514	44.237	45.234
N	352	352	352

Source: CILS4EU, wave 1, own calculations.
Note: $^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$.

Table A.10: Metaregression, predicting P(NatMigFF=1), Equation 1.

	M1	M2	M3
Count of female natives	$-.015^{***}$	$-.004$	$-.004$
	(.002)	(.002)	(.003)
Count of male natives	$-.002$	$.006^{*}$	$.005^{*}$
	(.003)	(.003)	(.003)
Count of female migrants	$-.024^{***}$	$-.012^{***}$	$-.012^{***}$
	(.003)	(.003)	(.003)
Count of male migrants	.000	$.009^{**}$	$.008^{**}$
	(.003)	(.003)	(.003)
Density		1.854^{***}	1.822^{***}
		(.220)	(.255)
Migrant diversity			.104
			(.053)
- Germany			.001
			(.022)
- The Netherlands			.015
			(.021)
- Sweden			.011
			(.022)
Constant	$.536^{***}$	$-.004$	$-.073$
	(.038)	(.073)	(.079)
I2	52.786	42.060	41.254
R2	32.285	55.652	56.751
N	352	352	352

Source: CILS4EU, wave 1, own calculations.
Note: $^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$.

Table A.11: Metaregression, predicting P(MigNatMM=1), Equation 1.

	M1	M2	M3
Count of male migrants	−.025***	−.016***	−.016***
	(.003)	(.003)	(.003)
Count of female migrants	−.001	.011**	.011**
	(.003)	(.003)	(.003)
Count of male natives	−.015***	−.006	−.006
	(.003)	(.003)	(.003)
Count of female natives	−.002	.009**	.010**
	(.003)	(.003)	(.003)
Density		1.802***	1.886***
		(.251)	(.285)
Migrant diversity			.160**
			(.060)
- Germany			−.020
			(.024)
- The Netherlands			.005
			(.023)
- Sweden			.016
			(.024)
Constant	.567***	.032	−.108
	(.042)	(.084)	(.091)
I2	61.202	54.727	53.213
R2	24.956	42.399	45.531
N	352	352	352

Source: CILS4EU, wave 1, own calculations.
Note: $^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$.

Table A.12: Metaregression, predicting P(MigNatFF=1), Equation 1.

	M1	M2	M3
Count of female migrants	−.023***	−.013***	−.015***
	(.003)	(.003)	(.003)
Count of male migrants	−.002	.005	.004
	(.003)	(.003)	(.003)
Count of female natives	−.014***	−.005	−.006*
	(.002)	(.003)	(.003)
Count of male natives	−.003	.004	.002
	(.003)	(.003)	(.003)
Density		1.543***	1.416***
		(.239)	(.274)
Migrant diversity			.159**
			(.058)
- Germany			.017
			(.024)
- The Netherlands			.033
			(.023)
- Sweden			.012
			(.023)
Constant	.540***	.090	.005
	(.040)	(.079)	(.086)
I2	55.983	50.083	48.666
R2	27.111	42.387	45.154
N	352	352	352

Source: CILS4EU, wave 1, own calculations.
Note: $^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$.

A.6 Multi-Level Regression

Table A.13: ML-Logit regressions for effect of gender availability on inter-ethnic friendship nominations in England.

	M1	M2	M3	M4
NatMigM	1.91^{***}			
NatMigF		0.81		
MigNatM			0.95^{*}	
MigNatF				1.18^{**}
L2 Effects:				
cNatM	-0.05^{***}	-0.05^{***}	-0.06^{***}	-0.04^{***}
cNatF	-0.05^{***}	-0.06^{***}	-0.05^{***}	-0.05^{***}
cMigM	-0.05^{***}	-0.05^{***}	-0.05^{***}	-0.05^{***}
cMigF	-0.04^{***}	-0.05^{***}	-0.04^{***}	-0.05^{***}
Migrant diversity	0.05	0.08	0.07	0.07
Density	0.76^{**}	0.75^{**}	0.76^{**}	0.76^{**}
Density^2	-0.06	-0.06	-0.06	-0.06
NatMigM × cNatM	-0.11^{***}			
NatMigM × cNatF	0.03			
NatMigM × cMigM	-0.07			
NatMigM × cMigF	0.01			
NatMigF × cNatF		-0.03		
NatMigF × cNatM		0.03		
NatMigF × cMigF		-0.02		
NatMigF × cMigM		0.04		
MigNatM × cMigM			-0.03	
MigNatM × cMigF			0.02	
MigNatM × cNatM			0.00	
MigNatM × cNatF			0.02	
MigNatF × cMigF				-0.05
MigNatF × cMigM				0.02
MigNatF × cNatF				-0.05
MigNatF × cNatM				-0.03
Constant	-2.44^{***}	-2.36^{***}	-2.40^{***}	-2.52^{***}
N	21868	21868	21868	21868
N_{groups}	41	41	41	41
$ICC2$	$1.9e-18$	$1.3e-16$	$5.0e-18$	$4.2e-16$

Source: CILS4EU, wave 1, own calculations.

Notes: Variable cNatM means count of male natives in class, cNatF, cMigM, and cMigF accordingly.

MFNat is a dummy indicating a dyad between a native male and a native female, other dummies accordingly.

Interaction terms represent cross-level interactions.

England as reference category for countries.

All models include dummy controls for major country-specific inter-ethnic native-migrant combinations (e.g., EN->IN, IN->EN, etc.)

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table A.14: ML-Logit regressions for effect of gender availability on inter-ethnic friendship nominations in Germany.

	M1	M2	M3	M4
NatMigM	1.65***			
NatMigF		1.03***		
MigNatM			1.08***	
MigNatF				0.57
L2 Effects:				
cNatM	−0.06***	−0.06***	−0.07***	−0.06***
cNatF	−0.06***	−0.06***	−0.06***	−0.06***
cMigM	−0.06***	−0.06***	−0.06***	−0.06***
cMigF	−0.06***	−0.06***	−0.06***	−0.06***
Migrant diversity	−0.05	−0.05	−0.02	−0.00
Density	0.73	0.74	0.74	0.67
Density^2	−0.05	−0.05	−0.05	−0.04
NatMigM × cNatM	−0.08***			
NatMigM × cNatF	0.05*			
NatMigM × cMigM	−0.08***			
NatMigM × cMigF	0.05**			
NatMigF × cNatF		−0.03		
NatMigF × cNatM		0.03		
NatMigF × cMigF		−0.07***		
NatMigF × cMigM		0.07***		
MigNatM × cMigM			−0.07***	
MigNatM × cMigF			0.06***	
MigNatM × cNatM			−0.02	
MigNatM × cNatF			0.04*	
MigNatF × cMigF				−0.06**
MigNatF × cMigM				0.04*
MigNatF × cNatF				−0.02
MigNatF × cNatM				0.05*
Constant	−2.15**	−2.14**	−2.15**	−2.13**
N	57800	57800	57800	57800
N_{groups}	115	115	115	115
$ICC2$	$8.4e-19$	$7.2e-20$	$3.4e-14$	$1.1e-21$

Source: CILS4EU, wave 1, own calculations.

Notes: Variable cNatM means count of male natives in class, cNatF, cMigM, and cMigF accordingly.

MFNat is a dummy indicating a dyad between a native male and a native female, other dummies accordingly.

Interaction terms represent cross-level interactions.

England as reference category for countries.

All models include dummy controls for major country-specific inter-ethnic native-migrant combinations (e.g., DE->TR, TR->DE, etc.)

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table A.15: ML-Logit regressions for effect of gender availability on inter-ethnic friendship nominations in The Netherlands.

	M1	M2	M3	M4
NatMigM	2.08***			
NatMigF		1.27***		
MigNatM			1.80***	
MigNatF				0.33
L2 Effects:				
cNatM	−0.06***	−0.06***	−0.06***	−0.06***
cNatF	−0.05***	−0.06***	−0.05***	−0.05***
cMigM	−0.05***	−0.05***	−0.05***	−0.06***
cMigF	−0.05***	−0.06***	−0.05***	−0.06***
Migrant diversity	0.05	−0.00	0.00	−0.06
Density	0.57	0.60	0.59	0.60
Density^2	−0.03	−0.04	−0.03	−0.04
NatMigM × cNatM	−0.08***			
NatMigM × cNatF	0.01			
NatMigM × cMigM	−0.14***			
NatMigM × cMigF	0.05*			
NatMigF × cNatF		−0.05**		
NatMigF × cNatM		0.03		
NatMigF × cMigF		−0.04*		
NatMigF × cMigM		0.01		
MigNatM × cMigM			−0.10***	
MigNatM × cMigF			0.04	
MigNatM × cNatM			−0.08***	
MigNatM × cNatF			0.03	
MigNatF × cMigF				−0.04*
MigNatF × cMigM				0.07**
MigNatF × cNatF				−0.02
MigNatF × cNatM				0.06**
Constant	−2.04***	−2.03***	−2.03***	−2.00***
N	46526	46526	46526	46526
N_{groups}	89	89	89	89
$ICC2$	$1.1e-19$	$3.0e-20$	$4.9e-15$	$7.1e-18$

Source: CILS4EU, wave 1, own calculations.

Notes: Variable cNatM means count of male natives in class, cNatF, cMigM, and cMigF accordingly.

MFNat is a dummy indicating a dyad between a native male and a native female, other dummies accordingly.

Interaction terms represent cross-level interactions.

England as reference category for countries.

All models include dummy controls for major country-specific inter-ethnic native-migrant combinations (e.g., NL->ID, ID->NL, etc.)

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table A.16: ML-Logit regressions for effect of gender availability on inter-ethnic friendship nominations in Sweden.

	M1	M2	M3	M4
NatMigM	1.30***			
NatMigF		1.20***		
MigNatM			1.71***	
MigNatF				1.60***
L2 Effects:				
cNatM	−0.06***	−0.05***	−0.06***	−0.05***
cNatF	−0.05***	−0.06***	−0.05***	−0.06***
cMigM	−0.06***	−0.05***	−0.06***	−0.05***
cMigF	−0.05***	−0.06***	−0.05***	−0.05***
Migrant diversity	0.01	0.03	0.00	0.02
Density	0.59*	0.62*	0.58*	0.66**
Density^2	−0.04	−0.04	−0.03	−0.04
NatMigM × cNatM	−0.06*			
NatMigM × cNatF	0.05*			
NatMigM × cMigM	−0.06*			
NatMigM × cMigF	0.07*			
NatMigF × cNatF		−0.02		
NatMigF × cNatM		0.01		
NatMigF × cMigF		−0.07**		
NatMigF × cMigM		0.05*		
MigNatM × cMigM			−0.07*	
MigNatM × cMigF			0.00	
MigNatM × cNatM			−0.03	
MigNatM × cNatF			0.02	
MigNatF × cMigF				−0.08***
MigNatF × cMigM				0.02
MigNatF × cNatF				−0.02
MigNatF × cNatM				−0.03
Constant	−1.97***	−2.04***	−1.97***	−2.13***
N	47822	47822	47822	47822
N_{groups}	107	107	107	107
$ICC2$	$2.0e-21$	$4.3e-19$	$1.5e-18$	$8.1e-18$

Source: CILS4EU, wave 1, own calculations.

Notes: Variable cNatM means count of male natives in class, cNatF, cMigM, and cMigF accordingly.

MFNat is a dummy indicating a dyad between a native male and a native female, other dummies accordingly.

Interaction terms represent cross-level interactions.

England as reference category for countries.

All models include dummy controls for major country-specific inter-ethnic native-migrant combinations (e.g., SE->FI, IN->FI, etc.)

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table A.17: ML-Logit regressions for effect of ethnic availability on cross-gender friendship nominations in England.

	M1	M2	M3	M4
L1 Effects:				
MFNat	-2.20^{*}			
MFMig		-1.04		
FMNat			-2.72^{**}	
FMMig				-1.36
L2 Effects:				
cNatM	-0.04^{***}	-0.05^{***}	-0.05^{***}	-0.05^{***}
cMigM	-0.06^{***}	-0.06^{***}	-0.06^{***}	-0.05^{***}
cNatF	-0.05^{***}	-0.05^{***}	-0.05^{***}	-0.05^{***}
cMigF	-0.06^{***}	-0.05^{***}	-0.05^{***}	-0.05^{***}
Migrant diversity	0.05	0.13	0.03	0.13
Density	0.88^{***}	0.74^{**}	0.81^{***}	0.74^{**}
Density^2	-0.08^{*}	-0.06	-0.07	-0.06
L1 × L2 Interactions:				
MFNat × cNatM	-0.05			
MFNat × cMigM	0.06			
MFNat × cNatF	0.09			
MFNat × cMigF	0.10			
MFMig × cMigM		0.04		
MFMig × cNatM		0.10		
MFMig × cMigF		-0.08		
MFMig × cNatF		-0.18		
FMNat × cNatF			-0.04	
FMNat × cMigF			0.06	
FMNat × cNatM			0.09	
FMNat × cMigM			0.14	
FMMig × cMigF				0.05
FMMig × cNatF				-0.12
FMMig × cMigM				-0.04
FMMig × cNatM				0.07
Constant	-2.51^{***}	-2.46^{***}	-2.40^{***}	-2.45^{***}
Constant	-0.46	-0.38	-0.68	-0.62
Constant	-18.94	-18.51	-18.70	-22.24
N	21868	21868	21868	21868
N_{groups}	41	41	41	41
$ICC2$	$1.1e-17$	$2.6e-17$	$1.7e-17$	$1.5e-20$

Source: CILS4EU, wave 1, own calculations.

Notes: Variable cNatM means count of male natives in class, cNatF, cMigM, and cMigF accordingly.

MFNat is a dummy indicating a dyad between a native male and a native female, other dummies accordingly.

Interaction terms represent cross-level interactions.

England as reference category for countries.

All models include dummy controls for major country-specific inter-ethnic native-migrant combinations (e.g., EN->IN, IN->EN, etc.)

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table A.18: ML-Logit regressions for effect of ethnic availability on cross-gender friendship nominations in Germany.

	M1	M2	M3	M4
L1 Effects:				
MFNat	−1.08			
MFMig		−0.97		
FMNat			−0.88	
FMMig				−1.93**
L2 Effects:				
cNatM	−0.06***	−0.05***	−0.06***	−0.06***
cMigM	−0.06***	−0.07***	−0.06***	−0.07***
cNatF	−0.05***	−0.05***	−0.05***	−0.05***
cMigF	−0.06***	−0.06***	−0.06***	−0.06***
Migrant diversity	−0.01	0.21	−0.01	0.20
Density	0.72	0.91*	0.79	0.85*
Density^2	−0.05	−0.07	−0.06	−0.07
L1 × L2 Interactions:				
MFNat × cNatM	−0.06			
MFNat × cMigM	−0.01			
MFNat × cNatF	−0.03			
MFNat × cMigF	0.02			
MFMig × cMigM		−0.07		
MFMig × cNatM		−0.04		
MFMig × cMigF		−0.08*		
MFMig × cNatF		0.02		
FMNat × cNatF			−0.09*	
FMNat × cMigF			0.02	
FMNat × cNatM			−0.07	
FMNat × cMigM			0.02	
FMMig × cMigF				−0.07
FMMig × cNatF				0.05
FMMig × cMigM				−0.02
FMMig × cNatM				0.04
Constant	−2.16**	−2.73***	−2.29**	−2.60***
N	57800	57800	57800	57800
N_{groups}	115	115	115	115
$ICC2$	$6.0e-15$	$3.2e-16$	$5.8e-14$	$9.7e-22$

Source: CILS4EU, wave 1, own calculations.

Notes: Variable cNatM means count of male natives in class, cNatF, cMigM, and cMigF accordingly.

MFNat is a dummy indicating a dyad between a native male and a native female, other dummies accordingly.

Interaction terms represent cross-level interactions.

England as reference category for countries.

All models include dummy controls for major country-specific inter-ethnic native-migrant combinations (e.g., DE->TR, TR->DE, etc.)

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table A.19: ML-Logit regressions for effect of ethnic availability on cross-gender friendship nominations in The Netherlands.

	M1	M2	M3	M4
L1 Effects:				
MFNat	-2.19^{*}			
MFMig		-1.67		
FMNat			-2.43^{**}	
FMMig				-0.81
L2 Effects:				
cNatM	-0.05^{***}	-0.06^{***}	-0.06^{***}	-0.05^{***}
cMigM	-0.06^{***}	-0.06^{***}	-0.06^{***}	-0.06^{***}
cNatF	-0.05^{***}	-0.05^{***}	-0.05^{***}	-0.05^{***}
cMigF	-0.06^{***}	-0.06^{***}	-0.06^{***}	-0.06^{***}
Migrant diversity	-0.05	0.06	-0.02	0.07
Density	0.53	0.70^{*}	0.59	0.74^{*}
Density^2	-0.02	-0.05	-0.03	-0.05
L1 × L2 Interactions:				
MFNat × cNatM	0.05			
MFNat × cMigM	-0.09			
MFNat × cNatF	-0.03			
MFNat × cMigF	0.03			
MFMig × cMigM		0.06		
MFMig × cNatM		-0.01		
MFMig × cMigF		-0.10		
MFMig × cNatF		0.02		
FMNat × cNatF			-0.03	
FMNat × cMigF			0.09	
FMNat × cNatM			0.07	
FMNat × cMigM			-0.06	
FMMig × cMigF				-0.04
FMMig × cNatF				-0.05
FMMig × cMigM				-0.06
FMMig × cNatM				-0.03
Constant	-1.79^{**}	-2.24^{***}	-1.89^{***}	-2.31^{***}
N	46526	46526	46526	46526
N_{groups}	89	89	89	89
$ICC2$	$1.1e-16$	$7.5e-22$	$4.6e-19$	$8.5e-17$

Source: CILS4EU, wave 1, own calculations.

Notes: Variable cNatM means count of male natives in class, cNatF, cMigM, and cMigF accordingly.

MFNat is a dummy indicating a dyad between a native male and a native female, other dummies accordingly.

Interaction terms represent cross-level interactions.

England as reference category for countries.

All models include dummy controls for major country-specific inter-ethnic native-migrant combinations (e.g., NL->ID, ID->NL, etc.)

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table A.20: ML-Logit regressions for effect of ethnic availability on cross-gender friendship nominations in Sweden.

	M1	M2	M3	M4
L1 Effects:				
MFNat	−1.02			
MFMig		−2.99**		
FMNat			−1.02	
FMMig				−1.38
L2 Effects:				
cNatM	−0.05***	−0.06***	−0.05***	−0.06***
cMigM	−0.07***	−0.06***	−0.06***	−0.06***
cNatF	−0.05***	−0.06***	−0.05***	−0.06***
cMigF	−0.07***	−0.07***	−0.07***	−0.06***
Migrant diversity	0.01	0.08	0.02	0.06
Density	0.63*	0.50*	0.60*	0.53*
Density^2	−0.04	−0.02	−0.04	−0.03
L1 × L2 Interactions:				
MFNat × cNatM	−0.23**			
MFNat × cMigM	−0.04			
MFNat × cNatF	0.01			
MFNat × cMigF	0.05			
MFMig × cMigM		−0.09		
MFMig × cNatM		−0.02		
MFMig × cMigF		0.14		
MFMig × cNatF		0.06		
FMNat × cNatF			−0.15*	
FMNat × cMigF			−0.06	
FMNat × cNatM			−0.02	
FMNat × cMigM			0.00	
FMMig × cMigF				0.08
FMMig × cNatF				−0.00
FMMig × cMigM				−0.22***
FMMig × cNatM				0.00
Constant	−1.95***	−1.79***	−1.90***	−1.85***
N	47822	47822	47822	47822
N_{groups}	107	107	107	107
$ICC2$	$9.3e-19$	$5.8e-22$	$1.2e-21$	$1.3e-15$

Source: CILS4EU, wave 1, own calculations.

Notes: Variable cNatM means count of male natives in class, cNatF, cMigM, and cMigF accordingly.
MFNat is a dummy indicating a dyad between a native male and a native female, other dummies accordingly.
Interaction terms represent cross-level interactions.
England as reference category for countries.
All models include dummy controls for major country-specific inter-ethnic native-migrant combinations (e.g., SE->FI, FI->SE, etc.)
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Appendix B

Appendix Chapter 3

B.1 Tables Ego-Level - Countries Pooled

Table B.1: OLS for SES (pooled).

	Count of friendship towards	
	Natives	Migrants
Migrant (ref.)		
- Native	0.459***	−0.312***
ISEI	0.005***	−0.002**
Native X ISEI	−0.003**	0.004***
2nd generation migrant	0.182***	−0.056
Class size	0.026***	0.018***
Migrant diversity (class)	−0.123	−0.148*
Share of natives (class)	3.467***	−3.529***
Migrant share in school: 0-10% (ref.)		
- 10-30%	0.038	−0.013
- 30-60%	0.011	−0.005
- 60-100%	−0.062	0.033
- independent schools (only England)	0.214*	0.120
England (ref.)		
- Germany	0.478***	0.303***
- Netherlands	0.354***	0.122***
- Sweden	0.348***	−0.066
Constant	−1.264***	3.280***
N	10,738	10,738
adj. R2	0.339	0.374

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B.2: Details on interaction of *SES* and *migrant status* from table B.1

	Count of friendship towards	
	Natives	Migrants
Migrant X SES	0.0047^{***}	-0.0024^{**}
Native X SES	0.0014	0.0013
N	10,738	10,738

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B.3: OLS for education (pooled).

	Count of friendship towards	
	Natives	Migrants
Migrant (ref.)		
- Native	0.100	-0.691^{**}
Education (w/o) (ref.)		
- Education (low)	0.074	-0.365^{**}
- Education (medium)	0.131	-0.341^{**}
- Education (high)	0.292^{*}	-0.406^{***}
Native X Education (w/o) (ref.)		
- Native X Education (low)	0.301	0.487^{*}
- Native X Education (medium)	0.251	0.556^{**}
- Native X Education (high)	0.119	0.647^{**}
Class size	0.027^{***}	0.018^{***}
Share of natives (class)	3.465^{***}	-3.527^{***}
2nd generation migrant	0.196^{***}	-0.058
Migrant diversity (class)	-0.113	-0.149^{*}
Migrant share in school: 0-10% (ref.)		
- 10-30%	0.039	-0.010
- 30-60%	0.009	-0.001
- 60-100%	-0.066	0.039
- independent schools (only England)	0.219^{*}	0.100
England (ref.)		
- Germany	0.462^{***}	0.307^{***}
- The Netherlands	0.309^{***}	0.097^{**}
- Sweden	0.324^{***}	-0.083^{*}
Constant	-1.211^{***}	3.538^{***}
N	10,738	10,738
adj. R2	0.338	0.375

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

B.2 Lowess - SES

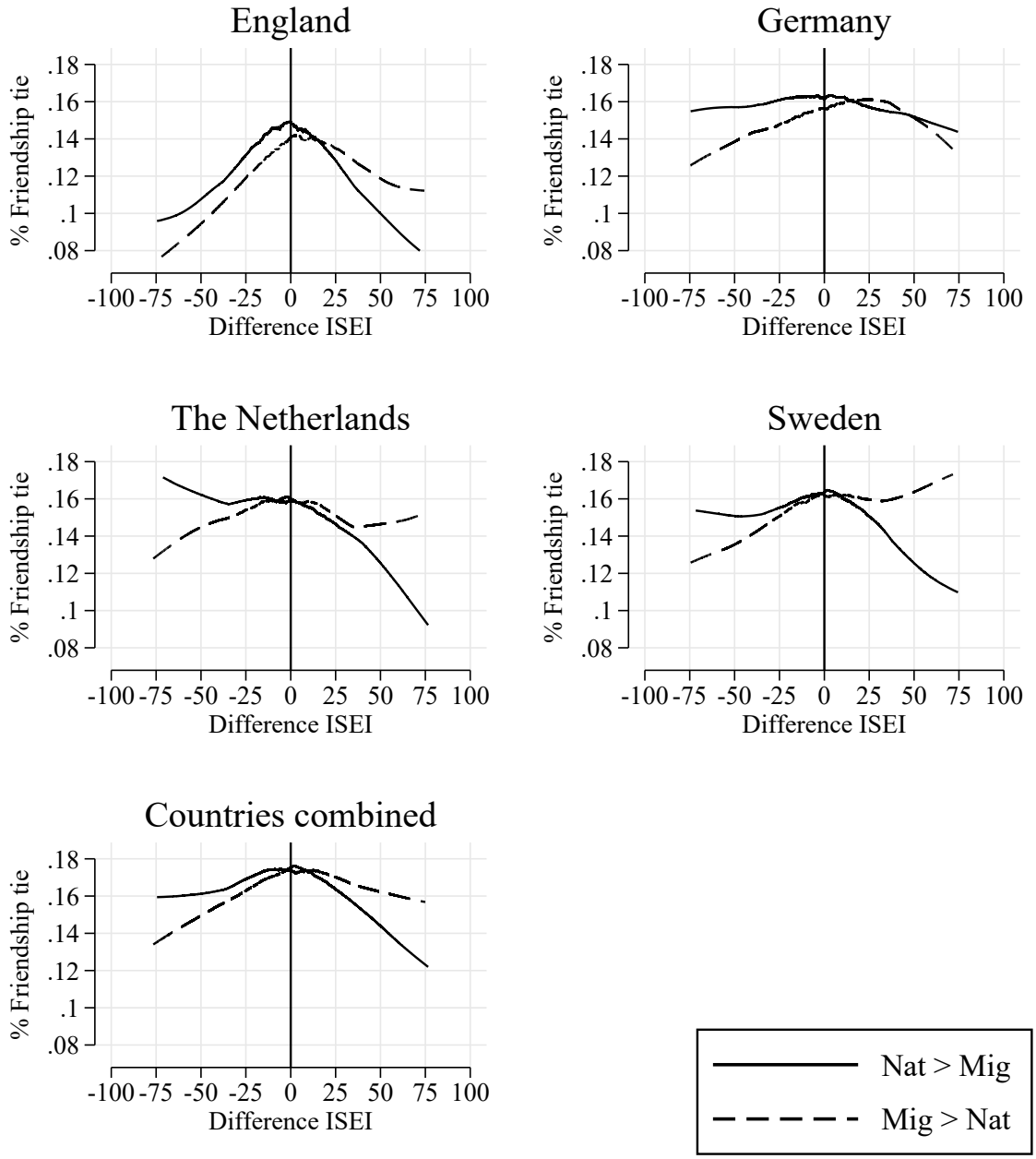


Figure B.1: Lowess for ISEI difference and inter-ethnic friendship.

Source: CILS4EU, wave 1, working sample, own calculations.

Notes: Dyadic data format. 'Difference in ISEI' means sender - receiver as denoted by legend.

B.3 Tables Multi-Level - SES

Table B.4: Multi-level-Logit regressions for ISEI (countries pooled).

	(1) linear	(2) quadratic	(3) cubic
L1 Effects			
NAT→NAT[a] (ref.)			
- NAT→MIG	−0.252***	−0.233***	−0.234***
- MIG→NAT	−0.239***	−0.231***	−0.231***
- MIG→MIG	−0.123***	−0.090*	−0.090*
ΔISEI	−0.000	−0.000	−0.000
2nd generation, sender	0.054*	0.050*	0.050*
2nd generation, receiver	0.088***	0.083***	0.083***
NAT→NAT × ΔISEI (ref.)			
- NAT→MIG × ΔISEI	−0.001	−0.001	−0.000
- MIG→NAT × ΔISEI	0.002**	0.002*	0.002
- MIG→MIG × ΔISEI	0.001	0.001	0.001
$\Delta ISEI^2$		−0.000***	−0.000***
NAT→NAT × $\Delta ISEI^2$ (ref.)			
- NAT→MIG × $\Delta ISEI^2$		−0.000	−0.000
- MIG→NAT × $\Delta ISEI^2$		−0.000	−0.000
- MIG→MIG × $\Delta ISEI^2$		−0.000	−0.000
$\Delta ISEI^3$			−0.000
NAT→NAT × $\Delta ISEI^3$ (ref.)			
- NAT→MIG × $\Delta ISEI^3$			−0.000
- MIG→NAT × $\Delta ISEI^3$			−0.000
- MIG→MIG × $\Delta ISEI^3$			−0.000
L2 Effects			
Migrant diversity, class	0.054	0.046	0.046
Migrant diversity^2, class	−0.034	−0.031	−0.030
Share of migrants, class	0.403**	0.403**	0.403**
Share of migrants^2, class	−0.410**	−0.406**	−0.406**
NW density, class	6.668***	6.652***	6.652***
Class size	0.044***	0.044***	0.044***
Class size^2	−0.001***	−0.001***	−0.001***
Migrant share in school: 0-10% (ref.)			
- 10-30%	0.003	0.002	0.002
- 30-60%	0.006	0.007	0.007
- 60-100%	0.007	0.007	0.007
- independent schools (only England)	0.012	−0.010	−0.010
England (ref.)			
- Germany	0.023	0.016	0.016
- Netherlands	0.019	0.015	0.015
- Sweden	0.023	0.022	0.022
Constant	−3.252***	−3.217***	−3.217***
N	228,070	228,070	228,070
$N_{classes}$	505	505	505
ICC2	0.000	0.000	0.000
LR(χ^2)		79	1
LR(df)		4	4
LR(p)		0.0000	0.9638

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

[a] NAT= Native, MIG= Migrant.

Table B.5: Multi-level-Logit regressions for ISEI (England).

	(1) linear	(2) quadratic	(3) cubic
L1 Effects			
NAT→NAT[a] (ref.)			
- NAT→MIG	−0.383***	−0.283***	−0.282***
- MIG→NAT	−0.343***	−0.268***	−0.270***
- MIG→MIG	−0.274***	−0.250**	−0.250**
ΔISEI	−0.001	−0.001	0.001
2nd generation, sender	0.126*	0.128*	0.129*
2nd generation, receiver	0.230***	0.233***	0.232***
NAT→NAT × ΔISEI (ref.)			
- NAT→MIG × ΔISEI	0.001	0.000	−0.001
- MIG→NAT × ΔISEI	0.003	0.003	0.002
- MIG→MIG × ΔISEI	−0.001	−0.001	−0.004
$\Delta ISEI^2$		0.000	0.000
NAT→NAT × $\Delta ISEI^2$ (ref.)			
- NAT→MIG × $\Delta ISEI^2$		−0.000**	−0.000**
- MIG→NAT × $\Delta ISEI^2$		−0.000*	−0.000*
- MIG→MIG × $\Delta ISEI^2$		−0.000	−0.000
$\Delta ISEI^3$			−0.000
NAT→NAT × $\Delta ISEI^3$ (ref.)			
- NAT→MIG × $\Delta ISEI^3$			0.000
- MIG→NAT × $\Delta ISEI^3$			0.000
- MIG→MIG × $\Delta ISEI^3$			0.000
L2 Effects			
Migrant diversity, class	0.119	0.143	0.143
Migrant diversity^2, class	0.038	0.001	0.001
Share of migrants, class	0.567	0.570	0.571
Share of migrants^2, class	−0.359	−0.373	−0.374
NW density, class	7.405***	7.331***	7.332***
Class size	0.047*	0.047*	0.047*
Class size^2	−0.001*	−0.001*	−0.001*
Migrant share in school: 0-10% (ref.)			
- 10-30%	0.044	0.047	0.047
- 30-60%	0.090	0.095	0.095
- 60-100%	0.134	0.137	0.137
- independent schools (only England)	0.050	0.034	0.034
Constant	−3.609***	−3.592***	−3.592***
N	35,070	35,070	35,070
$N_{classes}$	79	79	79
ICC2	0.000	0.000	0.000
LR(χ^2)		21	2
LR(df)		4	4
LR(p)		0.0003	0.7256

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

[a] NAT= Native, MIG= Migrant.

Table B.6: Multi-level-Logit regressions for ISEI (Germany).

	(1) linear	(2) quadratic	(3) cubic
L1 Effects			
NAT→NAT[a] (ref.)			
- NAT→MIG	−0.224***	−0.244***	−0.243***
- MIG→NAT	−0.269***	−0.283***	−0.278***
- MIG→MIG	−0.000	0.018	0.018
ΔISEI	0.001	0.001	0.000
2nd generation, sender	0.023	0.019	0.018
2nd generation, receiver	0.021	0.017	0.017
NAT→NAT × ΔISEI (ref.)			
- NAT→MIG × ΔISEI	−0.001	−0.001	−0.001
- MIG→NAT × ΔISEI	0.001	0.001	0.003
- MIG→MIG × ΔISEI	0.001	0.001	0.002
$\Delta ISEI^2$		−0.000**	−0.000**
NAT→NAT × $\Delta ISEI^2$ (ref.)			
- NAT→MIG × $\Delta ISEI^2$		0.000	0.000
- MIG→NAT × $\Delta ISEI^2$		0.000	0.000
- MIG→MIG × $\Delta ISEI^2$		−0.000	−0.000
$\Delta ISEI^3$			0.000
NAT→NAT × $\Delta ISEI^3$ (ref.)			
- NAT→MIG × $\Delta ISEI^3$			−0.000
- MIG→NAT × $\Delta ISEI^3$			−0.000
- MIG→MIG × $\Delta ISEI^3$			−0.000
L2 Effects			
Migrant diversity, class	0.071	0.073	0.071
Migrant diversity^2, class	−0.061	−0.064	−0.064
Share of migrants, class	0.618*	0.624*	0.626*
Share of migrants^2, class	−0.578*	−0.577*	−0.580*
NW density, class	6.142***	6.156***	6.161***
Class size	0.034	0.037	0.037
Class size^2	−0.001	−0.001	−0.001
Migrant share in school: 0-10% (ref.)			
- 10-30%	−0.002	−0.003	−0.003
- 30-60%	−0.003	−0.004	−0.003
- 60-100%	−0.001	−0.001	−0.000
Constant	−3.070***	−3.072***	−3.073***
N	71,268	71,268	71,268
$N_{classes}$	153	153	153
ICC2	0.000	0.000	0.000
LR(χ^2)		22	2
LR(df)		4	4
LR(p)		0.0002	0.7804

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

[a] NAT= Native, MIG= Migrant.

Table B.7: Multi-level-Logit regressions for ISEI (Netherlands).

	(1) linear	(2) quadratic	(3) cubic
L1 Effects			
NAT→NAT[a] (ref.)			
- NAT→MIG	−0.119*	−0.102	−0.104
- MIG→NAT	−0.136*	−0.122*	−0.124*
- MIG→MIG	−0.031	0.010	0.010
ΔISEI	−0.000	−0.000	−0.000
2nd generation, sender	0.024	0.016	0.016
2nd generation, receiver	−0.003	−0.011	−0.011
NAT→NAT × ΔISEI (ref.)			
- NAT→MIG × ΔISEI	−0.003*	−0.002*	−0.001
- MIG→NAT × ΔISEI	0.001	0.000	−0.000
- MIG→MIG × ΔISEI	0.000	0.000	−0.000
$\Delta ISEI^2$		−0.000*	−0.000*
NAT→NAT × $\Delta ISEI^2$ (ref.)			
- NAT→MIG × $\Delta ISEI^2$		−0.000	−0.000
- MIG→NAT × $\Delta ISEI^2$		−0.000	−0.000
- MIG→MIG × $\Delta ISEI^2$		−0.000	−0.000
$\Delta ISEI^3$			0.000
NAT→NAT × $\Delta ISEI^3$ (ref.)			
- NAT→MIG × $\Delta ISEI^3$			−0.000
- MIG→NAT × $\Delta ISEI^3$			0.000
- MIG→MIG × $\Delta ISEI^3$			0.000
L2 Effects			
Migrant diversity, class	0.000	−0.013	−0.011
Migrant diversity^2, class	0.007	0.026	0.024
Share of migrants, class	0.361	0.329	0.328
Share of migrants^2, class	−0.327	−0.293	−0.292
NW density, class	6.536***	6.539***	6.537***
Class size	0.039	0.038	0.038
Class size^2	−0.001	−0.001	−0.001
Migrant share in school: 0-10% (ref.)			
- 10-30%	0.000	−0.002	−0.001
- 30-60%	0.002	0.004	0.004
- 60-100%	0.008	0.011	0.011
Constant	−3.167***	−3.132***	−3.130***
N	68,038	68,038	68,038
$N_{classes}$	147	147	147
ICC2	0.000	0.000	0.000
LR(χ^2)		16	1
LR(df)		4	4
LR(p)		0.0033	0.8528

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

[a] NAT= Native, MIG= Migrant.

Table B.8: Multi-level-Logit regressions for ISEI (Sweden).

	(1) linear	(2) quadratic	(3) cubic
L1 Effects			
NAT→NAT[a] (ref.)			
- NAT→MIG	−0.356***	−0.333***	−0.334***
- MIG→NAT	−0.264***	−0.270***	−0.271***
- MIG→MIG	−0.329***	−0.288***	−0.288***
ΔISEI	−0.001	−0.002*	−0.002
2nd generation, sender	0.080	0.072	0.072
2nd generation, receiver	0.177***	0.167***	0.166***
NAT→NAT × ΔISEI (ref.)			
- NAT→MIG × ΔISEI	−0.000	0.001	0.002
- MIG→NAT × ΔISEI	0.003**	0.003*	0.003
- MIG→MIG × ΔISEI	0.002*	0.003*	0.004
$\Delta ISEI^2$		−0.000**	−0.000**
NAT→NAT × $\Delta ISEI^2$ (ref.)			
- NAT→MIG × $\Delta ISEI^2$		−0.000	−0.000
- MIG→NAT × $\Delta ISEI^2$		0.000	0.000
- MIG→MIG × $\Delta ISEI^2$		−0.000	−0.000
$\Delta ISEI^3$			0.000
NAT→NAT × $\Delta ISEI^3$ (ref.)			
- NAT→MIG × $\Delta ISEI^3$			−0.000
- MIG→NAT × $\Delta ISEI^3$			0.000
- MIG→MIG × $\Delta ISEI^3$			−0.000
L2 Effects			
Migrant diversity, class	−0.002	−0.035	−0.037
Migrant diversity^2, class	−0.005	0.004	0.007
Share of migrants, class	0.211	0.197	0.200
Share of migrants^2, class	−0.325	−0.307	−0.310
NW density, class	6.965***	6.983***	6.985***
Class size	0.030	0.036	0.036
Class size^2	−0.001	−0.001	−0.001
Migrant share in school: 0-10% (ref.)			
- 10-30%	0.000	−0.000	0.000
- 30-60%	0.014	0.018	0.018
- 60-100%	0.021	0.019	0.019
Constant	−2.989***	−2.972***	−2.974***
N	53,694	53,694	53,694
$N_{classes}$	126	126	126
ICC2	0.000	0.000	0.000
LR(χ^2)		39	1
LR(df)		4	4
LR(p)		0.0000	0.8563

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

[a] NAT= Native, MIG= Migrant.

B.4 Table Multi-Level - Education

Table B.9: Multi-level-Logit regressions for education.

	pooled	EN	DE	NL	SE
L1 Effects					
NAT→NAT[a] (ref.)					
- NAT→MIG	−0.199**	−0.350*	−0.206	−0.086	−0.068
- MIG→NAT	−0.334***	−0.306*	−0.387**	−0.249	−0.339*
- MIG→MIG	−0.045	−0.249	0.061	0.198	−0.191
Δeduc-2 (ref.)					
- Δeduc-1	0.103*	0.164	0.082	0.007	0.218
- Δeduc 0	0.105*	0.081	0.126	0.064	0.144
- Δeduc 1	0.069	0.037	0.096	0.006	0.139
- Δeduc 2	0.052	0.091	0.043	0.018	0.025
2nd generation, sender	0.057*	0.130*	0.022	0.028	0.086
2nd generation, receiver	0.088***	0.233***	0.019	−0.001	0.178***
- NAT→MIG × Δeduc-1	−0.054	−0.193	−0.034	0.052	−0.279
- MIG→NAT × Δeduc-1	0.039	−0.230	0.166	0.091	−0.104
- MIG→MIG × Δeduc-1	−0.100	−0.129	−0.051	−0.161	−0.227
- NAT→MIG × Δeduc 0	−0.044	0.088	−0.019	−0.072	−0.262
- MIG→NAT × Δeduc 0	0.111	0.053	0.101	0.108	0.118
- MIG→MIG × Δeduc 0	−0.113	−0.029	−0.085	−0.345	−0.130
- NAT→MIG × Δeduc 1	−0.058	−0.087	0.016	−0.012	−0.377*
- MIG→NAT × Δeduc 1	0.108	−0.142	0.111	0.155	0.132
- MIG→MIG × Δeduc 1	−0.014	0.113	−0.029	−0.088	−0.117
- NAT→MIG × Δeduc 2	−0.178	−0.109	−0.097	−0.255	−0.388
- MIG→NAT × Δeduc 2	0.156	0.102	0.106	0.377	0.259
- MIG→MIG × Δeduc 2	−0.044	−0.076	−0.001	−0.042	−0.068
L2 Effects					
Migrant diversity, class	0.061	0.114	0.083	0.009	0.036
Migrant diversity^2, class	−0.038	0.046	−0.071	−0.001	−0.036
Share of migrants, class	0.411**	0.606	0.610*	0.414	0.180
Share of migrants^2, class	−0.412**	−0.386	−0.568*	−0.360	−0.291
NW density, class	6.655***	7.413***	6.144***	6.493***	6.987***
Class size	0.043***	0.045	0.037	0.039	0.028
Class size^2	−0.001***	−0.001*	−0.001	−0.001	−0.001
Migrant share, school: <10% (ref.)					
- 10-30%	0.002	0.042	−0.005	−0.002	−0.001
- 30-60%	0.006	0.090	−0.008	0.000	0.016
- 60-100%	0.004	0.135	−0.007	0.003	0.022
- independ. schools (only Engl.)	0.012	0.039			
England (ref.)					
- Germany	0.016				
- Netherlands	0.005				
- Sweden	0.014				
Constant	−3.331***	−3.689***	−3.195***	−3.219***	−3.127***
N	228,070	35,070	71,268	68,038	53,694
$N_{claseduc}$	505	79	153	147	126
ICC2	0.000	0.000	0.000	0.000	0.000

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

[a] NAT= Native, MIG= Migrant.

B.5 Subcountry Graphs - ISEI

B.5.1 Linear

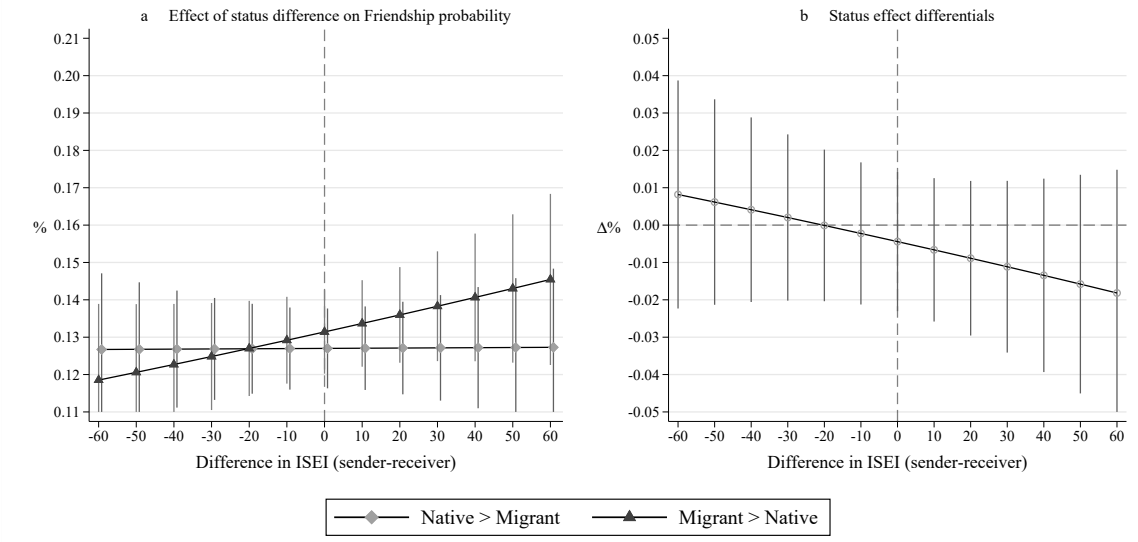


Figure B.2: Linear effect of ISEI-difference on between-group contact, England, ML-model (CILS4EU, wave 1).

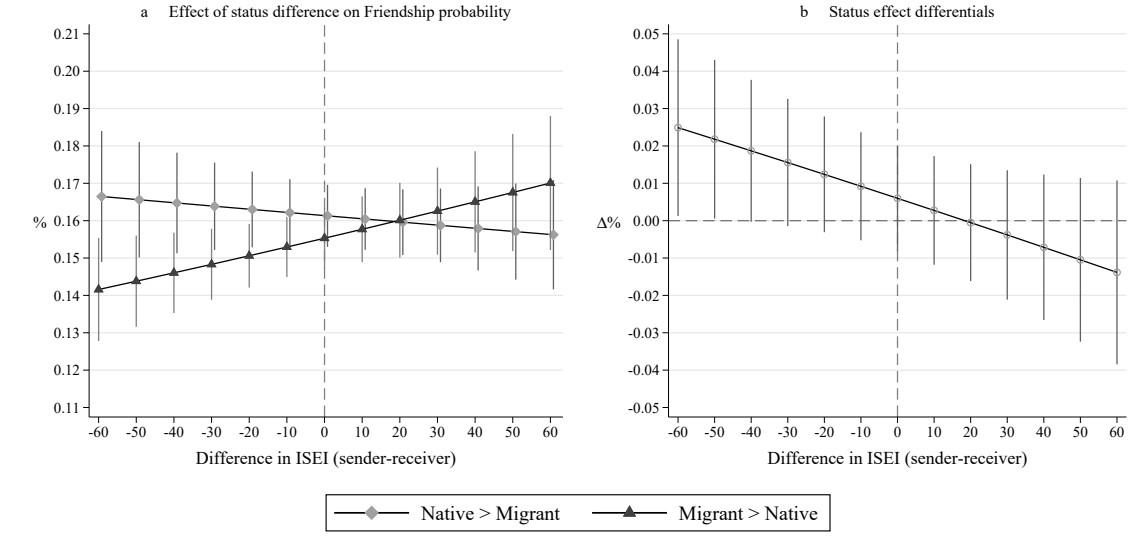


Figure B.3: Linear effect of ISEI-difference on between-group contact, Germany, ML-model (CILS4EU, wave 1).

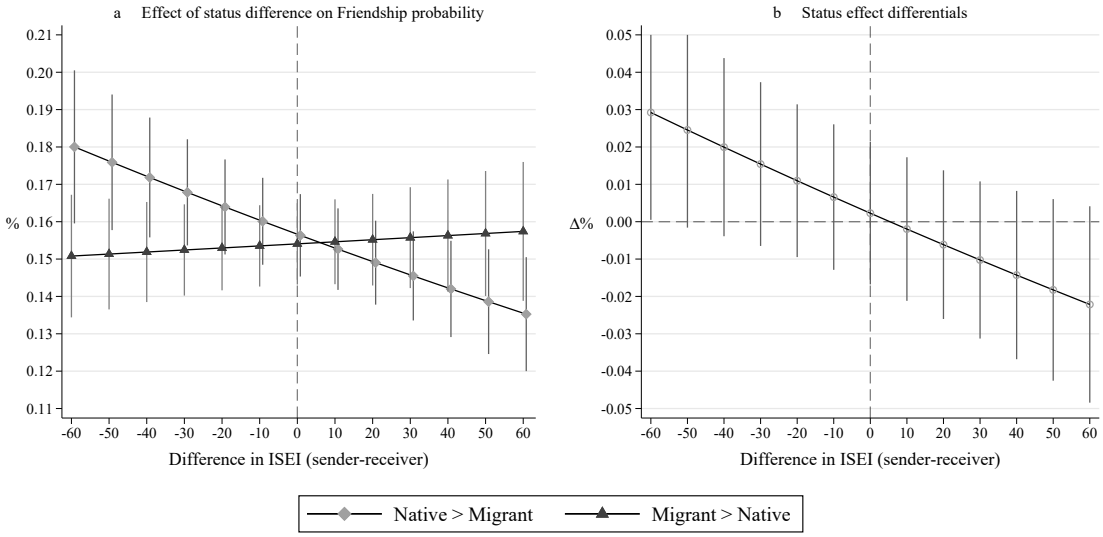


Figure B.4: Linear effect of ISEI-difference on between-group contact, Netherlands, ML-model (CILS4EU, wave 1).

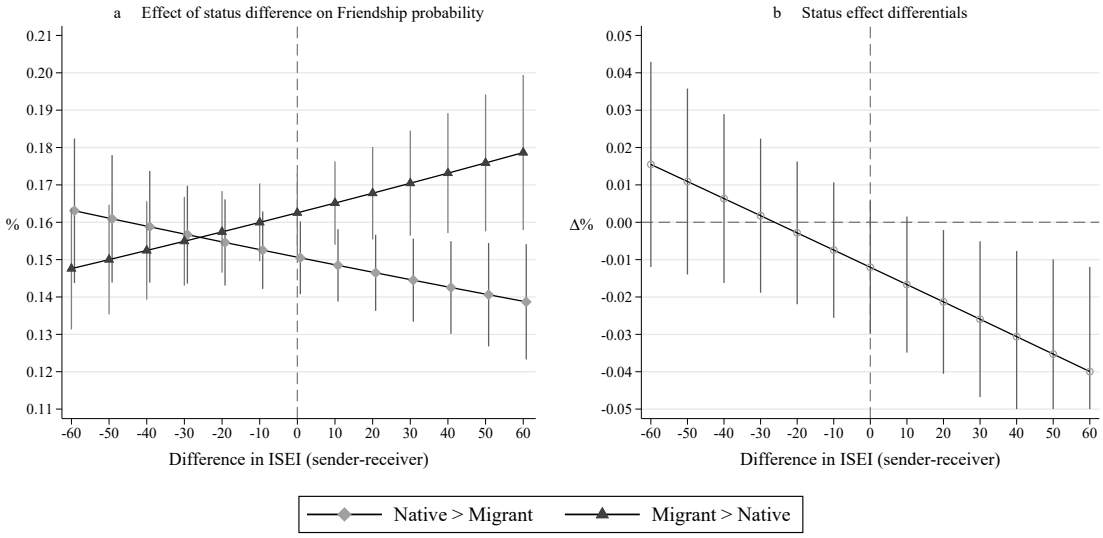


Figure B.5: Linear effect of ISEI-difference on between-group contact, Sweden, ML-model (CILS4EU, wave 1).

B.5.2 Quadratic

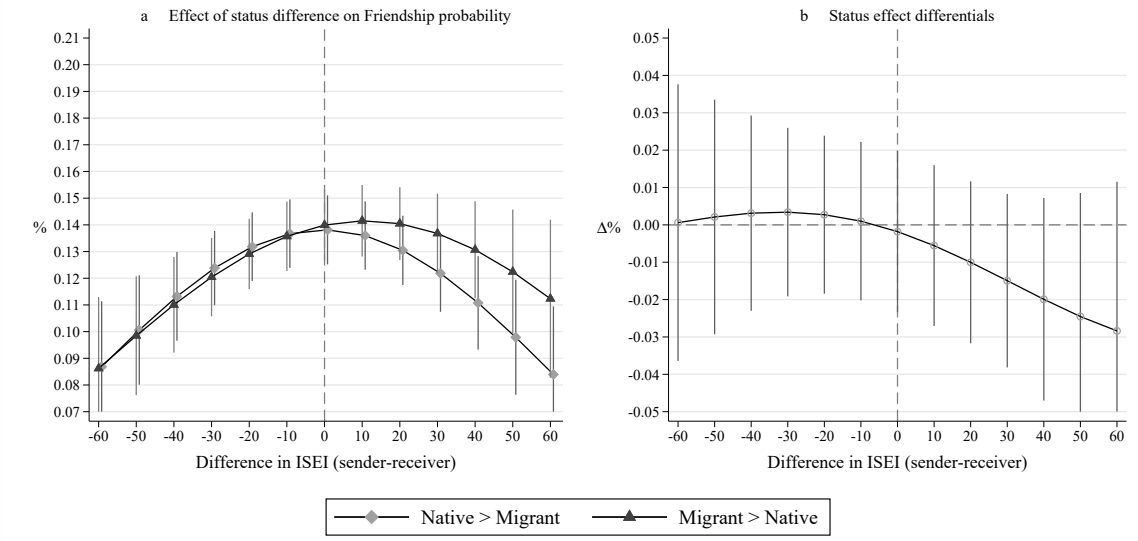


Figure B.6: Effect of ISEI-difference on between-group contact, England, ML-model (CILS4EU, wave 1).

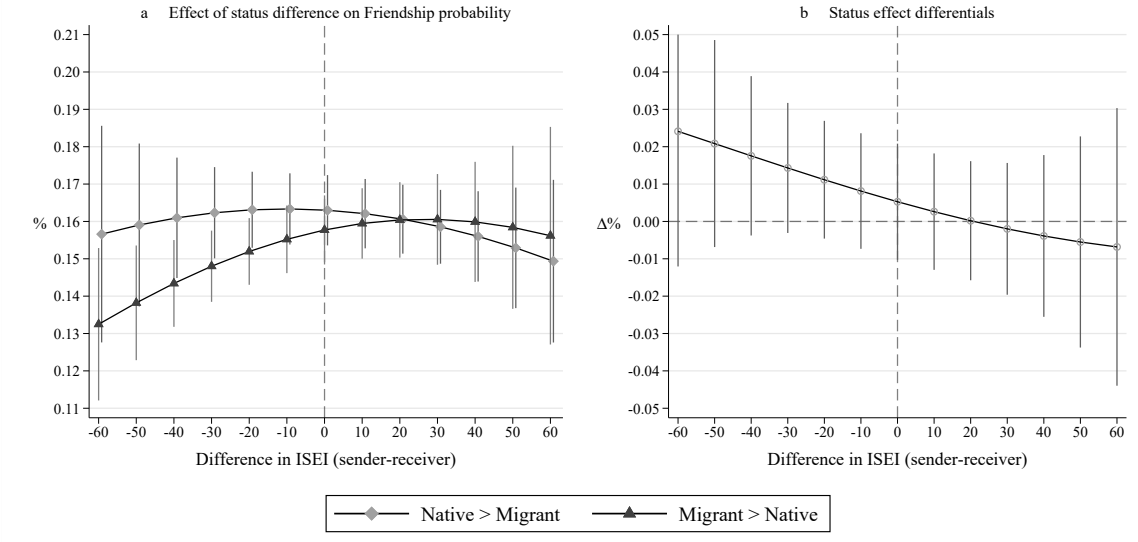


Figure B.7: Effect of ISEI-difference on between-group contact, Germany, ML-model (CILS4EU, wave 1).

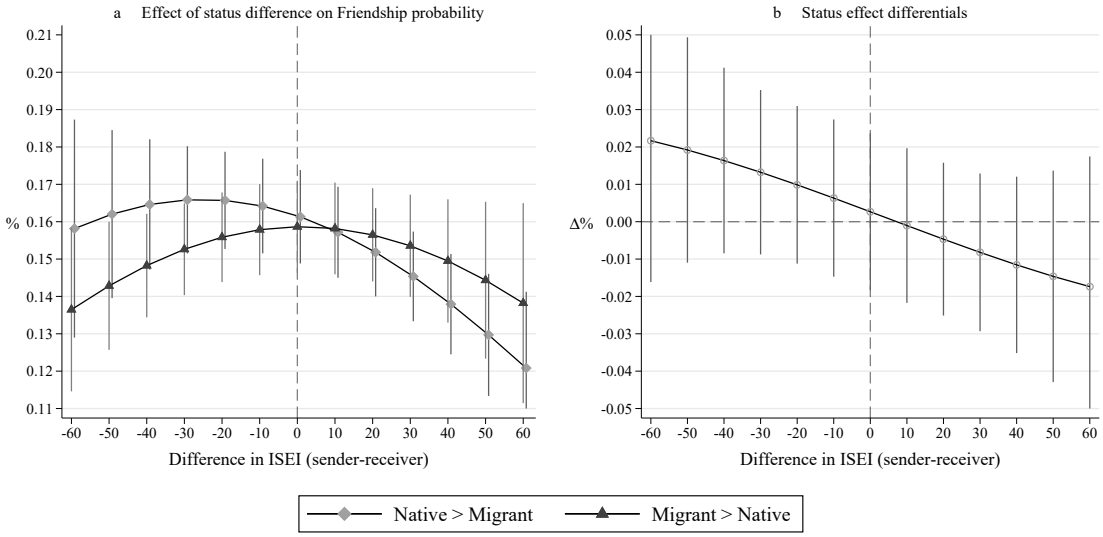


Figure B.8: Effect of ISEI-difference on between-group contact, Netherlands, ML-model (CILS4EU, wave 1).

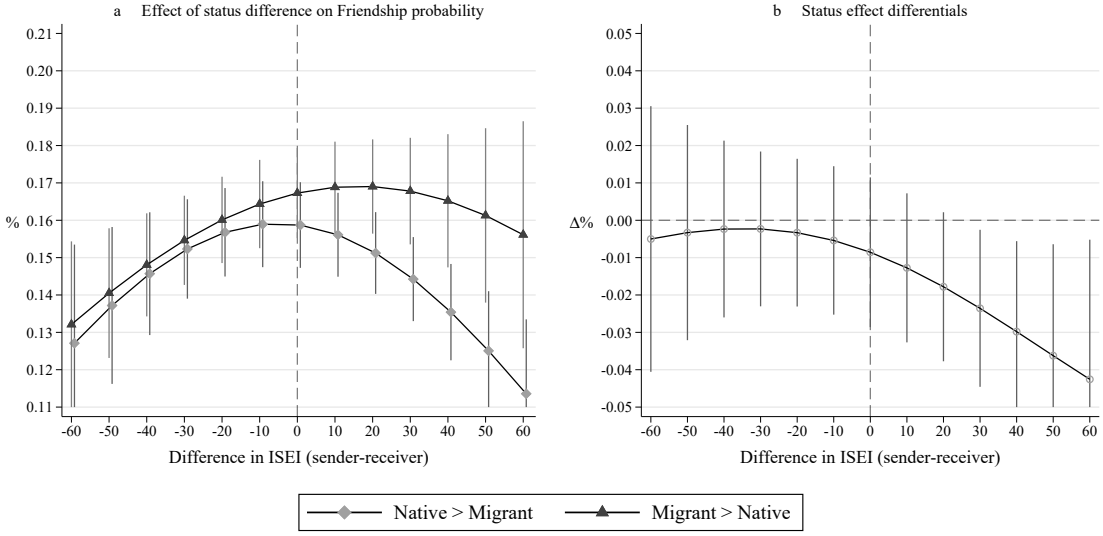


Figure B.9: Effect of ISEI-difference on between-group contact, Sweden, ML-model (CILS4EU, wave 1).

B.6 Subcountry Graphs - Education

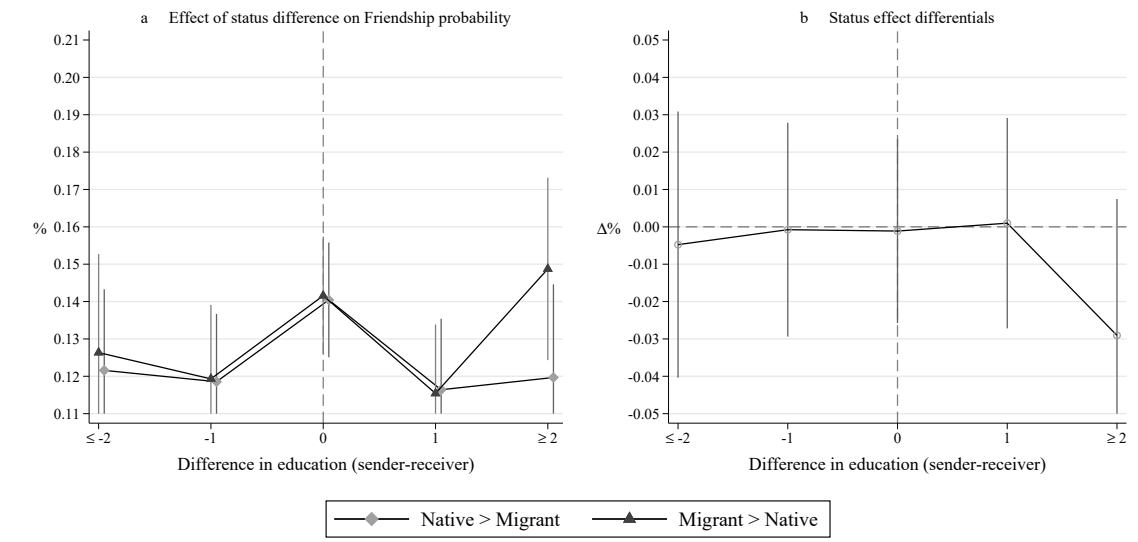


Figure B.10: Effect of educational-difference on between-group contact, England, ML-model (CILS4EU, wave 1).

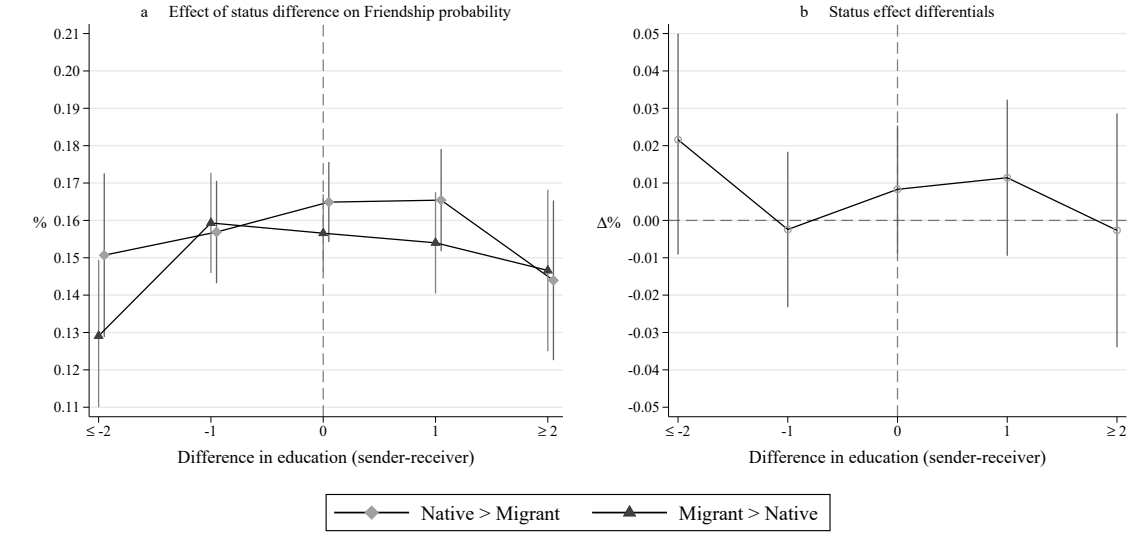


Figure B.11: Effect of educational-difference on between-group contact, Germany, ML-model (CILS4EU, wave 1).

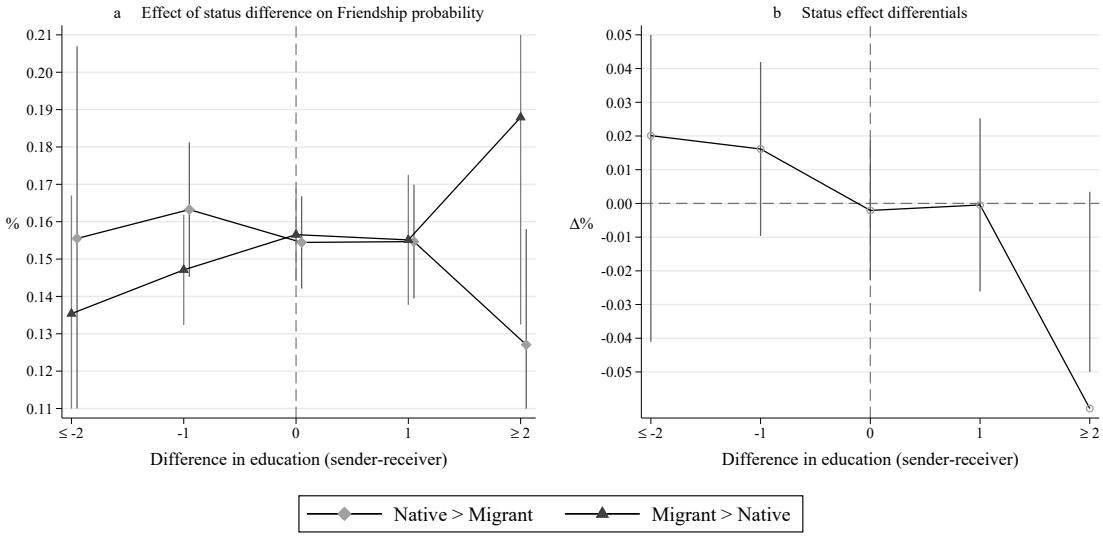


Figure B.12: Effect of educational-difference on between-group contact, Netherlands, ML-model (CILS4EU, wave 1).

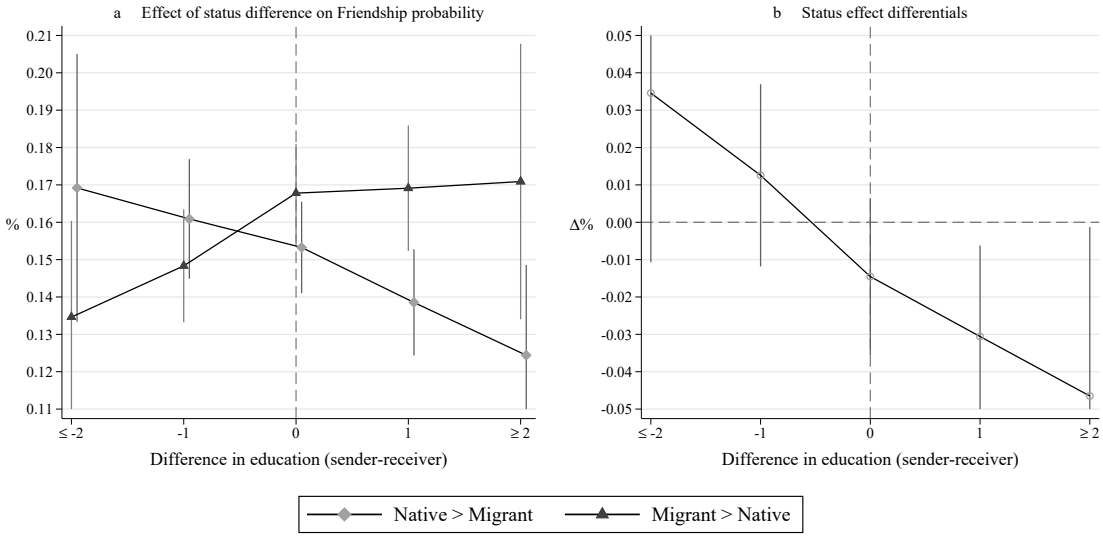


Figure B.13: Effect of educational-difference on between-group contact, Sweden, ML-model (CILS4EU, wave 1).

B.7 Ethnic Makeup of Working Sample

Table B.10: Ethnic makeup of the working sample in Germany (left) and Sweden (right), students-level.

	Percent	Country	Percent	Country
1	47.48	**Germany**	51.29	**Sweden**
2	13.36	Turkey	8.10	Finland
3	6.24	Poland	5.04	Unknown country of origin
4	5.97	Former Soviet Union	4.69	Former Yugoslavia
5	4.00	Former Yugoslavia	2.58	Turkey
6	2.81	Eastern Europe	2.19	Other Europe
7	2.77	Other Europe	1.97	Iraq
8	2.73	Italy	1.97	Germany
9	2.50	Unknown country of origin	1.75	Latin America and the Caribbean
10	1.89	Southern Asia	1.75	Eastern Europe
11	1.77	Southern Europe	1.71	South Eastern Asia
12	1.42	Other Asia	1.66	Denmark
13	1.39	Other Africa	1.66	Southern Europe
14	1.31	Latin America and the Caribbean	1.45	Norway
15	1.16	Northern Africa	1.36	Islamic Republic of Iran
16	0.89	Western Asia	1.31	Other Asia
17	0.85	Greece	1.23	Poland
18	0.85	Northern America and Oceania	1.14	Southern Asia
19	0.46	Lebanon	1.05	Eastern Africa
20	0.15	Unknown immigrant background	0.96	Lebanon
21			0.96	Northern America and Oceania
22			0.92	Other Africa
23			0.83	Unknown immigrant background
24			0.79	Syrian Arab Republic
25			0.70	Western Asia
26			0.66	Northern Africa
27			0.26	Somalia

Table B.11: Ethnic makeup of the working sample in the Netherlands (left) and England (right), students-level.

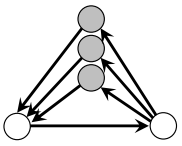
	Percent	Country	Percent	Country
1	59.68	**Netherlands**	53.16	**UK**
2	5.27	Suriname	7.91	Unknown country of origin
3	5.27	Indonesia	6.54	India
4	3.46	Turkey	4.43	Ireland
5	3.46	Morocco	3.90	Pakistan
6	2.78	Netherlands Antilles	2.95	Other Europe
7	2.78	Unknown country of origin	2.74	Unknown immigrant background
8	2.29	Southern Europe	2.64	Jamaica
9	2.15	Germany	2.43	Southern Europe
10	2.00	Other Europe	2.00	Other Asia
11	1.95	Africa	1.79	Eastern Africa
12	1.90	Southern Asia	1.58	Eastern Europe
13	1.85	Other Asia	1.37	Nigeria
14	1.76	Western Europe	1.37	Other Africa
15	1.17	Northern America and Oceania	1.37	Eastern Asia
16	1.12	Latin America and the Caribbean	1.27	Northern America and Oceania
17	1.02	Western Asia	0.95	Latin America and the Caribbean
18	0.10	Unknown immigrant background	0.53	Bangladesh
19			0.53	Western Africa
20			0.53	Southern Asia

Appendix C

Appendix Chapter 4

C.1 Description of Terms Used in MLERGMs

Table C.1: Typology of effects used in MLERGMs.

	Visual	Formula	Description
(1)		$\sum_{i=1}^{N}\sum_{j=1}^{N} x_{ij}$	*Density*: Sum of ties.
(2)		$\sum_{i=1}^{N}\sum_{j=1}^{N} x_{ij}x_{ji}$	*Reciprocity*: Sum of reciprocated ties.
(3)		$\sum_{i=1}^{N}\sum_{j=1}^{N} x_{ij}y_i$	*y-Activity*: Sum of outgoing ties from node with attribute y (categorical case). Sum of attribute values of y for all outgoing ties from node (metric case).
(4)		$\sum_{i=1}^{N}\sum_{j=1}^{N} x_{ij}y_j$	*y-Popularity*: Sum of ingoing ties to node with attribute y (categorical). Sum of attribute values of y for all ingoing ties to node (metric).
(5a)		$\sum_{i=1}^{N}\sum_{j=1}^{N} x_{ij}\delta_{y_i,y_j}$	*y-Homophily*: Sum of ties between nodes of same attribute y (categorical).
(5b)		$\sum_{i=1}^{N}\sum_{j=1}^{N} x_{ij}\lvert y_i - y_j\rvert$	*y-Homophily*: Sum of absolute attribute differences (y) for tie (metric).
(6)		$e^{\alpha}\sum_{i=1}^{N-2}\{1-(1-e^{-\alpha})^i\}p_i$	*Transitivity-GWESP-ITP*: Geometrically weighted edgewise shared partners (incoming twopaths). Here p_i is the count of edges that have i edgewise shared partners of incoming two-paths, with the decay parameter α. For the mini example graph left (N=5), $p_1 = 6$, $p_2 = 0$, and $p_3 = 1$. Similarly for GWESP-OTP, which stands for outgoing two-paths.

Source: Own illustration, based on Lusher, Koskinen, & Robbins (2013).
Notes: Node= the single student (individual). Edge/Tie= directed friendship nomination between two students. x_{ij}= value of the sociomatrix with the coordinates i and j. y_i is the value of the attribute y belonging to the individual i. $\delta_{a,b}$ is the Kronecker delta function on the variables a and b.

C.2 Goodness of Fit (GOF) - Within

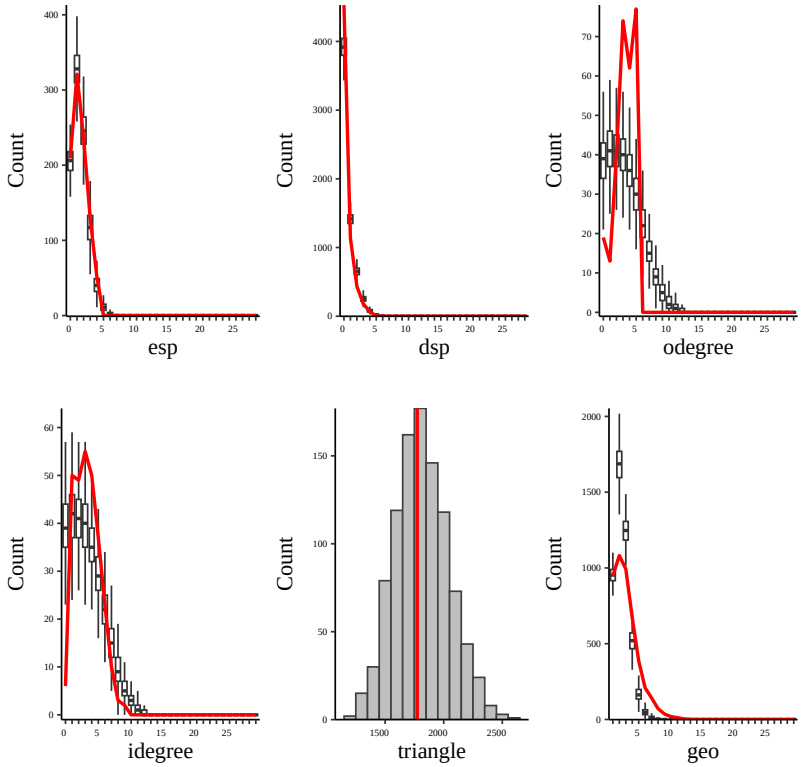


Figure C.1: Goodness of fit for England (base model M0) (CILS4EU, wave 1, working sample).

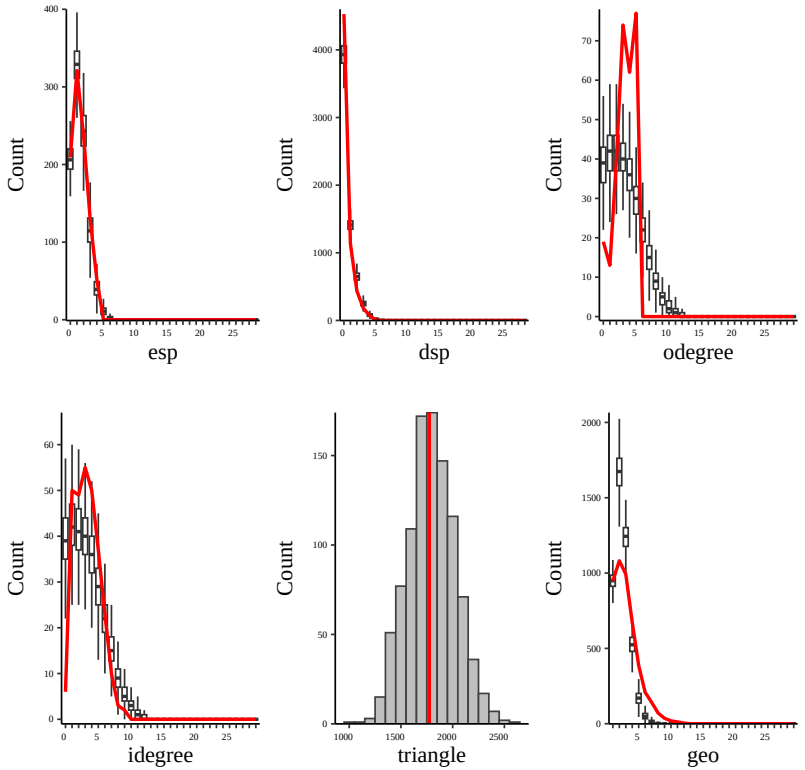


Figure C.2: Goodness of fit for England (extended model M1) (CILS4EU, wave 1, working sample).

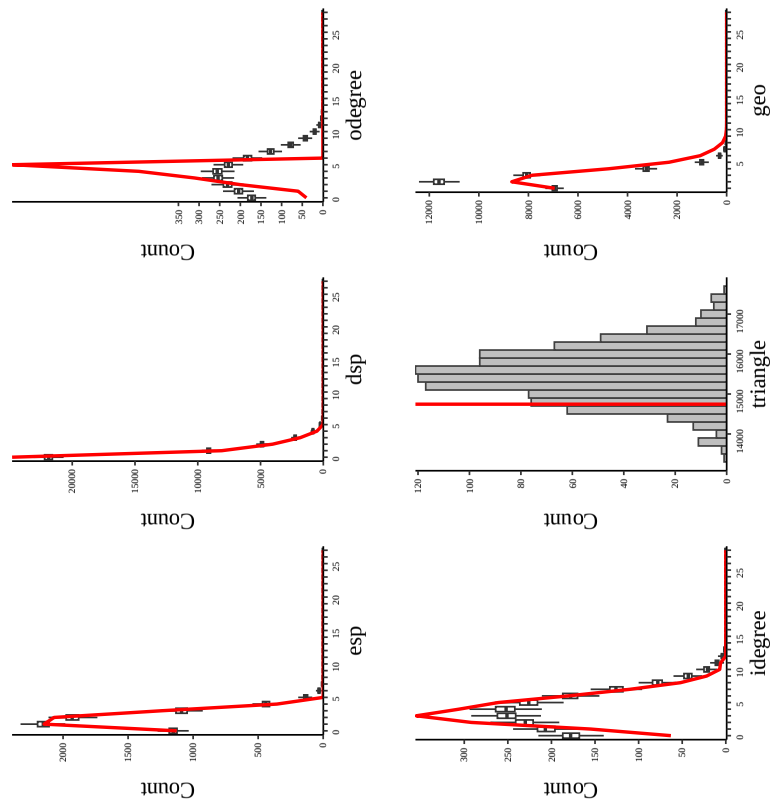


Figure C.3: Goodness of fit for Germany (base model M0) (CILS4EU, wave 1, working sample).

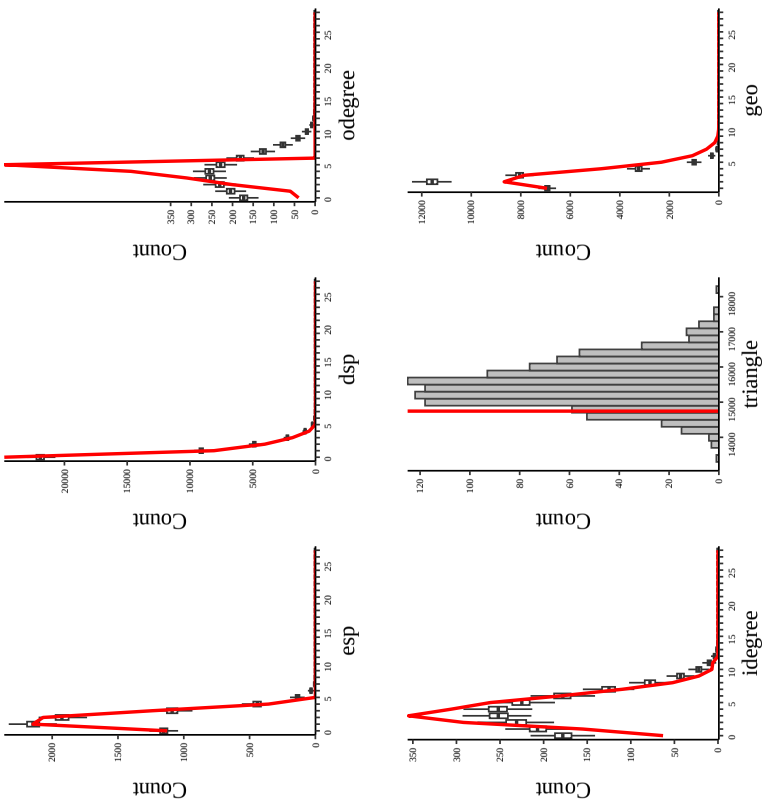


Figure C.4: Goodness of fit for Germany (extended model M1) (CILS4EU, wave 1, working sample).

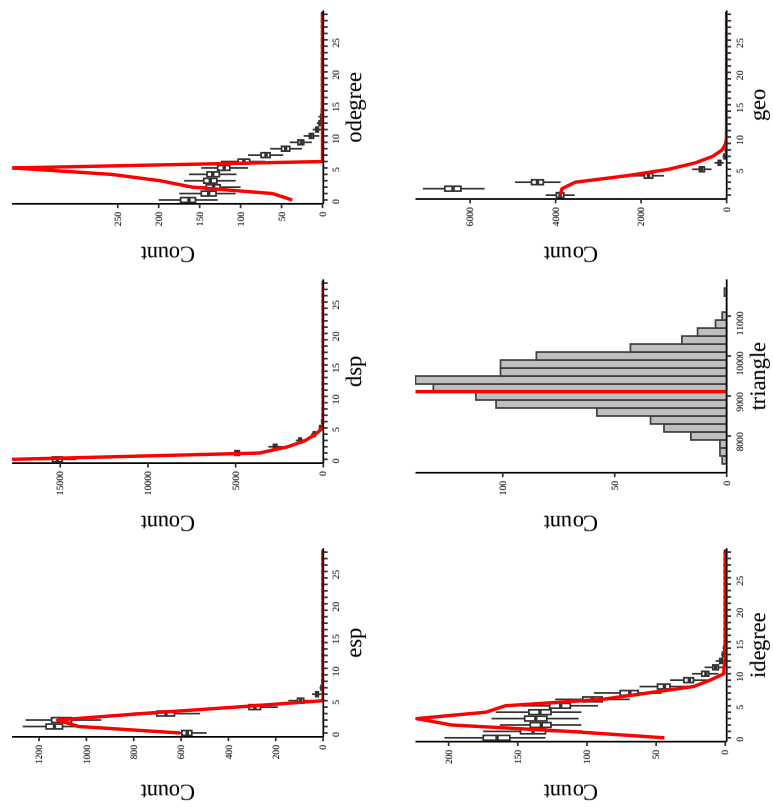


Figure C.5: Goodness of fit for the Netherlands (base model M0) (CILS4EU, wave 1, working sample).

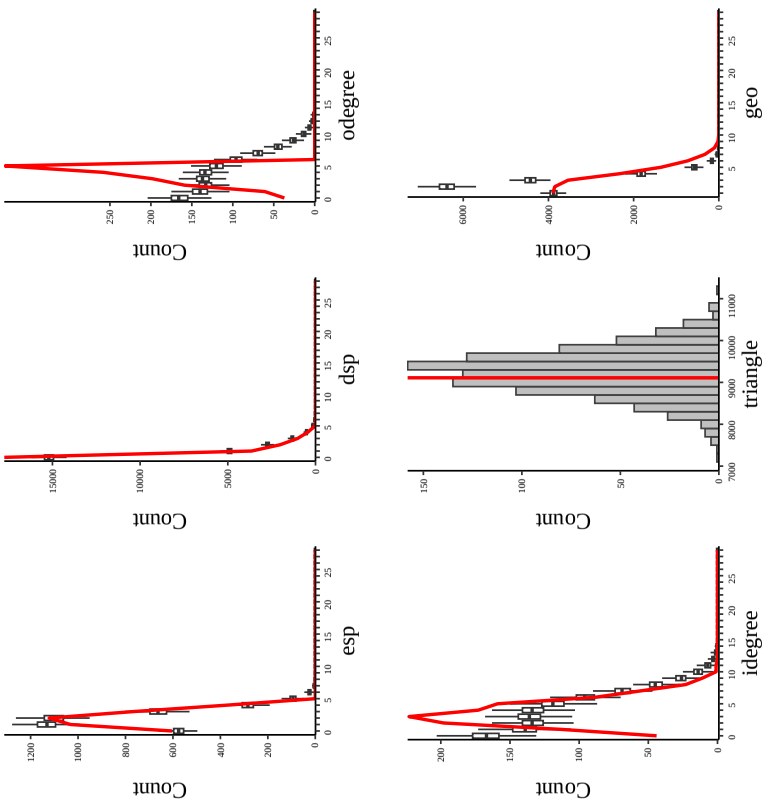


Figure C.6: Goodness of fit for the Netherlands (extended model M1) (CILS4EU, wave 1, working sample).

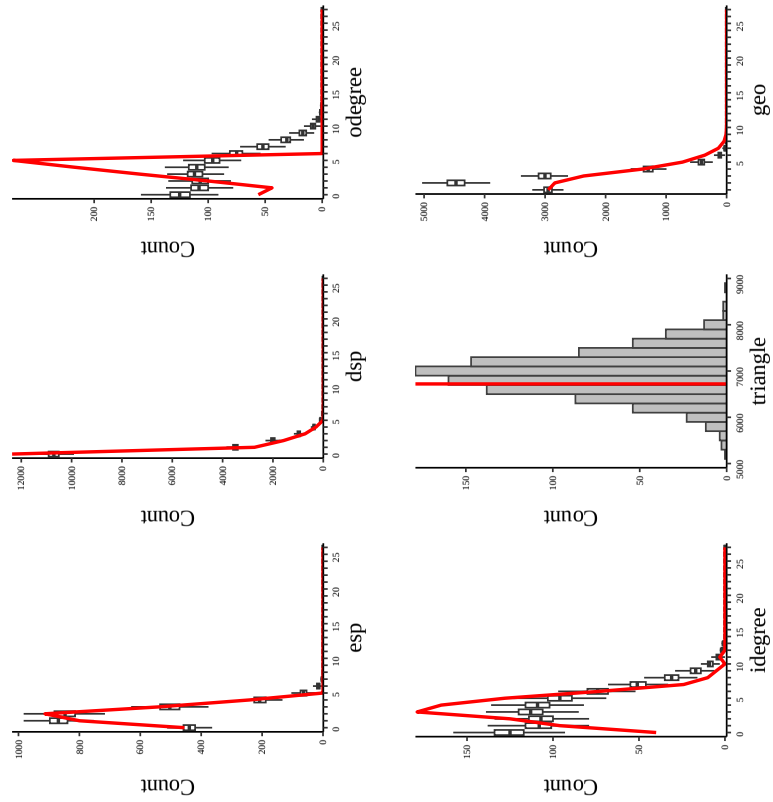


Figure C.7: Goodness of fit for Sweden (base model M0) (CILS4EU, wave 1, working sample).

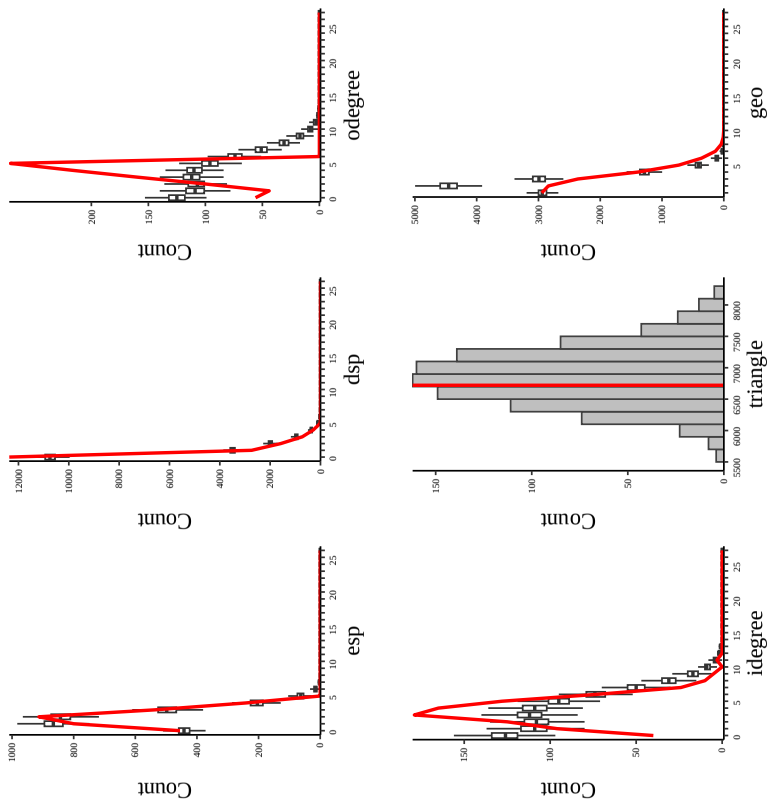


Figure C.8: Goodness of fit for Sweden (extended model M1) (CILS4EU, wave 1, working sample).

C.3 Goodness of Fit (GOF) - Between

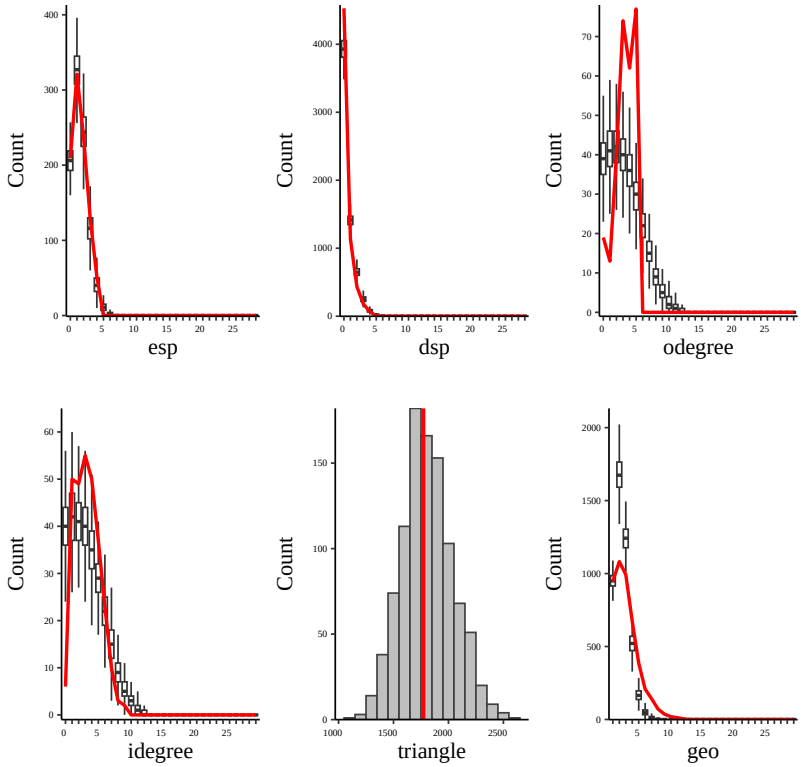


Figure C.9: Goodness of fit for England (base model M0) (CILS4EU, wave 1, working sample).

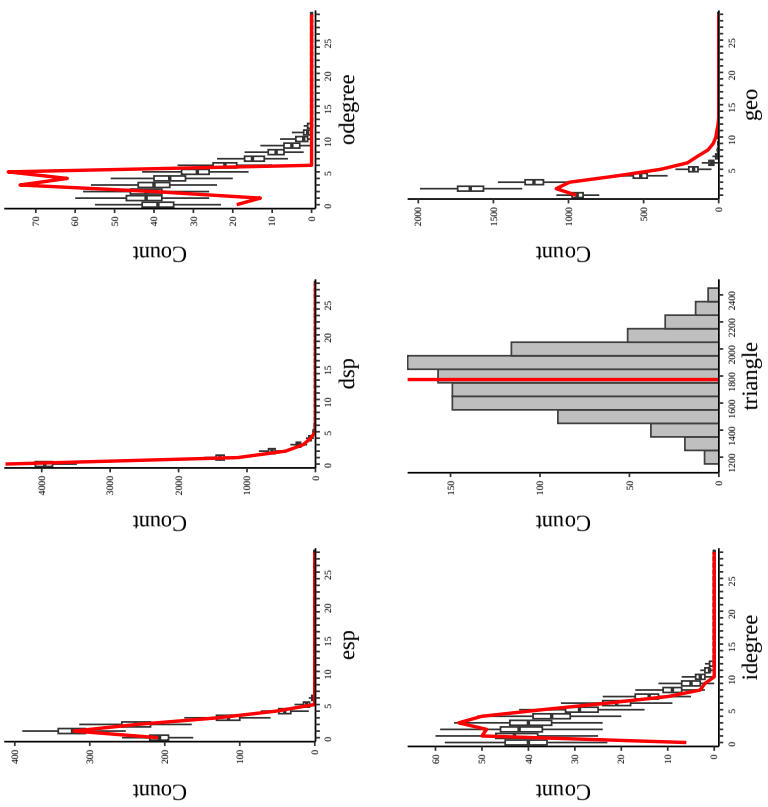


Figure C.10: Goodness of fit for England (extended model M1) (CILS4EU, wave 1, working sample).

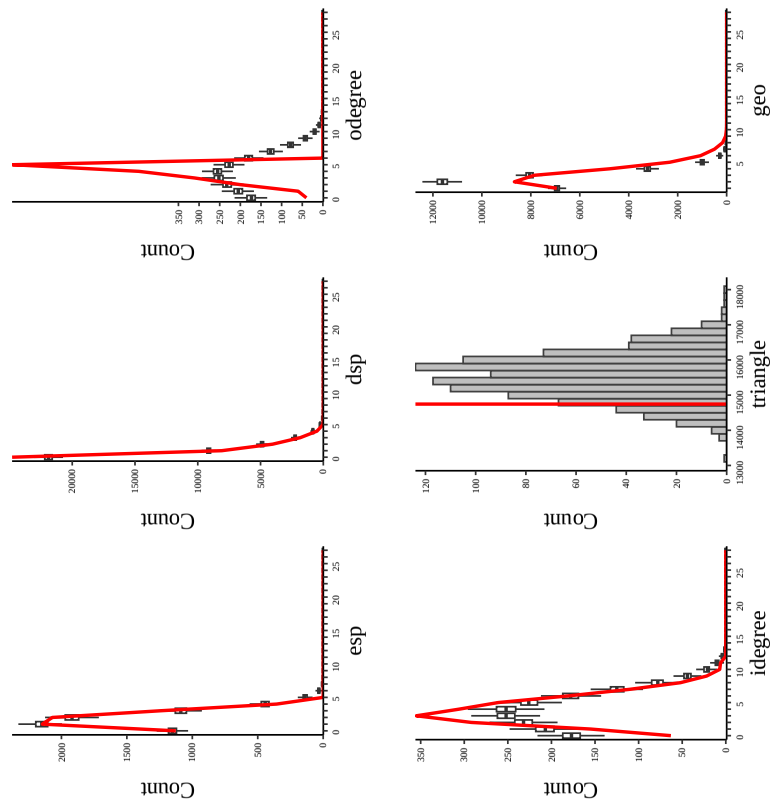


Figure C.11: Goodness of fit for Germany (base model M0) (CILS4EU, wave 1, working sample).

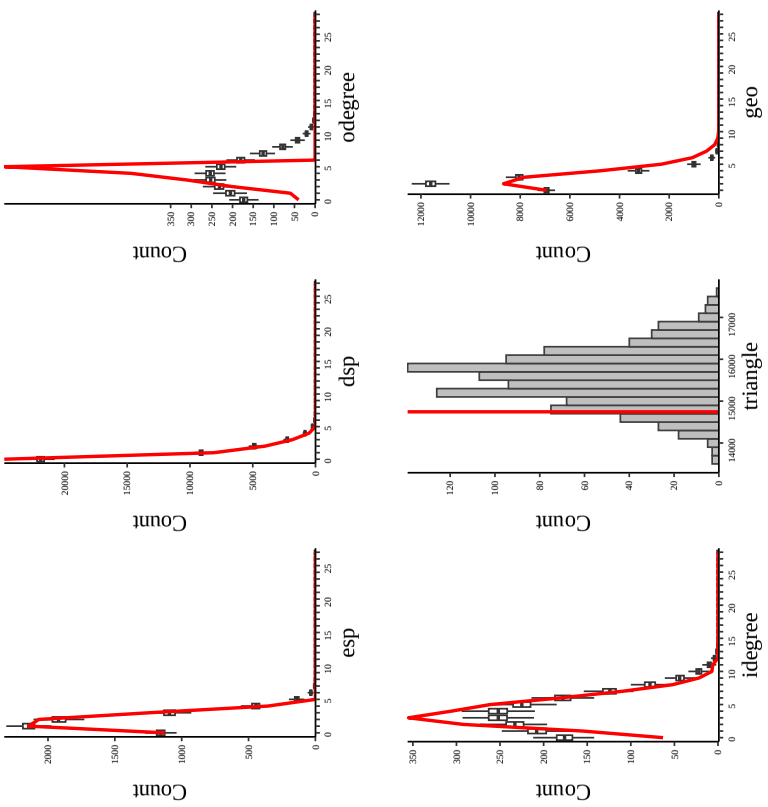


Figure C.12: Goodness of fit for Germany (extended model M1) (CILS4EU, wave 1, working sample).

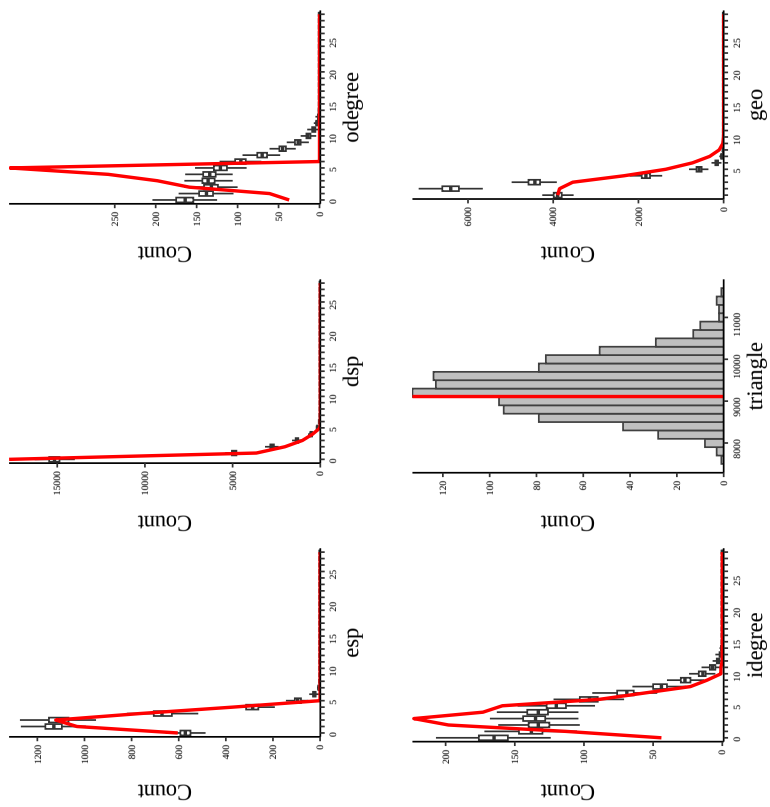


Figure C.13: Goodness of fit for the Netherlands (base model M0) (CILS4EU, wave 1, working sample).

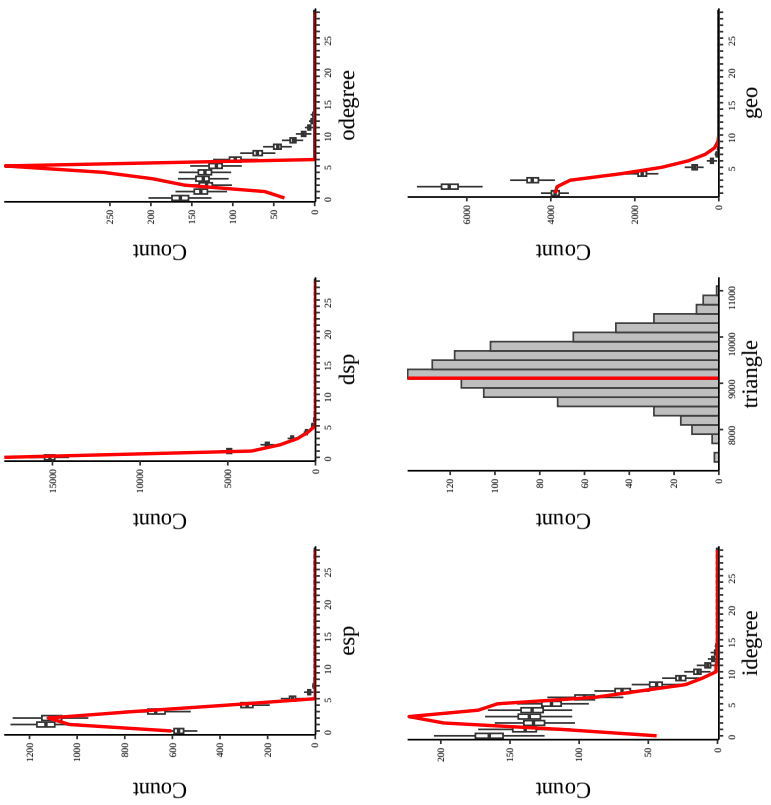


Figure C.14: Goodness of fit for the Netherlands (extended model M1) (CILS4EU, wave 1, working sample).

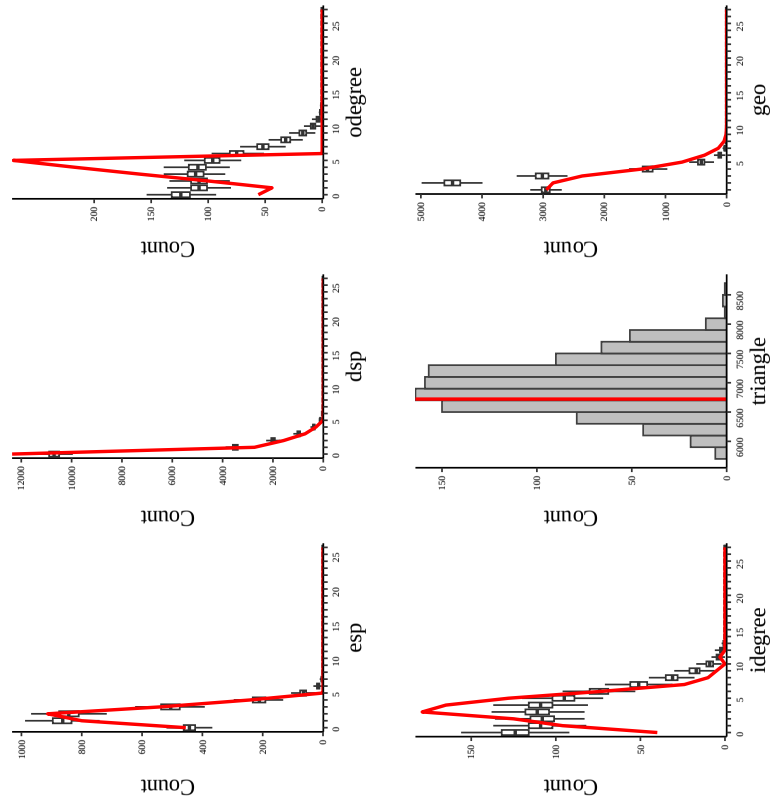


Figure C.15: Goodness of fit for Sweden (base model M0) (CILS4EU, wave 1, working sample).

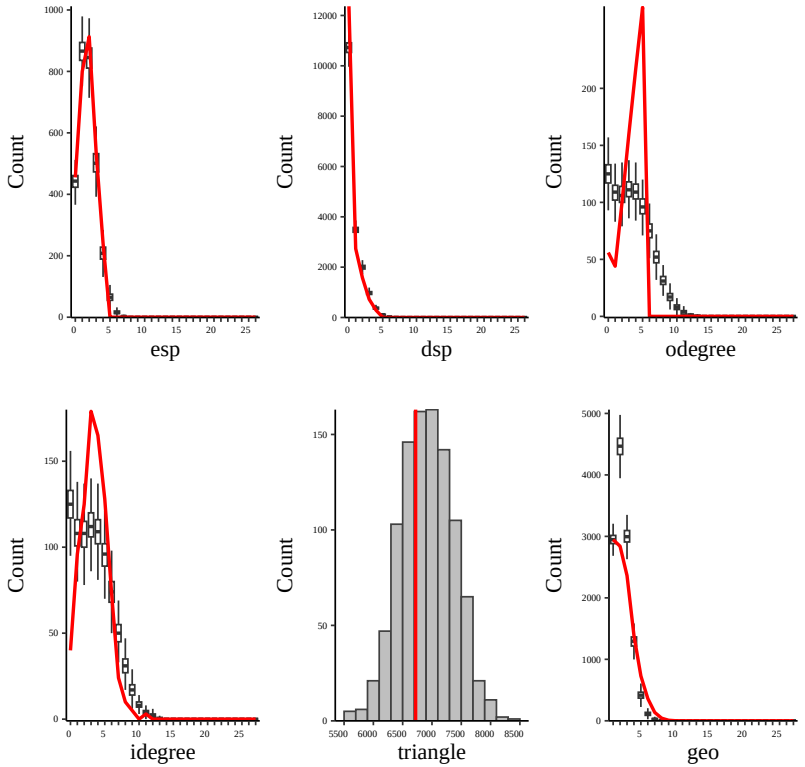
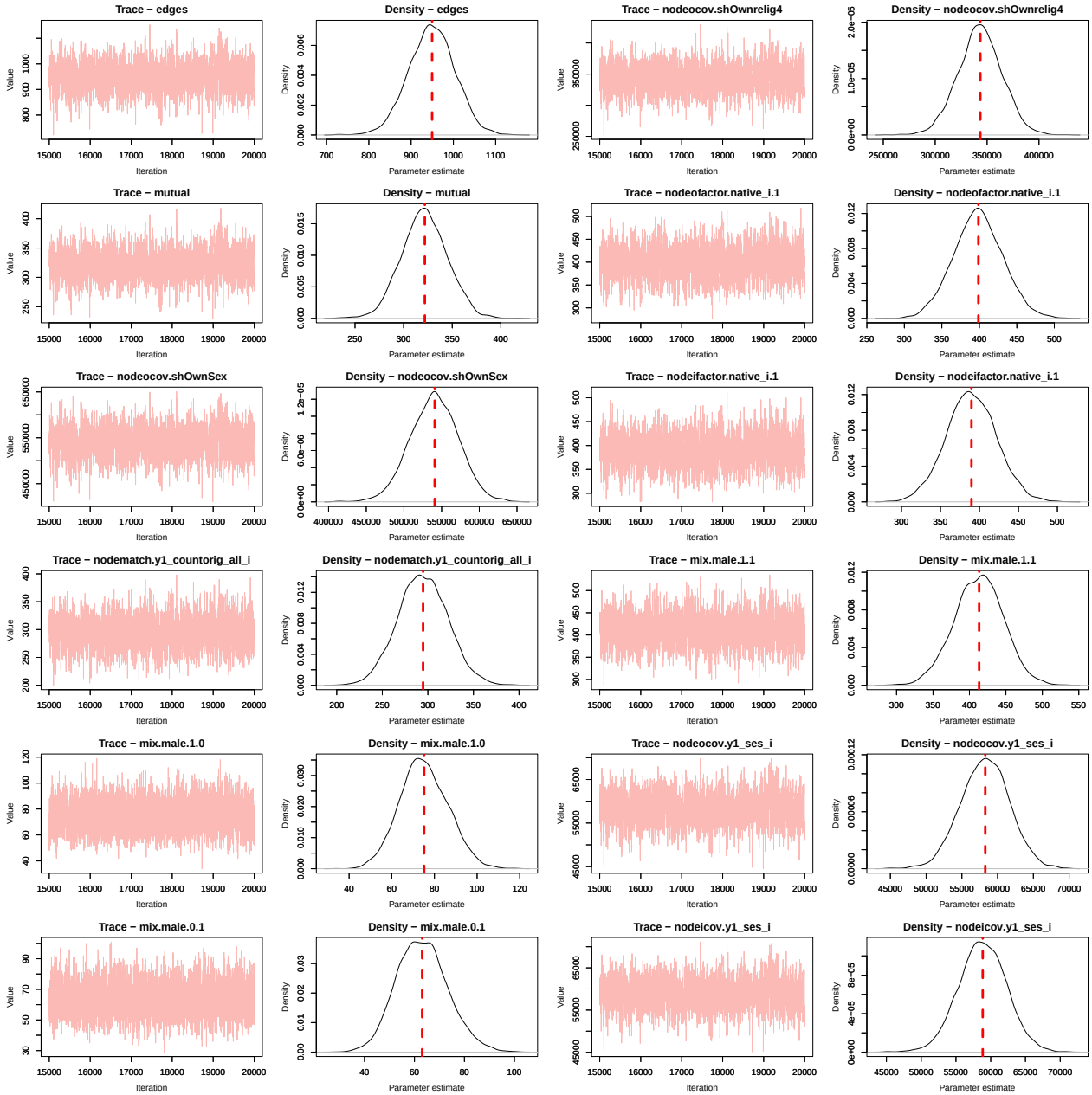
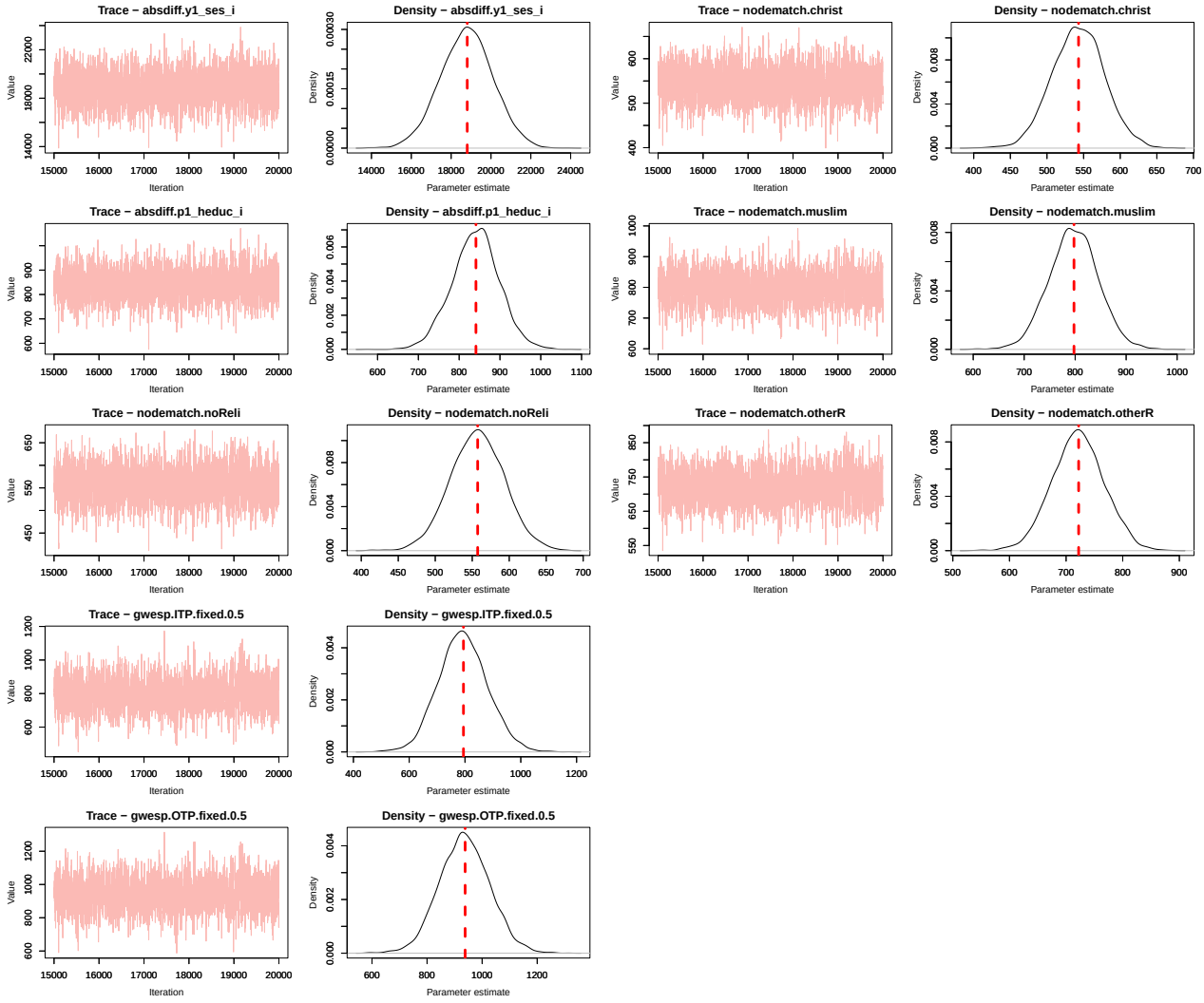


Figure C.16: Goodness of fit for Sweden (extended model M1) (CILS4EU, wave 1, working sample).

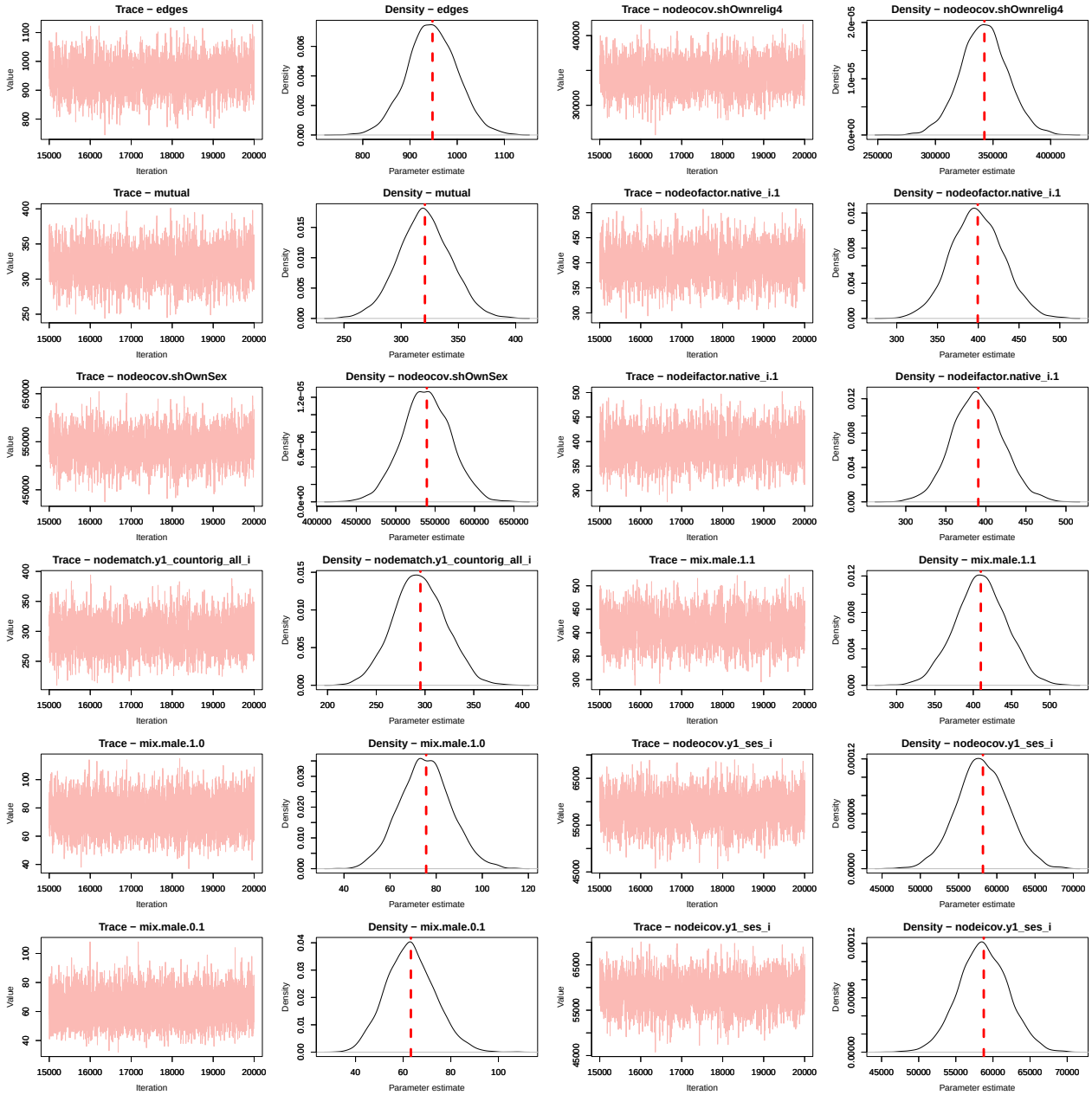
C.4 Convergence of Estimations - Within

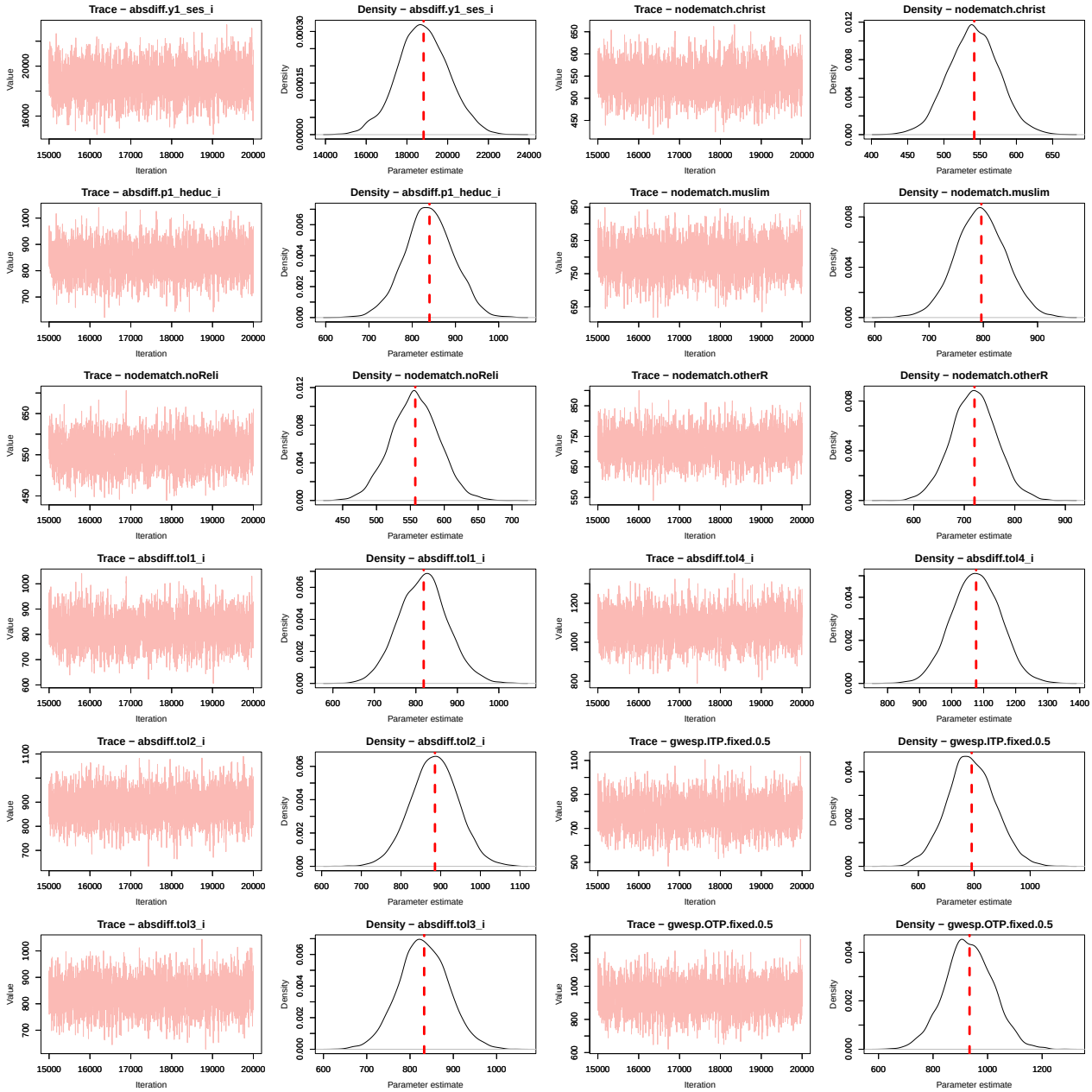
C.4.1 England - M0



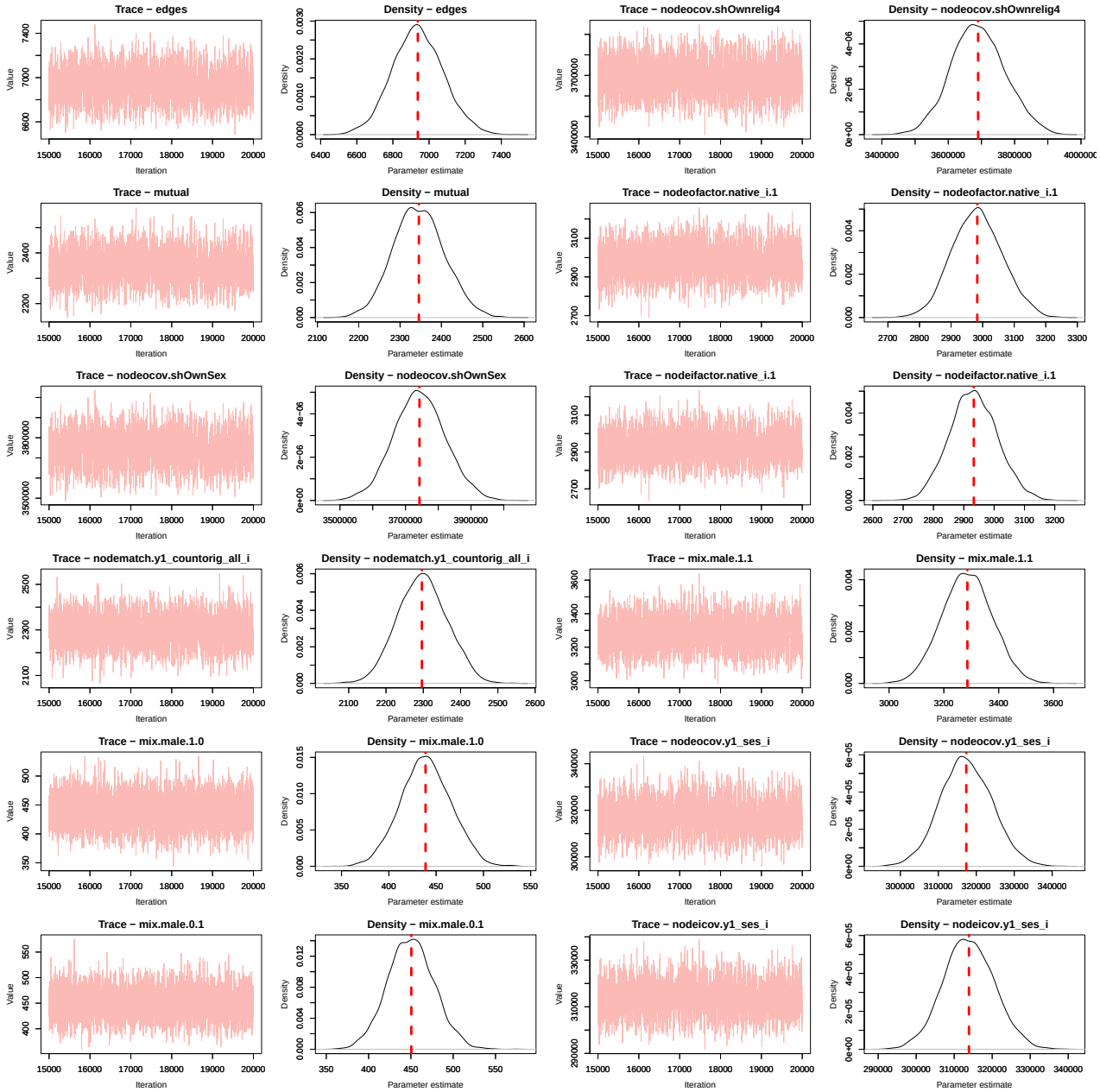

Trace – absdiff.y1_ses_i
Density – absdiff.y1_ses_i
Trace – nodematch.christ
Density – nodematch.christ
Trace – absdiff.p1_heduc_i
Density – absdiff.p1_heduc_i
Trace – nodematch.muslim
Density – nodematch.muslim
Trace – nodematch.noReli
Density – nodematch.noReli
Trace – nodematch.otherR
Density – nodematch.otherR
Trace – gwesp.ITP.fixed.0.5
Density – gwesp.ITP.fixed.0.5
Trace – gwesp.OTP.fixed.0.5
Density – gwesp.OTP.fixed.0.5
Value
Density
Iteration
Parameter estimate

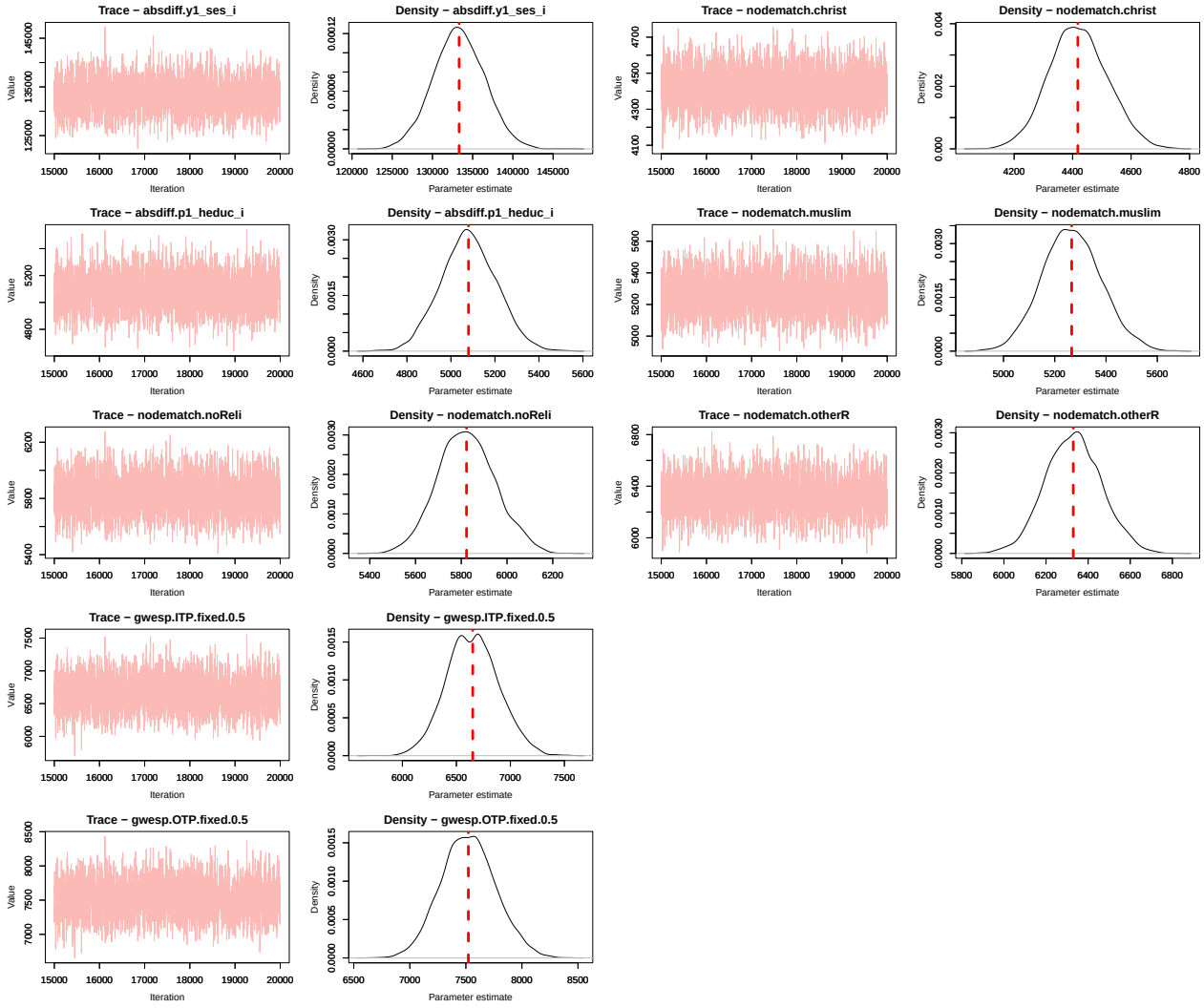
C.4.2 England - M1



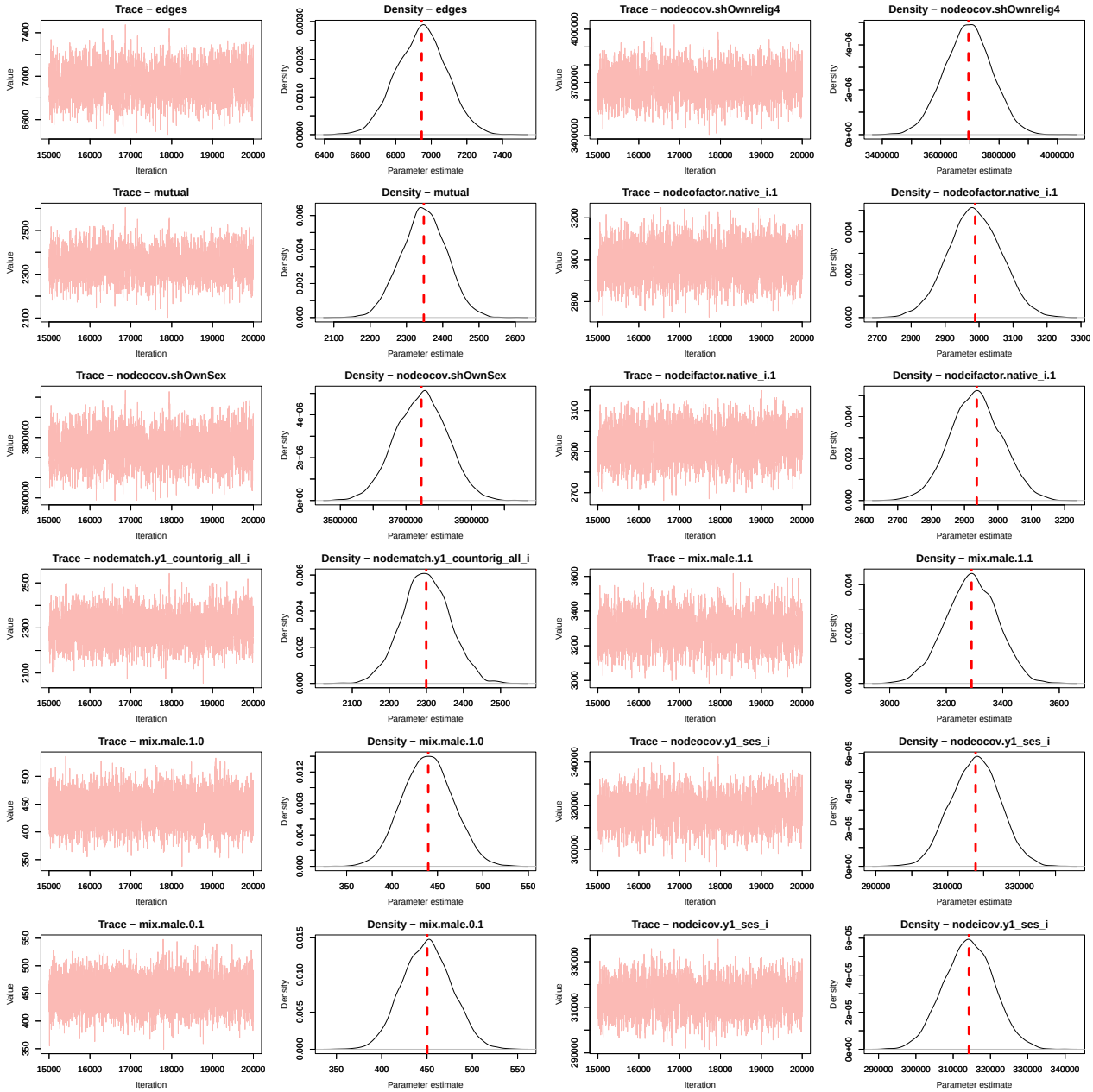

Trace – absdiff.y1_ses_i
Density – absdiff.y1_ses_i
Trace – nodematch.christ
Density – nodematch.christ
Trace – absdiff.p1_heduc_i
Density – absdiff.p1_heduc_i
Trace – nodematch.muslim
Density – nodematch.muslim
Trace – nodematch.noReli
Density – nodematch.noReli
Trace – nodematch.otherR
Density – nodematch.otherR
Trace – absdiff.tol1_i
Density – absdiff.tol1_i
Trace – absdiff.tol4_i
Density – absdiff.tol4_i
Trace – absdiff.tol2_i
Density – absdiff.tol2_i
Trace – gwesp.ITP.fixed.0.5
Density – gwesp.ITP.fixed.0.5
Trace – absdiff.tol3_i
Density – absdiff.tol3_i
Trace – gwesp.OTP.fixed.0.5
Density – gwesp.OTP.fixed.0.5
Value
Density
Iteration
Parameter estimate

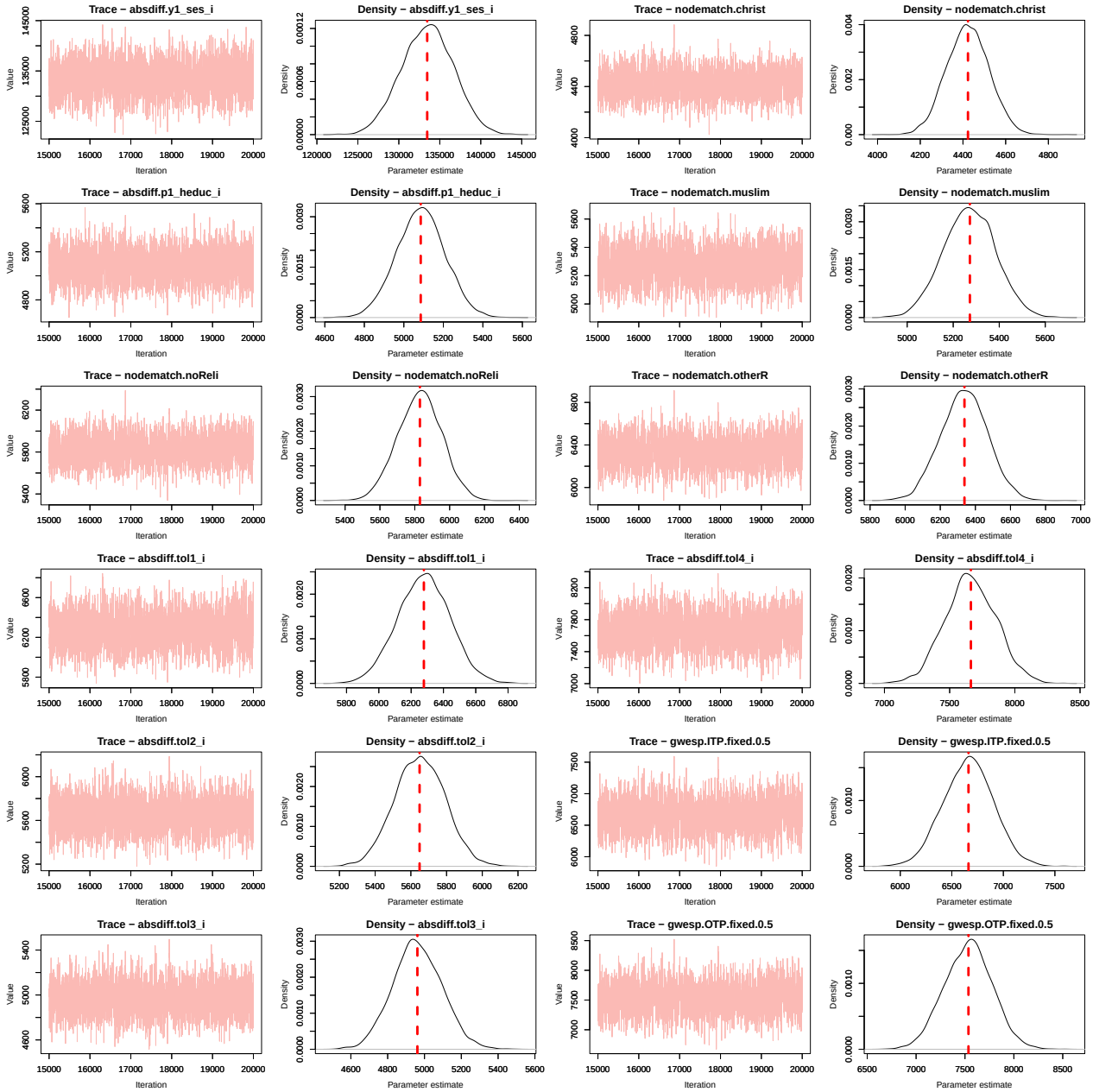
C.4.3 Germany - M0




Trace – absdiff.y1_ses_i
Density – absdiff.y1_ses_i
Trace – nodematch.christ
Density – nodematch.christ
Trace – absdiff.p1_heduc_i
Density – absdiff.p1_heduc_i
Trace – nodematch.muslim
Density – nodematch.muslim
Trace – nodematch.noReli
Density – nodematch.noReli
Trace – nodematch.otherR
Density – nodematch.otherR
Trace – gwesp.ITP.fixed.0.5
Density – gwesp.ITP.fixed.0.5
Trace – gwesp.OTP.fixed.0.5
Density – gwesp.OTP.fixed.0.5
Value
Density
Iteration
Parameter estimate

C.4.4 Germany - M1

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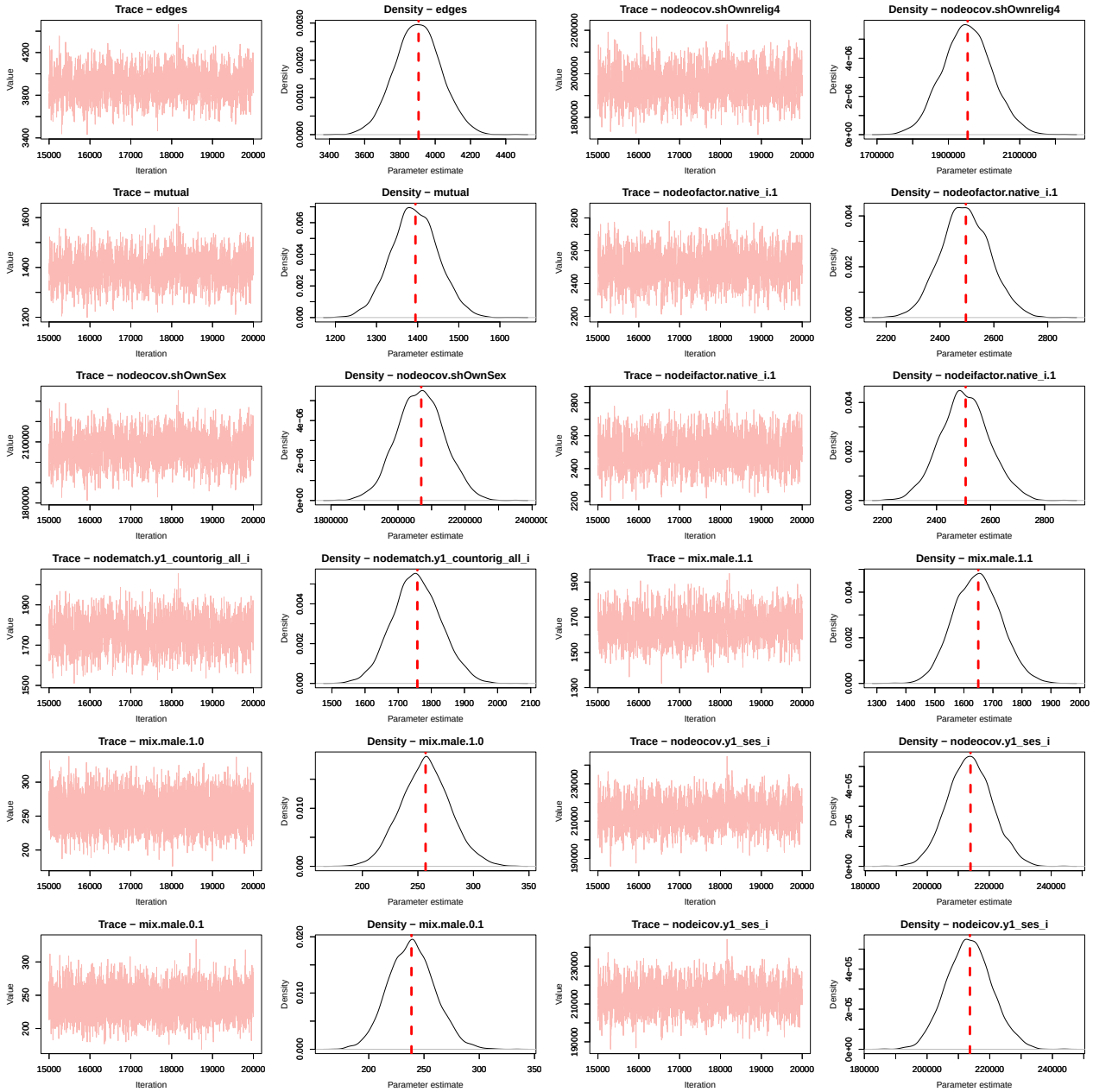
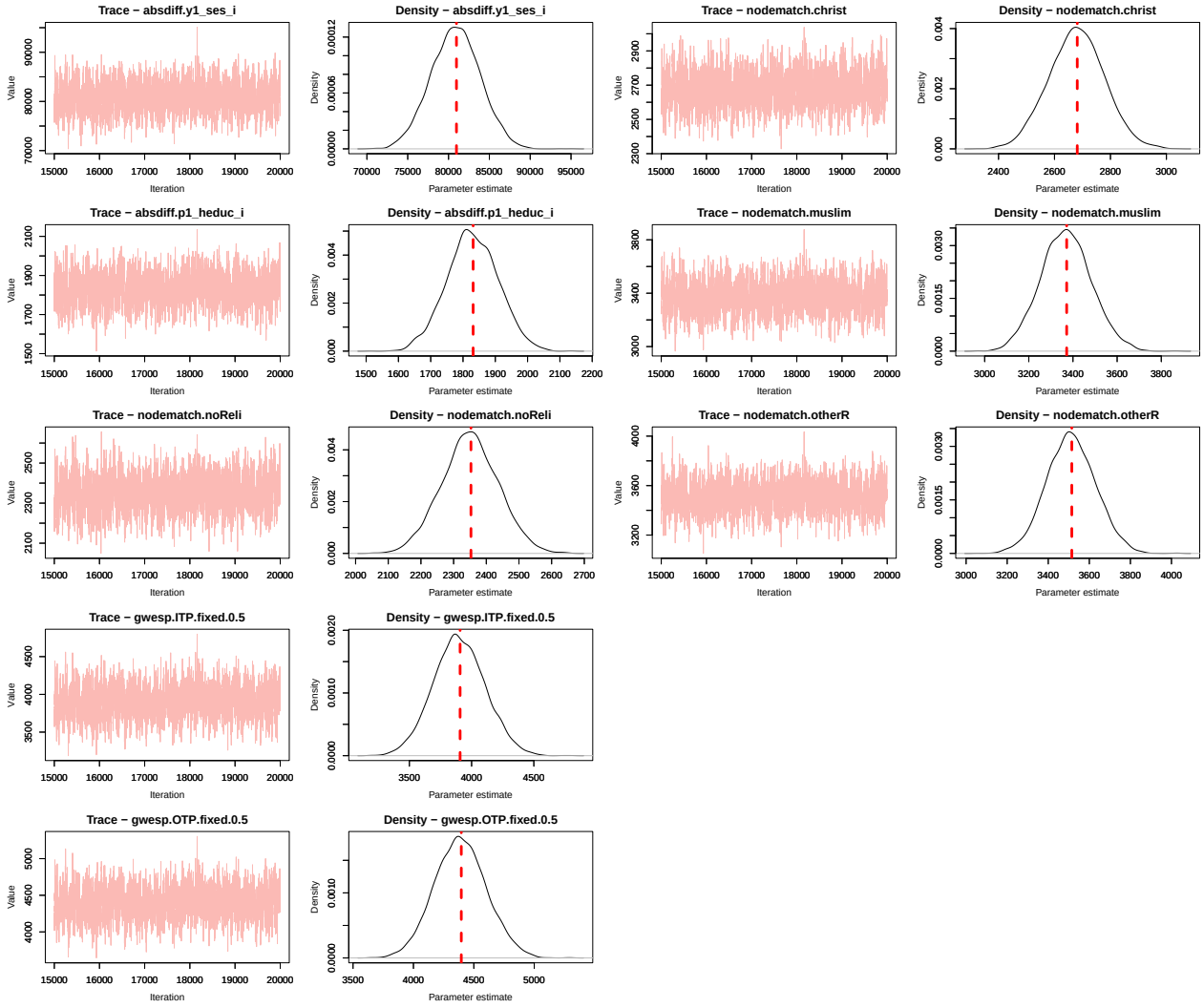
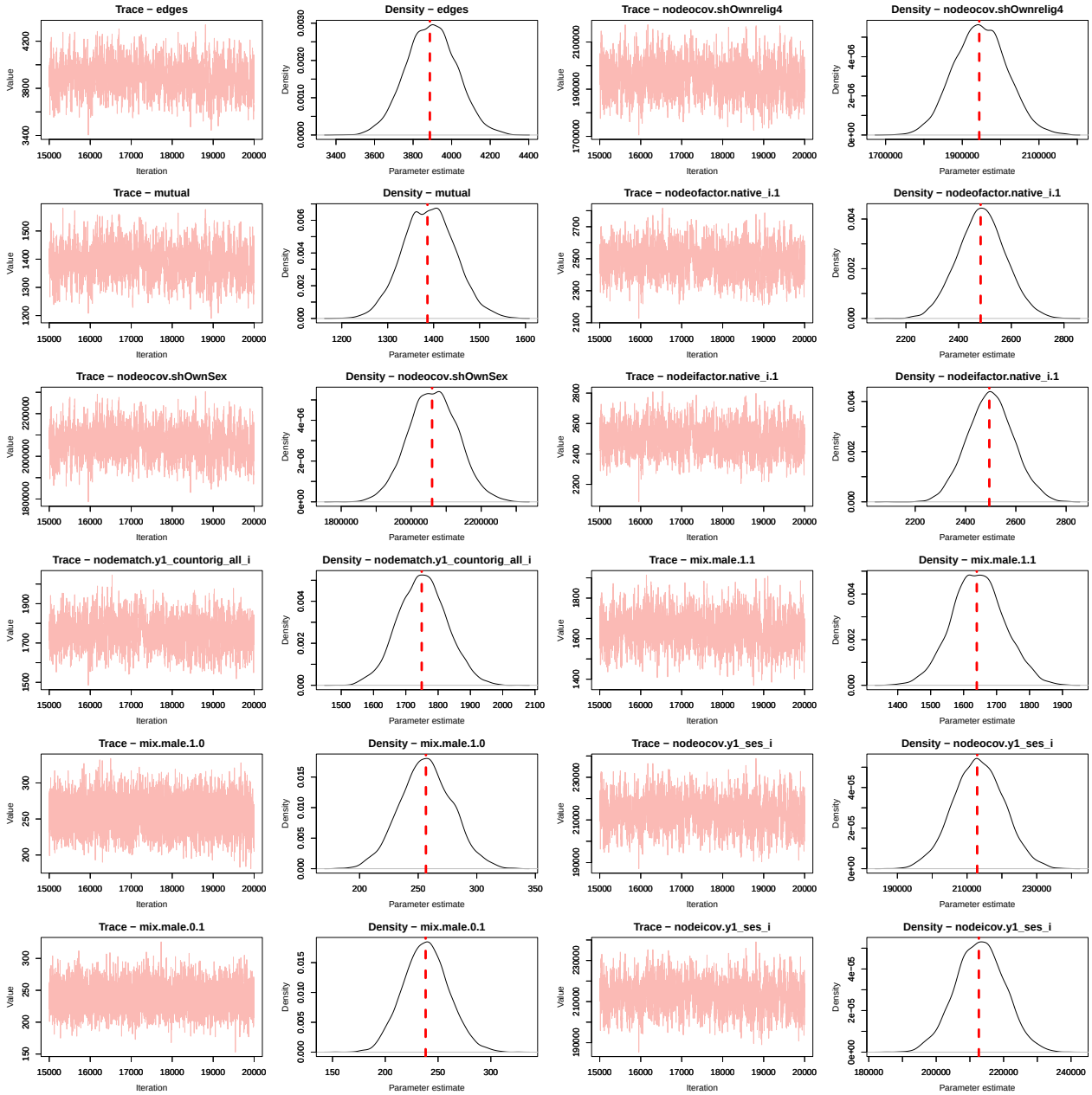
Density – absdiff.y1_ses_i
Trace – nodematch.christ
Density – nodematch.christ
Trace – absdiff.p1_heduc_i
Density – absdiff.p1_heduc_i
Trace – nodematch.muslim
Density – nodematch.muslim
Trace – nodematch.noReli
Density – nodematch.noReli
Trace – nodematch.otherR
Density – nodematch.otherR
Trace – absdiff.tol1_i
Density – absdiff.tol1_i
Trace – absdiff.tol4_i
Density – absdiff.tol4_i
Trace – absdiff.tol2_i
Density – absdiff.tol2_i
Trace – gwesp.ITP.fixed.0.5
Density – gwesp.ITP.fixed.0.5
Trace – absdiff.tol3_i
Density – absdiff.tol3_i
Trace – gwesp.OTP.fixed.0.5
Density – gwesp.OTP.fixed.0.5
Value
Density
Iteration
Parameter estimate

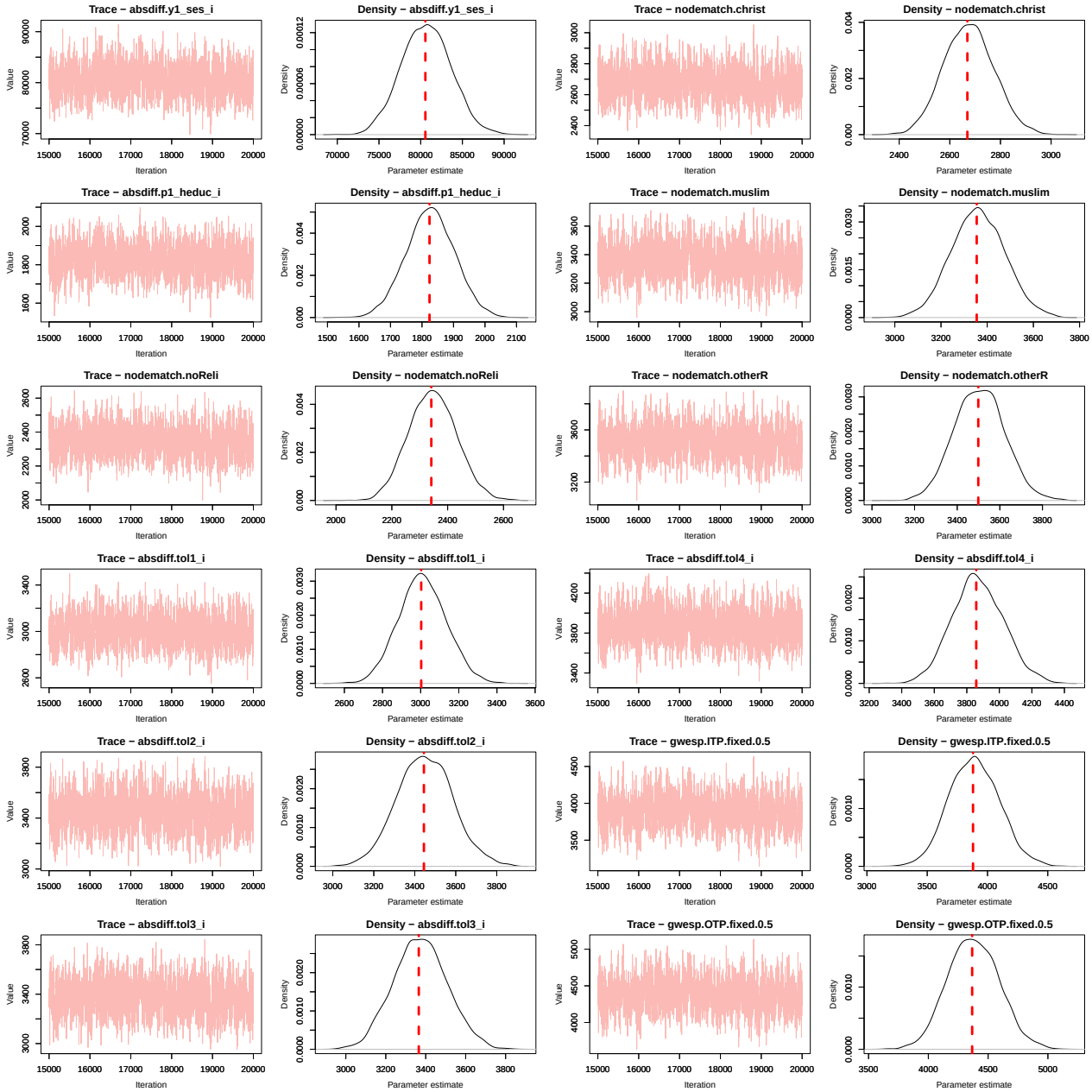
C.4.5 Netherlands - M0




Trace – absdiff.y1_ses_i
Value
Iteration
Density – absdiff.y1_ses_i
Density
Parameter estimate
Trace – nodematch.christ
Value
Iteration
Density – nodematch.christ
Density
Parameter estimate
Trace – absdiff.p1_heduc_i
Value
Iteration
Density – absdiff.p1_heduc_i
Density
Parameter estimate
Trace – nodematch.muslim
Value
Iteration
Density – nodematch.muslim
Density
Parameter estimate
Trace – nodematch.noReli
Value
Iteration
Density – nodematch.noReli
Density
Parameter estimate
Trace – nodematch.otherR
Value
Iteration
Density – nodematch.otherR
Density
Parameter estimate
Trace – gwesp.ITP.fixed.0.5
Value
Iteration
Density – gwesp.ITP.fixed.0.5
Density
Parameter estimate
Trace – gwesp.OTP.fixed.0.5
Value
Iteration
Density – gwesp.OTP.fixed.0.5
Density
Parameter estimate

C.4.6 Netherlands - M1

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Density – nodematch.christ
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Density – absdiff.p1_heduc_i
Trace – nodematch.muslim
Density – nodematch.muslim
Trace – nodematch.noReli
Density – nodematch.noReli
Trace – nodematch.otherR
Density – nodematch.otherR
Trace – absdiff.tol1_i
Density – absdiff.tol1_i
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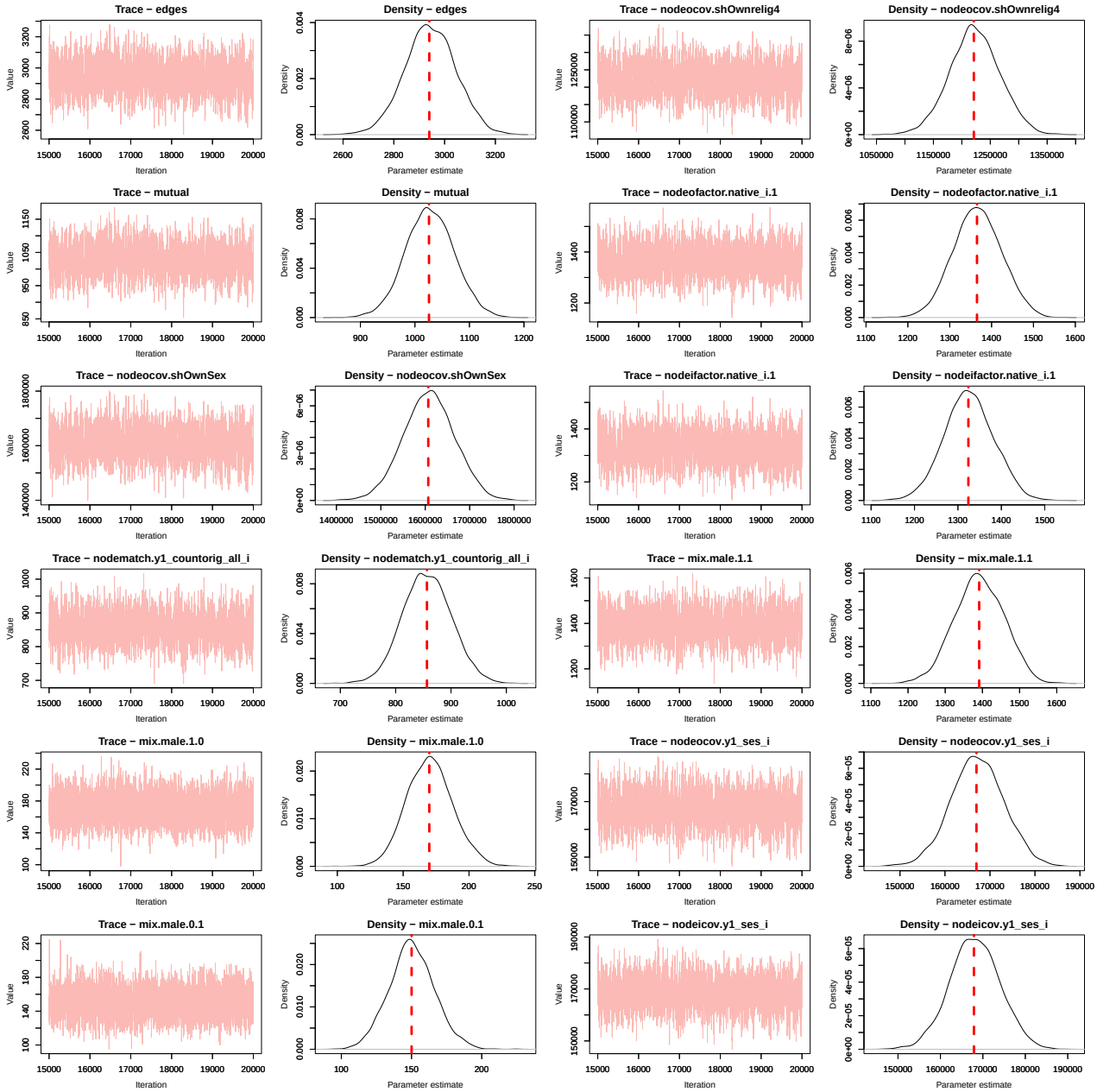
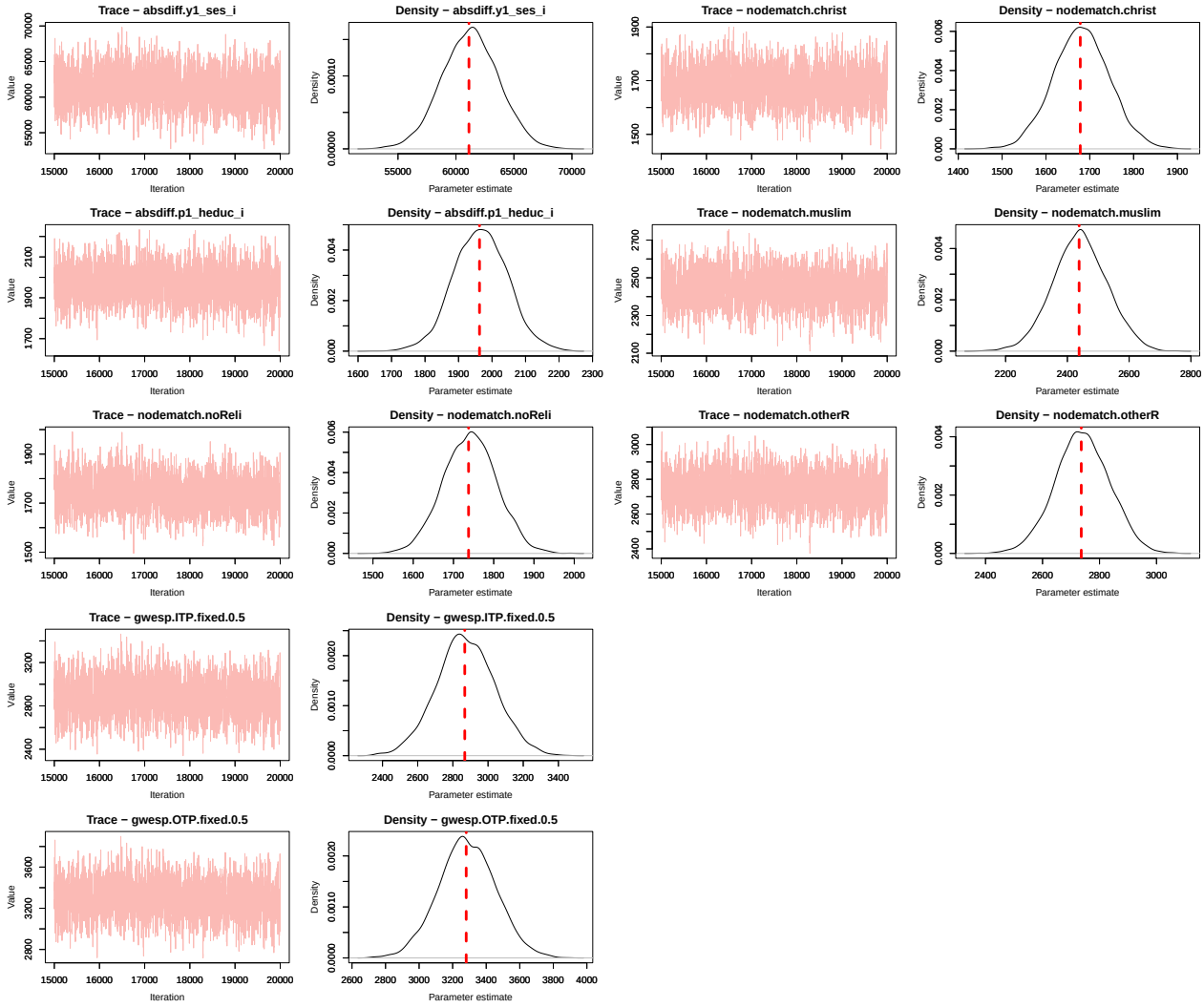
Density – absdiff.tol4_i
Trace – absdiff.tol2_i
Density – absdiff.tol2_i
Trace – gwesp.ITP.fixed.0.5
Density – gwesp.ITP.fixed.0.5
Trace – absdiff.tol3_i
Density – absdiff.tol3_i
Trace – gwesp.OTP.fixed.0.5
Density – gwesp.OTP.fixed.0.5
Value
Density
Iteration
Parameter estimate

C.4.7 Sweden - M0

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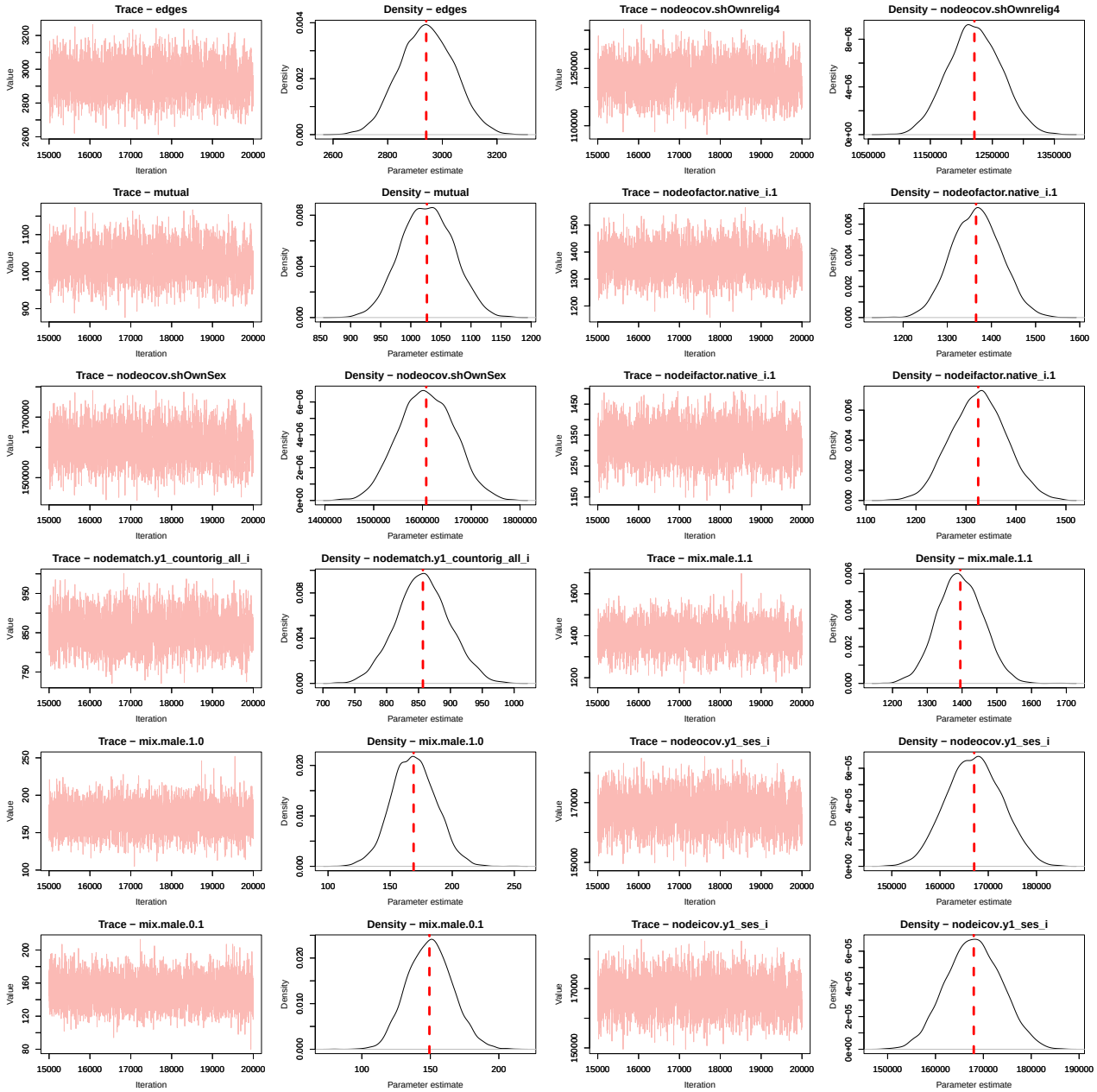
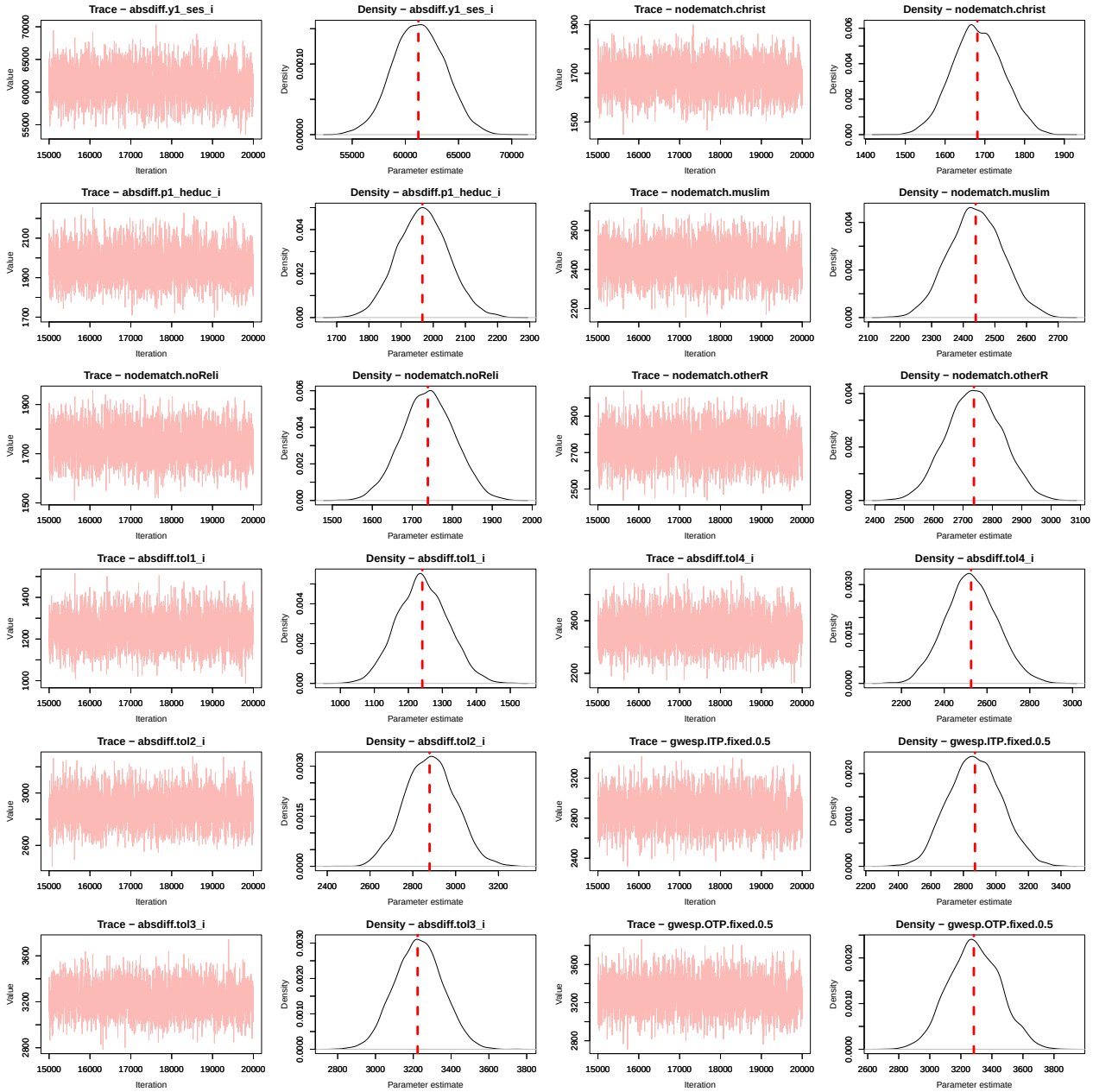
Density – absdiff.y1_ses_i
Trace – nodematch.christ
Density – nodematch.christ
Trace – absdiff.p1_heduc_i
Density – absdiff.p1_heduc_i
Trace – nodematch.muslim
Density – nodematch.muslim
Trace – nodematch.noReli
Density – nodematch.noReli
Trace – nodematch.otherR
Density – nodematch.otherR
Trace – gwesp.ITP.fixed.0.5
Density – gwesp.ITP.fixed.0.5
Trace – gwesp.OTP.fixed.0.5
Density – gwesp.OTP.fixed.0.5
Value
Density
Iteration
Parameter estimate

C.4.8 Sweden - M1

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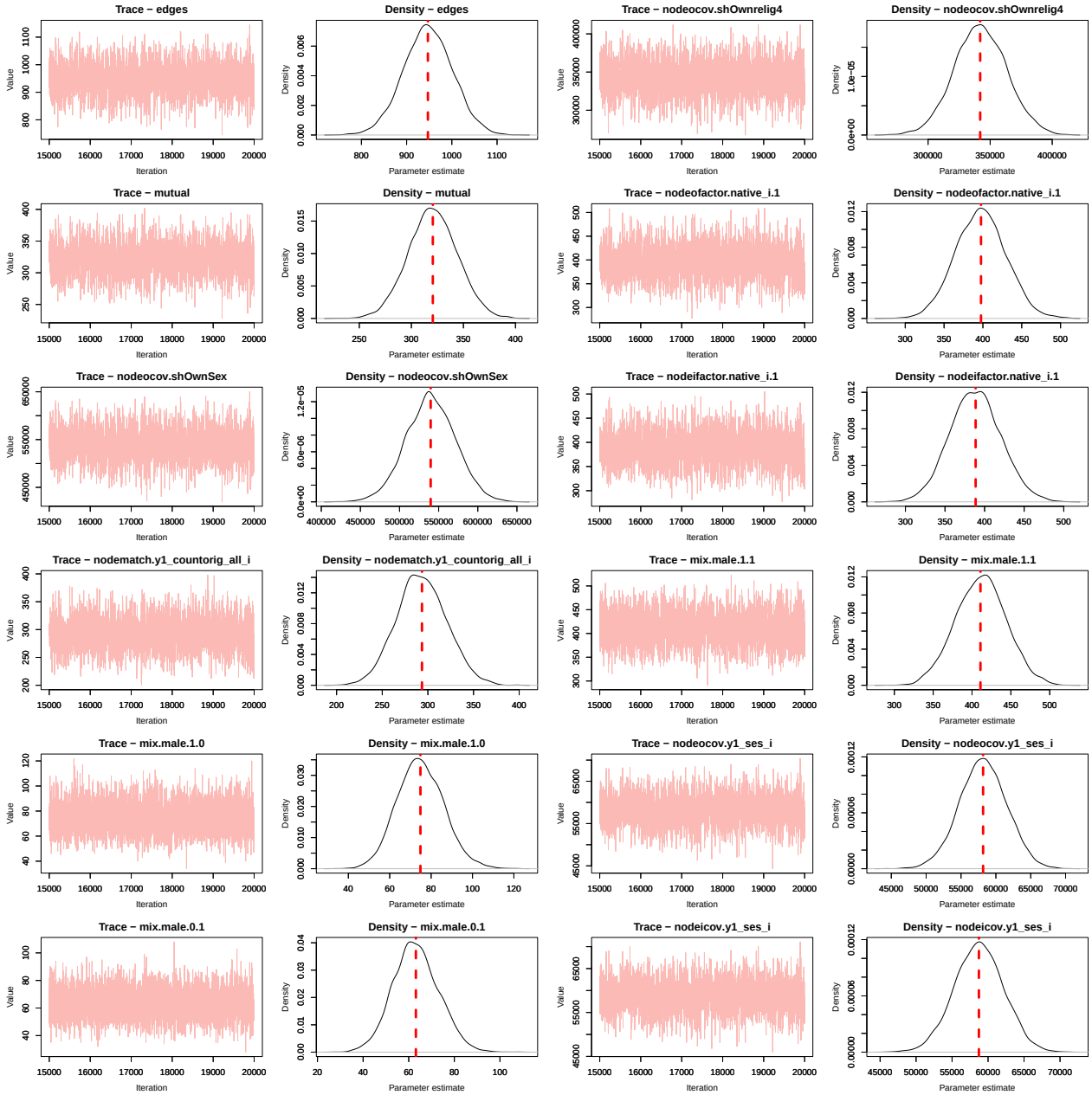
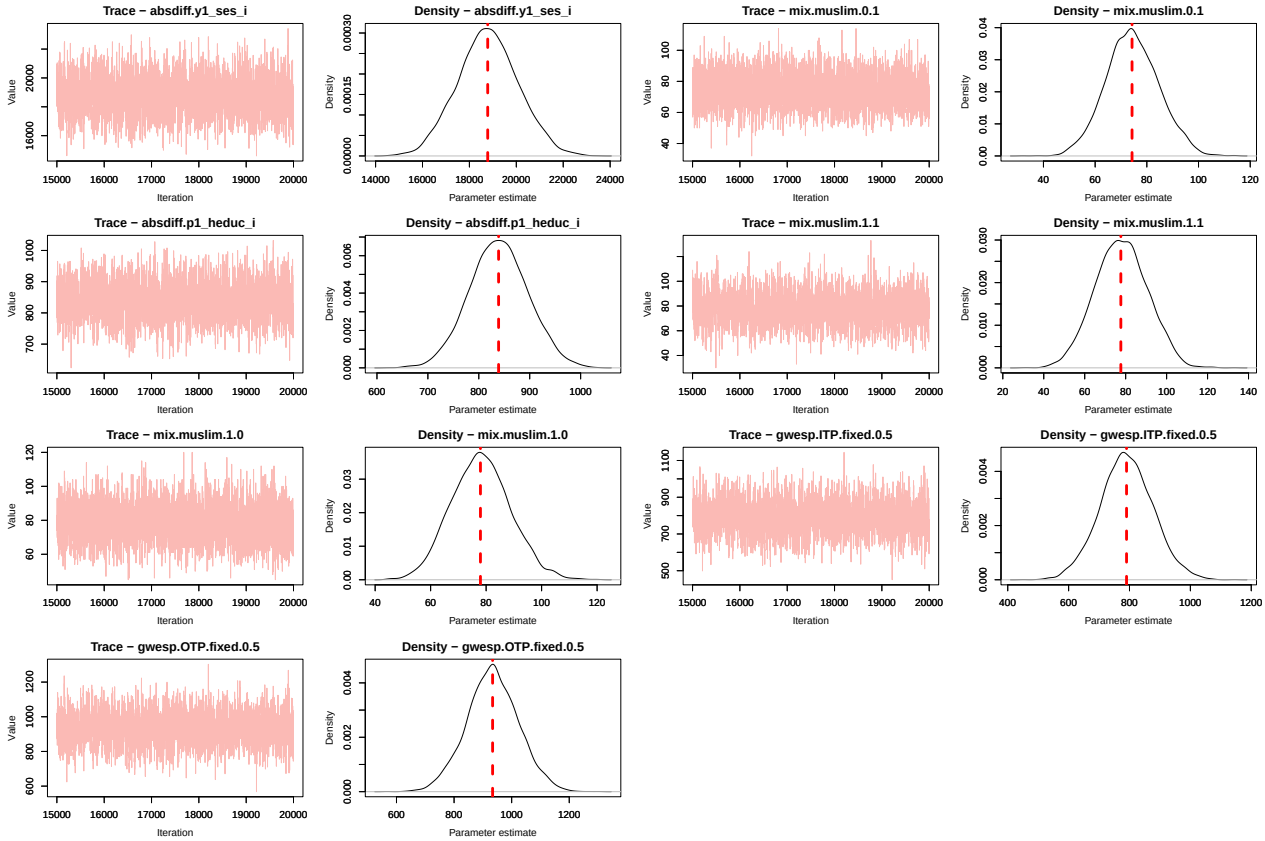
Density – nodematch.christ
Trace – absdiff.p1_heduc_i
Density – absdiff.p1_heduc_i
Trace – nodematch.muslim
Density – nodematch.muslim
Trace – nodematch.noReli
Density – nodematch.noReli
Trace – nodematch.otherR
Density – nodematch.otherR
Trace – absdiff.tol1_i
Density – absdiff.tol1_i
Trace – absdiff.tol4_i
Density – absdiff.tol4_i
Trace – absdiff.tol2_i
Density – absdiff.tol2_i
Trace – gwesp.ITP.fixed.0.5
Density – gwesp.ITP.fixed.0.5
Trace – absdiff.tol3_i
Density – absdiff.tol3_i
Trace – gwesp.OTP.fixed.0.5
Density – gwesp.OTP.fixed.0.5
Value
Density
Iteration
Parameter estimate

C.5 Convergence of Estimations - Between

C.5.1 England - M0

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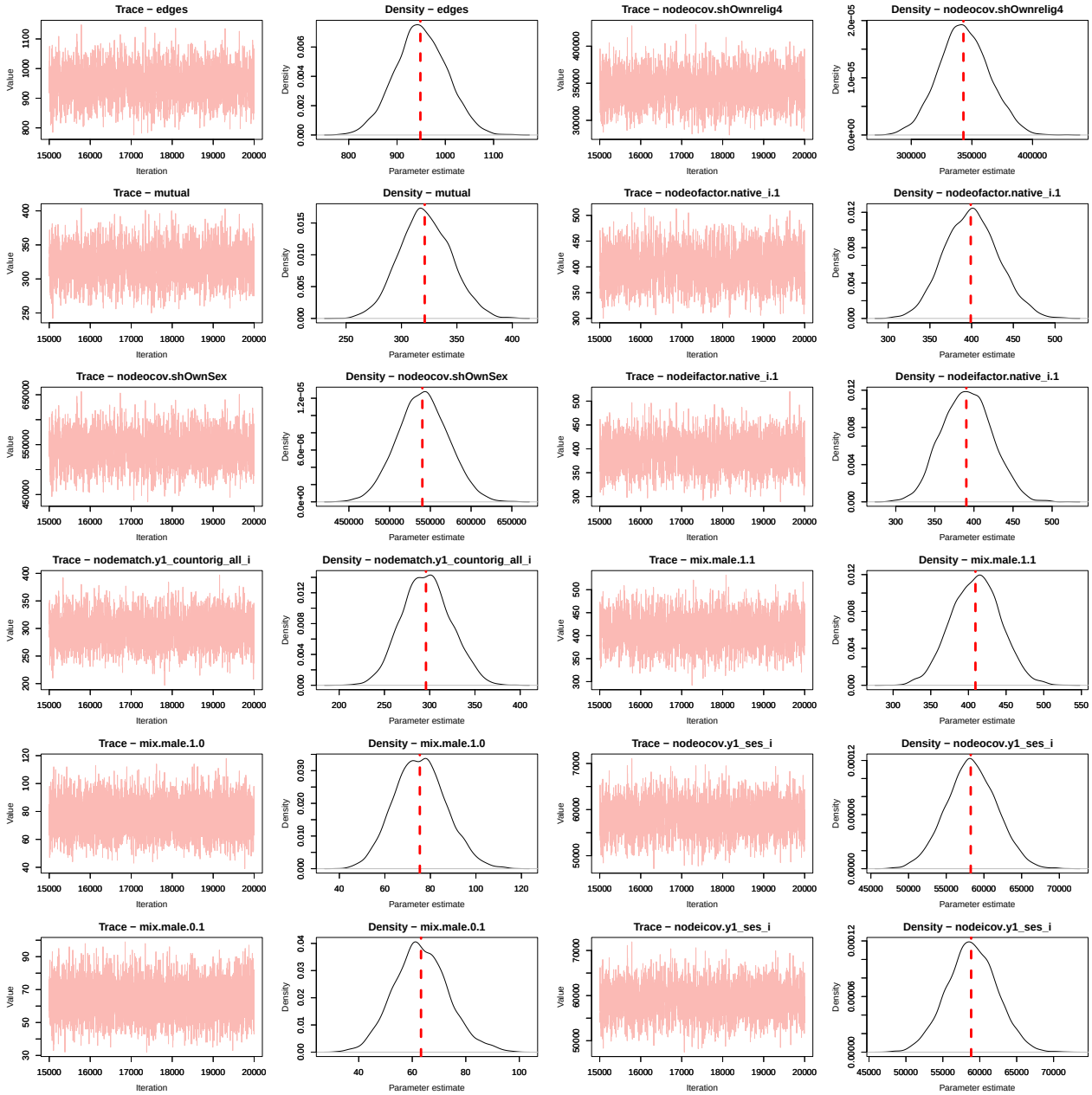
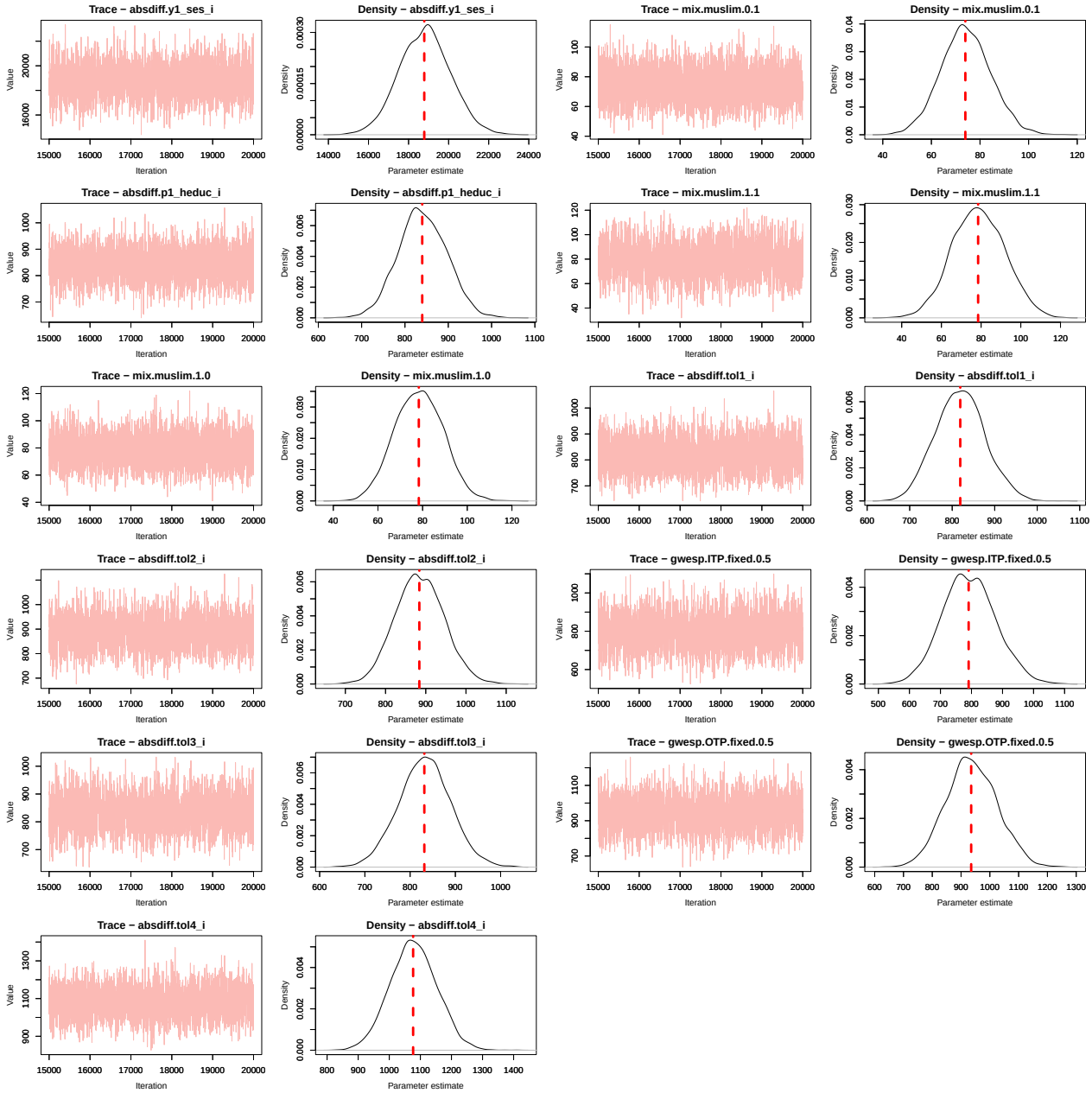
Value
Iteration
Density – absdiff.y1_ses_i
Density
Parameter estimate
Trace – mix.muslim.0.1
Value
Iteration
Density – mix.muslim.0.1
Density
Parameter estimate
Trace – absdiff.p1_heduc_i
Value
Iteration
Density – absdiff.p1_heduc_i
Density
Parameter estimate
Trace – mix.muslim.1.1
Value
Iteration
Density – mix.muslim.1.1
Density
Parameter estimate
Trace – mix.muslim.1.0
Value
Iteration
Density – mix.muslim.1.0
Density
Parameter estimate
Trace – gwesp.ITP.fixed.0.5
Value
Iteration
Density – gwesp.ITP.fixed.0.5
Density
Parameter estimate
Trace – gwesp.OTP.fixed.0.5
Value
Iteration
Density – gwesp.OTP.fixed.0.5
Density
Parameter estimate

C.5.2 England - M1

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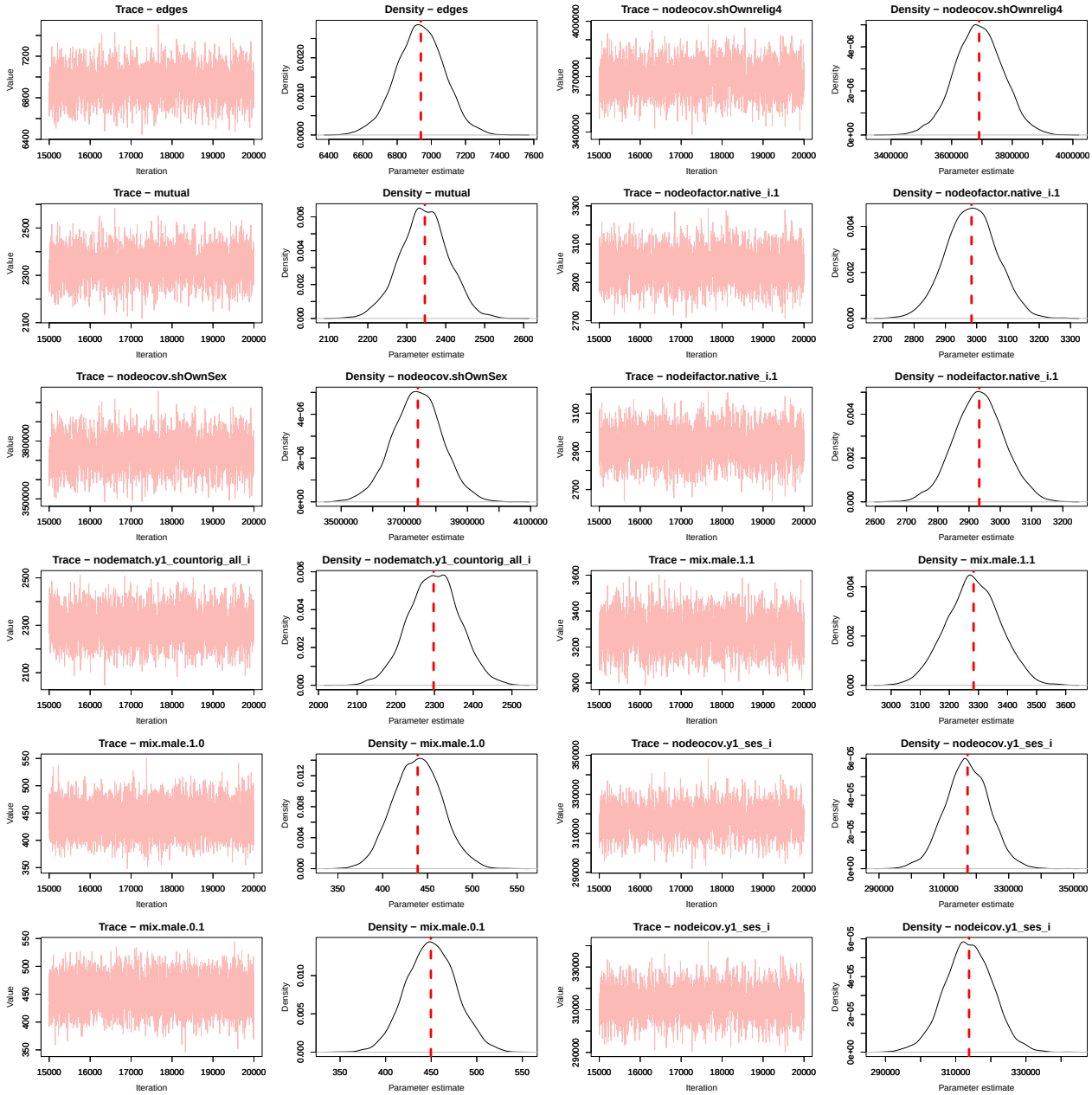
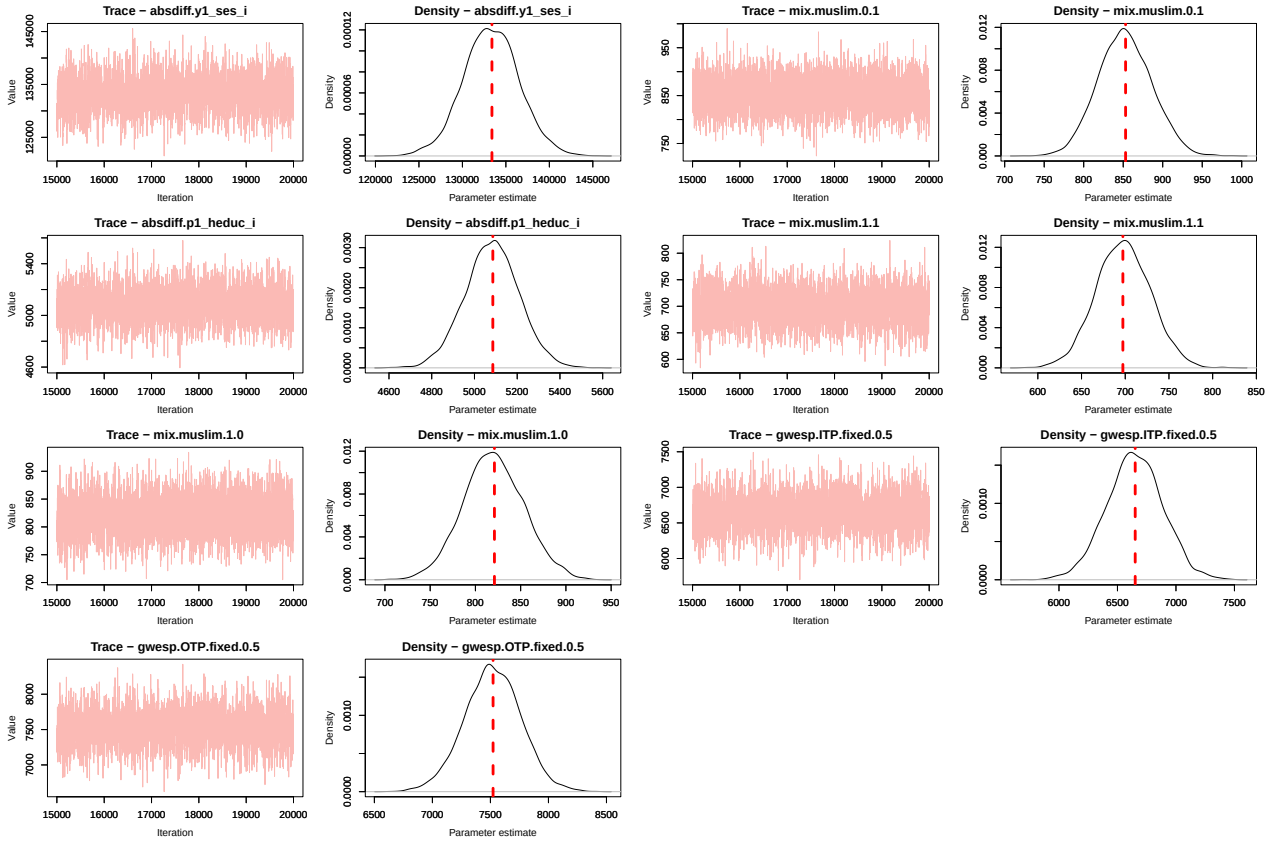
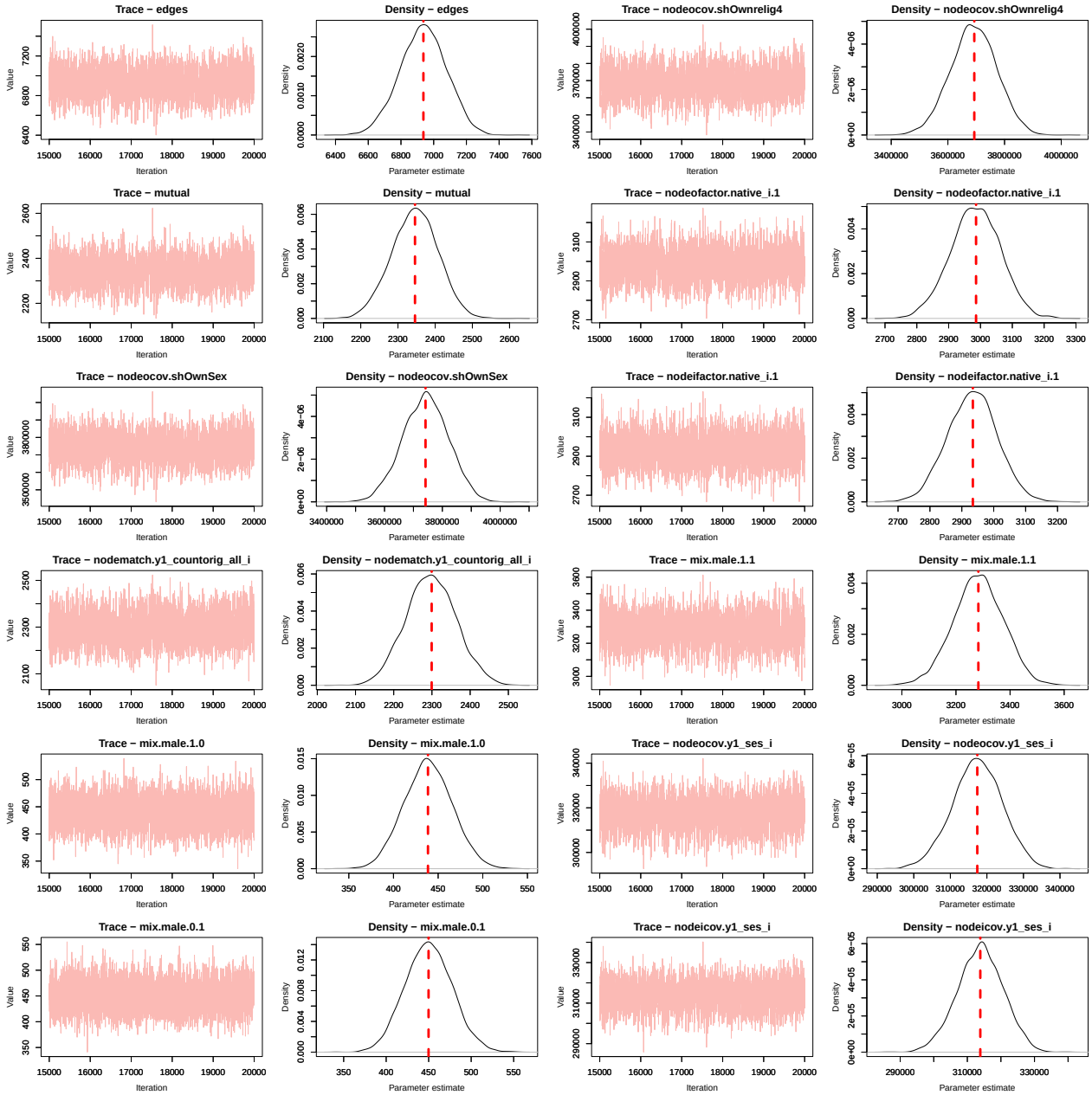
Density – mix.muslim.0.1
Trace – absdiff.p1_heduc_i
Density – absdiff.p1_heduc_i
Trace – mix.muslim.1.1
Density – mix.muslim.1.1
Trace – mix.muslim.1.0
Density – mix.muslim.1.0
Trace – absdiff.tol1_i
Density – absdiff.tol1_i
Trace – absdiff.tol2_i
Density – absdiff.tol2_i
Trace – gwesp.ITP.fixed.0.5
Density – gwesp.ITP.fixed.0.5
Trace – absdiff.tol3_i
Density – absdiff.tol3_i
Trace – gwesp.OTP.fixed.0.5
Density – gwesp.OTP.fixed.0.5
Trace – absdiff.tol4_i
Density – absdiff.tol4_i
Value
Density
Iteration
Parameter estimate

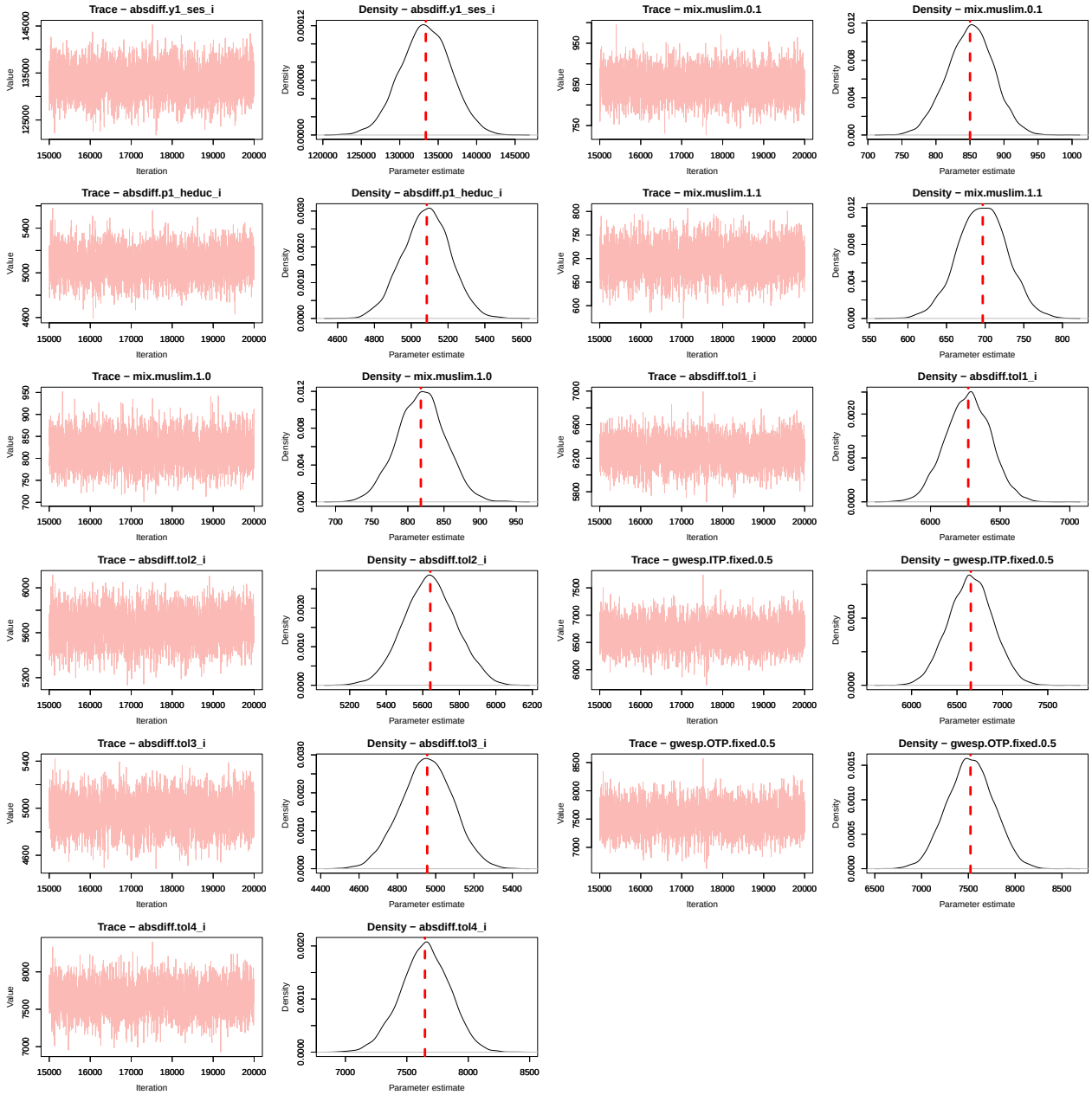
C.5.3 Germany - M0




Trace – absdiff.y1_ses_i
Value
Iteration
Density – absdiff.y1_ses_i
Density
Parameter estimate
Trace – mix.muslim.0.1
Value
Iteration
Density – mix.muslim.0.1
Density
Parameter estimate
Trace – absdiff.p1_heduc_i
Value
Iteration
Density – absdiff.p1_heduc_i
Density
Parameter estimate
Trace – mix.muslim.1.1
Value
Iteration
Density – mix.muslim.1.1
Density
Parameter estimate
Trace – mix.muslim.1.0
Value
Iteration
Density – mix.muslim.1.0
Density
Parameter estimate
Trace – gwesp.ITP.fixed.0.5
Value
Iteration
Density – gwesp.ITP.fixed.0.5
Density
Parameter estimate
Trace – gwesp.OTP.fixed.0.5
Value
Iteration
Density – gwesp.OTP.fixed.0.5
Density
Parameter estimate

C.5.4 Germany - M1

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Density – absdiff.y1_ses_i
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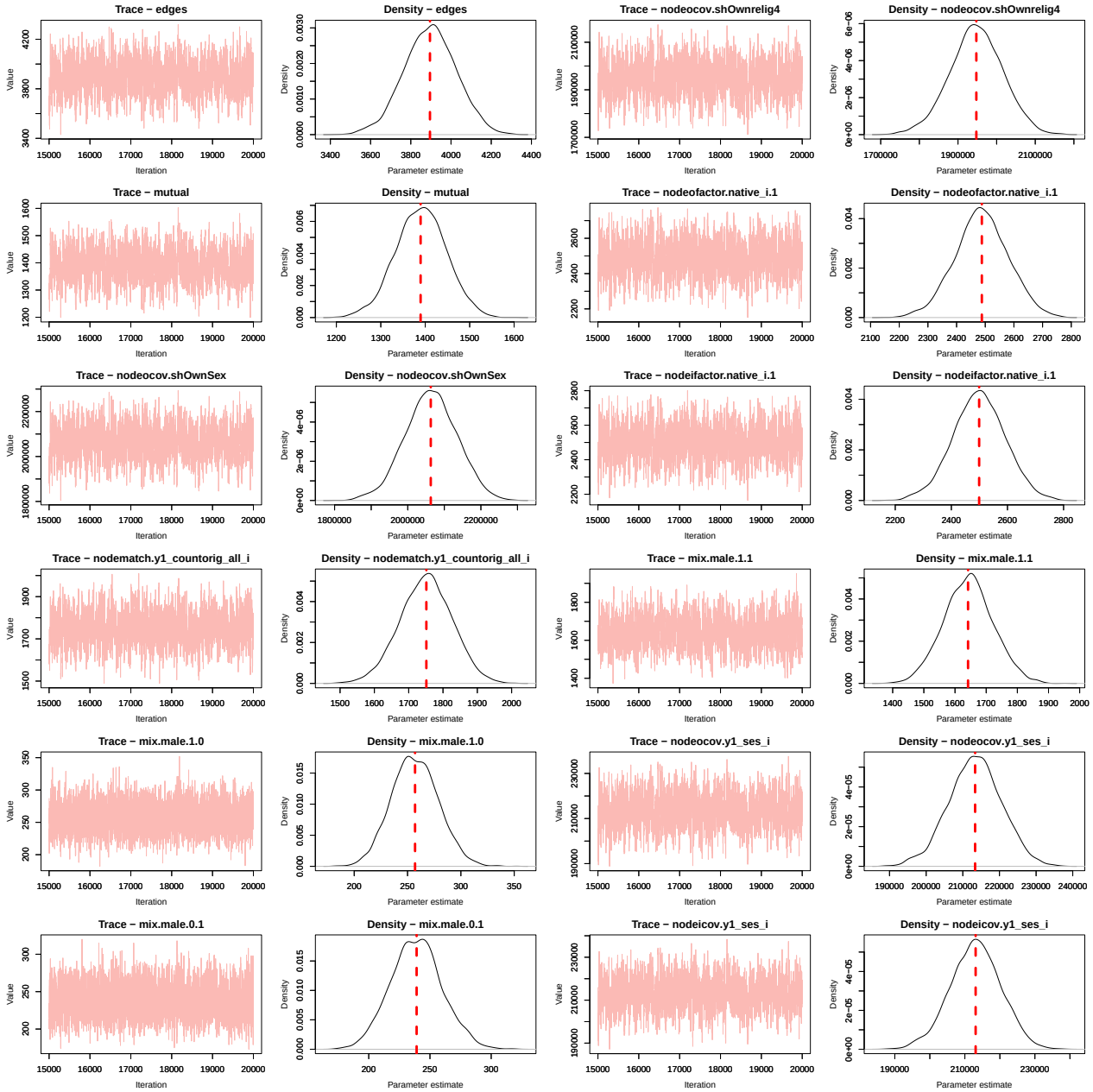
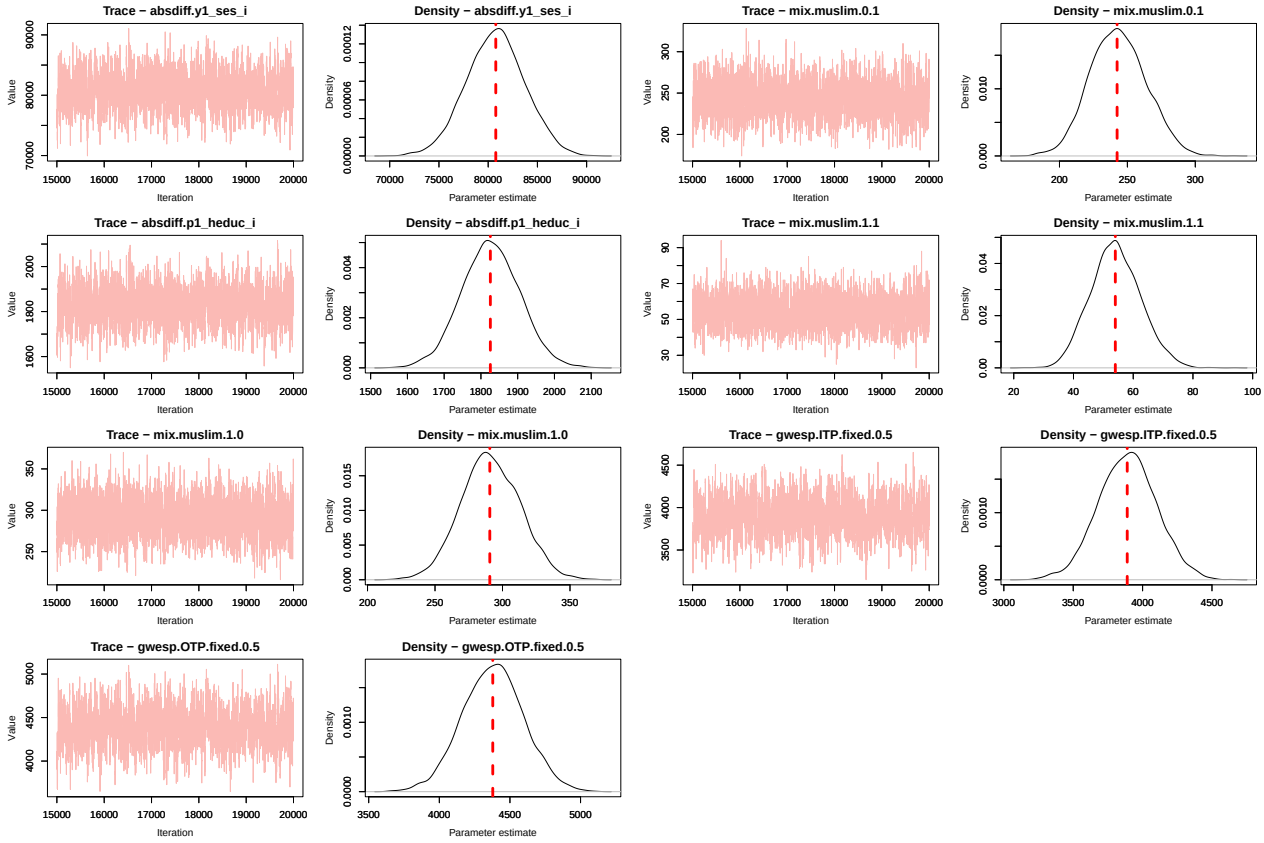
Density – mix.muslim.0.1
Trace – absdiff.p1_heduc_i
Density – absdiff.p1_heduc_i
Trace – mix.muslim.1.1
Density – mix.muslim.1.1
Trace – mix.muslim.1.0
Density – mix.muslim.1.0
Trace – absdiff.tol1_i
Density – absdiff.tol1_i
Trace – absdiff.tol2_i
Density – absdiff.tol2_i
Trace – gwesp.ITP.fixed.0.5
Density – gwesp.ITP.fixed.0.5
Trace – absdiff.tol3_i
Density – absdiff.tol3_i
Trace – gwesp.OTP.fixed.0.5
Density – gwesp.OTP.fixed.0.5
Trace – absdiff.tol4_i
Density – absdiff.tol4_i
Value
Density
Iteration
Parameter estimate

C.5.5 Netherlands - M0

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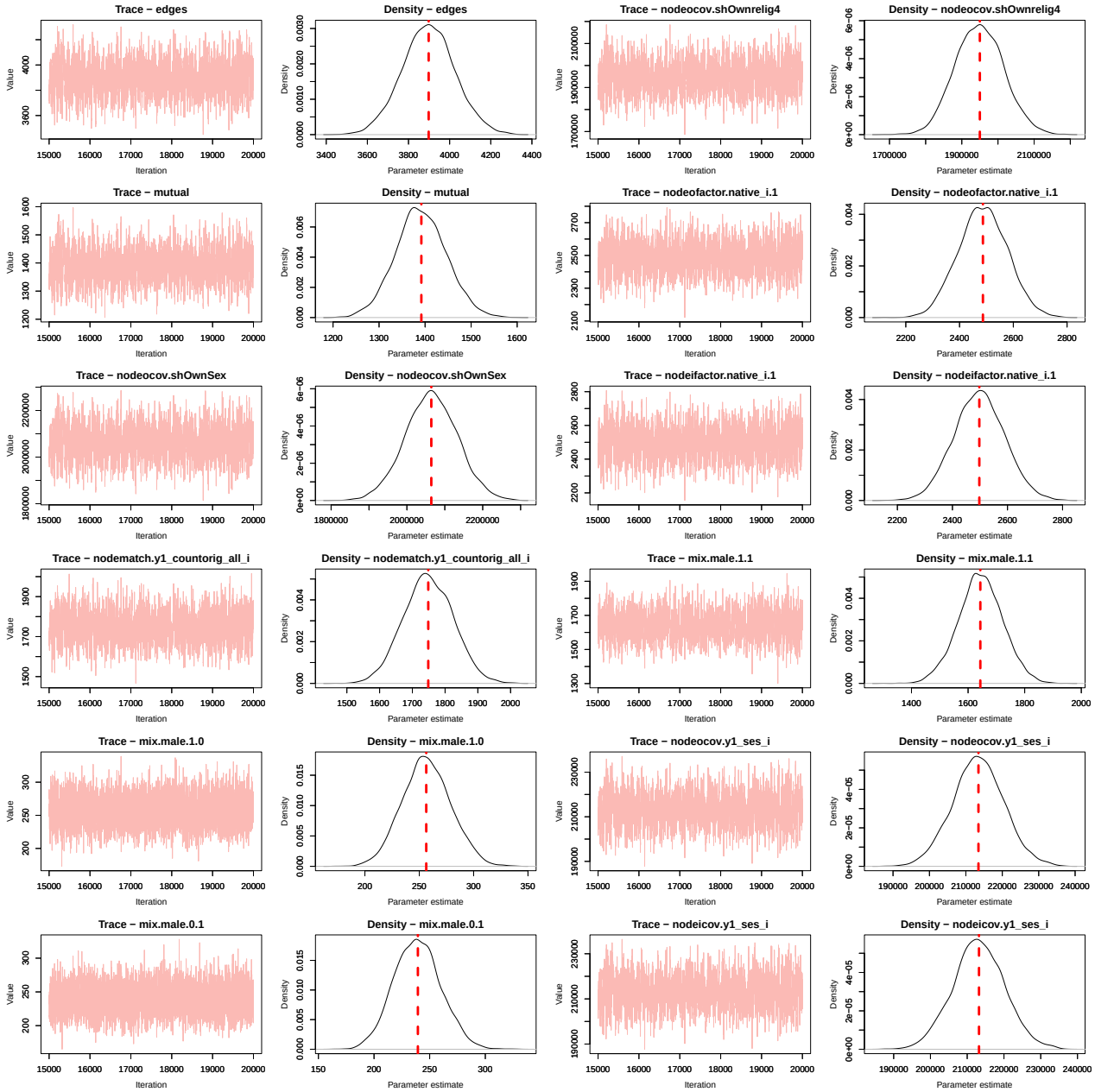
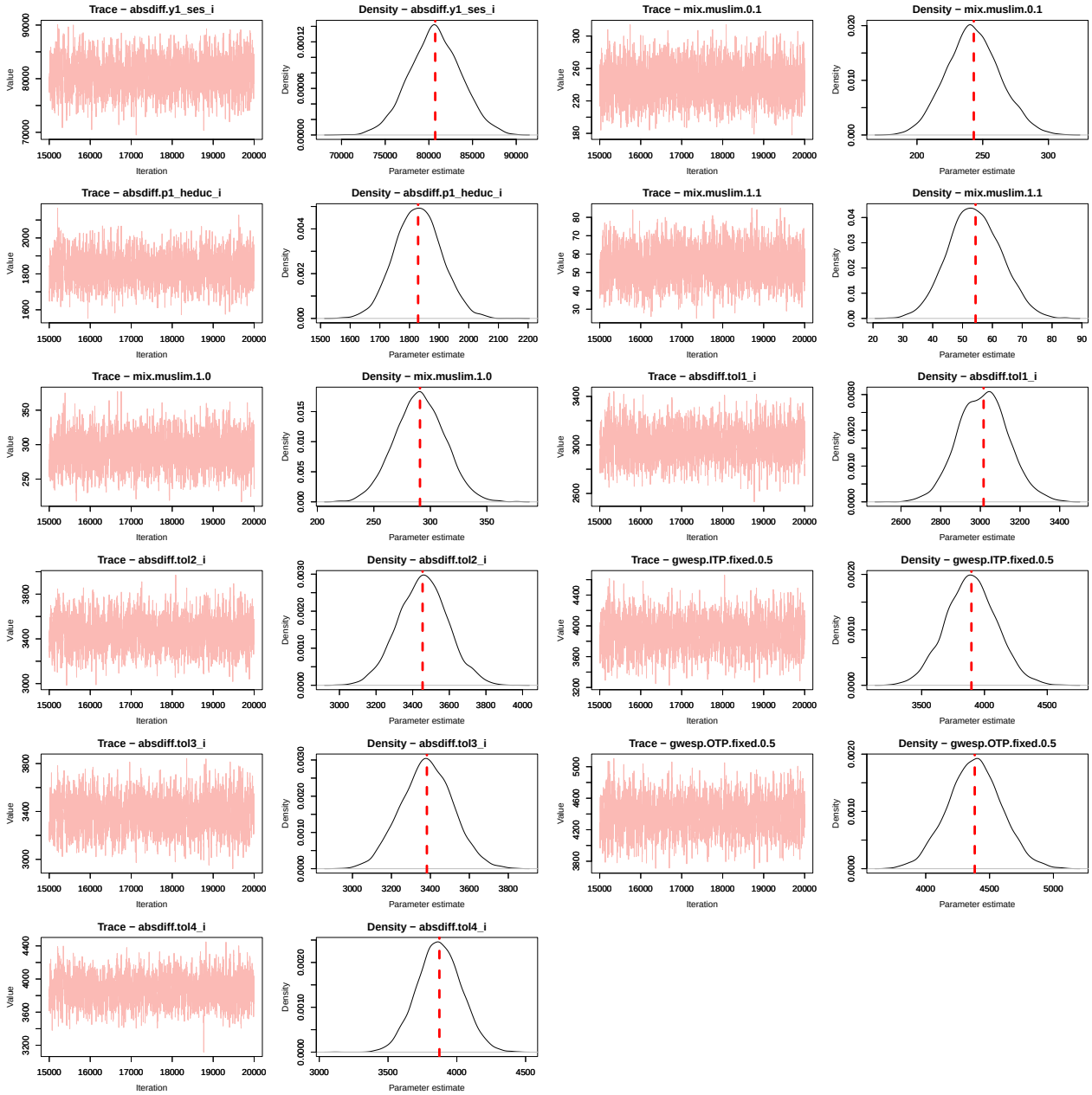
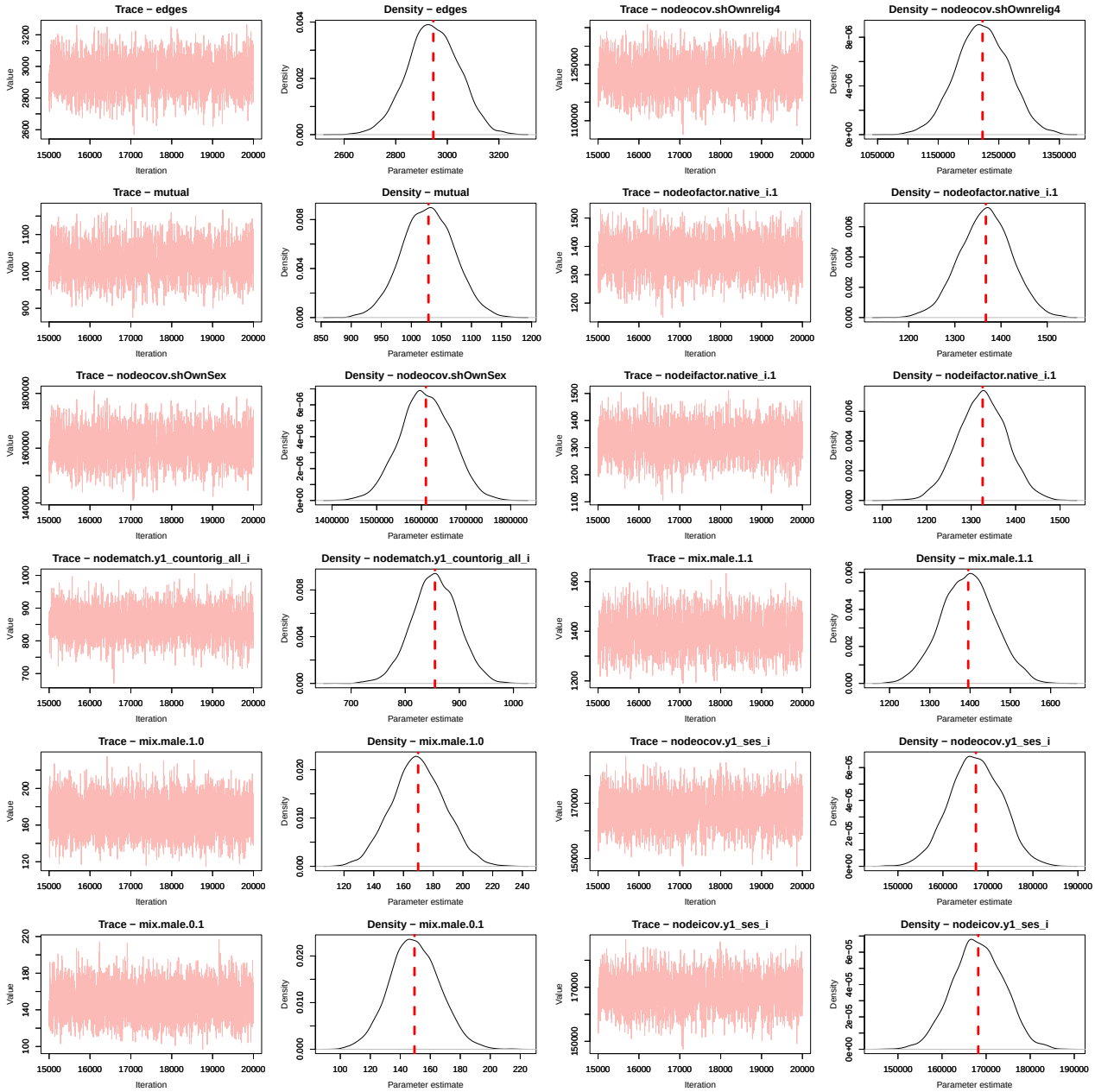
Value
Iteration
Density – absdiff.y1_ses_i
Density
Parameter estimate
Trace – mix.muslim.0.1
Value
Iteration
Density – mix.muslim.0.1
Density
Parameter estimate
Trace – absdiff.p1_heduc_i
Value
Iteration
Density – absdiff.p1_heduc_i
Density
Parameter estimate
Trace – mix.muslim.1.1
Value
Iteration
Density – mix.muslim.1.1
Density
Parameter estimate
Trace – mix.muslim.1.0
Value
Iteration
Density – mix.muslim.1.0
Density
Parameter estimate
Trace – gwesp.ITP.fixed.0.5
Value
Iteration
Density – gwesp.ITP.fixed.0.5
Density
Parameter estimate
Trace – gwesp.OTP.fixed.0.5
Value
Iteration
Density – gwesp.OTP.fixed.0.5
Density
Parameter estimate

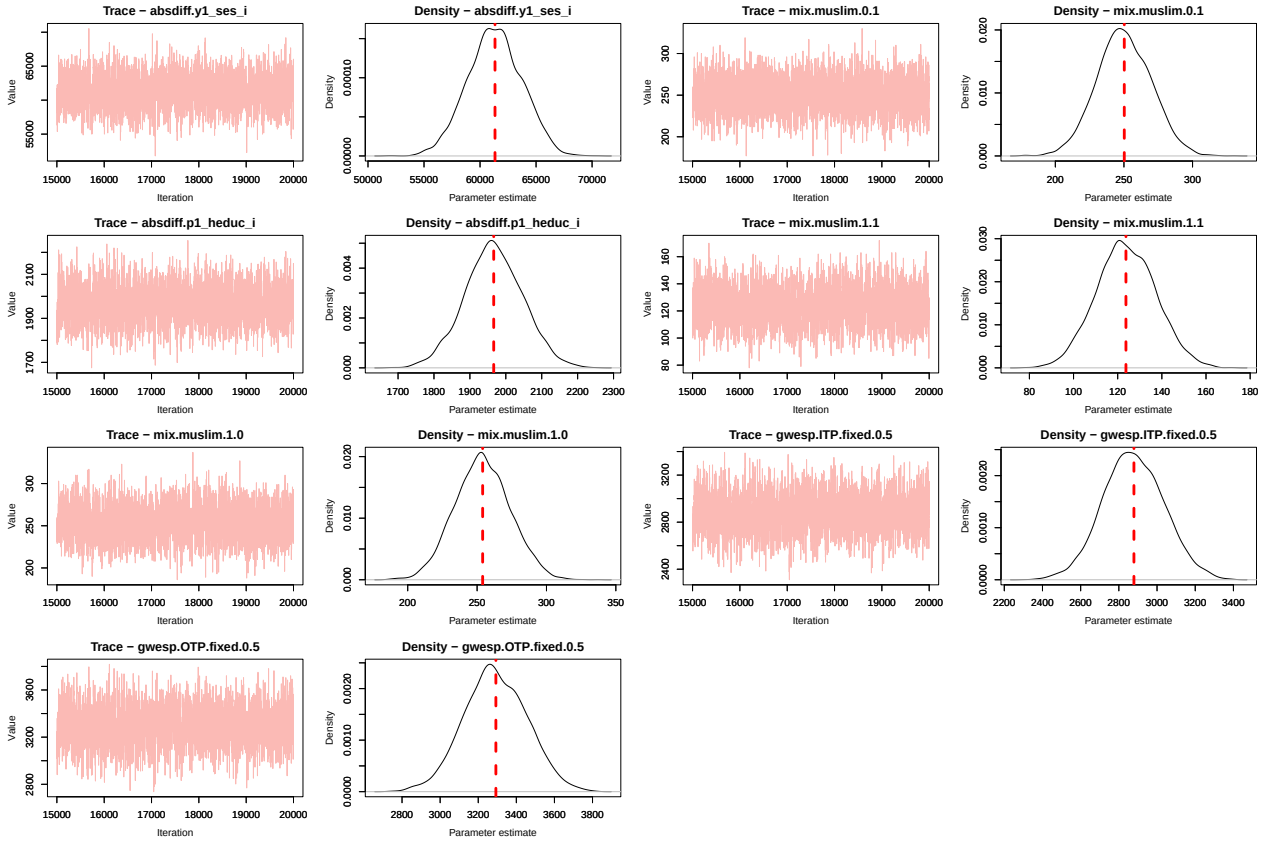
C.5.6 Netherlands - M1




Trace – absdiff.y1_ses_i
Density – absdiff.y1_ses_i
Trace – mix.muslim.0.1
Density – mix.muslim.0.1
Trace – absdiff.p1_heduc_i
Density – absdiff.p1_heduc_i
Trace – mix.muslim.1.1
Density – mix.muslim.1.1
Trace – mix.muslim.1.0
Density – mix.muslim.1.0
Trace – absdiff.tol1_i
Density – absdiff.tol1_i
Trace – absdiff.tol2_i
Density – absdiff.tol2_i
Trace – gwesp.ITP.fixed.0.5
Density – gwesp.ITP.fixed.0.5
Trace – absdiff.tol3_i
Density – absdiff.tol3_i
Trace – gwesp.OTP.fixed.0.5
Density – gwesp.OTP.fixed.0.5
Trace – absdiff.tol4_i
Density – absdiff.tol4_i
Value
Density
Iteration
Parameter estimate

C.5.7 Sweden - M0

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Density – absdiff.y1_ses_i
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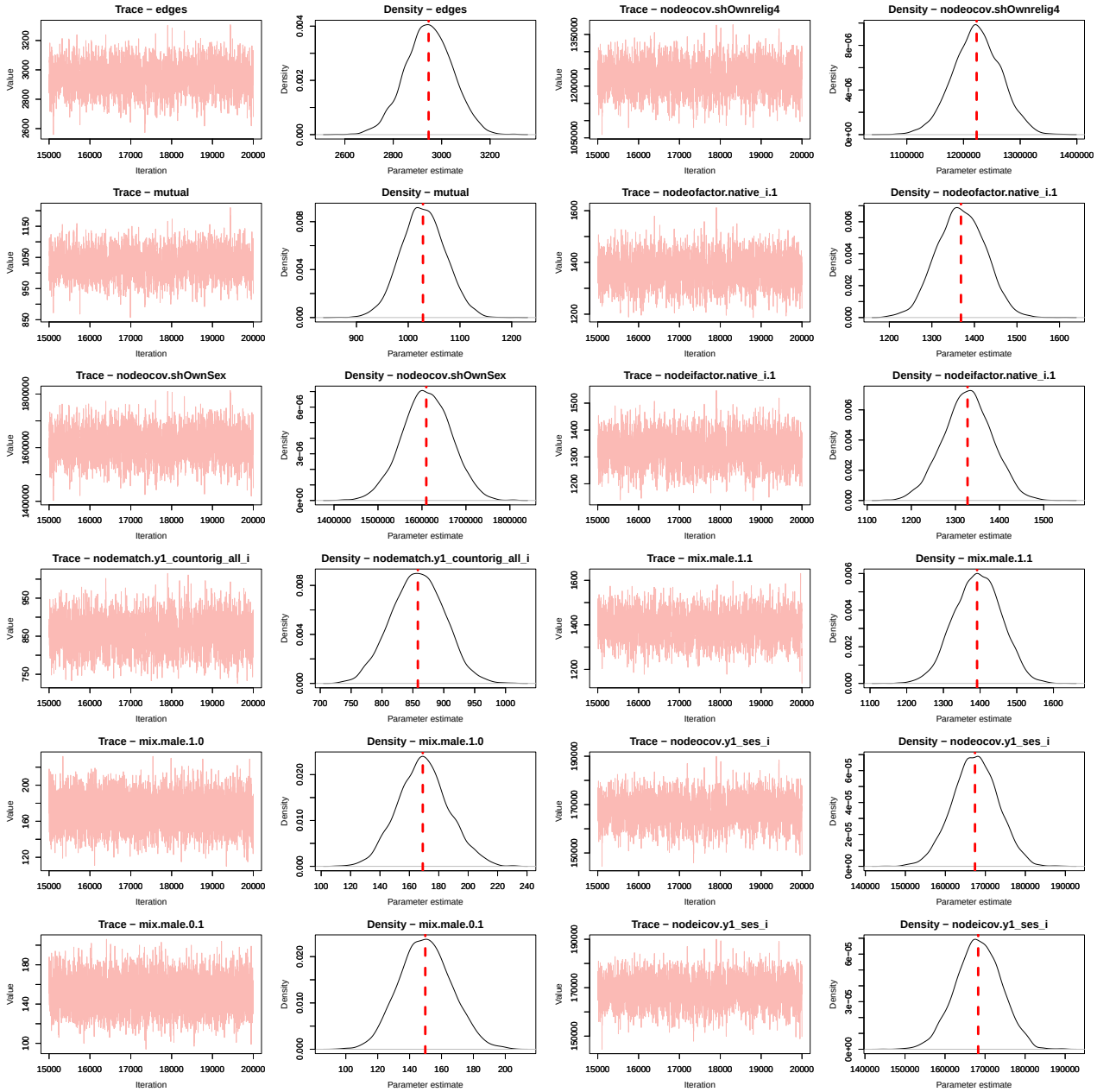
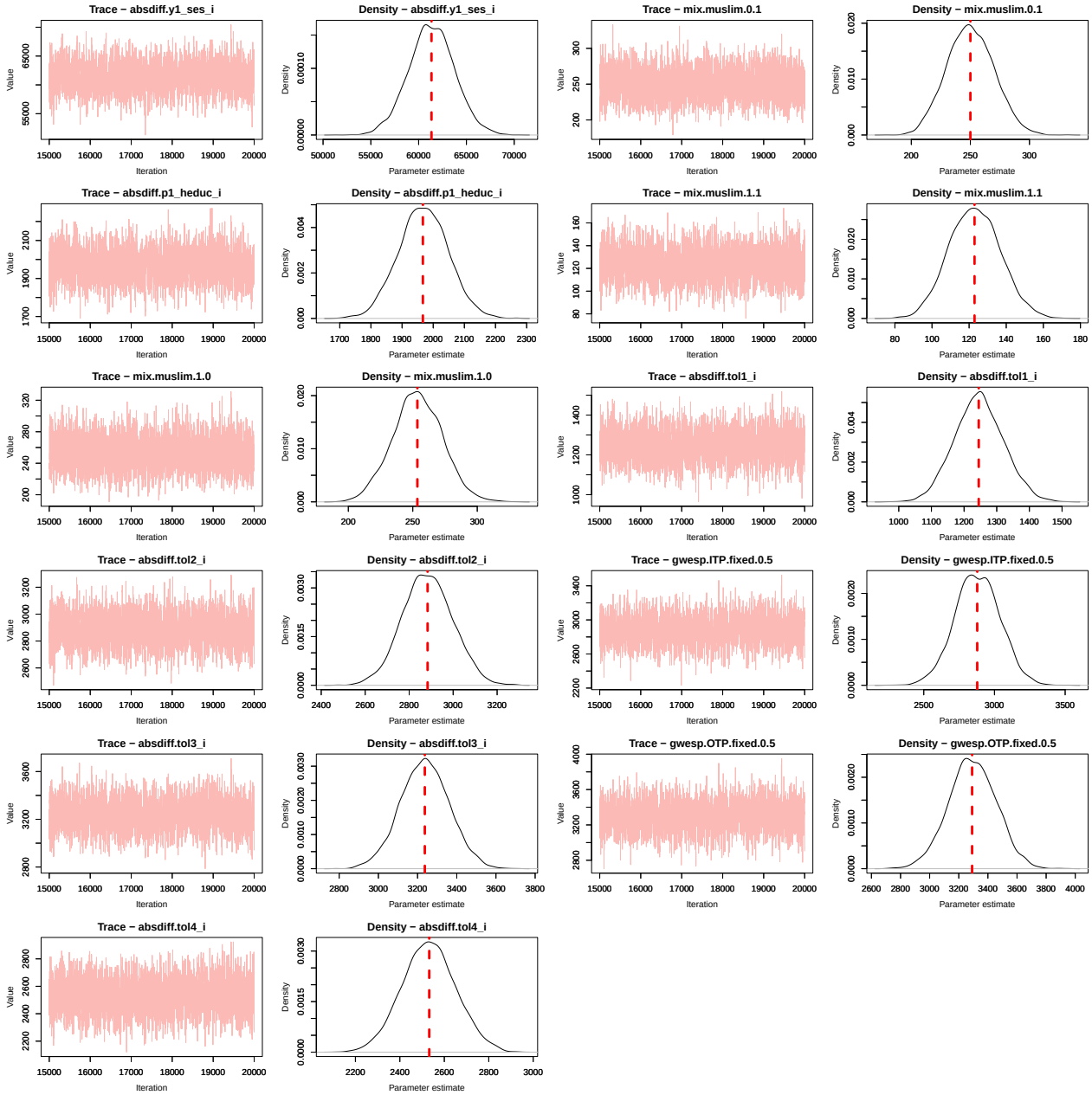
Density – mix.muslim.0.1
Trace – absdiff.p1_heduc_i
Density – absdiff.p1_heduc_i
Trace – mix.muslim.1.1
Density – mix.muslim.1.1
Trace – mix.muslim.1.0
Density – mix.muslim.1.0
Trace – gwesp.ITP.fixed.0.5
Density – gwesp.ITP.fixed.0.5
Trace – gwesp.OTP.fixed.0.5
Density – gwesp.OTP.fixed.0.5
Value
Density
Iteration
Parameter estimate

C.5.8 Sweden - M1




Trace – absdiff.y1_ses_i
Density – absdiff.y1_ses_i
Trace – mix.muslim.0.1
Density – mix.muslim.0.1
Trace – absdiff.p1_heduc_i
Density – absdiff.p1_heduc_i
Trace – mix.muslim.1.1
Density – mix.muslim.1.1
Trace – mix.muslim.1.0
Density – mix.muslim.1.0
Trace – absdiff.tol1_i
Density – absdiff.tol1_i
Trace – absdiff.tol2_i
Density – absdiff.tol2_i
Trace – gwesp.ITP.fixed.0.5
Density – gwesp.ITP.fixed.0.5
Trace – absdiff.tol3_i
Density – absdiff.tol3_i
Trace – gwesp.OTP.fixed.0.5
Density – gwesp.OTP.fixed.0.5
Trace – absdiff.tol4_i
Density – absdiff.tol4_i
Value
Density
Iteration
Parameter estimate

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