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PhD thesis

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Dating in Modern Societies

Způsoby seznamování v současné společnosti

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Declaration

Prohlašuji, že jsem disertační práci napsala samostatně s využitím pouze uvedených a řádně citovaných pramenů a literatury a že práce nebyla využita v rámci jiného vysokoškolského studia či k získání jiného nebo stejného titulu.

I hereby declare that this dissertation is the result of my own work and that I wrote it independently, using only duly listed and properly cited sources and references; and that it has not been submitted in connection with any other university course or in fulfilment of the requirements of the same or any other degree.

Renáta Topinková

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Declaration of publication of individual chapters

Most of this dissertation has already been published in the form of peer-reviewed articles in international and Czech journals. Specifically, the following texts were published:

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Abstract

In the past decade, online dating has been displacing other ways of meeting partners. In the US, online dating has surpassed meeting through friends and family around the 2013 for heterosexual couples. Despite the widespread popularity of online dating, relatively little is known about its prevalence, user perceptions, and behavioral dynamics in online dating platforms within the context of Czechia. This dissertation aims to fill this gap in empirical insights into Czech online dating market by utilizing two main data sources: 1) a survey of adult Czech internet users, 2) digital trace data from a Czech mobile dating app.

The study starts with the historical overview of matchmaking, transitioning from newspaper ads in the 19th and early 20th centuries to the flourishing of online platforms in the modern era, reflecting societal norms and demands of different eras.

The survey of Czech internet users reveals that online dating is a prevalent mode of finding romantic partners among surveyed Czechs, resonating with trends observed in the US and other Western countries.

The fast emergence and widespread popularity of online dating begs the question of how it is related to one of the most persistent patterns in the research on partnerships and families – homogamy. The remainder of the thesis therefore focuses on homogamy on two factors: age and desirability.

The analysis of online dating data reveals a variance in messaging trends between genders. Women, particularly younger ones, receive notably more attention, placing them in a 'chooser' position on dating market. Despite the prevalence of older men reaching out to younger women, the data supports a tendency for homogamous matches where successful connections are primarily formed between individuals of similar ages. This is especially true for women as they exhibit a propensity to reciprocate interest from men closer to their own age, while dismissing pursuits from significantly older counterparts. Furthermore, both men and women display a shift in preference towards younger partners with increasing age; however, women tend to initiate contact with significantly younger men later in life compared to men. Moreover, the results also underscore a men's pervasive avoidance to initiate contact with older women, suggesting that actual dating interactions do not necessarily align with professed openness towards older partners declared in surveys.

The last chapter reveals that while initial pursuits are aspirational, i.e., users reaching out to more desirable counterparts, homophily predominantly results from rejections, resulting in matches between individuals with similar levels of desirability.

Keywords: online dating, homophily, homogamy, partner selection, digital trace data, computational social science, age preferences, desirability

Abstrakt

V posledních letech se z online seznamování stal dominantní prostředek, jakým se nové páry seznamují, přičemž již v roce 2013 v USA u heterosexuálních párů předstihlo seznamování prostřednictvím přátel a rodiny. Navzdory široké popularitě online seznamování je o jeho rozšíření, vnímání společností a dynamice chování uživatelů na online seznamovacích platformách v kontextu Česka známo poměrně málo. Tato disertační práce si klade za cíl zaplnit tuto mezeru v empirických poznatcích o českém trhu online seznamování s využitím dvou hlavních zdrojů dat: 1) dotazníkového šetření mezi dospělými českými uživateli internetu, 2) digitálních stop z české mobilní seznamovací aplikace.

Studie začíná historickým přehledem seznamování, který přechází od novinových inzerátů v 19. a na počátku 20. století k rozkvětu online platform v moderní době, přičemž odráží společenské normy a požadavky různých historických period.

Šetření na kvótním výběru českých uživatelů internetu ukazuje, že online seznamování je mezi dotazovanými Čechy převládajícím způsobem hledání romantických partnerů, což odpovídá trendům v USA a dalších západních zemích.

Rychlý nástup a široká obliba online seznamování vyvolává otázku, jak souvisí s jedním z nejstabilnějších vzorců ve výzkumu partnerských vztahů a rodin - homogamií. Zbývající část práce se proto zaměřuje na homogamii, respektive homofilii, na základě dvou faktorů: věku a desirability.

Analýza dat z online seznamovací aplikace ukazuje rozdíly v trendech zasílání zpráv mezi pohlavími, přičemž ženám, zejména mladším, je věnována nápadně větší pozornost, což je na seznamovacím trhu staví do role "vybírajících". Navzdory množství starších mužů, kteří oslovují mladší ženy, úspěšná spojení vznikají především mezi dvojicemi podobného věku. To platí zejména pro ženy, neboť vykazují sklon opětovat zájem mužů bližších jejich věku, zatímco návrhy výrazně starších protějšků odmítají. Kromě toho muži i ženy vykazovali s přibývajícím věkem posun k preferenci mladších partnerů. Ženy však mají ve srovnání s muži tendenci navazovat kontakty s výrazně mladšími muži až v pozdějším věku. Výsledky také ukazují, že se muži obecně vyhýbají navazování kontaktů se staršími ženami. To ukazuje, že skutečné seznamovací interakce nemusí nutně odpovídat preferencím věkových rozdílů, které muži deklarují v dotaznících.

Poslední kapitola ukazuje, že zatímco počáteční snahy jsou aspirační, a tedy že uživatelé oslovují desirabilnější protějšky. Výsledná homofilie je však spíše výsledkem odmítnutí než preferencí, což vede ke spárování jedinců s podobnou úrovní desirability.

Klíčová slova: online seznamování, homofilie, homogamie, výběr partnera, digitální stopy, computational social science, věková preference, desirability

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1 Introduction

Most people look for love throughout most of their lives. While finding a partner and subsequent marriage was historically seen as an economic transaction to acquire in-laws and cumulate property and finances, too important to be based on “*something as fragile and irrational as love*” (Coontz, 2006, p. 15), nowadays we expect our romantic partner or spouse to fulfil many roles. We expect our romantic partners to be our best friends, confidants, lovers, parents to our children, to take care of most, if not all, of our needs. There are measurable benefits to being in a healthy romantic relationship such as lower psychological distress or higher subjective well-being (e.g., Kawamichi et al., 2016). Moreover, prior research has consistently shown lower substance abuse, better health, and longer lifespan for married individuals (e.g., Cho et al., 2008; Hamplová, 2012; Martikainen et al., 2005). These tangible benefits apply across different cultural and social contexts in contemporary societies.

Individuals do not choose who they affiliate with at random. Quite the opposite – people tend to associate themselves with those who display remarkable similarity to them on multitude of traits. This is referred to as homophily, a principle posing that “*a contact between similar people occurs at a higher rate than among dissimilar people.*” (McPherson et al., 2001, p. 416). The principle seems to be universal and can be seen in romantic partnerships (Hamplova, 2009; Kalmijn, 1998), friendships (Verbrugge, 1977), schools (Hogue & Steinberg, 1995), workplaces etc. Individuals were found to forge connections with similar alters in terms of education, race, religion, race, or psychological and behavioral traits such as depression or aggression (McPherson et al., 2001). A special case of homophily is homogamy – the tendency to marry someone who is similar. Much like homophily in general, homogamy is one of the most robust patterns that we observe in the research on marriages and romantic unions (e.g., Blackwell & Lichter, 2004a; Blossfeld & Timm, 2003b; Fu & Heaton, 2008; Hamplova, 2009;

Schwartz, 2013; Schwartz & Mare, 2005). Homophily and homogamy are usually explained by two, mutually non-exclusive, factors – preferences and opportunities.

Preferences refer to individuals wanting to associate with similar people. For instance, educational homogamy not only often implies homogamy on income, but is also related to shared values and lifestyles (Kalmijn, 1991a). Similarly, homogamy on ethnicity may make it psychologically easier to communicate with the partner in the same language and to connect with the in-laws.

Opportunities the structures that enable or restrain individual choices, i.e., who is likely to meet with whom. They may be limited by e.g., geographical constraints (e.g., residential segregation) or local marriage markets (e.g., the distribution of available single men and women). Furthermore, as individuals develop their personal networks, which are often homophilic, it is likely that their spouse will also be selected from these personal networks, further increasing homogamy (Kalmijn, 1998).

Throughout history of modern society, the most common ways to meet a romantic partner were through friends, family, school, work or in bar or a restaurant. Geographical constraints played an important role for partner selection – in fact, in their study of a marriage licences issued between 1930 and 1939 in Simsbury, Connecticut, Ellsworth (1948) found that even though only third of marriages were between residents of the same city, the geographical distances were rather small, meaning that marriages occurred mainly between residents of neighbouring cities. Ellsworth concludes that “*one is tempted to say that people will go as far as they have to find a mate, but no farther*” (Ellsworth, 1948, p. 446). In general, the institutions which individuals go through during their lives strongly shape the opportunities and constraints for meeting potential romantic partners, starting from elementary schools through universities to shared workplaces (Kalmijn, 1998). In all these institutions, people are more likely to meet

similar others, be it due to their similar background (i.e., opportunities) or similar interests (i.e., preferences).

In the past decade, online dating has been displacing other ways of meeting partners (Rosenfeld et al., 2019). In the US, online dating has surpassed meeting through friends and family around the 2013 for heterosexual couples (Rosenfeld et al., 2019). For same sex couples, meeting online has been the most prevalent way to meet for the past two decades (Rosenfeld et al., 2019; Rosenfeld & Thomas, 2012). Those who meet online are often complete strangers with no mutual acquaintances. The disintermediation of friends and family has two implications – first, the couples evade the initial “pre-screening” by friends and family, and second, they are not recruited from within one’s social circle, which likely consists of similar individuals. The latter has implications for homogamy – Ortega and Hergovitch (2017) posit that online dating will increase interracial marriages, i.e., lower racial homogamy. That is not to say that the social dimension no longer matters. For instance, Sprecher and Felmlee (1992) found that friends’ and family’s support for the romantic relationship predicted its quality and the likelihood of dissolution. Since relationships that originated online should, ideally, translate into one’s life, the eventual approval of one’s social circle remains important. Although online dating (and the spread of technology in general) lowers the physical boundaries by creating a possibility for people who do not navigate the same environment to meet, it is important to note that it does not render the geographical distances meaningless. The ultimate goal of online dating remains for the two parties to meet, and many people consider living too far away a dealbreaker (Barroso, 2020). Similarly, according to a 2019 poll, two thirds of American online daters set their limit for searching for a partner to a maximum of 30 miles (approx. 50km), indicating that there is, in fact, a geographical limit present online (Kirkham, 2019).

The spread of online dating warrants a question for those studying union formation: Does it matter whether couple meets online or offline? And if it does matter, how does it affect

homogamy? On the one hand, online dating can lead to less similarity since the constraints imposed on the individuals are somehow lifted. Individuals should not be as bound by their physical environments, e.g., their neighbourhoods or the number of people they can realistically meet, or their social contacts, e.g., families, friends, or churches. As such, there is a possibility of increased heterogeneity as online dating allows for meeting of individuals who would have not met otherwise. On the other hand, online dating sites and apps commonly include ways to narrow one's search for a partner, such as filtering or other affordances. Such affordances could be the design of the online dating site or app, such as the availability of filters, or matching algorithm at place. Thus, despite the possibility of increased heterogeneity, individuals can actually become more efficient in their search for similarity.

As Kalmijn (1998, p. 397) puts it, homogamy is highly relevant for sociology because it is: *“not just a reflection of the boundaries that currently separate groups in society, it also bears the potential of cultural and socioeconomic change”*. As online dating becomes more and more prominent pathway to forming romantic unions (e.g., Cacioppo et al., 2013; Potarca, 2020; Rosenfeld et al., 2019), it is necessary to understand the process of online dating, whether or how it affects the relationships formed, and subsequently, the society at large. As such, studying online dating in terms of homophily (a process preceding homogamy itself) in a pursuit of a romantic partner and homogamy is valuable in two ways. First, to assess whether online dating brings change to the union formation, and second, as a way to study whether homophily is already present in the beginning of the mating process that may or may not result in homogamy. Furthermore, studying online dating allows for controlling for the structure of available partners on the online dating market, an information typically missing in studies of homogamy. This dissertation aims to contribute to the research addressing the questions related to the advent of online dating and partner selection in the context of Czech Republic, an understudied context

that is different from other frequently studied countries (Western Europe, USA, or China) due to rather traditional gender norms (Hamplová et al., 2019).

This dissertation is structured as follows: The second chapter gives an overview of historical development of online dating in the Czech lands, describing the evolution from lonely hearts ads in newspapers and magazines, early computer-mediated matchmaking, to the online dating. The third chapter describes the state of online dating in Czechia as of September 2022. It examines who dates online in Czechia, the current attitudes toward online dating, the experiences of online daters, and the distribution of couples who met this way. The subsequent chapters explore homophily using 2017 data from a Czech mobile online dating app. These chapters contain three studies that either have been published before in peer-reviewed journals or are currently under review. Chapter four focuses on age homophily. Chapter five expands upon the previous chapter, examining not only whether a match is homophilous in terms of age, but also the age gaps and their acceptability online, controlling for the age distribution of available partners online. Chapter six examines homophily in terms of desirability online, measured as the number of received messages from the opposite sex. In its Conclusions, the thesis summarizes the findings and proposes future directions.

2 From newspaper ads to online dating

The story of online dating begins on July 19th 1695, hundreds of years before the invention of the Internet, when the first lonely hearts ad was published in *A Collection for Improvement of Husbandry and Trade*, a British pamphlet advertising all kinds of merchandise. According to Beauman (2011), it read: *“A Gentleman about 30 Years of Age, that says he had a Very Good Estate, would willingly Match himself to some Good Young Gentlewoman that has a Fortune of 3000l. or thereabout and he will make Settlement to Content.”* (Beauman, 2011, p. 1). Many of the early lonely heart ads were quite similar - brief, pragmatic in their wordings, explicitly mentioning the desired yearly income, age, or domestic prowess of the sought after mate. Although those ads may seem extremely crude to readers nowadays, it is important to note that for a long time, marriage was viewed mainly as an economic transaction to gain finances and in-laws (Coontz, 2006). From its inception, lonely hearts ads served a dual purpose: as a way to meet someone and as a source of entertainment. In some cases, people found them amusing on their own (Staněk, 1977); in some cases, the ads were amusing on purpose or were read to fulfill the *“voyeuristic pleasure of trying to work out the identity of the would-be suitors”* (Beauman, 2011, p. 2).

Although some sources claim the first lonely hearts ad in the Czech lands appeared on the 8th of March 1794 in *Poštovské noviny*¹ (e.g., Havlová, 2019; Novák, 2012), the digitalized version of the newspaper from this particular date or the subsequent dates shows no record of lonely hearts ads. Instead, we can find advertisements for selling a pub, a mill, and various seeds. It is thus unclear when exactly was the first lonely hearts ad in the Czech lands was published. However, *Národní politika*, a daily newspaper published from 1883, contains lonely hearts ads already in its oldest issues. For instance, a 1884 lonely hearts ad dryly announces that *“A young*

¹ The name at the time was „Kraméryusowy Cýs. král. Pražské Posstowské Nowiny“. The issue in question can be accessed through <https://kramerius.nkp.cz/kramerius/PShowIssue.do?id=202502>

man of decent looks, 30 years of age, with a secure livelihood, intends to marry a domestic girl, aged 20-25, possessing a dowry." ('Národní Politika', 1884)². Women's lonely hearts ads of the time was similarly pragmatic, e.g., in an ad from 1902 a "*girl 28 years old with dowry of 800zl. wishes to make acquaintance with a finer craftsman or a finer servant*"³ ('Národní Politika', 1902).

According to Neumann (1932), lonely heart ads spread to most countries by the mid-18th century. Given that newspapers and magazines were not as evolved as in the United Kingdom, instead of being published in the newspaper or magazines, they were handed out as flyers on the street in the beginning (Neumann, 1932, pp. 78–79). Neumann (1932) criticizes the practice heavily in his writing, bashing its transactional and entrepreneurial nature and the "petit bourgeois ideal of marriage" of the time. As he puts it:

„In this gallant and selfish world, it is for women to have money, for it is not the face that counts, but the weight. If the maiden Sabina would have a handsome man, she must have money, jewels, and pearls. If the maiden Mária would have a brave officer, she must have ducats and silverware. If Miss Leonora wants to become Her Grace, money will help her best; money will solve everything in the world; otherwise, Miss Klárinka, Katynka, Bábinka are not worth a penny, if they have no tolar in their chests. Nobleness and virtue are not worth much, and she who marries is best married only when she has money. Golden hair and a leaden sack mean nothing, but leaden hair and a golden sack earn praise and triumph in every place.“ (Neumann, 1932, p. 76).

Hajn goes even further in his criticism, claiming that utilizing lonely hearts ads to find a spouse was "*unworthy of an educated and honest man*", and that reducing marriage to a trade

² Czech original: „Oženiti se hodlá mladý muž slušného zevnějšku, 20 roků stár, se zajištěnou existencí, s dívkou domácně vychovanou, ve stáří 10-25 roků, vládoucí nějakým věnem.“

All excerpts from historical newspapers and magazines can be accessed digitally via Kramerius.

³ Czech original: „Dívka 28letá s věnem 800zl. přeje si učiniti známost s lepš. řemeslníkem nebo lepším sluhou.“

“corresponds to the cultural level of savages and not to civilized people” (Hajn, 1939, p. 87). Lonely hearts ads of officers were considered especially crass as they very explicitly sought ladies with significant amounts of money (Neumann, 1932). Lonely hearts ads also developed its own phraseology to express meaning covertly. For instance, “man without prejudice”, “men with mature worldview” were often used to signify being okay with a child outside of wedlock, not-so-upstanding relatives or willingness to become one’s lover (Neumann, 1932).

During the First Czechoslovak Republic period (1918 – 1938), lonely hearts ads were ubiquitous. In 1926, a new magazine *1. československý sňatkový zpravodaj* (The First Czechoslovakian Marriage Bulletin) emerged and consisted mainly of lonely hearts ads and tips for personal grooming or short romantic novellas. Indeed, in the early 1930s Neumann writes that *“every reader is more or less familiar with [lonely hearts ads] in detail from the nearest daily paper, and for many, perhaps, these columns are in the newspaper are also a daily amusement”* (p. 200). The ubiquity of the practice is further corroborated by Hladík (1938), who estimated over 300 000 lonely hearts ads published yearly at the time. Despite the harsh criticism by the writers of the time, condemning it as solely business oriented with no space for any romance, a criticism which is undoubtedly true for many lonely heart ads – e.g., *“I wish to marry off my sister who has a small shop to a trader or clerk aged 36 and over”* (*1. Československý Sňatkový Zpravodaj*, 1926) – some ads in *1. československý sňatkový zpravodaj* were testaments of loneliness, rather than financially motivated:

„A young man, much disappointed in life, with a good existence, of a very gentle and tender disposition, of a good heart and a hopeful future, seeks a girl under 20 years of age, independent, preferably poor, but of the same nature, who would desire a happy life together.

*Sincere replies even without photo on the sign "Only love repays love"*⁴ (‘1. Československý Sňatkový Zpravodaj’, 1926)

Similarly, few issues later, a young woman writes:

*„Who will make me happy? I'm 22 years old and I live with relatives. I have a fortune of 230 000 CZK from my parents and a large inheritance to look forward to. I am not, however, beautiful, but educated in literature and music, and I have a firm belief that I will find a man who would be at least grateful for the financial help I would provide. Will my expectations not be disappointed?”*⁵ (‘1. Československý Sňatkový Zpravodaj’, 1926)

In 1938, sociologist Miroslav Hladík analysed lonely hearts ads in selected ten days of 1933 and 1934⁶. Hladík found that men posted most ads, and that the most sought qualities included social status (income, pension, education) and physical attractiveness. He notes that psychological qualities were not mentioned nearly as often as the former two, and if they were mentioned, it was more likely by women. Compared to women, men were more often stressing the financial aspect, i.e., the size of dowry.

After 1948, lonely hearts ads and marriage agencies were forbidden in Czechoslovak Socialist Republic (ČSSR) because they “*gave emphasis on the most typical features of a bourgeois marriage: above all and almost exclusively financial interests*“, which was incompatible with the “*educational social action at the time*” (Radvanová, 1964, p. 57), highlighting the requirements for the social status of a partner or their size dowry size present in the lonely heart

⁴ Czech original: „Mladý muž, životem mnoho zklamaný, s dobrou existencí, velmi jemné a něžné povahy, dobrého srdce a nadějně budoucnosti hledá dívku do 20let samostatnou, nejráději chudobnou, ale stejné povahy, která toužila by po šťastném společném životě. Upřímné nabídky i bez foto na zn. "Jen láska lásku oplátí"

⁵ Czech original: Kdo učiní mne šťastnou? Jsem 22 roků a žiji u příbuzných. Po rodičích mám jmění 230 000 Kč a ještě velké dědictví k očekávání. Nejsem však krásnou, ale vzdělanou literárně i hudebně a mám pevnou víru, že najdu muže, který by mi alespoň vděčným za finanční pomoc, kterou bych mu poskytla. Nezklame mne moje očekávání?

⁶ It is worth noting that the digitalized version of the article (Nešpor & Kopecká, 2011) contains a typo that the author has analysed the first ten days of December 1953 and the first ten days of May 1934. Given that the study was published in the 1938 and mentions that the text is a part of an unfinished dissertation of an author who „who died prematurely of an insidious case of tuberculosis“, it is safe to assume that the intended year was indeed 1933.

ads. According to Staněk (1997), the idea at the time was the new socialist society would be free of all negative phenomena, including loneliness. However, the cancellation of lonely heart ads was met with disdain from the general public, as shown by multiple letters sent by readers to various organs and magazines, asking for the re-establishing of lonely heart ads columns (Radvanová, 1964; Staněk, 1977). Readers argued that lonely hearts ads were harmless and wished to utilize them for the “purpose of marriage, not to solve their financial issues through marriage” (Radvanová, 1964, p. 59). Furthermore, they explained the need for lonely hearts ads because of loneliness, lack of possibilities to meet someone within their geographical or social proximity⁷, shyness, divorce, widowhood, or childcare. It seems that even though lonely heart ads were never the main avenue to find a romantic partner, there has always been a segment of individuals who exhausted traditional options and thus either depended on other options or at least liked having the possibility to utilize them if needed, such as lonely heart ads (Staněk, 1977) - something that will repeat itself again in the case of online dating. As a result, lonely heart ads were allowed again in 1964.

Whether lonely hearts ads truly worked remains unknown – if they were, the couples would keep it secret as finding a mate this way was frowned upon (Beauman, 2011) or seen as a less than ideal way to meet a partner (Staněk, 1977). Many successful couples thus instead concocted elaborate stories of being introduced through a mutual acquaintance, or meeting at a fictional party.

2.1 Bringing computers into the equation

One of the first attempts to bring computers into the dating world (while making some money) dates to 1964. In the United Kingdom, Joan Ball advertised her computer dating agency, later

⁷ For instance, regions with specific industries had unequal gender ratios – while regions with textile industry mostly employed women, heavy industry more likely employed men (Radvanová, 1964).

known as Com-Pat, on pirate radios – since none “*respectable newspapers wanted to publish ads for this unseemly type of establishment*” (Hicks, 2017). Likely because her previous career was at the marriage bureau, her dating agency sought to bring long-term partnerships to its clients, focusing mainly on older or divorced clients. Clients were asked to fill in a paper and pencil questionnaire, which was subsequently transferred to punched cards and processed by a computer. Subsequently, clients receive back a letter containing names and address of their matches. Interestingly, the questionnaire focused more on which qualities would have disqualified a potential partner, rather than who they were and what kind of partner they were interested in. This was likely due to Ball’s aim to avoid ill-suited matches, as she allegedly wanted to “*eliminate the embarrassment of introducing people with the wrong background and nationality and politics and religion*” (Hicks, 2016), effectively baking similarity, and thus social inequality, and replication of gender norms into the process (Hicks, 2016; Hinrichs, 2020).

A year later in the United States, three Harvard undergraduate students, Jeff Tarr, Dave Crump, and Vaughan Morrill, created a different computer-mediated dating agency, Operation Match. Operation Match had a more casual approach to finding suitable matches as it aimed to get American college students dates (Matthews, 1965), mainly because Harvard university, like many other at the time, were segregated based on sex (e.g., separate dormitories or dining halls). Same as Joan Ball’s company, it asked clients to fill in a questionnaire, mail it back, and for a fee of 3 dollars, their answers were processed by a computer which generated matches for the clients. Other dating companies followed suit during the 1970s and 80s, with the emergence of mail-order-bride catalogues, video dating agencies, and the resurgence of newspaper ads.

The attempts to bring computers into matchmaking soon spread throughout Europe – similar services emerged in Germany, France, or Switzerland. The Czechoslovak Socialist Republic also launched its own version of computer matchmaking, called Rendez-vous 68 in cooperation

with magazine 100+1 Zahraniční zajímavost. Its founders cited the increasing divorce rate in ČSSR as the motivation behind launching Rendez-vous 68, hoping that the “scientific approach to mating” would help reduce the divorce rate (Šubert, 1969a, 1969b). Inspired by similar services abroad, Rendez-vous 68 also transferred clients’ questionnaire onto punch cards and paired their clients based on the results. Interestingly, in the contemporary article from 1969, the invention of computer-mediated matchmaking is portrayed positively, with the author noting that “*even in modern society, many seemingly attractive people have great difficulty in choosing a life partner, mainly because they do not have a dull character*” (Šubert, 1969b). The clients were mostly women, and young individuals aged 25-30. Occupation-wise, female teachers, nurses, doctors, and male technicians were the most represented. According to Staněk (1977), clients often previously placed a lonely heart ad to newspapers or magazines but were not successful. In its first year, almost fourteen thousand clients tasked Rendez-vous 68 with finding their romantic match. The computer then matched 3 466 couples, 5 of which later confirmed getting married.

With the spread of the Internet, the first online dating websites quickly emerged, making the process of computer-mediated dating faster and more efficient. In many ways, its beginnings resemble those of lonely hearts ads in the 1920s and computer-mediated matchmaking of the 60s. In 1986, the first online dating bulletin board, Matchmaker.com, was launched. In 1996, the popular dating site Match.com was launched on the world wide web. Match.com is still operating today and is currently a part of Match group, which owns over 45 other dating sites and apps worldwide, including Tinder, OkCupid, and Hinge. Other countries soon followed suit: for instance, the first dating site in France, Netclub.fr, was founded in 1997 (Carimmat 2022), and Germany’s Dating Cafe started in 1998 (Dating Cafe, 2018). In Czechia, a web-based online dating site Seznamka.cz was, according to its website, founded in 1998, making it

one of the oldest ones in the country⁸. The estimated proportion of Czech population using the Internet at the time was only 4% (Peterka, 2013).

In 2012, Tinder, a new mobile online dating app was launched. The app uses geolocation, and each user creates a brief profile which includes their name, age, photo, and a short bio⁹. Users swipe left to dislike other people's profiles, and swipe right to indicate their interest. If both parties swipe right, a match is made, and the users can start messaging each other. The double opt-in feature, and the overall gamification of the app which makes "swiping" fun for people, proved to be a massive success. By 2023, the app was available in 190 countries, downloaded 530 million times and generated over 75 billion matches for its users (Tinder, 2023). The press is undoubtedly intrigued by the app, with many reporters writing about the "dating apocalypse", worrying that the abundance of choice will lead to hook-ups as opposed to meaningful connections, and increase infidelity. These views are not purely academical – for instance, Pakistani government banned Tinder in 2020 for disseminating immoral content – in case of Pakistan, this immoral content being homosexuality and extramarital affairs ('Pakistan Blocks "immoral" Tinder, Grindr and Other Apps', 2020).

It only makes sense that with people spending so much time online and managing many of their daily tasks there, finding partners will soon follow. Although online dating may seem novel or appear to come with many new risks, history shows that humans will utilize any new technology to find romantic partners – from print, through video and computers, to the Internet. As with every new communication technology, there are always doubts (and hopes) about its consequences for interpersonal relationships and humanity at large. For instance, the invention

⁸ To add a bit of context, the beginning of the Internet in Czechia dates to 1992, however, its use was quite limited due to exclusive licence to provide Internet access held by Eurotel company. This changed in the 1995 when Eurotel sold its internet division to Telecom, which no longer included the monopoly for providing access, which liberalized the use of the Internet in Czechia and opened it further for commercial use (Peterka, 2005).

⁹ In its current version, Tinder users have more tools at their disposal – they can link their profile to other social media such as Instagram or Spotify, use short videos, share their hobbies, interest and many other things, or specify kind of relationship they are interested in.

of telegraph made some authors worry about the “trooping of emotion” (Lowell, 1904), indicating that the invention would change not only how we communicate, but also how we feel. Similarly, the invention of telephone made some worry that the expansion of the possible contacts across different geographical distances would lead to the erosion of local ties. Postman (1986) even equated television with the dystopian society depicted in Aldous Huxley’s *Brave New World*, with people giving up their freedom for endless entertainment. Others blamed television for the rise of crime or social disharmony (Standage, 2013).

In the 1930s, the newspapers were concerned about lonely hearts ads, claiming they were utilized by lowlifes, targeted gullible individuals or straight out offered prostitution services (Hladik, 1938). As described above, the financial aspect of lonely hearts ads was also heavily criticized, calling them more of a financial affair than anything else. Thirty years later, Joan Ball had to advertise her computer matching business on the pirate radios as newspapers of the time believed any dating business to be a front for prostitution (Hicks, 2016). And, with the emergence of online dating, concerns about its potential to destroy relationships and promote hook-up culture surfaced. Even though today’s lonely hearts ads posted on online dating sites often do not contain information about finances, researchers and media alike often use phrases such as “relationshopping” or talk about first dates as “job interviews” (Ansari & Klinenberg, 2015; Heino et al., 2010). When online dating apps first emerged, those concerns resurfaced again. Same as in the case of its predecessors, the brevity of ads or shallowness of online dating profiles were cited as inevitable way to destroying relationships (Sales, 2015).

Despite the criticism, the number of people having experience with online dating is growing as well as the revenue of online dating companies. Online dating is a multibillion industry with a steady growth over the years and is projected to grow even further (Statista, 2023). While in 2013 only 11% of adult Americans reported ever using online dating, in 2022 it was 30% (McClain & Gelles-Watnick, 2023; Smith & Duggan, 2013). The views toward online dating

has been also improving throughout the years as more people personally know someone who found love online (Brown, 2020c; McClain & Gelles-Watnick, 2023; Smith & Duggan, 2013). Indeed, Cacioppo et al. (2013) found that more than a third of new marriages between 2005 and 2012 began online in the US. Similarly, 20% of new unions (2013 to 2018) began online in Germany (Potarca, 2021) and 25% in Switzerland (2017-2018) (Potarca, 2020). One fourth of Slovak internet users who have previously used online dating sites reports meeting their current partner this way (Nielsen Admosphere, 2021). In his master's thesis, Kačena (2017) shows that this situation may as well be similar in Czechia, with 33% of Czech spouses meeting online between 2005 and 2015. Quantifying the success of lonely hearts ads in magazines or newspapers, or the success of the early computer matchmaking is difficult and easy to dismiss as a marginal way to meet a partner. Although not all couples who meet online meet on a dating site, it would be a mistake to underestimate its prevalence and importance.

3 Online dating in Czechia: An Overview as of 2022

We know a lot about the online dating attitudes, experiences, and their development over time of the American population. However, data from the Czech Republic is rare. Most research on the topic is limited to qualitative research with a very low number of (young) respondents done by either bachelor or master's students as a part of their theses. With the exception of Nielsen Admosphere survey collected in November 2021 on a sample of 509 Czech Internet users aged 15+, we have virtually no prior quantitative information regarding online dating behaviour or opinions of the Czech population.

For this reason, this chapter presents up-to-date information about online dating in Czechia. It relies on a data collected by Behavio Labs in September 2022. The data was collected via an online panel and contains responses from 1000 respondents. The panel is based on a quota sampling (gender, age, education, region, size of residence, household income, economic status, and voting behavior) of the adult Czech population. The panel is representative to adult Czech population which uses the Internet at least once every three months. All graphs in the following chapter are based on the data from Behavio Labs survey.

This chapter aims to give first glimpse into Czech online dating landscape and to answer the following questions: Who dates online? How do Czechs perceive online dating? What are the users' experiences with online dating in terms of quality and experiences? How many Czech couples met online?

3.1 Who dates online?

Initially, online dating spread among people navigating so-called thin markets. Rosenfeld and Thomas define that individuals are in thin markets when *the "market for potential partners*

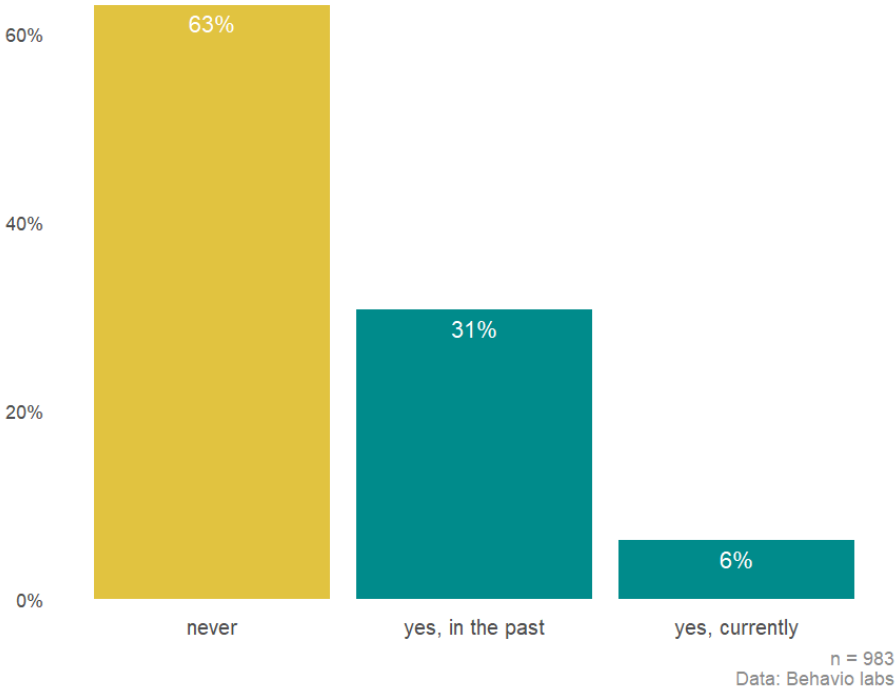
when the cost of identifying multiple potential partners who meet minimum criteria may be large enough to present a barrier to relationship formation“ (Rosenfeld & Thomas, 2012). Typically, LGB individuals or middle-aged heterosexuals are likely to be facing thin markets, while, for example, young college students with many possibilities to meet potential partners are not (Rosenfeld & Thomas, 2012).

In the early stages of online dating, Valkenburg and Peter (2007) presented Dutch respondents with a questionnaire regarding online dating with the aim to answer the question: Are online daters any different than the general population? Their findings showed no relationship between income or educational level and the likelihood of using online dating. Moreover, they have dispelled the myth that online daters would be introverts with high dating anxiety – on the contrary, their results supported the “rich get richer” mechanism, i.e., those with low dating anxiety seemed to be those who use online dating more actively. In other words, those already successful in dating used online dating to cast wider nets, not to compensate for lack of success or personality issues. Furthermore, respondents between 30 and 40, especially divorcees, were more likely to date online, supporting the claims about so-called ‘thin markets’.

Today’s online daters tend to be younger, more educated, and never married. The experience with online dating is pervasive – in 2019, 30 % of all American adults reported ever using a dating site or app (Vogels, 2020). In both 2015 and 2019 Pew Research Center survey, never married individuals were more likely than divorcees to report having used online dating before (30% vs. 19% in 2015, 52% vs. 35% in 2019) (Vogels, 2020). 65% of never-married respondents born between 1981 and 1996 reported a personal experience with online dating. The prevalence remains high among those born between 1965 and 1980, with the majority having used online dating (53%). However, online dating remains more prevalent among daters who identify as LGB than for heterosexuals (Brown, 2020a). The higher prevalence can be

explained by the thin markets LGB daters navigate and by the higher privacy and safety that online dating provides.

Figure 3.1 Have you ever used online dating?

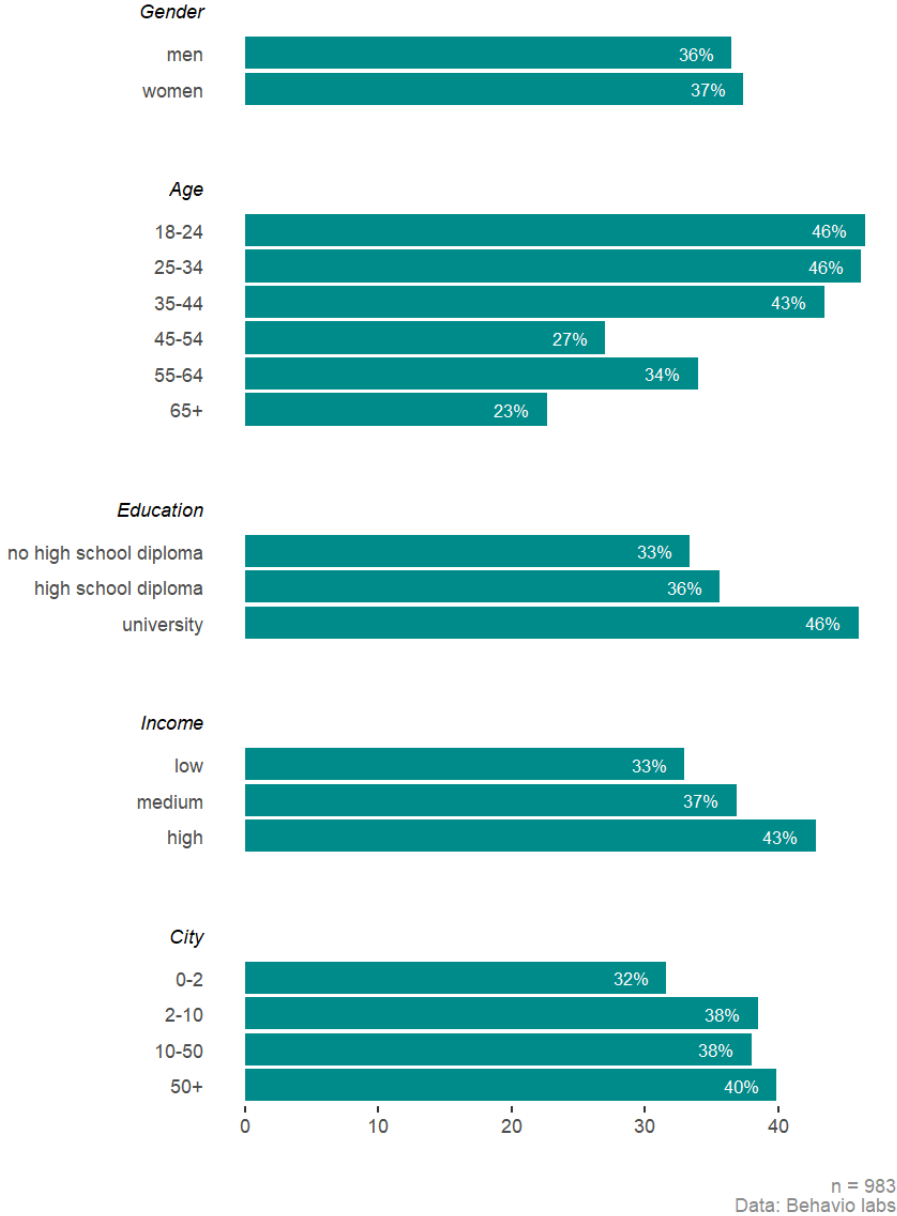


37% of Czechs surveyed have experience with online dating¹⁰, either using it currently or have used it in the past (Figure 3.1). This is similar to numbers from abroad – 30% of American (McClain & Gelles-Watnick, 2023), 33% of British (Online Dating Association, 2023), and 33% of German (Bitkom Research, 2022) respondents reported ever using online dating. Globally, online daters tend to be younger individuals living in bigger cities and having higher socioeconomic status. As shown in Figure 3.2, this is also true for the Czech Republic; however, the size of the city seems not to matter much, as the only category that differs are municipalities

¹⁰ This is a lower proportion (42%, CI: 0.38; 0.46) than reported in the 2021 Nielsen Admosphere survey. However, the 95% confidence intervals of Nielsen admosphere survey proportion and our data overlap.

with less than 2 000 inhabitants, where less than a third of respondents have used online dating before.

Figure 3.2 Who dates online



Almost half (46% for 25-34-year-olds) of 18- to 34-year-olds have previous experience with online dating. 43% of 35–44-year-olds, 27% of 45–54-year-olds, 34% of 55-64 and 23% of

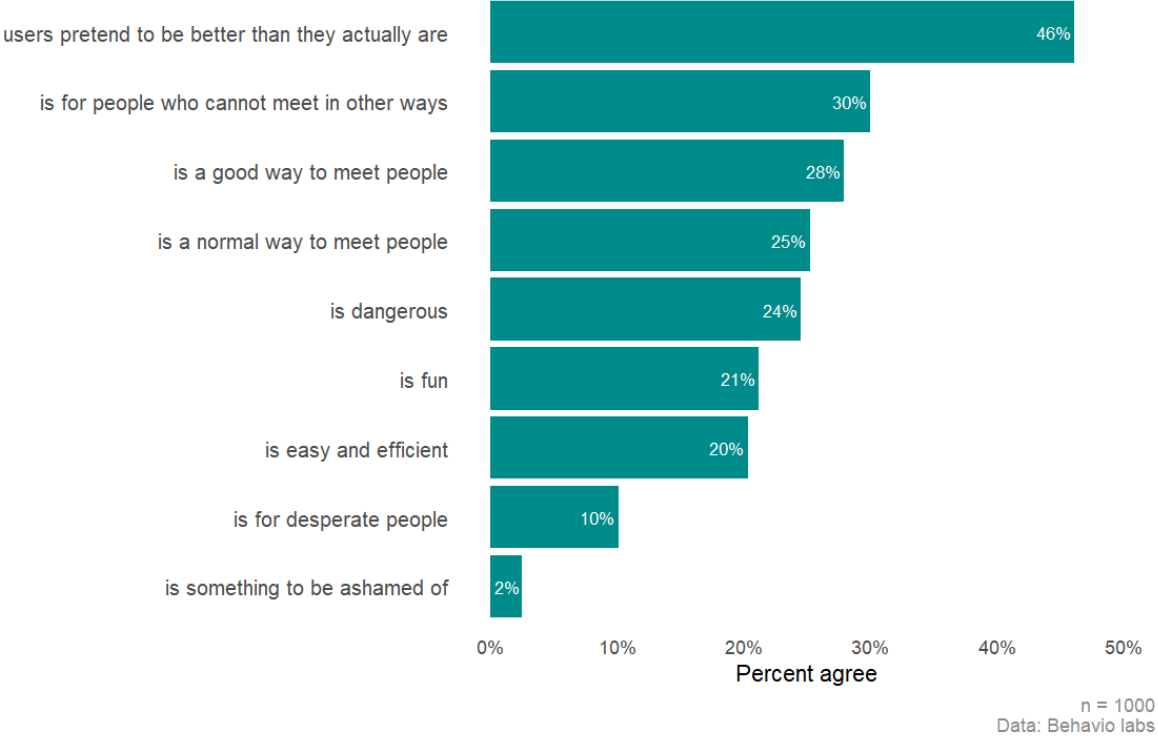
respondents over 65. Again, this is consistent with research abroad, as younger users are universally more likely to have an experience with online dating, even more so with mobile dating apps (Bitkom Research, 2022; McClain & Gelles-Watnick, 2023; Nielsen Admosphere, 2021; Online Dating Association, 2023).

In Czechia, 46% of surveyed university-educated respondents have experience with online dating, while only 33% of respondents without a high school diploma and 36% of respondents who completed high school with a diploma did so. Similarly, respondents with high income were the most likely to have used online dating (43%), while 37% with medium-level income and 33% with low income did.

3.2 Opinions

46% of Czechs surveyed agreed that “*Online dating users pretend to be better than they actually are*” (Figure 3.3). Compared to non-users of online dating, online daters were more likely to agree with the statement (42% vs 55%), likely due to experience with deception (either by being misled in the past, or by altering some information about themselves). Unsurprisingly, there is evidence that users do engage in deception. For example, (Lo et al., 2013) show that individuals are more likely to engage in deception if they find their counterpart desirable. Furthermore, users tend to deceive more if their self-esteem is lower, and that the desired outcome (type of relationship sought) also impacts the level of deception (Ranzini & Lutz, 2017). Rudder (2014b) shows that men often tend to claim to be taller, while women claim to be younger and slimmer. While most online daters embellish their profiles to some extent (Peng, 2020), the level of these misrepresentations is generally not high (Peng, 2020; Ranzini & Lutz, 2017; Rudder, 2014b).

Figure 3.3 Agreement with "Online dating..."

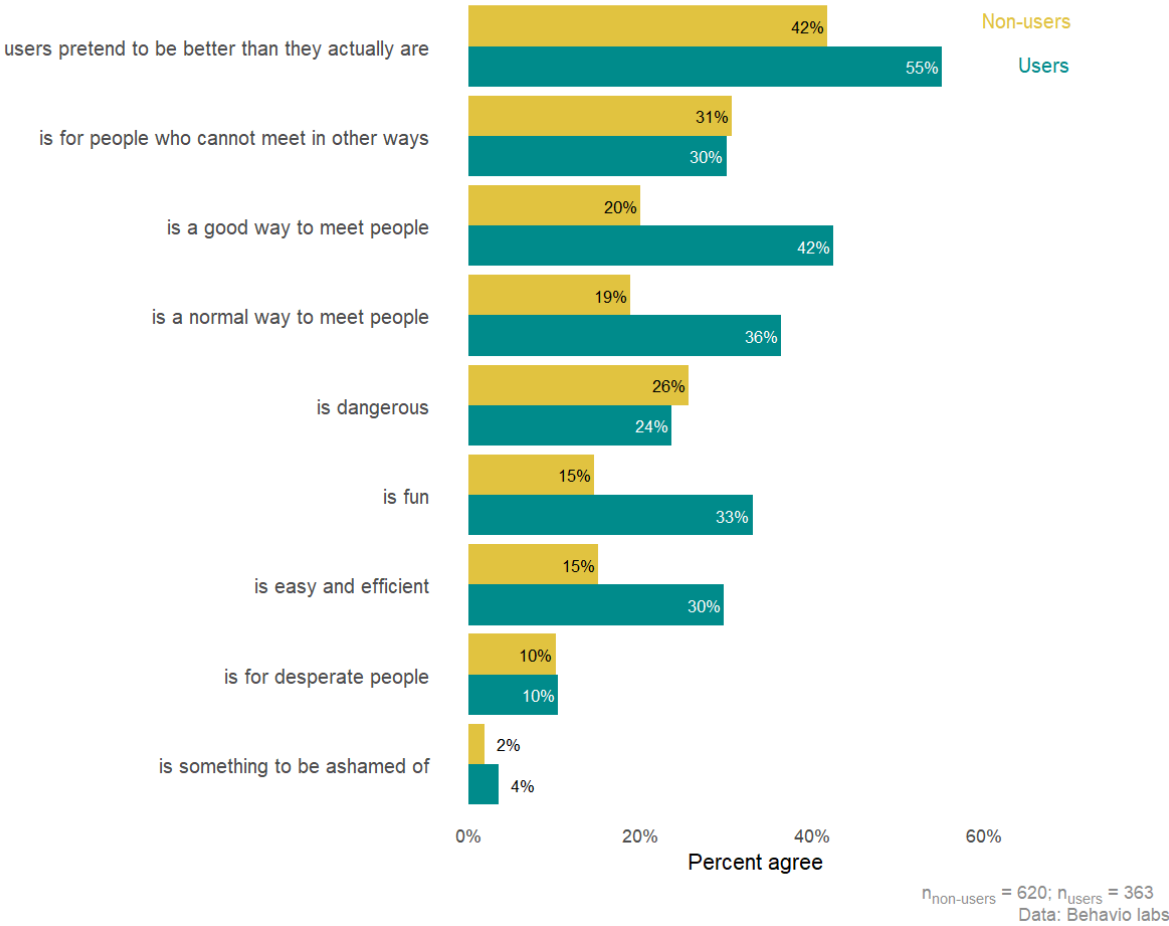


The second most frequent opinion among Czech respondents was that online dating is for people who cannot meet in other ways (30%. There was little difference between men and women or online dating users and non-users (Figure 3.4, Figure 3.5). However, since the question is a bit vague, it is difficult to disentangle whether this opinion is based on thinking that online dating users have certain characteristics (e.g., shyness), lifestyle (e.g., not having time to date), constraints (e.g., not having wide enough social circle), or acknowledge that most couples who meet online wouldn't have met otherwise as they have no social intermediary, a finding supported by previous research (Ortega & Hergovitch, 2017).

28% of Czechs surveyed think online dating is a good way to meet people. This view is more pronounced for people with prior experience with online dating – 42% of online dating users

agreed with the statement, while only 20% of non-users did so (Figure 3.4). Similarly, the agreement that online dating is a normal way to meet people is more common among online dating users (36%) than non-users (19%). It is unclear whether this difference results from an influence (the experience with online dating) or selection (people who believe online dating is a good way to meet people being more likely to try online dating). Younger individuals were also more likely to agree with the statement than older individuals (39% of 18-24-year-olds and 33% of 25-34-year-olds agreed, while 22-24% of respondents older than 45 years did).

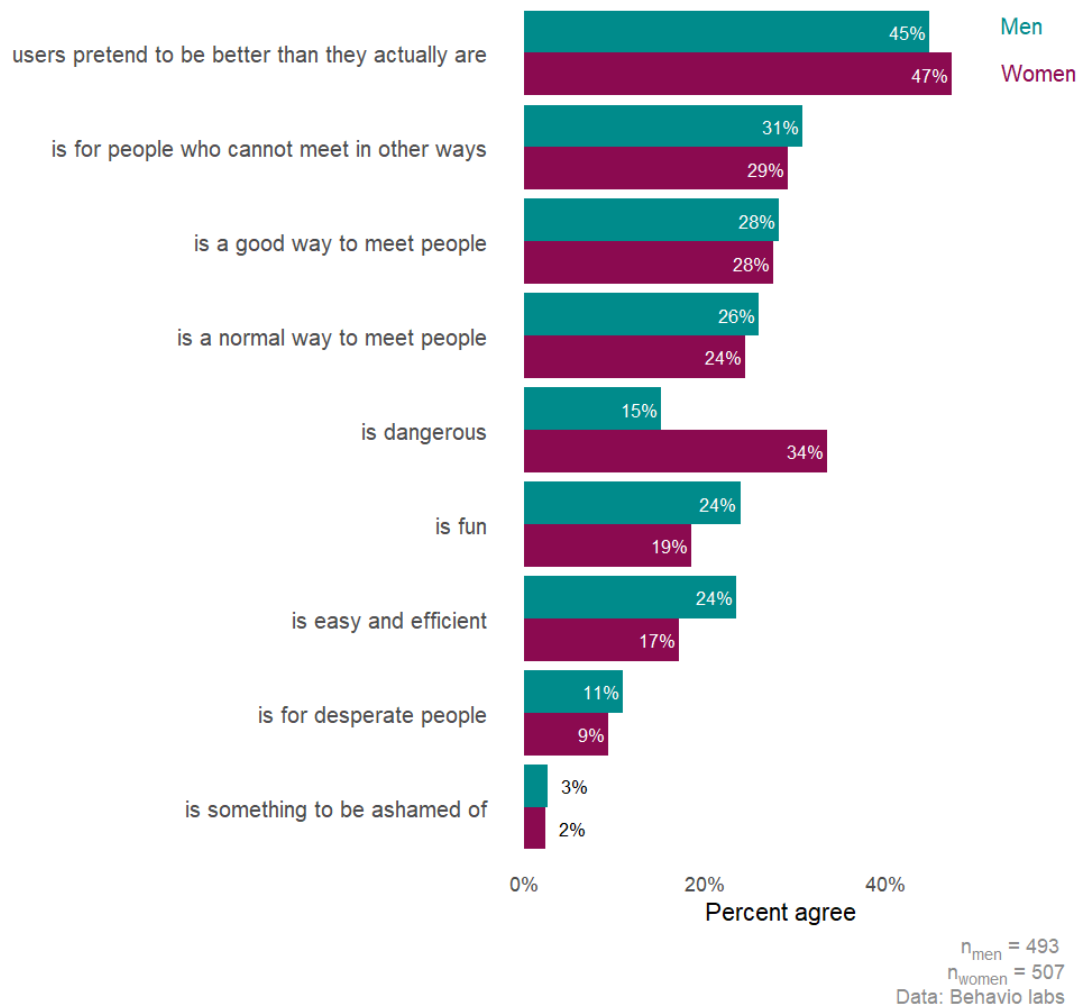
Figure 3.4 Agreement with "Online dating..." by experience with online dating



Almost one-fourth (24%) of Czech respondents agreed that online dating is dangerous. Non-users were slightly more likely to agree with the statement (26%) than users (24%), but the

difference was not statistically significant. A major difference was, however, between genders (Figure 3.5). While only 15% of men agreed, more than a third of women (34%) did. This is in line with previous research showing that women, especially younger women and LGB users, are much more likely to face harassment online (M. Anderson & Vogels, 2020; Brown, 2020a). However, this is not a problem exclusive to online dating scenarios – young women and LGB users are generally more often the target of sexualized harassment online (M. Anderson & Vogels, 2020; Brown, 2020a; Vogels, 2021). The only form of negative experience men tend to report more often is being catfished (Gronewold & Elbouez, 2018), i.e., being lured into a meeting or a relationship through a fictional online persona.

Figure 3.5 Agreement with "Online dating..." by gender



Moreover, police departments in numerous countries have issued warnings concerning romance fraud (e.g. Irish police 2022), including Czech police departments in, among others, Prague (Rösslerová, 2013), Liberec (Baláková, 2020), and Pilsen (Horkrová, 2021). In romance fraud, „*criminals pretend to initiate a relationship with the intention to defraud their victims of large sums of money*“ (Whitty, 2018). They lure their victims by their seeming ideal (albeit fake) profiles, often posing as attractive high-status men, e.g., military men, or attractive, low-status women (Whitty, 2013). Typically, they meet their victims on online dating sites or other social media and establish a romantic relationship with them, essentially grooming the victims to ask them for money in the future under the guise of an emergency, help with investment, etc. The

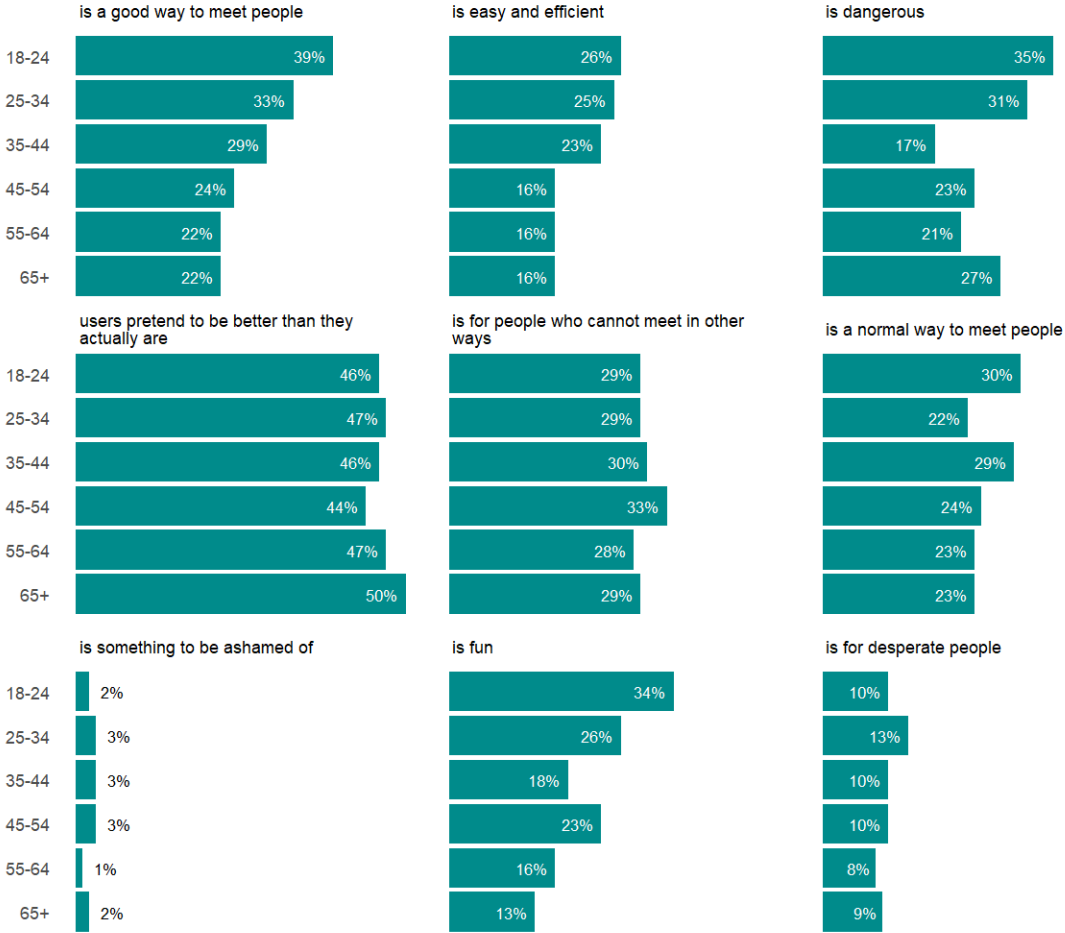
number of people defrauded by romance scammers has been increasing in recent years (Buil-Gil & Zeng, 2022), with FTC in the US reporting victims losing 47 million USD in 2021 (Fletcher, 2022), and UK's Action Fraud (2022) reporting victims losing 92 million GBP. The exact amount of losses in Czechia is not published; however, the police warnings issued mention individual losses in over tens of thousands of USD (Baláková, 2020; Horkrová, 2021; Rösslerová, 2013). It is obvious that the online dating sites and apps recognize these issues as many of them started implementing "safety" sections of their sites, trying to educate people on the potential dangers, and also allowing to report users for inappropriate behavior. Interestingly, romance scams are nothing new – for instance, the magazine *1. československý sňatkový zpravodaj* publishing lonely heart ads during the First Czechoslovak Republic era also issued warnings to its readers to beware of anyone who claims to facilitate meetings on its behalf ('*1. Československý Sňatkový Zpravodaj*', 1926).

Despite the perceived dangers of online dating, around one-fifth of Czech respondents agreed with statements that online dating is fun, and that it is an easy and efficient way to meet people (20% and 21%, respectively). Again, those with prior online dating experience tended to agree more than those without (33% vs 15%, and 30% vs 15%). Furthermore, men were more likely to agree than women with both statements (but those differences were not statistically significant), as did younger respondents compared to older ones (Figure 3.5, Figure 3.6).

Lastly, only 10% of Czech respondents agreed that online dating is for desperate people, and 2% agreed that using online dating is something to be ashamed of. Though there is no long-term data on the development of opinions about online dating in the Czech Republic, it is likely that these opinions have improved over time. Pew Research Center has been asking Americans about their views and experiences with online dating for years. One thing is clear: The overall sentiment about online dating has been steadily improving. For example, the agreement with the statement "*people who use online dating sites are desperate*" has been declining – in 2005,

29% of internet users agreed with it, while in 2013, it was 21% (Smith & Duggan, 2013), and it further declined in 2015 to 19% (Smith, 2016). Similarly, there is a rise in agreement with the statement *that “online dating is a good way to meet people”* – 44% of American internet users agreed in 2005, 59% in 2013, and 62% in 2015. This opinion is even higher among current and past online dating users, as 80% agreed with the statement (Smith, 2016). The agreement with the opinion that *„online dating allows people to find a better match for themselves because they can get to know a lot more people“* has been increasing as well – 47% of internet users agreed in 2005, 53% in 2013 and 2015 (Smith, 2016; Smith & Duggan, 2013). Again, online dating users tend to hold more favourable views towards online dating than non-users (Smith, 2016). The increasingly favourable view toward online dating is likely due to many Americans personally knowing someone who uses online dating (31% in 2005 vs. 42% in 2013 and 41% in 2015) or who found a partner online (15% in 2005 vs. 29% in 2013 and 2015). Similarly in 2023, 17% of British respondents said that have attended a wedding or a civil ceremony of a couple who had met online (Online Dating Association, 2023). Therefore, people likely do not think about online daters as unnamed, strange individuals who would have not met otherwise, but rather imagine them as someone close to them. Indeed, according to Nielsen Admosphere 2022 survey (2022), 63% of Czech respondents consider online dating to be “a common part of today’s relationships”.

Figure 3.6 Agreement with "Online dating..." by age group

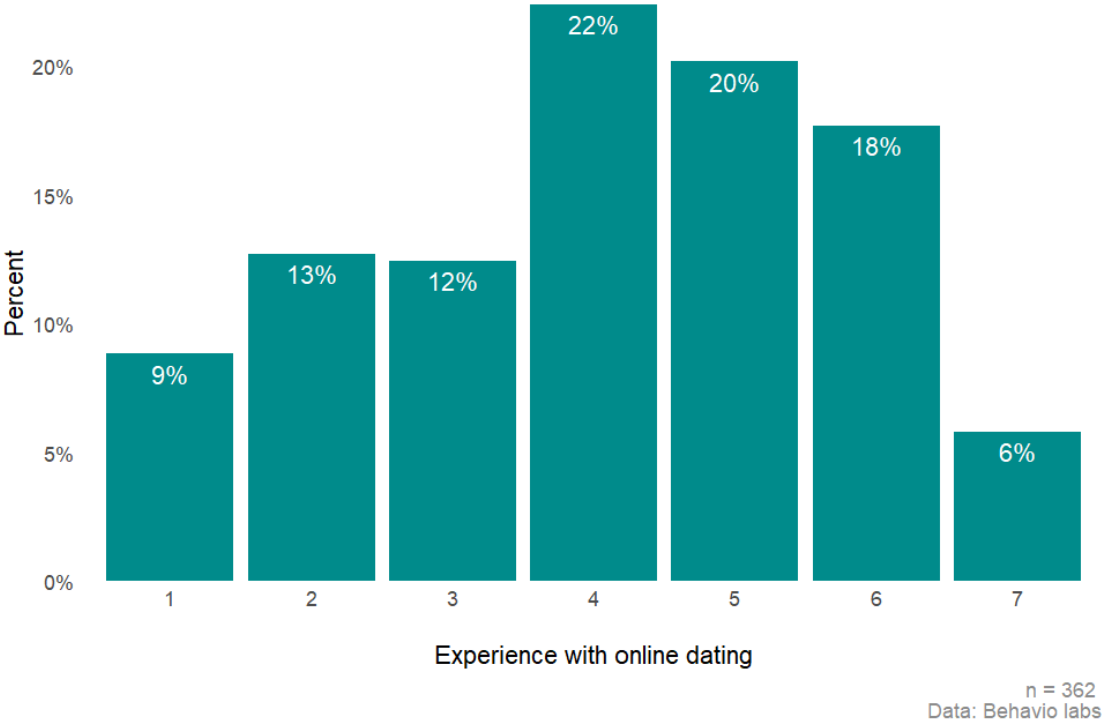


n = 1000
Data: Behavior labs

3.3 Online dating experiences

Surprisingly, most Czech online daters (66%) rate their experience online as either neutral (22%) or positive (44%) (Figure 3.7). While previous data from the Czech Republic showed a higher percentage of users who rated their experience as positive (50%), this is likely due to the Nielsen Admosphere survey not including a “neutral” category as a possible answer. Similarly, around half of American and German online dating users report having positive experiences online (Bitkom Research, 2022; McClain & Gelles-Watnick, 2023).

Figure 3.7 Experience with online dating rated from negative (1) to positive (7)



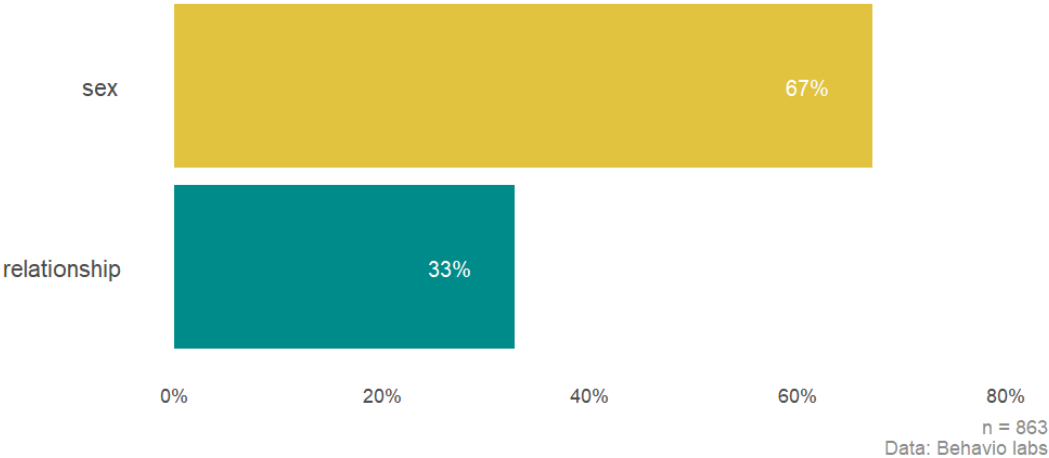
However, it would be a mistake to paint online dating as a solely positive experience. Ansari and Klinenberg (2015) point out that in every focus group with online daters, the word “exhausting” came up. Moreover, as Ansari and Klinenberg (2015) point out not everybody naturally excels in online dating, which can further make the experience frustrating. For instance, individuals admit to tweaking their profiles over time to attract more matches (Heino et al., 2010), and consulting them with friends, family, or even strangers on the Internet. For instance, a popular discussion platform Reddit, hosts subreddits (discussion boards centered around a topic) such as r/Tinder or r/SwipeHelper which often include users seeking advice on their online dating profiles.

Additionally, experience with harassment is pervasive in online dating. Users often report either receiving unsolicited sexually explicit messages or images, being contacted after making clear they were not interested, or being called offensive names, experiences felt especially by women

and LGB users (McClain & Gelles-Watnick, 2023). Furthermore, many users report being dissatisfied with the users they meet online, women are more likely to feel overwhelmed by the amount of messages they receive, while men are more likely to feel insecure as they do not receive as many messages (McClain & Gelles-Watnick, 2023). Another common experience is “ghosting”, i.e., a situation in which one side of the match unilaterally and unexpectedly decides to disengage from the communication by either not responding anymore, unmatching or blocking the other party (Van de Wiele & Campbell, 2019).

As stated before, online dating is often portrayed in the media as promoting hook-ups (Sales, 2015). This view is also prevalent among the Czech respondents - the majority (67%) thinks that online dating is primarily for seeking sex (Figure 3.8).

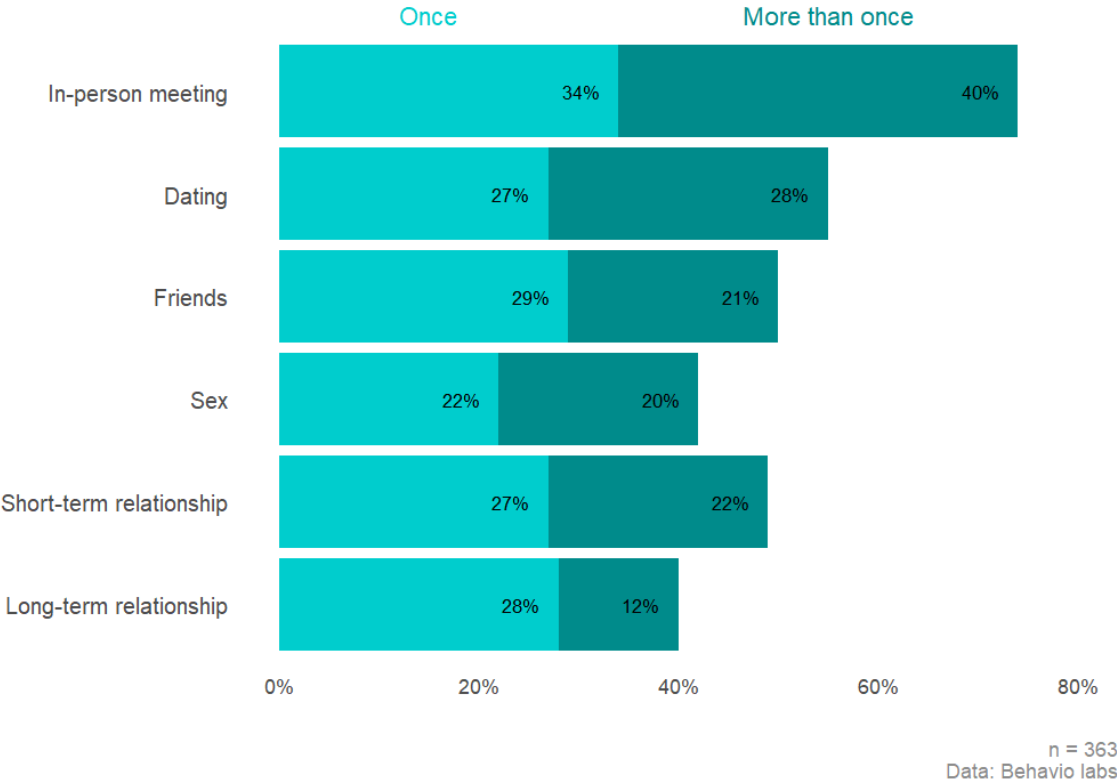
Figure 3.8 Agreement with "People who use online dating are looking for..."



While 42% of Czech online daters surveyed reported having sex with someone they met online at least once, more of them reported having a date (55%), finding a new friend (50%) or entering a short-term relationship (50%). Additionally, 40% of Czech online daters found a long-term partner online at some point (Figure 3.9). Although we did not ask about the motivations of online dating users in the questionnaire, according to a Nielsen Admosphere reports (2021, 2022) based on a quota samples of Czechs and Slovaks, 63% of Czech and 49% of Slovak

online daters were looking for a serious relationship. In both surveys, men were more likely than women to state they are looking for a serious relationship. However, they were also more likely to state they were interested in sex (Nielsen Admosphere, 2021, 2022).

Figure 3.9 Percentage of Czech online daters surveyed reporting having the following experience with someone they met online



The mismatch between perception of online dating and users’ motives for using online dating can be also seen abroad. Finding a long-term partner is often stated as the primary motive by a higher percentage of users than seeking sex. Most single individuals who are actively looking report being interested either in a serious relationship or are open to both serious and casual relationships; only a minority claims to be interested in hook-ups only (Brown, 2020b; McClain & Gelles-Watnick, 2023). According to Singles in America (2022), the largest annual representative survey of American singles, this is especially true after the pandemic – more singles now state that they are interested in things like emotional maturity, confidence, or

trustworthiness than in physical attractiveness, and only 11% are interested in casual dating only. Interestingly, it is men who claim to be more ready to find a long-term romantic relationship than women (42% vs. 29%), claim to feel emotional connection faster (38% vs. 29%), and believe they can fall in love over video call (41% vs. 30%) (Singles in America, 2022).

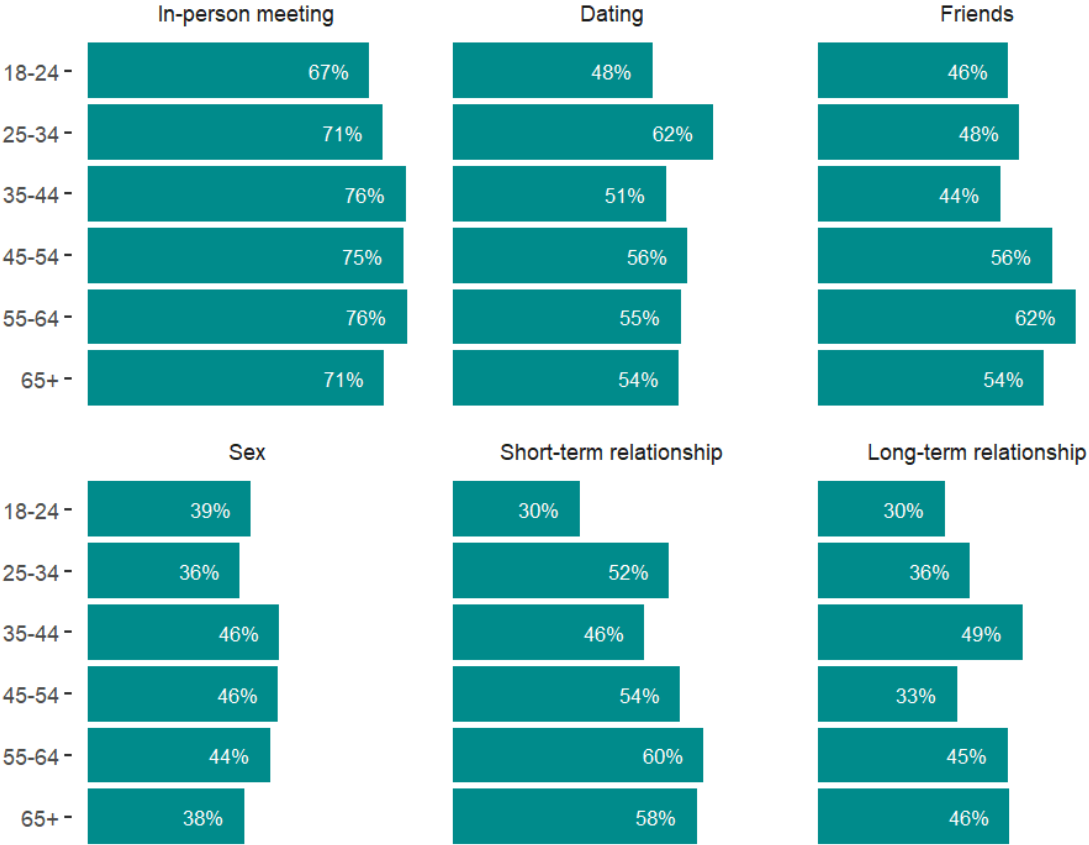
Similarly, Morning consult (Gronewold & Elbouez, 2018) did a nationally representative poll of Americans, asking them about their motivations for using online dating. 38% of adults who have used online dating sites or apps answered that their primary purpose for using it was to find a partner for a long-term relationship. 21% used it to meet people generally, to have fun (16%), to fill the time (9%) and only 6% answered they sought a partner for a short-term relationship. Men were less likely to respond that they were looking for a serious relationship (33%) than women (44%), however, the proportion remains high. They were much more likely to use the app to have fun (22% vs. 11%), to fill the time (11% vs. 6%), and to be interested in short-term relationships (8% vs. 3%).

However, the percentages and importance of each motivation varies a lot across different surveys and users of different online dating platforms. For example, while 2017 Kaspersky Lab report on online dating shows that sex was not the reason for dating online for most users, with only 13% stating it as their motivation, finding friends was reported by 41%, making it the second most common reason after using it for fun (48%). Only 24% of respondents said they were looking to find a partner online (Kaspersky Lab, 2017).

Although having hook-ups is commonly associated with younger individuals, having sex-only encounters was most often reported by individuals aged 35 to 64 (44 – 46%) than those of ages 18-34 (36 – 39%). The finding that older respondents were more likely to experience sex-only encounter from online dating is in line with previous research – in Pew Research Center survey

on online dating, older respondents were more likely to answer that they were interested in casual relationships (Brown, 2020b). This is further supported by research on partner preferences, which shows that especially older women are often not interested in traditional forms of partnership, e.g., cohabitation or marriage (Formánková & Křížková, 2015; Lewin, 2018), as they may want to avoid caregiving responsibilities (Lewin, 2018; McWilliams & Barrett, 2014).

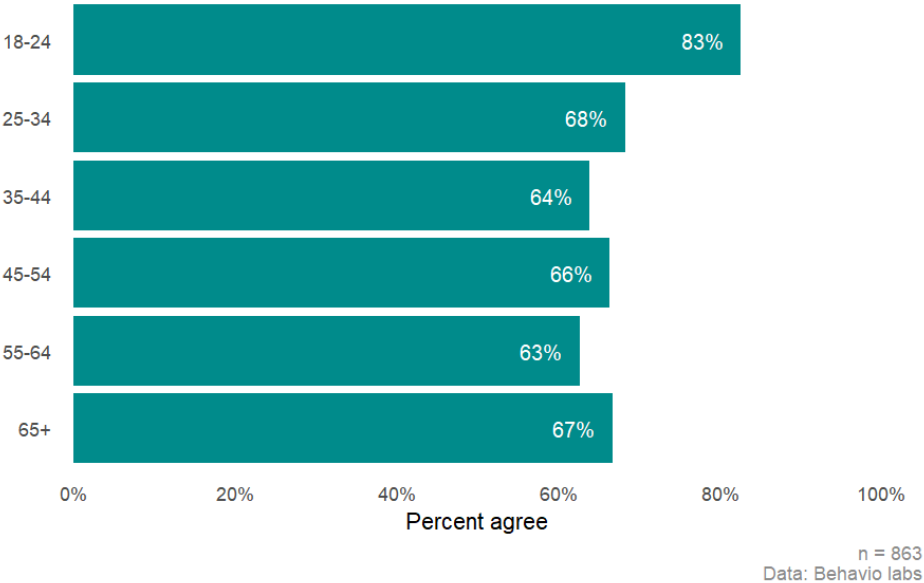
Figure 3.10 Experienced outcomes of online dating by age group



This goes also against the beliefs about online dating – while most Czechs believe that the main purpose of online dating is finding someone to hook-up with, Czechs aged 18-24 are the most likely to hold this belief (83%), despite the online daters in this age group being the least likely

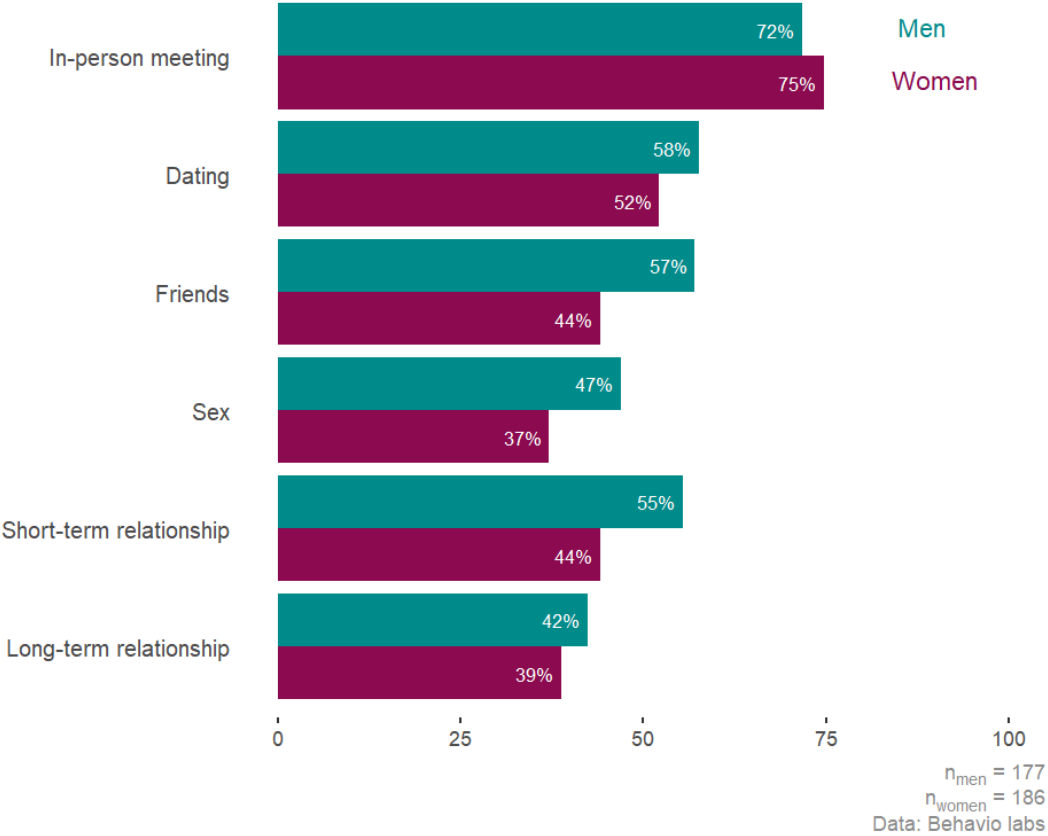
having the experience. Interestingly, despite the younger generations being most likely to use online dating, especially mobile apps, research shows that young people start having sex later in life nowadays, and overall have less sex than previous generations (Beutel et al., 2018; CDC, 2015; Lei & South, 2021).

Figure 3.11 Agreement with "Online daters are looking for sex" by age group



As shown in Figure 3.12, men reported dating, finding a new friend, sex, and finding a short-term partner more often than women did. However, these differences are not statistically significant.

Figure 3.12 Percentage of online daters report having following experience with someone they met online by gender



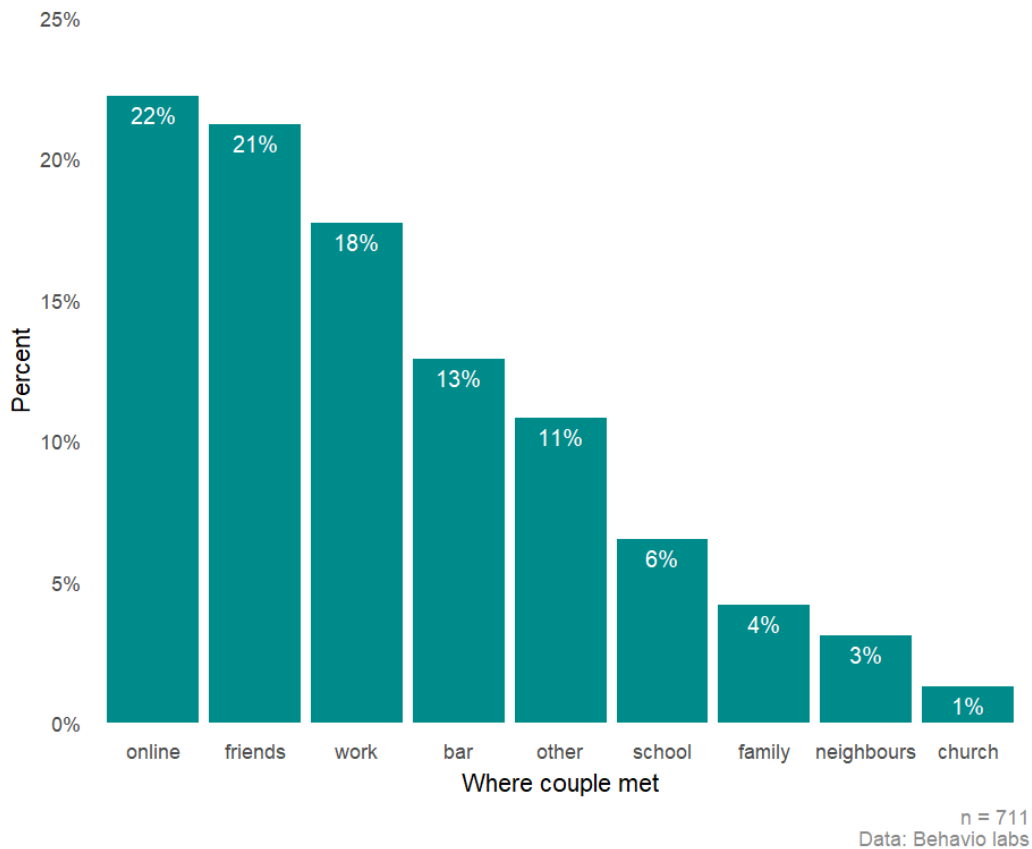
3.4 Couples

According to Rosenfeld and Thomas (2012), almost 70% of US-based same-sex couples formed in 2009 have met online. At the same time, only 22% of US-based heterosexual couples formed at the same time did so. Since then, there has been a continued increase in the proportion of new heterosexual couples that originated online (Brown, 2020b; Rosenfeld et al., 2019). More recent data shows that almost 40 % of new heterosexual couples originated online, effectively surpassing all other ways to meet a partner (Rosenfeld et al., 2019). While Pew Research (Brown, 2020b) shows a smaller percentage (28 %) couples who met between 2017 and 2020,

it is clear that meeting online (whether through a dating website, app, or another way) is either as common as meeting partners through friends and family (Brown, 2020b) or even more likely (Rosenfeld et al., 2019).

Online dating was the most common way to meet a long-term partner (22%) among the surveyed Czechs, followed by meeting through friends (21%), work (18%), or in a bar (13%). A small percentage of respondents have met their partners in school (6%), through family (4%), neighbors (3%) or in a church (1%). 11% of respondents met their partners in some other way. Although meeting online was the most common way to meet a partner, it is important to note that meeting online does not equate meeting on an online dating site or app. Indeed, while 38% of respondents who met their partner online did so through a dating site or app, 20% met through social media (e.g., Instagram) and 42% met elsewhere on the Internet.

Figure 3.13 Where couple met

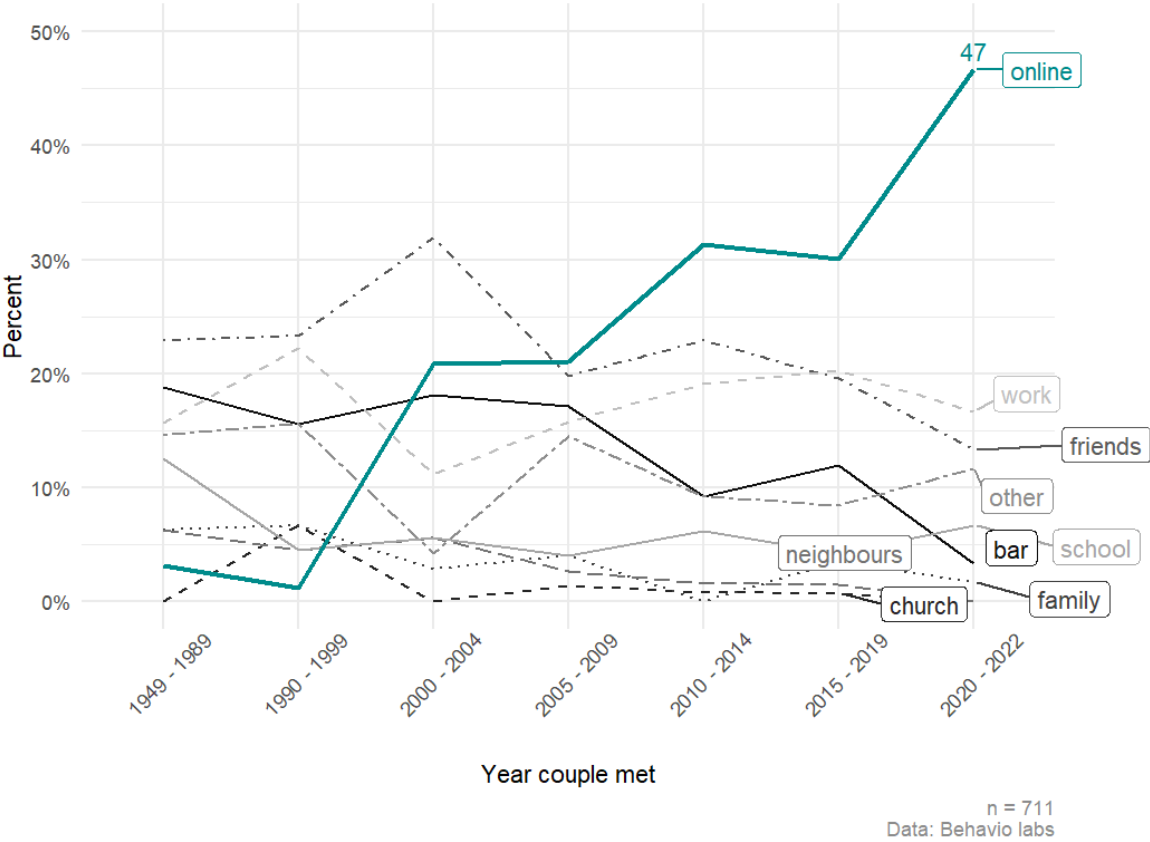


The estimated proportion of Internet users in 1998 was only 4% population (Peterka, 2013), of a staggering difference from 2008 with 42% of all households (Český statistický úřad, 2008), and 83% of households in 2021, with practically all younger households being connected (Český statistický úřad, 2022). As the penetration of Internet increases, so does the proportion of couples who met online. While almost no couples originated online until 2000. The steady rise of the importance of online spaces as a way to meet a romantic partner is in line with findings from the US (Rosenfeld et al., 2019) and Switzerland (Potarca, 2020).

As shown in Figure 3.14, meeting a partner online has already been on par with meeting through friends between 2005 and 2009 among the Czechs surveyed, when 21% of couples met online. Until then, the most common ways to meet was through friends, work, or in a bar. Between

2010 and 2014, 31% of couples met online, a similar proportion of couples (30%) met online also between 2015 and 2019. This is not far from the findings of Kačena (2017) who found that a third of Czech spouses who married between 2005 and 2015 met online. Similarly, meeting online surpassed other means of meeting a partner around 2013 in the US (Rosenfeld & Thomas, 2012).

Figure 3.14 How couples met by year



Note: The year couple met refers to year when couple first met, not when they became a couple.

Unsurprisingly, there was a high surge in the number of couples who met online between 2020 and 2022, likely as a result of the covid-19 pandemic restricting one’s possibilities to meet new people (Figure 3.14). This is in line with the prevalent opinion that dating is not easy nowadays, which is shared by both Czech and American respondents (Brown, 2020c; Nielsen

Admosphere, 2022), and that has become more pronounced after COVID-19 pandemic (Brown, 2022).

When asked to rate their relationship satisfaction from 1 (worst) to 7 (best), on average, both people who met their partners offline and online reported being quite satisfied in their relationships. The mean value reported those who met their partner offline was 5.88 and the mean value reported by those who met their partner online was 5.89. The difference was not statistically significant. This is in line with the findings of Kačena (2017) who also found a slightly higher, albeit not statistically significant, marital satisfactions of spouses who met online compared to those who met offline. This is in contrast with the findings of Cacioppo et al (2013) who found that American spouses who met online were happier than those who met offline. Similarly, there was no statistically significant difference in terms of satisfaction with respondents' intimate lives ($\text{mean}_{\text{offline}} = 5.33$, $\text{mean}_{\text{online}} = 5.23$).

4 Age homophily on a Czech online dating site ¹¹

4.1 Introduction

Once a marginal activity, online dating now represents an increasingly important way of starting a relationship. U.S. online dating site OkCupid mediates around thirty thousand first dates every day (Rudder, 2014b). Year by year, online dating is becoming increasingly popular, especially in the younger generations. 27% of Americans in the category of young adults (aged 18–24) tried a dating service in 2015, almost a triple increase from the year 2013. Czech data suggest a similar level of popularity, with 42% of Czech internet users admitting having experienced online dating (Nielsen Admosphere, 2019).

In addition, potential changes to the marriage market are implicated by the growth of online dating. Geographic distance historically posed one of the central structural constraints to partner search. Online dating has expanded the pool of potential partners from people one can meet in their immediate surroundings to all users within a user-defined distance. The traditional matchmaking roles of friends, family, or colleagues have weakened as online dating helps us meet people anywhere and at any time, independently of our social circle and geographic distance (Rosenfeld & Thomas, 2012; Valkenburg & Peter, 2007). According to Rosenfeld and Thomas (2012), as much as 74% of the relationships based on online dating were started by individuals with no pre-existing ties.

Is the new way of dating going to affect the traditional structures of assortative mating consistently observed in the offline world? Online dating scholars take two distinct approaches to the relationship between online mating and homophily. Some argue that the large pool of potential partners will result in more diverse couples, as people who would likely never meet

¹¹ This chapter was published in Czech as: Topinková, R. and Šetinová, M. (2020) ‘Věková homofilie na české online seznamce’, *Czech Sociological Review*, 56(4), pp. 447–470. doi:10.13060/csr.2020.014.

can now connect online (Rosenfeld & Thomas, 2012). Others expect the exact opposite as online dating allows filtering users according to one's expectations. No growth in diversity will be observed if individuals personally prefer contacts with partners like them. They will simply filter out users who substantially differ from them or otherwise do not meet their expectations (Potarca, 2017).

In the present paper, we take this perspective to investigating age homophily on real-life user data from the Czech context. Like in other Western countries, a steadily decreasing age difference has been observed for Czech couples, with one year being the modal age difference between the years 1994 and 2004. Thus, most Czech marriages are "age-traditional", with men equally old or somewhat older than women (Fučík, 2006; Katrňák, 2008). However, evidence on marriages performed does not tell us whether such mating results from preferences or structure. Will preferences for partners of equal age be observed on the Czech internet as well? And will women prefer older partners, rather than young ones, and men the opposite? Existing age homogamy patterns may be weakened, but also replicated or strengthened, by easy access to thousands of partners of different age groups through an online dating service.

A major advantage of data from online dating sites is that we do not rely on individuals' reports, but rather observe their actual behaviour in the online dating environments, which allows us to obtain an unprecedented detail of insight in the mating process. We know who users contact, who replies to them, who contacts them, and how they respond to the latter. When asked about their preferences of partners of a given age, some respondents might not provide an honest account or be fully aware of their preferences.

Dating service data can also shed light on the mating mechanism and how homophily emerges. There is likely a difference between a person's ideal partner and one who responds to them and is actually available for contacting and starting a relationship. In other words, many men in their fifties might ideally be interested in a beautiful young woman, yet only a few of them can reach

such a relationship; others will be “left over” with same-aged women. Thus, evidence from dating apps tells us not only whom users contact but also who responds to them and who doesn't. A clearer picture of preferences can emerge as dating app users are able to contact large numbers of counterparts at little cost or loss (Kreager et al., 2014a).

In this paper, we first focus on the concept of age homophily and present pioneering studies that have examined the phenomenon in online contexts. Based on those studies, we formulate our hypotheses, assuming that the patterns known from the offline world are replicated online and that it is women's choices that give rise to age-homophilic contacts. The hypotheses are supported by the results of our descriptive analyses and regression models using data from a Czech dating service.

4.2 Homophily and age

Instead of mating randomly, people typically prefer contacts with individuals who are similar to them in certain traits and characteristics. Couples often share the same educational level, belong to the same ethnic groups, or live similar lifestyles (Fiore & Donath, 2005). Age is also an important shared trait, one that may serve as an “underlying variable that strongly determines behaviours, views, values, attitudes, and social action” (Fučík, 2006, p. 724). People often have similarly aged friends and partners because such people may have comparable experiences, face the same problems, share similar values, and are also more likely to share the same physical space. Social sciences use the term homophily to refer to more frequent contacts with similar individuals (McPherson et al., 2001). In the mating context, the term homogamy is used when such contacts translate into relationships; this is the focus of most assortative mating research. Thus, homophily (the process) precedes homogamy (the outcome). Our paper examines homophily with respect to age, which can also be interpreted as a tendency to age homogamy.

When looking at existing relationships, age homogamy research demonstrates the key role of age in mating. The age difference between partners can somewhat determine the nature of a marital relationship. Similarly aged partners will be closer in their views and cultural characteristics, likely share similar perspectives on family life, form a more egalitarian relationship, and have compatible views of gender roles (Katrňák, 2008). Age heterogamy refers to age differences between partners. Fučík (2006) differentiates between traditional and nontraditional age heterogamy. In traditional age heterogamy, the man is older than the woman, and nontraditional age heterogamy refers to couples where the woman is older than the man.

The age difference between married partners declined during the 20th century in Western Europe. The Czech Republic has exhibited the same development since the 1950s, with the number of age-homogamous marriages increasing over time. Most marriages are traditional ones, whereby the man is equally old or older than the woman (Fučík, 2006; Katrňák, 2008; Zeman, 2006). Nevertheless, the proportion of age-nontraditional marriages, with the woman older than the man, has also been slowly rising since 1965. The growth became more pronounced in the 1990s, when the number of nontraditional heterogamous marriages started increasing at the expense of traditional heterogamous marriages (Katrňák, 2008).

Katrňák's (2008) analysis of Czech marriages shows that age at marriage is an important determinant of age homogamy and heterogamy. At a relatively young age, both men and women have higher chances of performing an age-homogamous marriage with a same-aged counterpart. In contrast, men who get married at a higher age are a substantially more likely to perform heterogamous marriages with younger women (Katrňák, 2008; Zeman, 2006). Older women, too, have higher chances of performing heterogamous marriages, albeit nontraditional ones, i.e., with younger husbands. In spite of these trends, one year was the modal age difference between married partners in the 1994–2004 time period. Therefore, age homogamy certainly appears to be relatively strong in the Czech context (Katrňák, 2008; for the years 1991–2004,

the same is indicated by Zeman, 2006). With some caution, then, it can be inferred that age homophily, as the process underlying age homogamy, is also widespread in Czechia. However, while homogamy research works with structural evidence on marriages, a homophily study of an online dating service rather provides more in-depth knowledge of the initial stages of mating and mutual contacts in a specific context. Even if mating patterns should more-or-less correspond to formed unions, this is not necessarily the case. At the moment, though, this is the closest available approximation for the Czech context.

4.2.1 How does homophily emerge?

Homophily research provides two main approaches to explaining the causes of the phenomenon. The first stream focuses on real-world structural constraints. In short, some people are viewed as more likely to meet than others. For example, college students have better chances of meeting individuals who are also in college, in the same age group, and of similar socioeconomic status (Kalmijn, 1998; McPherson et al., 2001). The social space, too, is structured by informal age norms, as different age groups have “their own” activities, establishments, or cultures. While this hypothesis may somewhat explain contacts in traditional contexts such as the neighbourhood or educational institutions, it cannot easily explain dating in the online context, where the effect of structural constraints should be weakened (Rosenfeld & Thomas, 2012). As online dating services typically allow users to browse all user profiles, the data should reflect their actual preferences rather than structural constraints. While such constraints are not completely absent, we assume they are more easily overcome online. The second stream focuses on preference-based homophily, which arises out of people’s personal preferences for meeting similar individuals as such relationships are viewed as more enriching and lasting (McPherson et al., 2001). As these two streams are not mutually exclusive, there is a general consensus that both mechanisms will play a role (Kalmijn, 1998). In this vein, existing studies typically deal with the strength of these mechanisms; in the online dating context, a

stronger effect of preference homophily can be expected given the considerably higher numbers of potential partners.

However, Schaefer (2012) argues that both explanations are inadequate. He illustrates their weaknesses on Hogue and Steinberg's (1995) study of homophily among adolescents living with depression. Those are much more likely to befriend other depressive adolescents. Schaefer (2012) argues that they do not necessarily prefer homophily or are structurally constrained. They rather tend to be passive and withdrawn from their peer groups, which is why their peers do not select them as friends. In this context, homophily does not result from underlying preferences but from rejection by others.

Based on this consideration, Schaefer (2012) presents an exchange theory-based mechanism behind homophily. Here, people strive to contact the most attractive and desirable counterparts independently of their own attractiveness. Yet those counterparts may not respond to them, giving rise to nonreciprocity. To increase their chances of a positive response, Schaefer argues, individuals will eventually adapt their behaviour based on the kind of counterparts that contact and respond to them. This process should effectively strengthen homophily because the most attractive individuals will pick from the pool of available users ones who are most like them, i.e., similarly desirable. As a result, less desirable individuals "become the leftovers". This process is theoretically not based on structural constraints (as there is a potential for heterophilic bonds) or on preferences (as no one prefers homophily as such, and individuals' efforts are not horizontal, given their similarity, but vertical, given their interest in "high-value" individuals) (Schaefer, 2012, p. 1273). In reality, this mechanism will also be affected by the structure of the marriage market – e.g., middle-aged individuals operate under much more severe constraints than ones around the age of 20 (Rosenfeld & Thomas, 2012).

4.2.2 Homophily in online dating

Schaefer's concept of homophily as a process shaped by the endogenous force of nonreciprocity seems adequate in the context of online dating. Here, the main homophilic mechanism should be that a user responds to the first message received, and this process should continue with each additional message exchanged between the users. This should effectively reduce heterophilic bonds in favour of homophilic ones because more attractive users will select similarly attractive counterparts and not respond to less desirable ones (or end such conversations before meeting in person). Consequently, less desirable users should be "left over" to one another.

Existing online dating research provides partial support for Schaefer's theory. Users exhibit a tendency to contact the most attractive counterparts independently of their own attractiveness (Bruch & Newman, 2018; Hitsch et al., 2010a; Kreager et al., 2014a). However, past studies have not corroborated the gradual change in preferences over time, namely that users realise their own value and adapt their further search accordingly (Kreager et al., 2014). In a U.S. study, less desirable users sent high numbers of messages to users of variable attractiveness, perhaps intentionally trading quality for quantity, yet did not abandon their efforts to find more desirable partners. Thus, homophily was exclusively caused by rejections (nonreciprocity), rather than rejection-based strategy adaptation. However, the absence of strategy adaptation towards more similar partners may be due to the specifics of online dating, which reduces the fear of rejection and the costs of contacting more desirable partners (Rosenfeld & Thomas, 2012).

4.2.3 Age and gender

In the present study, we focus primarily on the relationship between homophily and age and gender in the context of online dating. One of the universal findings of existing online dating research is that women receive on average several times more invitations than men (Fiore & Donath, 2005; Hitsch et al., 2010a; Kreager et al., 2014a; Rudder, 2014b; Skopek, Schmitz, et al., 2011). Men are also more likely to experience not being contacted by anyone (Kreager et al., 2014), and even the most attractive men receive on average fewer messages than women in

the lowest quartile of attractiveness (Rudder, 2014). Another common denominator is that men are substantially more likely to initiate first contacts while women tend to await being contacted (Fiore & Donath, 2005; Hitsch et al., 2010; Kreager et al., 2014; Rudder, 2014). This disproportion is typically explained by the higher number of men at online dating services and by the persistent gender norm that men should make the first move (Morr Serewicz & Gale, 2008; Rose & Frieze, 1993). We expect to observe the same pattern in the Czech data as well.

H1: Men receive much fewer invitations than women.

As the women using dating services are considerably outnumbered by male users and more likely to receive dating invitations, we expect their invitations to be returned more often. Thus, this hypothesis should test whether women “have the upper hand”, i.e., are the choosers in the online dating app.

H2: Women’s invitations are returned much more often.

In addition to gender, age plays an important role in contact frequency and reciprocity. When analysing OkCupid data, Rudder (2014) inquired at what age men and women are the most attractive for the opposite gender. Users were asked to evaluate the attractiveness of counterparts shown on photographs. The results indicated that women under thirty found men of their age or slightly older ones the most attractive. Women aged 30 or older, then, found slightly younger men than themselves to be attractive. In contrast, there was no time change in the preferences of male users, who found women around 20 the most attractive. Rudder notes: “A fifty-year-old man’s idea of what’s hot is roughly the same as a college kid’s, at least with age as the variable under consideration—if anything, men in their twenties are more willing to date older women.” (Rudder, 2014, p. 36) When explaining young men’s higher inclination to contact older women, he refers to the “cougar” phenomenon whereby older women seek

considerably younger men for their sexual gratification. We expect those preferences to translate into the contact structure in our data as follows:

H3: Men contact young women. Women contact same-aged or somewhat older men.

If men of all ages find young women the most attractive, as contended by Rudder (2014), and primarily contact such women, then we can argue that young women are the most desirable ones online. As assumed by nonreciprocity-based homophily theory, such women ultimately decide the mating outcome. Thus, young women will select equally desirable counterparts and then no longer answer less desirable users. Given their high number of incoming invitations, young women can select such partners that they really want and afford to reject considerably older men who they do not find attractive (see Rudder, 2014) or compatible (preference-based homophily).

H4: Although men contact considerably younger partners, they are rejected by such women.

But does ageing have the same effects on women and men? With increasing age, both genders have access to fewer potential partners in their age group because a part of the men and women get married. Thus, structural constraints apply to both genders (Kalmijn, 1998). However, social sciences typically assume that ageing does not make men less attractive because older men will be more successful and wealthier, which may attract even younger women (Buss, 1994; Fučík, 2006; Hakim, 2011; Možný, 2002; Rudder, 2014b). In contrast, ageing women will gradually have less dating options as they are found attractive by fewer men (Hakim, 2011; Rudder, 2014). This seems to be supported by the online dating research as men systematically penalise older women in favour of young ones (Hitsch et al., 2010; Rudder, 2014). Thus, women may not enjoy a universal advantage in online dating services. Older women may have smaller pools to choose from and be less selective as a result, i.e., accept a higher share of incoming invitations than younger women. Previous research also indicates that while younger women are rather not

interested in relatively younger men, older women are more open to younger partners (Rudder, 2014). This is also supported by data on marriage unions, with higher likelihood of age heterogamy in older age groups (Fučík, 2006; Katrňák, 2008). Therefore, it can be assumed that success with younger, same-aged, and older partners will not be constant but depend on the man's and the woman's age.

*H5: Men's success with younger, older, and same-aged female partners changes with age.*¹²

4.3 Characteristics of the dating app

Anonymised data from the Czech mobile dating app Pinkilin were used for the analysis. Pinkilin entered the Czech market in 2016 and is only available for mobile phones. Since its introduction, it has been downloaded by more than 50,000 users. It uses a relatively simple GPS-based algorithm whereby users who are in one's closest geographic vicinity are shown first. For each user shown by the app, one must choose whether or not to contact them. In the positive case, the app will immediately notify the potential partner, show them the profile of the interested party, and asks them whether they are interested to date them. The users are allowed to chat only if the invitation is accepted by the potential partner (i.e., in the case of mutual interest). Users decide by age, one or more photographs, or a short profile description provided by the user.

The data were obtained per agreement with the app admins. The admins themselves provided the data in anonymised form, with each user represented by a unique code. Since users send dating invitations to one another, we have information about who contacts whom and whether the invitation is accepted or rejected. At the same time, we know the age and gender of the sender and of the recipient. Given a relatively low number of same-sex searches in the app, only heterosexual online mating data could be analysed. Although photographs strongly influence

¹² We only formulate this hypothesis for men. This is due to a high success rate of the women in our sample (96%) and thus insufficient variability for modelling women's success.

users' decisions, we are unable to consider their physical attractiveness in the analysis. We also cannot observe changes in user behaviour over time because we do not have the time stamps.

The data cover a random sample of Pinkilin users. More specifically, we observe contacts among users using the app during July 2017. On one hand, the fundamental strength of our data is that it indicates the user's actual behaviour in the app, not their reported preferences. On the other hand, the primary limitation is that our data were not created for academic research purposes but as a byproduct of the app's operation (for more on this issue, see Salganik, 2018). Therefore, the dataset only provides limited information such as user gender and age but no in-depth insight in user motivations or the subsequent development of their relationships. We first conduct a descriptive analysis of our data and then use negative binomial regression and logistic regression to model invitation numbers and user success. Our analysis does not seek to generalise about the Czech population or about the user population of online dating services, but to make inferences about relationships in the model (Snijders & Bosker, 2012).

4.3.1 Dataset descriptives

The dataset consists of 10,563 users, who exchanged a total of 197,519 dating invitations.¹³ An invitation sent between users represents the unit of analysis. In terms of sociodemographics, the app is primarily used by young college graduates under 35 years living in major cities of the Czech Republic. The gender distribution was 3785 (36%) female and 6860 (64%) male users. Female users were typically younger than male users, with a median age of 24 years for women and 28 years for men. One quarter of the women were older than 30 and one quarter of the men were older than 32. This structure is not substantially different from other dating sites in terms of age or gender distribution. Practically all dating sites and portals are dominated by men, including the well-known mobile dating app, Tinder (McGrath, 2015). The age structure, too,

The dataset consists of 10,737 users, who exchanged a total of 199,581 dating invitations.¹³ Given a very low number of gay users or users older than 55, these contacts were excluded.

is consistent with international mobile dating apps. Compared to website-based dating sites, mobile dating app users are on average up to ten years younger (Smith & Duggan, 2013).

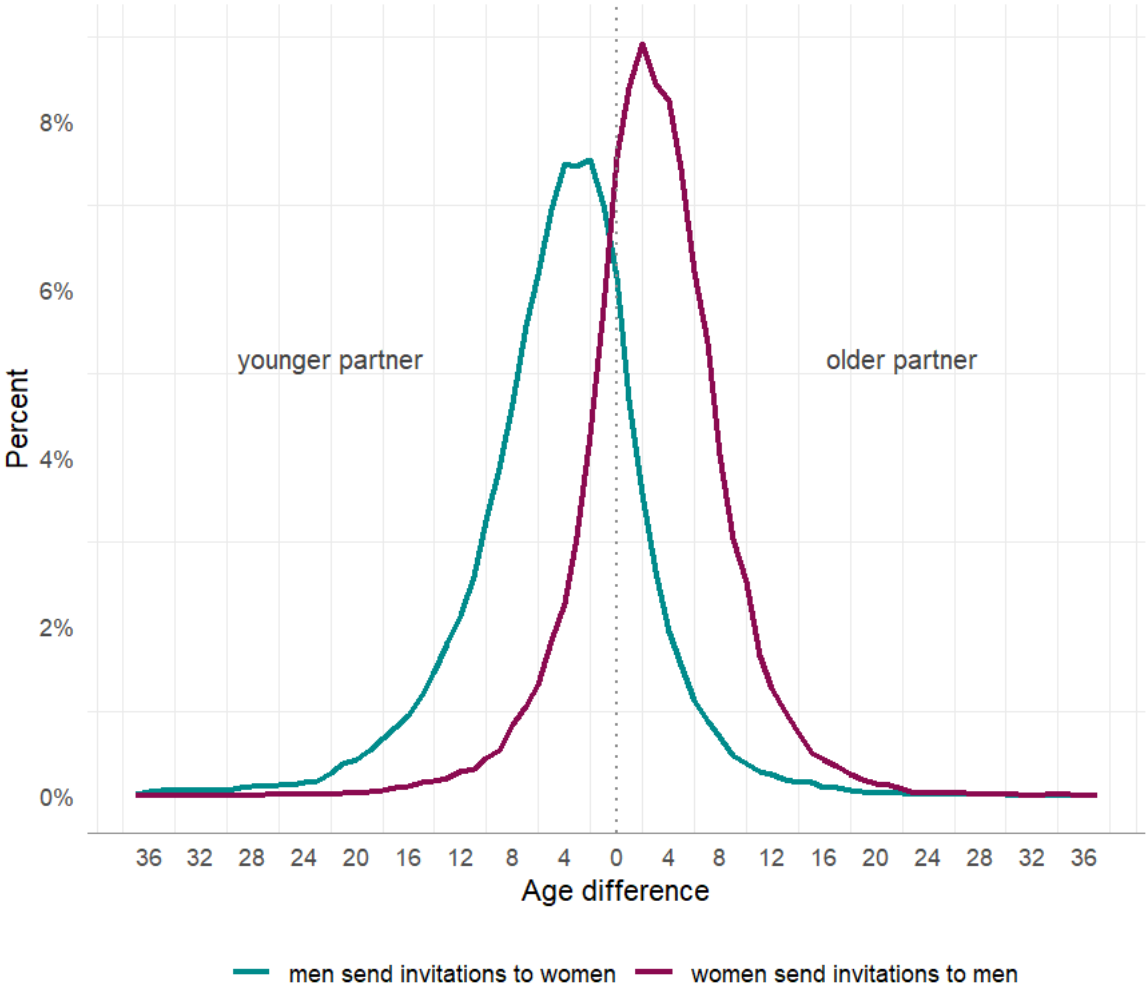
Previous research systematically demonstrates that women receive several times more invitations than men (Kreager et al., 2014; Rudder, 2014), and our first hypothesis is supported by the Czech dating app data. The median number of incoming invitations was 14 for women and only 4 for men. There was also a fundamental difference in variance: while 50% of women received between 4 and 40 invitations from men, the interquartile distance was much narrower for men, between 1 and 10. This situation corresponds to the existing evidence that women generally receive more invitations than men independently of their attractiveness, with even less attractive women receiving more invitations than the most attractive men (Rudder, 2014).

As for the number of invitations sent, men sent more invitations than women but the difference was not nearly as dramatic as for incoming invitations. The median number of outgoing invitations was 8 from men to women and 5 from women to men. Three out of four men sent fewer than 24 invitations, while three out of four women sent fewer than 17 invitations.

When looking at the age difference between counterparts, it is clear that men and women pursued different strategies in line with Hypothesis 3.¹⁴ Figure 4.1 demonstrates that men were much more likely to contact women who were younger than them. Only one-fourth of men's invitations were addressed to same-aged or older women. On median, men contacted 4.3-years-younger women.

¹⁴ It should be noted that the number of invitations both sent and received may correlate with app use duration. Users who have been using the app longer and more often are more likely to both send and receive more invitations because their profiles will be seen by more users. In contrast, some users may have only downloaded the app out of curiosity and soon deleted it, thus exhibiting fewer invitations both sent and received. However, we are unable to identify or correct this effect in the absence of usage duration data.

Figure 4.1 Sent invitations by age difference between partners (percentages)



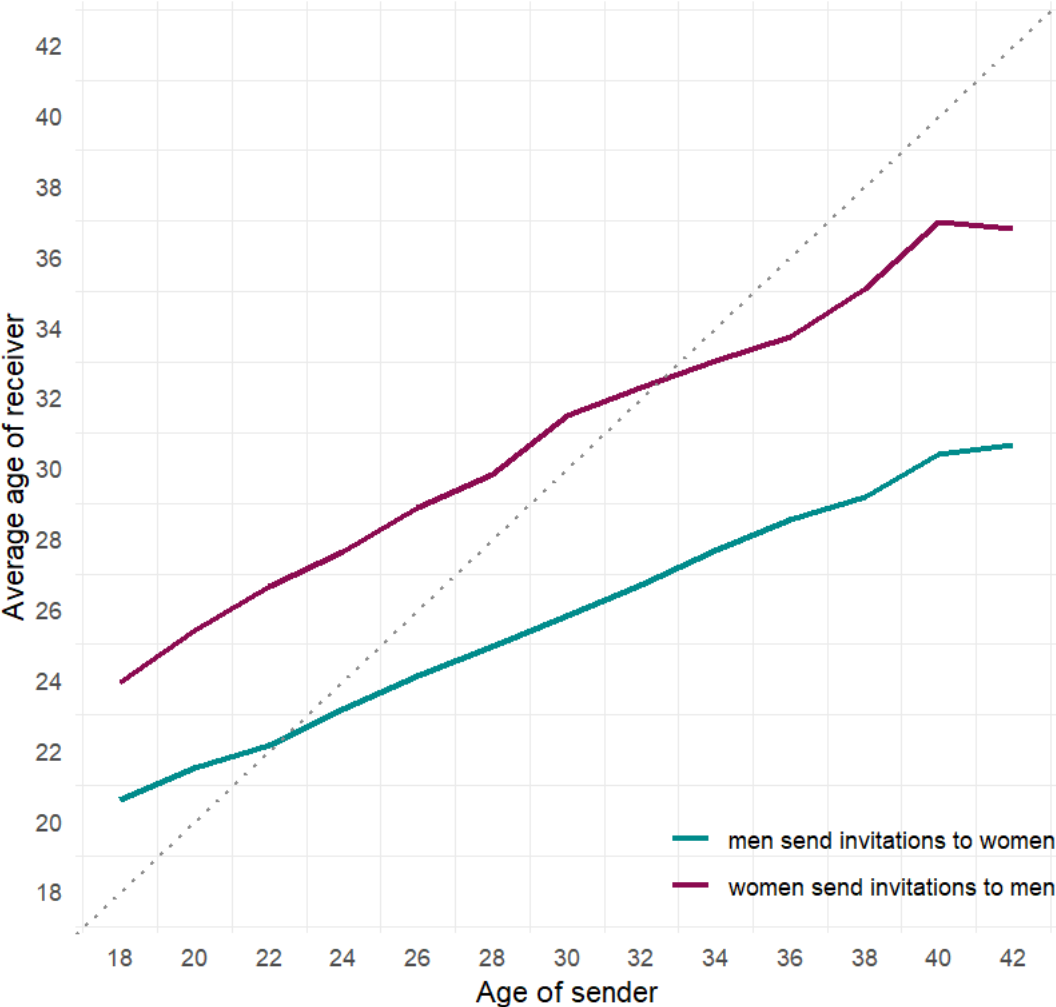
Note: n = 136,504 men’s invitations sent to women, n = 61,015 women’s invitations sent to men.

In contrast, women exhibited opposite strategies by age difference. The distribution of contacts is skewed to the right. Women primarily contacted men who were approximately two to three years older than them. As many as 75% of women’s invitations were addressed to same-aged or older men. On median, women contacted men who were 2.8 years older.

Figure 4.2 demonstrates that except the youngest men, who on average contacted somewhat older partners than them, men of all age categories on average contacted young women, especially women under 30. Women’s different behavioural pattern of systematically contacting several-years-older partners only changes after thirty, when women start contacting

younger men. Rudder (2014) observed the same results on U.S. data. Although the mean age of contacted counterparts grows with sender’s age, men continue to contact considerably younger partners. While women aged 38–39 years contacted 37-year-old men, men of the same age strived for 30-year-old women.

Figure 4.2 Mean age of invitation recipient by sender’s age and gender

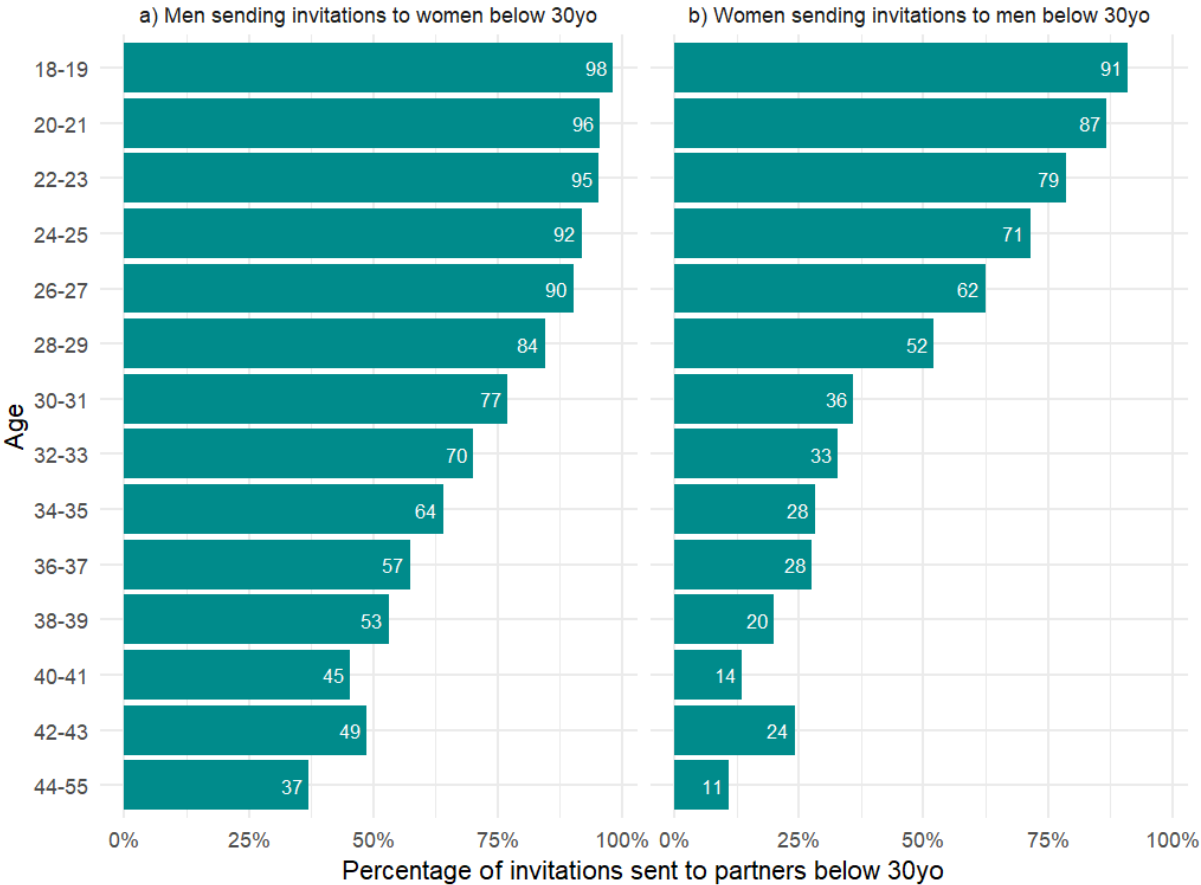


Note: n = 136,504 men’s invitations sent to women, n = 61,015 women’s invitations sent to men.

When looking at the shares of men and women younger and older than 30 years contacted by users in each age category, men and women once again exhibit substantially different contacting patterns. Women under 30 constitute a highly attractive group for men (Figure 4.3, panel a). Independently of men’s age, young women under thirty comprise at least one-half, or almost

one-half, of their contacts. Thus, even the oldest cohorts retain the preference for both relatively younger women and for women of young age.

Figure 4.3 Shares of invitations sent to women and men under 30 years of age



Note: Weighted data. The weight applied is 1/(total invitations sent by a) male user, b) female user).

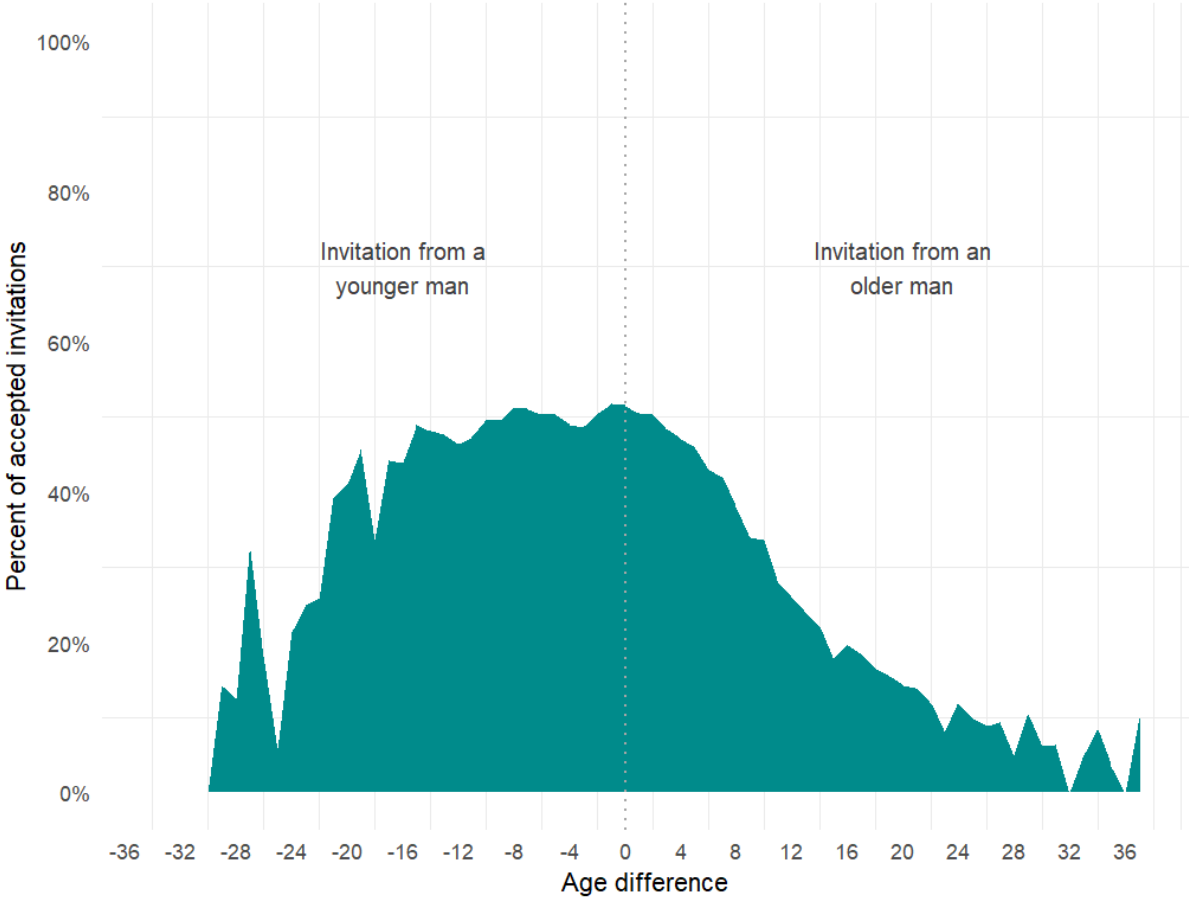
In contrast, a change in pattern occurs among women aged 30 or older, who start preferring men over 30 to men under 30 (Figure 4.3, panel b). This preference then grows with each additional year of woman’s age, as women are increasingly less likely to contact young men. In contrast, young women are substantially more likely to contact young men under 30 and rarely contact men over 30; the percentage of men over 30 contacted increases with women’s age. Thus, while 40-year-old men address 55% of their invitations to women under 30, 40-year-old women only contact men under 30 in 14% of the cases.

Not only do women receive considerably more invitations than men, but also, in line with Hypothesis 2, their invitations are more likely to be accepted. Women's invitations were returned in 96% of the cases. In contrast, only 43% of invitations sent by men were answered, while 57% remained unanswered. In other words, women's invitations were 3.18 times more likely to be answered than men's.

Although sociological literature often states that the pool of men's potential partners does not shrink with growing age, and women are attracted to older men by their wealth and status (e.g. Becker, 1973; Katrňák, 2008; Možný, 2002), the results in Figure 4.4 exhibit an opposite trend. A growing age difference between partners (with much older men) is accompanied by a sharp decline of positive answers to dating invitations. Of course, this could be a specific case of older men in our sample, who may not have sufficient status or wealth. Indeed, accumulation of resources works in both directions – age shows not only what a man has achieved but also what he has not (Buss, 1994). In contrast, a higher age difference in the woman's favour seems to be a smaller obstacle to mating. Although men are less likely to contact older women¹⁵, as shown in Figure 4.2, those who did contact them had an almost 50% chance of success – an above-average figure. The highest share of accepted invitations was observed for same-aged partners or when the women were one year older than the men (52% of positive answers). Since women's invitations were answered in 96% of the cases, it was meaningless to create the same graph for women, where even high age differences showed success rates around 90%.

¹⁵To illustrate, there were 10,228 cases of men contacting four-years-younger women but only 2659 cases of men contacting four-years-older women. When looking even further, men contacted ten-years-younger partners 4448 times and ten-years-older partners only 518 times.

Figure 4.4 Percentage of accepted invitations by age difference

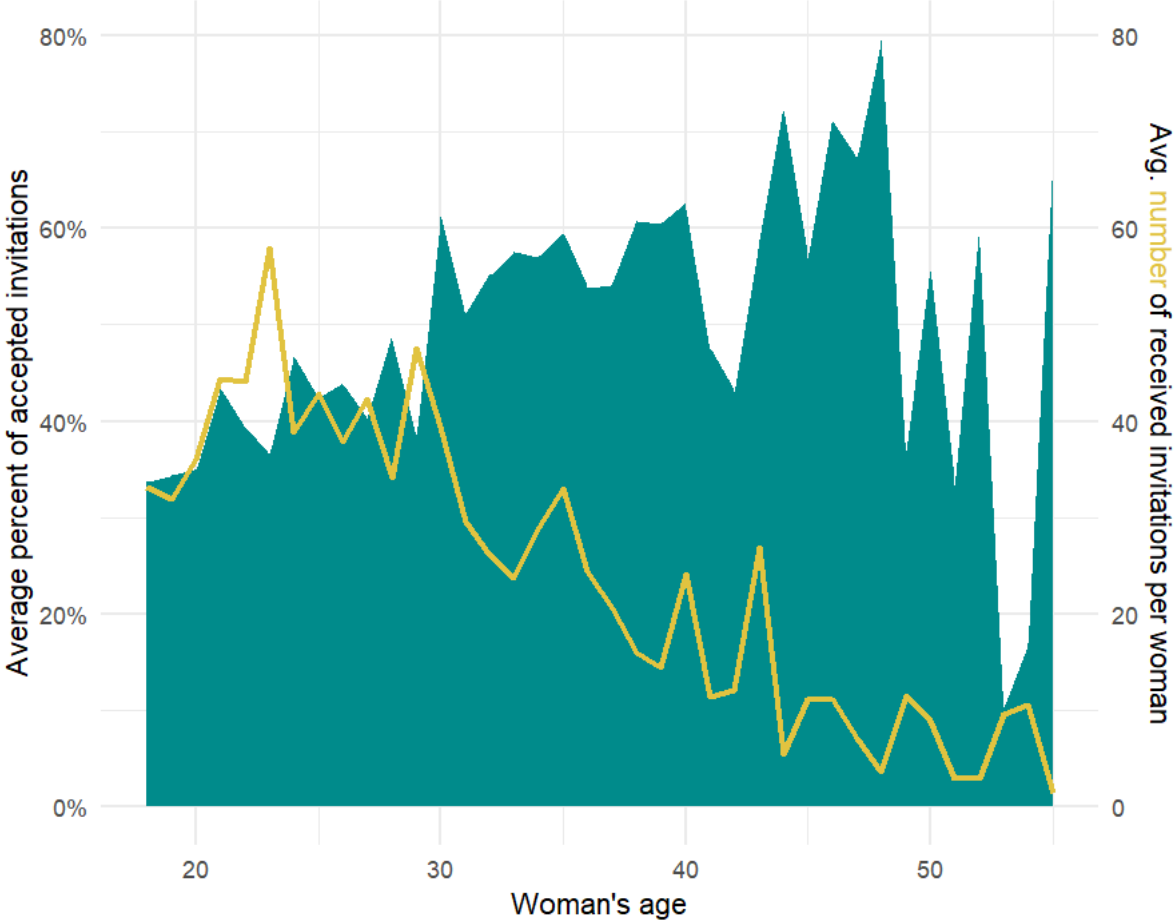


Note: Negative values refer to nontraditional heterogamy situations (with men younger than women). Positive values refer to traditional heterogamy (men older than women); n = 136,504.

It can be inferred from these results that women enjoy a sizeable advantage in online dating, and they are the choosers. The fact that women, not men, give rise to nonreciprocity supports our fourth hypothesis. Figure 4.5 indicates that women aged 20 to 30 years receive on average the most invitations (invitations per woman in the age category) and also make the most choices. Older women exhibit a similar ratio of accepted and rejected messages. When women aged 50 or older are merged, we can see that they only accepted 33% of their invitations, even less than 18-year-old users (34%). On one hand, younger women seem to have more freedom to choose because they receive the most invitations. On the other hand, the fact that older women receive

relatively few invitations makes this explanation improbable. It can be speculated that the high proportion of rejected invitations by older women is caused by their lack of attractive choices. Although Možný (2002) notes anecdotally that so-called “second-hand men” (divorced ones) may be a “treasure” to practical women, such men can be seen as “leftovers” and thus unattractive to potential partners.

Figure 4.5 Average percentage of accepted invitations by age and mean number of invitations per woman



Note: The left axis indicates the mean number of invitations received by a woman of a given age. N = 136,504

To sum up, the results of the descriptive section are as follows: Reciprocity is much weaker for men than for women. Although men contact younger women more often, they have much higher

chances with older women. While the latter do not initiate conversations with them, they are more likely to accept their invitations than younger women, who can be more selective. If men contact considerably older partners, they have substantially higher chances of receiving an answer than with considerably younger women, despite the large age difference. Men also have good chances of success when inviting reasonably older or younger partners. For women, activity (being the first to send an invitation) seems advantageous as almost all women's invitations are accepted irrespective of any age difference, sender age, or recipient age.

4.4 Number of dating invitations received

We opted for negative binomial regression to answer the question how the number of incoming invitations in the mobile dating app changes with age. Negative binomial regression is suitable for modelling frequencies when distribution is strongly skewed, like in the case of number of dating invitations received. Number of incoming invitations is the dependent variable, and each recipient is counted once and only once. The number of observations is 10,563 users, of whom 707 (24 women, 683 men) did not receive any dating invitation. The minimum number of incoming invitations is 0 and the maximum 803.

First, our baseline model includes only recipient gender and recipient age without any interaction. The second model includes an interaction term between recipient gender and recipient age. However, while linearity is assumed in both these models, it is not necessarily present in the data. As mentioned in the above sections, existing literature supports the assumption that number of invitations may not evolve linearly and instead may start declining at a certain age (Rudder, 2014). Therefore, our third model relaxes the linearity restriction by including a quadratic term. Given the information criteria (Table 4.1), we opt to interpret Model 3 that does not assume linearity.

Table 4.1 Overview of the models

Model	Rovnice	AIC	BIC
Model 1	N invitations ~ gender + age of receiver	77 390	77 419
Model 2	N invitations ~ gender * age of receiver	77 367	77 404
Model 3	N invitations ~ gender + (age of receiver) ²	77 222	77 258

Table 4.2 Negative binomial regression results (Model 3)

N of invitations	Coef.	St. Error.	Conf. interval (95 %)	
Woman	1,399***	0,027	1,345	1,454
Age of receiver	0,142***	0,012	0,118	0,166
(Age of receiver) ²	-0,003***	0,000	-0,003	-0,002
Constant	0,384*	0,190	0,011	0,758

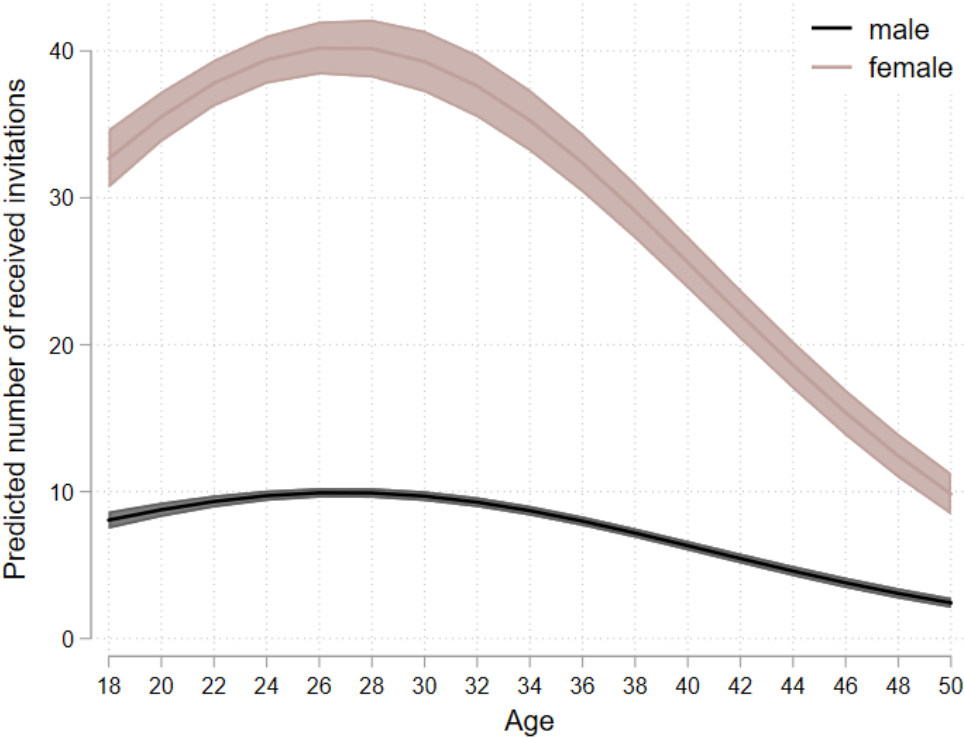
n = 10 563

* p < 0,05, ** p < 0,01, *** p < 0,001

The results of negative binomial regression (Table 4.2) indicate that gender plays a key role in the number of messages received, which is not surprising given the descriptive results. Women receive more messages than men, which is in line with Hypothesis 1. As for the quadratic term of age, it is statistically significant and negative, which means that number of invitations does not evolve linearly with age and gender: it grows up to a certain age and then starts decreasing. Figure 4.6 indicates that number of received invitations grows up to the age of approx. 26–28 years for women, in line with Hypothesis 3 (men mostly contact young women), and is followed by a steep decline. Despite the steep decline, even the oldest women receive on average more messages than men of any age. Men exhibit a similar evolution, yet a much less dramatic one, since the mean variance of men’s invitations received is much lower than for women. A slight

growth up to the age of 30 is followed by a slight decrease, which steepens after approx. 30 years of age. The number of invitations received by the oldest men approximates zero. This result contradicts the existing literature, which typically assumes that men, as opposed to women, do not become less attractive with age.

Figure 4.6 Prediction of the number of invitations by age and gender



Note: The lines indicate the predicted means of incoming invitations by age and gender. 95% confidence intervals are represented by the shaded areas around the lines.

4.5 Analysis of success

We used binary logistic regression to analyse Pinkilin user success in contacting other users. Dating invitation acceptance or rejection is the dependent variable. We only model cases of men contacting women because the invitations sent by women succeeded in 96% of the cases, which precludes meaningful analysis of the latter. A simple weight of $1/(\text{total invitations sent})$

by user) was applied in the analysis of success: the sum of a user's outgoing applications always equals one. This is due to different levels of user activity. More active users sent more invitations, and the results would be biased towards their preferences. Skopek, Schulz, & Blossfeld (2011) use the same procedure in analysing data from an online dating service.

The independent variables are male user age in interaction with the age homogeneity parameter. By age homogeneity (reference category), we mean cases when the male user is same-aged, one year older, or one year younger than the woman contacted by him. This allows us include in the same-aged category partners who are only a few months apart and would otherwise be misclassified as different-aged. Under sensitivity analysis, we also tested a variant operationalising homogeneity as a difference of one year in favour of the woman and up to two years in favour of the man, in line with other studies (e.g., Fučík, 2006; Katrňák, 2008). Yet model interpretation remained unchanged. In addition, we control for the female recipient's age.

Table 4.3 Binary logistic regression results

Reciprocity	Coef.	St. Error	Conf. interval (95 %)	
Man's age	-0,02*	0,01	-0,03	0,00
Homogeneity				
Man older than woman	1,69***	0,20	1,31	2,07
Man younger than woman	-1,65***	0,27	-2,18	-1,12
Homogeneity * Man's age				
Man older than woman	-0,06***	0,01	-0,07	-0,04
Man younger than woman	0,05***	0,01	0,03	0,07
Woman's age	0,07***	0,00	0,07	0,08
Constant	-1,06***	0,17	-1,40	-0,72

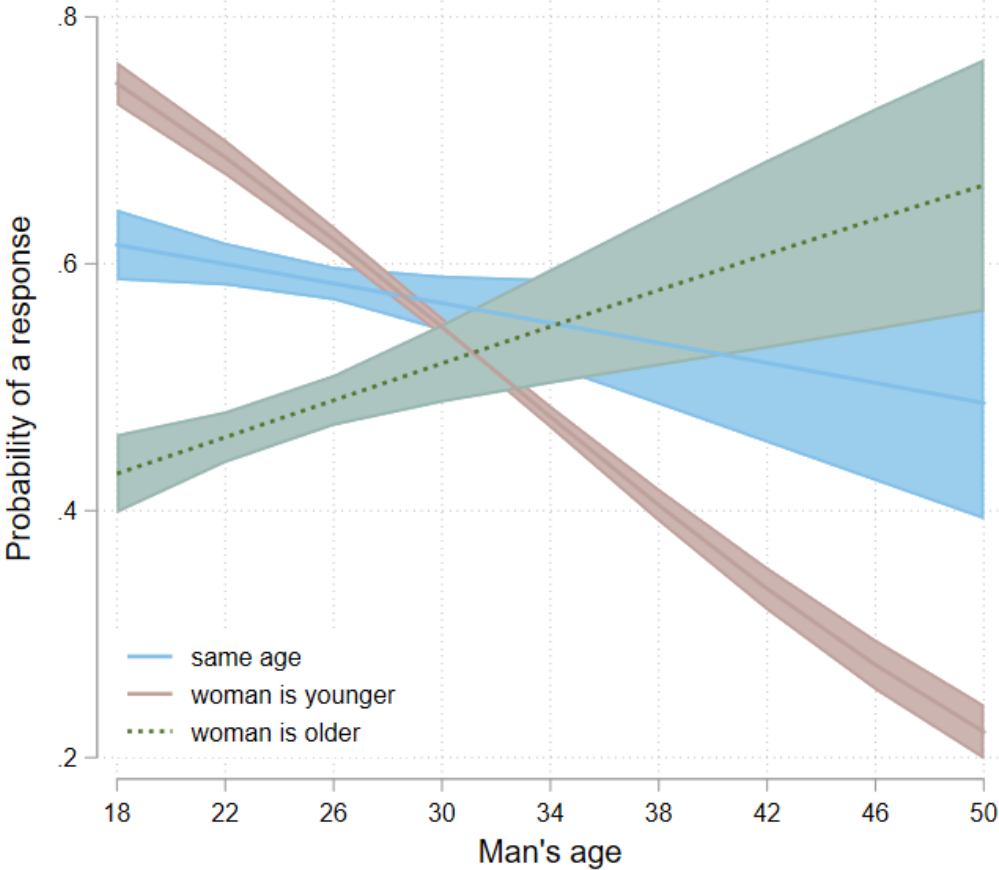
n = 136 504

* p < 0,05, ** p < 0,01, *** p < 0,001

The model (Table 4.3) clearly shows that the older women are, the more likely they will accept an incoming invitation. It can also be seen that success likelihood by age homogamy changes with age, as proposed by Hypothesis 5. Younger men have the highest chances with relatively younger women. In contrast, older men have negligible chances with young women. Their lack of success supports Hypothesis 4. As in the previous model, it is apparent that our data do not substantiate the expectation that men's attractiveness does not decline with age and that older men have the potential to appeal to even younger women. Success likelihood with same-aged counterparts slightly decreases with age, yet even the oldest men in the sample are successful in approx. 50% of the cases. When contacting older women, younger men are less likely to succeed than older men. But it should be noted that the confidence intervals are relatively broad in the case of older men contacting older or same-aged women, yielding highly variable success rates. This may be due to the low share of users in older age groups. Figure 4.7 shows predicted answer likelihoods by the man's age and age homogamy¹⁶.

¹⁶ The apparent question is whether success by age homogamy must evolve linearly or whether nonlinear evolution will be observed like in the case of number of incoming invitations. We fitted a special model to test that hypothesis (results upon request). Model interpretation would change due to lower success rates among men aged 36+ in contacting same-aged or older women, yet with considerably broader confidence intervals. Success in contacting younger women would remain unchanged. Nevertheless, there would be extremely low coefficients for the quadratic term of male user age in interaction with the categorical variable of age homogamy, which would even not be statistically significant in the case of contacting older women. The information criteria (AIC, BIC) was poorer than for the linearity-based model. For these reasons, we opt not to present the model.

Figure 4.7 Predicted answer likelihoods by male user age and age homo/heterogamy



Note: The lines show predicted likelihoods of an answer to a sent invitation by the man’s age and age homogeneity or heterogeneity. 95% confidence intervals are represented by the shaded areas around the lines.

4.6 Conclusion

Online dating data can help us understand changes in the marriage market and gain a better insight in the initial phase of partner search. This paper has focused on age homophily in the context of a Czech online dating app. Generally speaking, men exhibit strong preferences for younger women. Women under 30 are the primary age category contacted by men of all age categories. No such clear trend was observed for women. While women under thirty preferred men from the same age category, preferences for older men increased with each additional year

in their lives. Women over 30, then, strongly preferred men over 30 to men under 30 years of age.

Paradoxically, the youngest women are not the most attractive ones, despite the considerable attention paid to them. Interest grows up to the age of approx. 26–28 and then declines steeply. Men exhibit a similar but a much less dramatic trend. Even so, the oldest women receive more dating invitations than men of any age category. Although social scientists often state that men do not become less attractive with age and continue to appeal even to young women, we were unable to observe any such phenomenon in our data. In contrast, older men have minimal likelihood of success with younger women. However, as stated by Hamplová et al. (2017, p. 20), Czech men “fade” faster because they do not take good care of themselves, which may be a country specific issue. Furthermore, accumulation of resources (status, money) works in both directions for older men. Age shows not only what a man has achieved but also what he has not (Buss, 1994). This opens space for further research, as we do not know whether this is a specific of older men using the Pinkilin dating app or a social trend whereby an increasingly egalitarian approach to relationships has weakened the importance of role complementarity and of exchanging youth and beauty for status and wealth. Moreover, female users of online dating services enjoy the freedom to choose from high numbers of invitations and thus can be more selective. In contrast, young men have the highest chances of success with young women. The chances of success in contacting same-aged partners slightly decrease with age, although this may be a specific of the dating app, with its decline of same-aged partners in older age groups. The descriptive section tells us that the younger a woman, the more likely she is to reject an invitation. Moreover, the older a man is than the woman contacted by him, the less likely his invitation is to be accepted. Indeed, young women are attractive for men of all ages and receive high numbers of invitations to choose from. As women use this fact to their advantage, they ultimately match with either same-aged partners (age homogamy) or partners of similar age,

who are only a few years older or younger than them. This situation is expected by assortative mating theories, and a similar trend can also be observed on Czech marriage data. Thus, our results support the nonreciprocity-based explanation of age homophily.

Yet we observe another trend as well. The older men are, the higher chances of success they have with relatively older women, even in the case of high age differences. Although older women sent very few invitations to younger men, they were relatively highly likely to accept any invitation received from them. Women exhibit much higher chances of accepting a considerably younger man's invitation than one from a considerably older man. These findings correspond to results from the Czech business sector. According to an analysis of data from Lide.cz (Novinky.cz, 2014), one of the Czech Republic's major dating sites, men primarily seek to contact younger partners, and this behaviour strengthens with increasing age. However, it was with older women that men's invitations had higher chances of success, i.e., of being returned. These observations can be viewed in the context of a growing number of age-nontraditional marriages in Czechia, where more and more women marry younger partners.

If women took the initiative and were the first to contact men, they would seize a key advantage in this market, as their invitations were almost universally returned. Men enjoyed no such advantage and were successful in less than half of the cases. Such observations were made in multiple studies of online dating services and are typically explained by the higher numbers of male users and by the social norm of letting men make the first move.

Therefore, the present work has largely corroborated the assumptions of international research about age homophily in the heterosexual online dating context and its results are also more-or-less in line with the trends of age homogamy and heterogamy in Czechia. Nothing suggests that people might be more tolerant of age differences in the online environment; online dating services rather seem to allow users to filter their counterparts more effectively. Thanks to nonreciprocity, women are the primary agents of age-homophilic contacts. A limitation of the

analyses is our inability to estimate whether relationships arose from the online contacts observed. Furthermore, self-selection plays a role in data from a single dating app, and additional bias may be caused by unobserved intervening variables (e.g., attractiveness, education, or income). It would also be interesting to verify whether user preferences, or their contacting strategies, change in time based on experienced rejections by, or success with, the opposite gender. Herein, then, remains a room for further analyses.

5 Partner preference and age: User's mating behavior in online dating^{17 18}

5.1 Introduction

Age is an important factor in mating. From an evolutionary perspective, it influences human reproduction opportunities and, thus, is linked to individual reproductive strategies, with youth being a fertility cue by females and mature age signaling the ability of males to provide for offspring (Buss & Schmitt 1993). From a sociological perspective, we observe the impact of social norms: Our peers might be deemed more appropriate partners by our family and friends. Therefore, age guides our choice of partner: Individuals have explicit or implicit age intervals that they apply during a partner search, and even the most basic online dating services will require a preferred partner age in order to match users. Moreover, age most likely influences the type of relationship an individual will form as well as its outcome: Couples with a smaller age difference tend to share similar values, life experiences, and opinions (Fiore & Donath, 2005; Fučík, 2006).

In terms of patterns in age homogamy, examinations of national marriage data probably constitute the oldest and richest research tradition (i.e., Atkinson & Glass 1985; Qian 1998; van de Putte et al. 2009). These findings, although representative and usually comparable among countries, lack partner search dynamics. By looking only at actual couples, we miss out on details regarding how individual partner age preferences manifest in the dating market and cannot separate the effects of individual choice and age-structured social systems that support age homogamy, such as schooling (Kalmijn, 1998; Katrňák, 2008). Since the late 1920s, partner

¹⁷ This chapter was previously published as: Šetinová, M. and Topinková, R. (2021) 'Partner preference and age: User's mating behavior in online dating', *Journal of Family Research*, 33(3), pp. 566–591. doi:10.20377/jfr-540.

¹⁸ This study was supported by The Czech Science Foundation (GA17-12099S) and GAUK (829417). Due to agreement with the provider of the data, the data used in the research are not available. The materials used in the research (do files) are available via email.

preference research has regularly employed self-reports from questionnaires undertaken to evaluate mate-selection criteria. These studies offer more detail regarding individual partner choice, but they often focus only on younger populations and are prone to social desirability bias (Schwarz & Hassebrauck 2012). Evolutionary theory posits that partner preferences can change as people age, although there is little data to support this claim (Buunk et al. 2002). However, the evidence does suggest differences between declared partner preference and real-life dating behavior (Rudder 2014; Skopek, Schmitz, & Blossfeld 2011).

A relatively new strand of research has used online dating data to examine partner preferences (i.e., (Fiore & Donath, 2005) Skopek et al. 2011). With around 75% of singles in the United States looking for partners online and with a similar trend in Europe, including the Czech Republic, the Internet has been gradually replacing traditional meeting places for partners (Dinh et al., 2018; Nielsen Atmosphere, 2018; Rosenfeld & Thomas, 2012). Moreover, contrary to the stigma involved, online dating sites are considered places to find a serious relationship: 35% of US marriages between 2005 and 2012 began online (Cacioppo et al. 2013).

The use of data from online dating to study partner preferences brings important benefits. First, unlike declared preferences, we can observe authentic dating behavior. Second, online dating sites record all user activity, and thus, we have access to more detailed data than even extensive questionnaires with large samples, thereby enabling richer analyses. Although there are obvious limits with regard to the representativeness of online dating data, as the analysis is usually focused on one service only and skewed toward younger users, it is a logical next step toward expanding partner preference research.

In this article, we build on the existing online dating research using digital trace data from the Czech online dating mobile app Pinkilin in order to understand partner preferences with regard to age. Aside from examining overall mating patterns relating to age and gender,

our data allow us to explore the age interval that users opt for when searching for a mate and how the interval varies relative to an individual's age and gender. This evidence further develops our knowledge about partner preference and age, but it is also intriguing as a case study of partner preferences in the Czech Republic, as this is the first local attempt at using online dating data to study age dynamics. Furthermore, as most online dating studies share a common flaw—they are limited to one online dating site—cumulative evidence is crucial to assess whether the observed patterns are truly present or merely a by-product of the design of particular sites.

5.2 Age Homogamy

When we look at actual couples, we often observe a strong tendency toward homogamy, i.e., partners resembling each other. This pattern holds across various cultures, times, and characteristics, including age Blossfeld & Timm 2003; Hamplová 2009; Kalmijn 1998). It is relatively easy to study age homogamy because marriage data involving partner age are widely available. However, marriage patterns show only part of the story: They represent the end product of the partnering process, which could have been brought about by various mechanisms. They show successful couples who have transitioned from strangers to spouses. Age homogamy could be explained by individuals' preference for age homophily—the tendency to like partners of the same age—but other factors such as our physical opportunities and the social forces around us are also at play (Kalmijn, 1998; Katrňák, 2008; Schwartz, 2013). An individual's preference for a partner of different age (heterophily), of a lower age (hypophily), or of a higher age (hyperphily) can also translate into homogamous marriage. To illustrate, a man over 60 could have a strong preference to date a woman in her 20s, but if their social circles do not overlap and the man's preference is not reciprocated, such a couple is unlikely to form.

Studying partner preferences can enhance our understanding of the forces behind mating outcomes, and it could be a mistake to assume that age-related marriage patterns are the result of a partner's age preferences (Skopek et al. 2011). However, it is also a topic that is interesting in itself, as partner preference dynamics expand our knowledge of the early stages of the mating process. This is especially true when using online dating data, which removes the structural constraints of the offline world, where the social environment is structured in such a way that it increases our probability of meeting some people while decreasing the probability of meeting others. Online dating expands the dating pool by allowing a wider variety of people of different ages and other characteristics to be in the same virtual place. Furthermore, the costs of initiating a contact are relatively low in terms of time and money, as such contact is easily undertaken on mobile devices in a matter of moments. Additionally, the psychological costs are also presumably lower in online dating, since there is no face-to-face interaction while initiating contact, and a potential non-response does not have to be interpreted as a rejection (Kreager et al., 2014a). Thus, the Internet could bring partner preferences and real dating behavior more in line, as the barriers are easier to cross than in traditional settings, and individuals can choose counterparts who are closer to their liking.

So far, the evidence from online dating research points to preferences for similarity in some aspects and dissimilarity in others (Blackwell & Lichter, 2004b; Fiore & Donath, 2005; Hitsch et al., 2010a). In terms of age, the evidence seems to be mixed. On one hand, Skopek et al. (2011) observed a non-random preference for contact with same-age partners on a German dating site. On the other hand, Rudder (2014) analyzed data from an American dating site and found a preference for same-age partners among women but not among men. This discrepancy can be due to different cultural contexts or differences in the dating sites studied.

As stated above, homogamy or heterogamy is an outcome of the mating process. There are two theoretical perspectives that aim to explain the forces underlying this outcome. The first

perspective is evolutionary theory, which links age to fertility and views mating dynamics between men and women through the perspective of different reproductive strategies (Eagly & Wood 1999;). We refer to the second perspective as the sociological perspective because it emphasizes the impact of social norms and the dynamics of the mating market (e.g., Casterline, Williams & McDonald 1986; Gustafson & Fransson 2015; Hakim 2010; Skopek et al. 2011). We elaborate on these two perspectives in the two following subsections.

5.3 Evolutionary Theory

Evolutionary theory posits that partner preferences, including age, are linked to human reproductive strategies and should vary according to an individual's gender and age (Buss et al. 2001; Buss & Schmitt 1993; Eagly & Wood 1999; Kenrick & Keefe 1992).

5.3.1 Men's partner preferences with regard to age

Within this perspective, academics argue that men are looking for a fertile partner with quality care potential and, thus, find young women the most attractive. Women are at their fertility peak in their early 20s, and the younger they are, the higher the likelihood they will survive labor and be able to physically care for their offspring. Men should, therefore, have stronger preferences for traits that signal a female's ability to reproduce. Partner preference research confirms this expectation: In samples across various cultures, physical attractiveness, youth, and domestic skills tended to be more important for men than for women (Buss et al. 2001; Shackelford, Schmitt & Buss 2005;), including in the Czech Republic (Hamplová, Klímová Chaloupková & Topinková 2019; Katriňák & Fučík 2009; Šetinová & Klímová Chaloupková 2019; Vymětalová 2000). However, only a few studies have looked at preferred partner age intervals or partner preferences in relation to age. In those that have, men seemed to consider female partners up to 10 years their junior but only about five years their senior. As men get older, their willingness to approach younger women increases, but their low acceptance of older women remains constant).

Male age preferences are also demonstrated on the dating market. Young women have a prominent position in online dating sites and are heavily approached by men of all ages, with digital trace data showing that men often go below their stated age preference when messaging single women (Fiore & Donath, 2005b; Rudder 2014). As men age, they avoid contacting older women and grow more ambitious in contacting even younger women (Skopek et al. 2011). According to the life history model, this can be understood by males' longer fertility (Kenrick & Keefe 1992). This could also explain why women, at the end of their fertility window (circa 40 years), have trouble finding suitable partners and experience the so-called "marriage squeeze" (Ní Bhrolcháin 2005).

5.3.2 Women's partner preferences with regard to age

According to evolutionary theory, as women's investment in motherhood is greater than that of their partner, they must choose a different reproductive strategy, which is reflected in their mating preferences (Buss & Schmitt 1993). Women look for a fertile and healthy partner, but they also need someone who will be able to provide for them and their children. This has become evident in partner preference research: Across cultures and age groups, women highlight the importance of a partner's income, education, and status (Sprecher, Sullivan & Hatfield 1994). As men's financial security tends to correlate with age, women might use it as a cue for a potential partner's income and status (Conway et al. 2015). However, male fertility declines with age, and at some point, a man's ability to provide is threatened due to aging. Women should, therefore, prefer a partner roughly around their age or a bit older (Kolk 2015).

In examining data that support this theoretical expectation, we find that women demonstrate tolerance for partners up to eight years their senior and five years their junior. As women age, their upper limit for a partner's age decreases, but they grow to accept men who

are significantly younger than they are). Users' behavior on online dating sites confirms these trends. On one of the biggest international dating sites, OkCupid, women's attention is largely focused on men their age, with the oldest allowable match being about five years older than them (remaining roughly constant as the woman ages). Although young women up to 28 years old are not very tolerant of younger men, this changes when they reach 30, and their acceptance of younger partners grows with age (Rudder 2014). An analysis of a German dating site reached a similar conclusion: Women reach out to older men, but as they grow older, their willingness to contact older males decreases in absolute terms. They then grow open to younger partners (Skopek et al. 2011).

As mentioned earlier, research on Czech partner preferences largely reflects the gendered expectations of evolutionary theory: For decades, we have observed the above-mentioned gender-specific partner preferences (Fialová et al. 2000). Although there is no research that focuses specifically on partner preferences and age, general partner preference research maintains that males seek youth and beauty, whereas females focus on income and status (Katrňák & Fučík 2009; Šetinová & Klímová Chaloupková 2019; Vymětalová 2000). Therefore, we expect that the gendered age preferences discussed in evolutionary theory and demonstrated in international research will also hold for the Czech dating site.

5.4 Sociological perspective

Evolutionary theory reduces dating to reproductive strategies. However, dating is a social behavior that takes place in a wider societal context, with individuals engaging in it to fulfill various needs—not limited to finding a life partner and reproducing. Sexual pleasure, company, status acquisition, self-realization, and societal expectations are all reasons why people choose to engage in active dating (Weigel 2016). Macro-level social forces, context, and individual

preferences all influence partner preferences when dating, including expectations regarding age.

5.4.1 Mating market dynamics

It is widely accepted that mating occurs within a “market” where individuals exchange various forms of capital to attract desirable mates. The final pairing is a result of individual preference, bargaining power, and partner availability (Becker 1985; Hakim 2010; Oppenheimer 1994; Skopek et al. 2011). Within this market, individuals wish to maximize their utility, which can stem from partner similarities. This is so because relationships with a partner from a similar background tend to enjoy a sense of easiness, since the couple often shares similar attitudes and lifestyle, making it easier to communicate, fall in love, and raise children (Kalmijn 1994; Lewis 2016). This holds true for partner age preferences: Partners of a smaller age difference are more likely to share common values, life experiences, and opinions as they have experienced important life stages in similar times (Fiore & Donath, 2005b; Fučík 2006). Age-homogamous relationships are also more likely to be rewarding and stable, egalitarian, and with lower incidences of domestic violence (Gustafson & Fransson 2015; Kolk 2015). In this view, individuals should prefer age-similar relationships regardless of their age.

Another dynamic of the mating market is social exchange. There is strong evidence to suggest that males, in particular, trade their financial and social capital for female erotic capital, i.e., female physical attractiveness and fertility (Buss & Schmitt 1993). According to some authors, for women, the marriage market is even as important as the labor market with regard to status attainment (Hakim 2000). We can assume that partner age preferences are an important part of this status–beauty exchange. In particular, with the growing importance of physical attractiveness in self-service mating markets, such as online dating, age can correspond with the erotic capital of a potential mate (Hakim 2010). Although we commonly see males trading their status for female youth, the dynamic has been increasingly seen to work inversely: Older,

wealthier women choose to date younger, more attractive men (Rudder, 2014b). To sum up, individuals' awareness and experience of interactional dynamics within the social exchange can influence their preferences, and in particular, those who are aware of their higher status can be more ambitious with regards to a partner's age (Lewis 2016).

An individual's dating strategy will also impact their behavior on the mating market, including in relation to a potential partner's age interval (Alterovitz & Mendelsohn 2013; Shackelford et al. 2005; Stewart et al. 2000). Physical attractiveness, which is closely linked to age, is more important in short-term relationships. Both genders are more selective when the goal is to search for a long-term partner. For males, beauty is of high importance in long-term relationships; for females, resource acquisition skills and signals (i.e., status, degree) and personal characteristics (i.e., kindness) (Stewart et al. 2000) are more important. An individual's own age can influence their choice of dating strategy, although this does not seem to substantially impact their stated partner preferences, especially in young adults (Bleske-Rechek & Ryan 2015; Shackelford et al. 2005). However, it is important to note that studies looking at how partner preferences develop over time commonly work exclusively with short intervals (e.g., three years), do not focus on preferred partner age, and mostly rely on self-reported preferences. This can be especially problematic as it assumes that individuals are conscious of their preferences and that preferences conform to future actions (Schmitz et al. 2009). The situation might be different in the context of behavioral data from online dating and various age groups, as we know that preferred partner age intervals do change with age (Skopek et al. 2011).

5.4.1.1 Social norms

Besides market dynamics, partner age preferences may also result from social norms guiding mate choice. Individuals internalize socially shared conceptions about appropriate partner age differences and then select their mates accordingly. Family and friends approve and reward “good choices” and penalize pairings that violate norms. Social norms can vary across countries as well as across social groups (Kalmijn 1998). Nevertheless, it appears that partners of similar age should be fairly widely accepted, as age homogamy features in most industrialized countries and seems to be on a rise (Esteve, Cortina, & Cabré 2009; Ní Bhrolcháin 2005). We can assume that in the context of Czechia, the norm of age homogamy is fairly strong: Age homogamy has increased from the 1950s onward, with husbands being the same age or a couple of years older than their wives. Currently, the most common age difference between spouses is just one year. Indeed, age at marriage is an important factor behind age homogamy in Czechia: The lower the age, the higher the chances of a homogamous spouse (Katrňák, 2008). By becoming a social norm, the already prevalent pattern of age homogamy may be further reinforced through expectations and sanctions. As the chances for age homogamous marriages are lower for older individuals, the perceived norm may be less binding for them.

Another factor impacting social norms seem to be gender relations. While older-female unions are mostly avoided, the acceptable age difference for men seems to be more flexible and varies across countries (Casterline et al. 1986). In societies with lower incomes and fewer educational opportunities for women, larger age differences are more frequently accepted and occur more often than by chance (Casterline et al. 1986; Ní Bhrolcháin 2005). In more egalitarian societies characterized by social and economic development and more educational opportunities for women, the age difference between partners is generally smaller, and larger age gaps are avoided (Casterline et al. 1986; Ní Bhrolcháin 2005).

In the last few decades, the position of women has undergone significant change: Women's participation in the labor market has increased, making them less economically dependent on their spouses. Women have also become more educated, currently outperforming men on every educational benchmark (Hamplová 2020; Klesment & Van Bavel 2012). With the rise of dual-earner families, the traditional male breadwinner model, which is assumed by evolutionary theory, has become less prevalent (Kulik 2011).

These social developments have challenged traditional gender roles, potentially affecting partner preferences. As women's status improves, they may be less inclined to mate with older men to provide them with resources they may otherwise lack. This is in line with previous findings on marital age, as younger women often enter marriages with older partners, while the difference for older women is far smaller (Katrňák, 2008). This may be because older women have already established their position in the labor market and are more economically independent. Thus, these macro-level changes could promote women's preference for age-homogamous partners. This could be especially true in the context of online dating, where women have a better position in this market and can be more selective because there are generally fewer women than men (Dinh et al., 2018; Rudder, 2014b).

In the European context, the Czech Republic is an interesting hybrid case in terms of welfare regime classification and female employment patterns (Hamplová et al. 2019: 2829). Despite having one of the highest female employment rates in Europe (OECD, 2019), when small children are present in the household (< 3 years), the employment rate plummets to one of the lowest in Europe. This is visible in social policies (i.e., long maternity leave) as well as in the overall support for the male breadwinner model and the traditional division of domestic labor (Hamplová et al. 2019; Hašková 2005). We also observe a higher incidence of age hypogamy in relation to males and age hypergamy in relation to females in comparison to other developed countries (Katrňák, 2008). Based on the sociological perspective, women's

participation in the labor market and higher levels of education should decrease the age gap between partners. However, the support in the local environment for traditional gender roles likely highlights the age and gender dynamic, thereby allowing for greater differences.

5.5 Hypotheses

Considering the expectations from evolutionary theory and the sociological perspective, as well as past research on partner preferences and evaluations of the local context, we anticipate the following in our data set:

Overall preference for a partner of roughly the same age (H1)

- *The lower the age of the individual, the more likely the preference for a partner of the same age (H1a).*

Men show a strong preference for younger women (H2).

- *Men will approach significantly younger women (H2a) but only slightly older (H2b). As they age, their acceptance of younger women widens (H2c), but the acceptance of older partners remains stable (H2d).*

Women have mixed age preferences (H3).

- *Women will consider men significantly older (H3a) and slightly younger (H3b). As they age, their acceptance of younger men widens (H3c), and their acceptance of older men decreases (H3d).*

5.6 Data

Our analysis relied on data from Pinkilin, a Czech mobile online dating app operating in the local market between years 2016 and 2019. It was available exclusively for mobile phones, and during the three years of its existence, over 50,000 users downloaded it. Compared to other dating sites operating in the Czech Republic at the time, the app had a minor share of the market and was heavily marketed as the “Czech Tinder.”¹⁹ The app’s algorithm was quite simple: It used GPS location and connected users who were physically nearby. We verified with the app’s providers that there was no other, more sophisticated algorithm (e.g., taking previous choices into account) that would suggest potential matches based on criteria other than physical proximity. As with Tinder, users had to approve each connection before they could chat. Every user was offered a selection of potential partners nearby and chose the ones they liked. Selected users received an invitation to chat, and if they accepted, a chat window would open.

We obtained our data after reaching an agreement with the application’s administrators, who provided the data in an anonymized form, whereby each user was represented by a unique code. The data set traces the online behavior of users who sent or received at least one invitation in July 2017. Each row in the data set contains information about an invitation sent between two users. Only the first messages were recorded. Each row contains information about the sender (their ID, gender, and age) and the receiver of the invitation. We restricted the sample to heterosexual searches, as there was insufficient data on same-sex search patterns. Additionally, we restricted the sample to users between 18 and 50 years old. We did so for two reasons: First, there were few users older than 50; second, of those few users, many were obviously fake profiles of users claiming to be over 100 years old. The final sample included a

¹⁹ Tinder is an online dating app that is especially popular among younger users. With more than 100 million downloads on Google Play, it is currently one of the most popular dating sites in the world. There is one significant difference between Tinder and Pinkilin: When user A is interested in user B on Tinder, neither one is notified unless the match is successful, i.e., users are showing interest in each other anonymously. In contrast, on Pinkilin, when user A is interested in user B, user B is immediately notified and has to choose whether to accept or reject user A – similar to Tinder’s “superlike” function.

total of 10,528 unique users, of which 68% were male, and 32% were female. Users sent each other 196,206 invitations to chat, with 69% sent by males to females ($n = 135,380$) and 31% sent by females to males ($n = 60,826$). The median age of the men was 28 years, while the median age of the women was 25 years. On average, men contacted women who were four years their junior, while women contacted men who were three years their senior.

Table 5.1 Age by gender (%)

Age categorized	male	female	Total
18-19	3.14	15.36	7.03
20-24	23.55	31.83	26.19
25-29	34.99	25.75	32.05
30-34	20.78	14.92	18.91
35-39	10.63	6.65	9.37
40-44	4.97	3.82	4.61
45-50	1.94	1.67	1.85
Total	100.00	100.00	100.00
N	7176	3352	10528

Although the analysis of online dating data follows a novel trend in mating research and is unique in the context of Czechia, there are some limitations to our data set.²⁰ First, it is based on a single mobile dating app. Thus, our data are not representative of the Czech population or online daters in general. Therefore, the conclusions from our analyses are limited to this sample, and we do not attempt to draw conclusions about the population at large. Second, unlike population survey data, our data set is not custom-made, meaning that it was not made for the purpose of academic research (Salganik 2018). The nature of the data is readymade and contains only limited information about users, such as the initial contact of partners, but no information

²⁰ An extensive discussion on the methodological aspects of using web-generated (digital trace) data versus traditional approaches to study mate choices can be found in Schmitz et al. (2009).

about relationship development (i.e., the number of messages exchanged or whether the “matches” met offline). Third, it is still quite rare for women to actively pursue mates by initiating contact (Rudder 2014). Consequently, the sample of women who initiated contact may differ from the passive majority.

Another caveat of analyzing online dating data is the possible presence of bots, i.e., “autonomous third-party programs trying to make users engage into contact and eventually into an over-priced and useless external product” (Schmitz, Yanenko & Hebing 2012: 320). In the context of online dating, bots typically pose as attractive young women who attempt to lure male users into clicking on malicious links under various pretexts, e.g., offering escort services (Huang, Stringhini & Yong 2015). Since we were aware of this issue, we replicated our analyses with samples in which we omitted the users whom we suspected to be bots. In particular, we suspected as potential bots women who sent or received a high number of invitations and accepted all invitations received. We chose to include both criteria because a woman who gets a great deal of attention does not have to be a bot; she can simply be highly desirable. However, if she receives tens or hundreds of messages and accepts all of them, this would reasonably arouse suspicion about the profile. Similarly, a woman who accepts all invitations does not have to be a bot if she receives only a few invitations. We only deleted the suspected bots as “senders” of invitations because they could skew the preferences of women. However, we kept them as “receivers,” since we did not take reciprocity into account, and even though bots are not real women, men’s interest in them is real.²¹ None of these restrictions altered the results considerably.

²¹ We tried various thresholds for identifying bots. The most restrictive cutoff of at least 10 received and accepted invitations resulted in deleting 655 women as senders of 26,266 invitations. The more relaxed cutoff of 30 received and accepted invitations resulted in deleting 272 women as senders of 19,695 invitations. This is in line with previous research showing that bots account for a large amount of traffic on online dating sites (Schmitz et al. 2012; Huang et al. 2015).

5.7 Analytical strategy

To answer our hypotheses regarding the age gaps and changing preferences over the lifetime, we adapted the approach used by Skopek et al. (2011). For each sender (initiator of the invitation), we calculated the fraction of contacts they sent to users of different ages. We then averaged these fractions by the sender's age and gender. Following Skopek et al. (2011), we also constructed the expected fractions of relations by age and gender that assumed a random match and took into account the gender-specific age distribution on the app. In this way, we obtained a baseline fraction of invitations that referred to situations in which users displayed no specific preferences, as these were governed by the app's age structure.

Unlike Skopek et al. (2011), however, we were not only interested in whether the users contacted others of the same age, older, or younger; we also asked how much older or younger the parties were willing to pursue. Thus, we constructed several categories of age gaps between the sender and receiver of the invitation. First, we constructed a category of age homophily, i.e., situations where partners (sender and receiver) are either of the same age or two years apart.²² The other categories were contacting a partner who was three to five years younger, six to nine years younger, 10+ years younger, three to five years older, six to nine years older, and 10+ years older than the sender. Although the range of age differences spanned a maximum of 32 years, we decided to include extreme categories of ten and more years of difference, as these observations were rare. Additionally, we experimented with different cutoffs, and the results were unaffected (results available upon request).

²² Here, we follow the range for homophily used by Skopek et al. (2011). Like them, we also experimented with different cutoffs.

5.8 Descriptive statistics

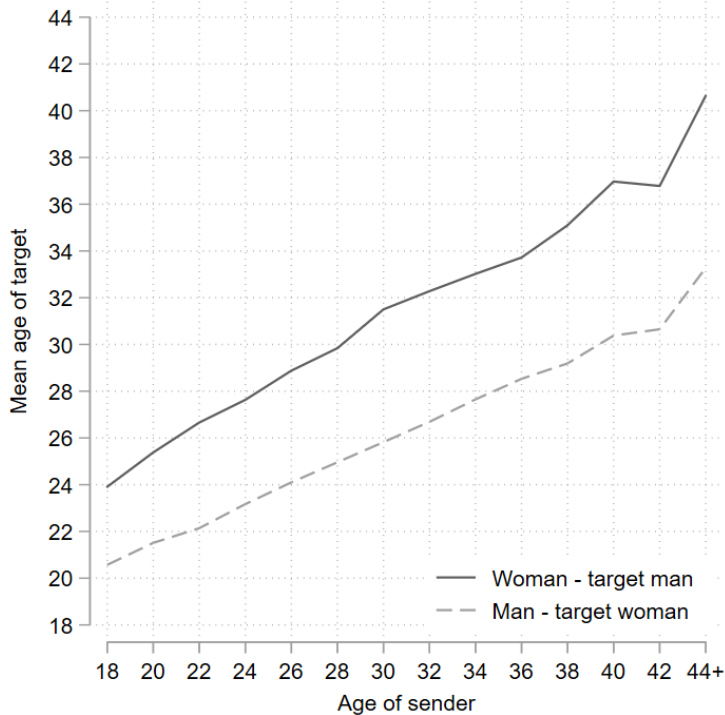
Table 5.2 shows the overall descriptive findings, which do not account for users' age or the age distribution on the app. As shown in Table 5.2, men were more willing to initiate contact with younger women than women with younger men. Additionally, women were more willing to initiate contact with older men, while men tended to avoid contact with women older than themselves.

Table 5.2 Age differences (categorized) by gender

	Younger partners				Older partners			Total
	10+	6-9	3-5	0-2	3-5	6-9	10+	
male	17.15	20.43	22.06	29.17	6.19	3.17	1.82	100.00
female	1.95	3.73	7.18	35.04	24.16	18.66	9.27	100.00
Total	12.44	15.25	17.45	30.99	11.76	7.98	4.13	100.00

In Figure 5.1, we can observe that other than the youngest men in the sample, men on average initiated contact with younger women, and the gap widened even more for older men. For example, 30-31-year-old men contacted women who were on average four years younger, while 38-39-year-old men were more likely to contact women who were on average almost nine years their junior. Women, however, had a different starting point. The youngest women in the sample contacted men who were on average seven years their senior. As they aged, the gap between them and their desired partner decreased. Around their 30s, the difference almost disappeared to the point that the oldest women contacted younger men than themselves.

Figure 5.1 Mean age contacted by men and women, by their age



5.9 Results

Although both men and women sought partners of the same age or two years apart from themselves, which was more than would be predicted by chance (H1), the pattern was quite different for men and women (Figure 5.2 and Figure 5.3). While men strongly preferred age homophily at a young age, this preference steadily decreased as men's age increased. Between 50 and 70% of invitations from 18–23-year-old men targeted women their age, while for 30-year-old men, it was only about 25%, with the proportion declining even further with age. In the case of men, we found evidence to support H1a, which proposed that the younger the man, the more likely he is to contact someone his age. By contrast, only around 30 to 40% of invitations by 18–23-year-old women targeted men in their age group. The peak for homophily was around 27 years old when the chances for homophilic contact were also peaking. Unlike men, and in contrast with H1a, older women initiated contact with men their age far more often

than expected under random conditions and at a similar rate as the youngest women in the sample. These results corroborate the findings of Skopek et al. (2011).

Figure 5.2 Men - target woman is homogamous

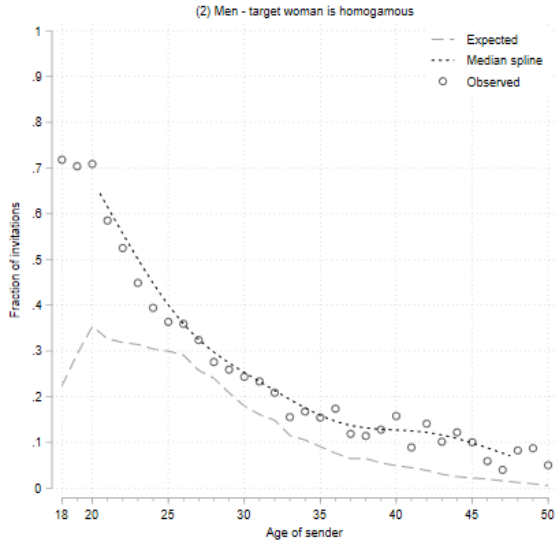
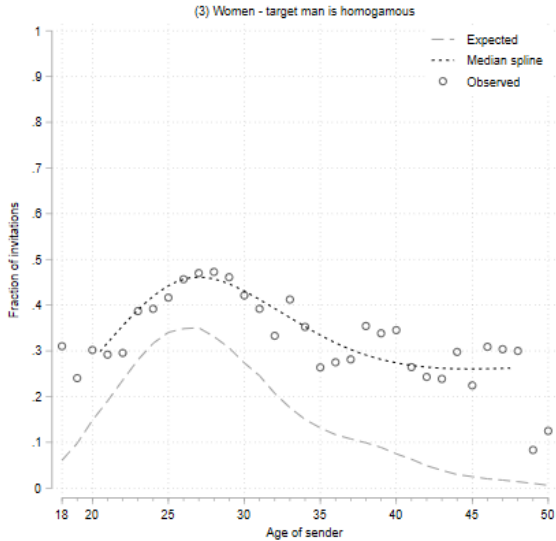


Figure 5.3 Women - target man is homogamous



Men were willing to pursue younger partners more often than by chance (H2) and, on average more often than women, whose preferences seemed to be more diverse with increasing age. Figure 5.4 shows that men started pursuing women who were three to five years their junior immediately after such women appeared on the app and that they continued to contact them more often than expected by chance, even at older ages. However, this preference started to decline slowly around their mid-twenties when they moved to even younger women. This is in line with H2c, which proposed that the older the man, the younger the partner he is willing to pursue.

In contrast, Figure 5.5 shows that, less often than expected, women contacted men who were three to five years their junior until their mid-thirties. After that, they initiated contact with them more often than by chance, as around 20% of their invitations targeted them.

Figure 5.4 Men - target woman is 3-5 years younger

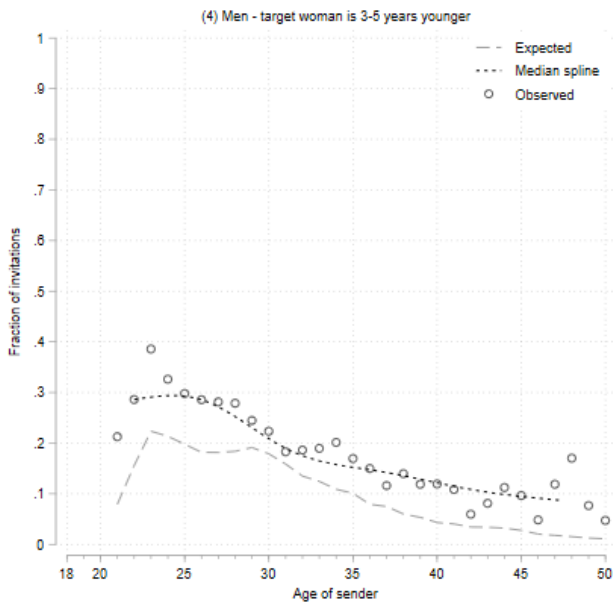
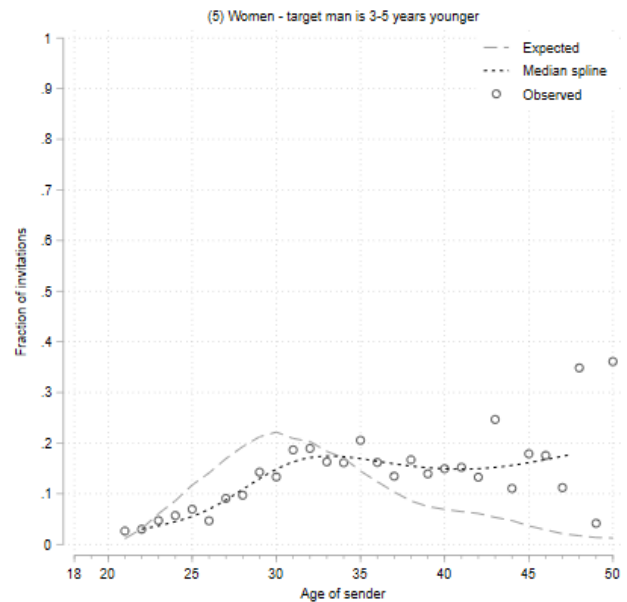


Figure 5.5 Women - target man is 3-5 years younger



A similar pattern could be observed with invitations sent to potential partners who were six to nine years younger. As with the previous category, men were again willing to pursue younger partners sooner than women (Figure 5.6). Men in their late twenties sent around 30% of their invitations to women six to nine years their junior, while women in the same category seemed to avoid pursuing such mates. Overall, until the age of 40, women contacted such men less often than expected by chance (

Figure 5.7).

Figure 5.6 Men - target woman is 6-9 years younger

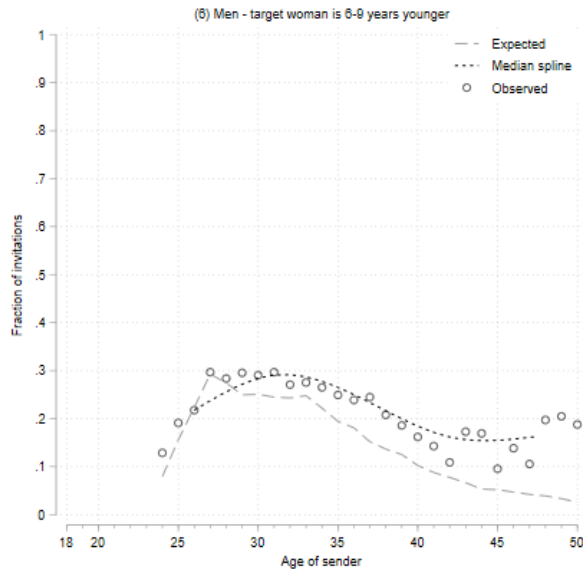
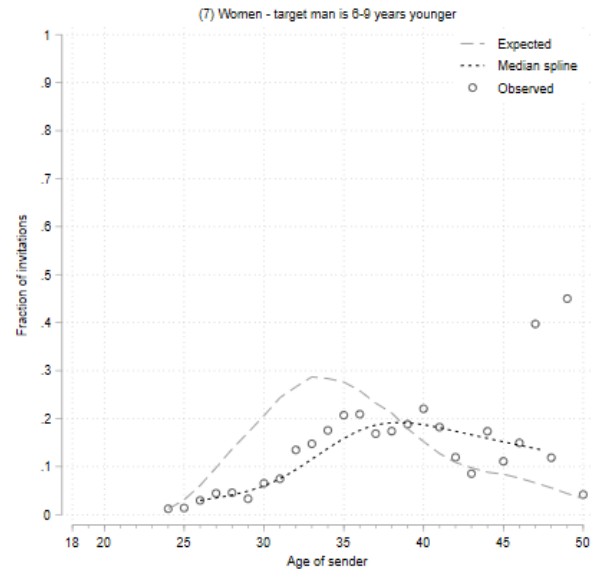


Figure 5.7 Women - target man is 6-9 years younger

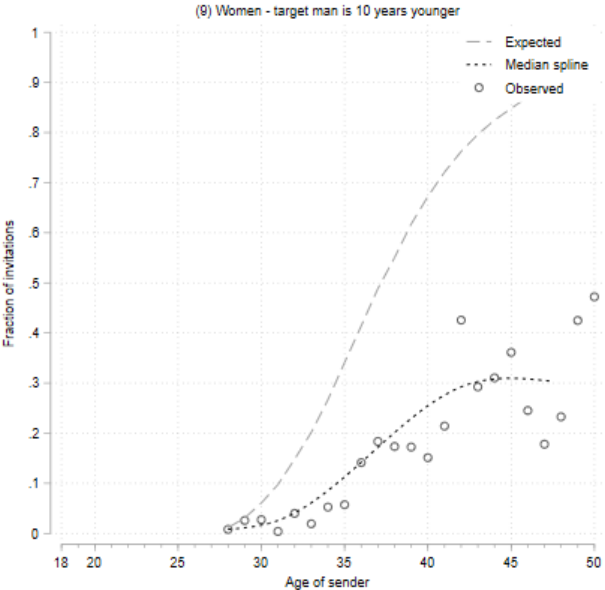
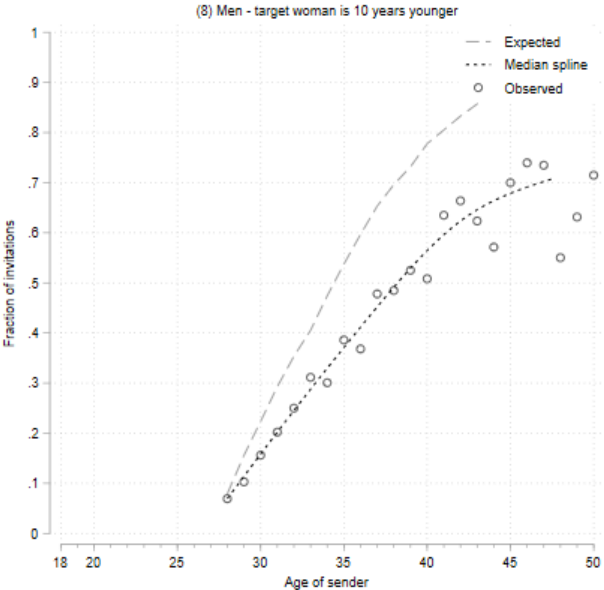


Both men and women initiated contact with partners who were more than nine years their junior less often than expected by chance (Figure 5.8 and Figure 5.9). Nevertheless, it is clear that men were not only more willing to do so, they were also doing so sooner than women. While 40% of invitations sent by 35-year-old men targeted women who were more than nine years their junior, only around 10% of women approached men this young. Such contacts were most frequent among women over 40 years of age, who sent 30% of their invitations to men more than nine years their junior. Conversely, 40-year-old men sent almost 60% of their invitations to women in this category, with older men doing so even more frequently. This is in line with H2a, which proposed that men would be willing to pursue partners more than nine years their junior. In H3c, we hypothesized that as women age, they are more open to contacting younger men. We found support for this hypothesis in our data. Additionally, we saw that not only were older women more willing to pursue younger partners, they were also more likely to cross a

wider gap toward them. However, there was a significant lag compared to men in terms of when the shift happens.

Figure 5.8 Men - target woman is 10 years younger

Figure 5.9 Women - target man is 10 years younger



Looking at the other end of the spectrum, it is apparent that men showed little interest in older partners (Figures Figure 5.10, Figure 5.12, Figure 5.14). Thus, we found no support for H2b, which proposed that men would be willing to initiate contact with women up to five years their senior. In H2d, we proposed that, as opposed to men’s growing preference for younger partners, their preference for older partners would remain stable. We found support for this hypothesis, as the avoidance of older women seemed to be more or less stable throughout men’s age ranges. The only exception were the youngest men who were more willing to initiate contact with older women.

When contacting an older partner, women seemed to be more generous than men (Figures Figure 5.11, Figure 5.13, Figure 5.15). This was especially true for the youngest

women, who sent roughly the same proportion of messages (around 30%) to men of their age, three to five years older, and six to nine years older. Although the proportion of contacts women sent to older men declined with age, it was still above the expected proportion. However, both men and women seemed to avoid contacting partners who were more than nine years older (Figures 14 and 15). This is in line with H3a, which proposed that women were unwilling to pursue significantly older men.

Figure 5.10 Men - target woman is 3-5 years older

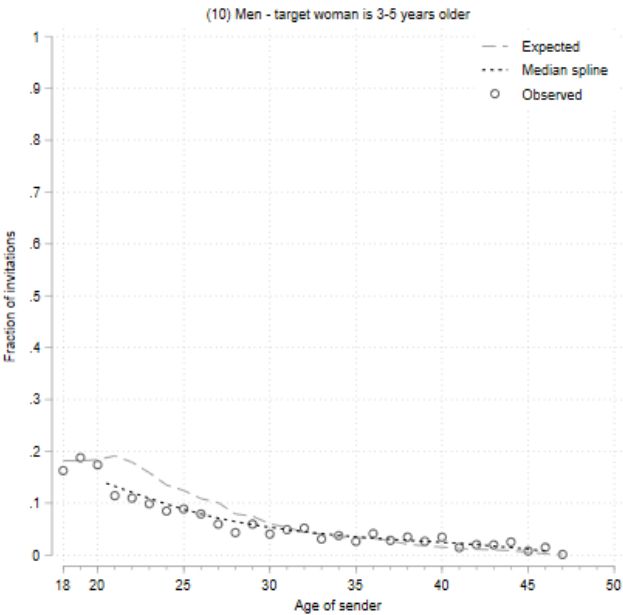


Figure 5.11 Women - target man is 3-5 years older

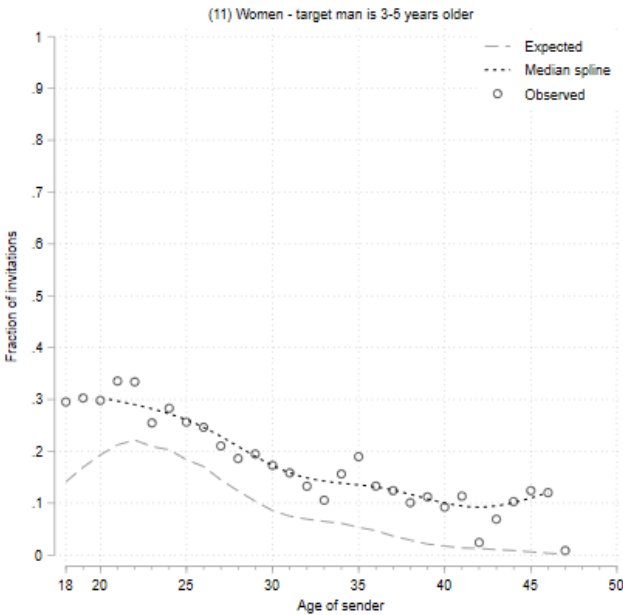


Figure 5.12 Men - target woman is 6-9 years older

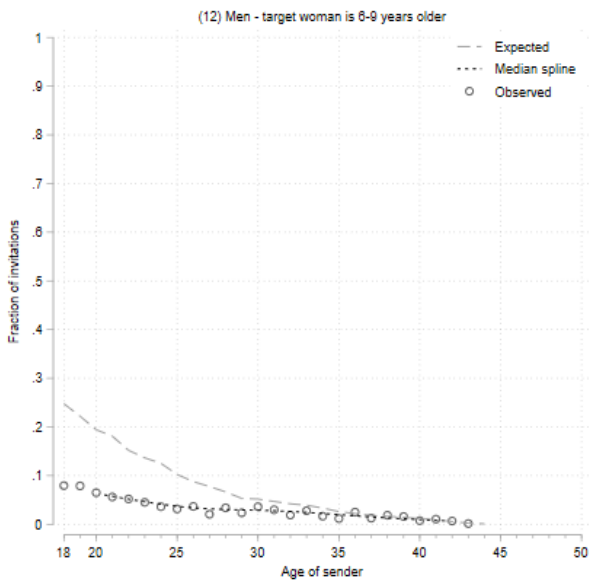


Figure 5.13 Women - target man is 6-9 years older

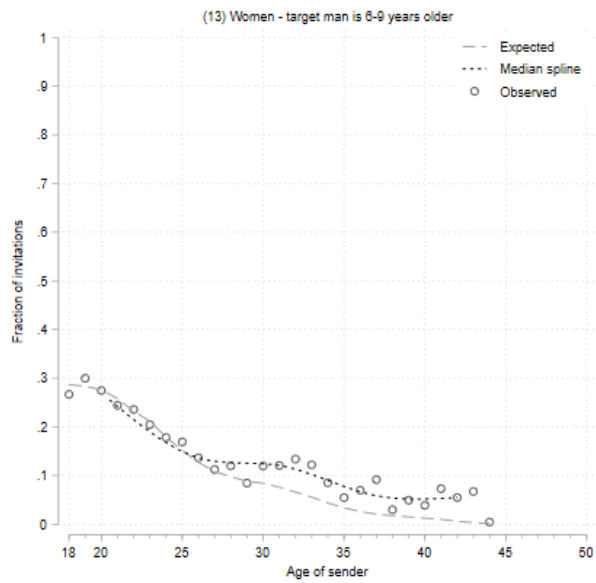


Figure 5.14 Men - target woman is 10 years older

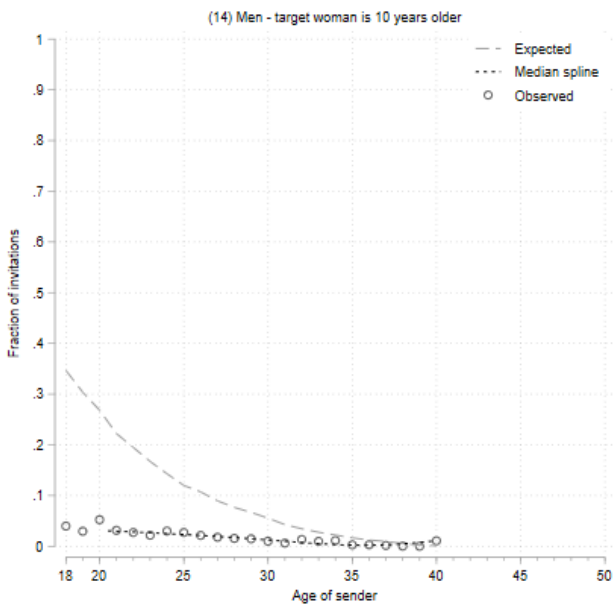
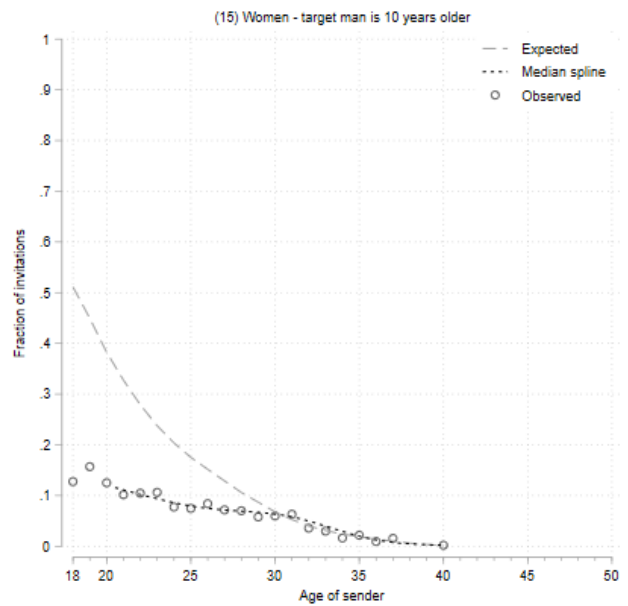


Figure 5.15 Women - target man is 10 years older



5.10 Discussion and Conclusion

Age plays a vital role in partner choice because it is linked to reproduction and relationship dynamics. Although it is relatively easy to study self-reported partner preferences and age differences in couples, connecting these factors with expressed partner age preferences in the dating market is often restricted by extensive data limitations, making such research scarce. In this paper, we explored partner preferences with regard to gender and age on the Czech online dating site Pinkilin to analyze 196,206 invitations to chat that users sent to each other in July 2017. To do so, we adapted the methodology used by Skopek et al. (2011), and our results largely corroborated their findings.

Following the tradition of partner preference research, our main focus was the interplay between age and gender. Evolutionary theory (i.e., Buss & Schmitt 1993) looks at mating through the lens of reproductive strategies and has very specific expectations regarding male and female partner age preferences. Men seek high levels of fertility and, therefore, find younger women attractive. Women need a partner who will be fertile but will also provide for their offspring. This translates to preferring males of the same age or older. Previous research (i.e., Buss et al. 2001), as well as our findings, mainly support these tendencies.

In surveys, men state an acceptable partner age interval of 10 years younger and five years older. As they age, their willingness to pursue younger women increases, but their non-acceptance of older women remains constant (Conway et al. 2015; Schwarz & Hassebrauck 2012). Data from online dating confirm men's strong preference for young women and their avoidance in terms of contacting older partners (Fiore & Donath, 2005; Rudder, 2014b; Skopek, Schmitz, et al., 2011). Our research is in line with the previous evidence. Young men showed a preference for women their age. However, this preference declined with age, and they gradually shifted to younger partners. With age, they grew more ambitious and were willing to

cross larger age gaps toward younger partners. Overall, the men in our data set avoided older women, including women who were only slightly their senior. This avoidance was stable for all ages, thereby confirming that although the men indicated a willingness to pursue slightly older partners in surveys, they rarely acted on these statements in real-life dating. This highlights the importance of mixing digital trace data with traditional surveys, as stated preferences may not necessarily translate to future actions (Schmitz et al. 2009).

As for women, their stated partner age interval was eight years older and five years younger. With age, they grew accepting of younger partners and became less willing to contact older men (Conway et al. 2015; Schwarz & Hassebrauck 2012). Looking at the online dating market, women showed a tendency to mate with partners of their age and slightly older. Women under 30 were not open to contact from younger men, but as they aged, their openness toward younger partners increased (Rudder 2014; Skopek et al. 2011). Again, this was largely supported in our Czech data set. The youngest women had a preference for older partners over partners their age. However, up to 30 years old, they preferred partners of the same age or up to nine years their senior. As women aged, they were more open to younger men and more restrictive toward older men. The older the woman was, the more willing she was to cross larger age gaps toward younger partners. As mentioned earlier, the same trend could be observed for men. However, there was a lag as to when this shift toward younger partners occurred. Women started initiating contact with significantly younger men (5–9 years younger) later, in their mid-forties, while men developed this preference around their mid-thirties.

The support for evolutionary theory in our analysis is, therefore, fairly strong. Two interesting findings are noteworthy. First, in comparison to previous research, men were, from an early age, very hesitant to contact older women. This can be seen as an impact of strong local gender norms that, at least in men's eyes, may highlight the importance of reproduction in dating and support the paradigm that the husband should be older than his wife. Men's tendency

to avoid older women in the early stages of dating could also be one of the mechanisms behind the higher incidence of male age hypogamy in Czechia (Katrňák, 2008). Second, we observed older women around their mid-forties contacting significantly younger men. This tendency was visible in past online dating research (Rudder 2014; Skopek et al. 2011) but did not fully correspond with expectations from evolutionary theory. Perhaps older women are aware of the marriage squeeze and believe they have more chances with a younger partner who might be attracted to their experience and status. Alternatively, they may be more economically independent than younger women and may not be drawn to older partners because they already have their own resources (Rudder 2014, confirms that response rates to older women's messages from younger males are fairly high). Growing levels of female hypogamy by older women in Czechia might support this hypothesis (Katrňák, 2008). Another interpretation could be related to seeking a sexual partner rather than one for reproduction. Not all dating site users are in search of a serious relationship, and older women seeking younger males for sexual pleasure, called "cougars" in popular culture, can offer noncommitted sex and demand no financial provision or status from men in return (Lowen 2019). Furthermore, in the post-reproductive phase, women may not place such importance on status, even when seeking a serious relationship. Without further data, however, it is difficult to understand the reason behind these two inconsistencies.

In our analysis, we examined users' behavior as a proxy for expressed partner preference. We mainly built on the literature concerning partner preferences, but we were also curious about how the observed dating behavior corresponded to final mating outcomes with regard to age. Developed countries, including the Czech Republic, show high levels of age homogamy, especially at a young marital age, so it is natural to ask how gendered partner preferences translate to homogamy patterns (Katrňák, 2008). Is this tendency visible at the point of first contact on dating sites, or does it form later in the mating process? Some online dating

studies have confirmed that, starting early on, there is a non-random preference for contact with partners who share similar sociodemographic characteristics (Blackwell & Lichter, 2004b; Fiore & Donath, 2005; Hitsch et al., 2010a; Skopek, Schmitz, et al., 2011). Upon examining the data, when we did not consider the ages of users or structural opportunities, we did not observe preferences for same-age partners; however, when we did consider users' ages and structural opportunities, same-age contacts occurred more often than by chance. We also observed a more frequent occurrence of homogamous contact in lower age groups. Specifically, only the youngest men contacted their peers, but this preference rapidly disappeared, and at 30, they avoided contact with women of the same age. Although the youngest women were contacting older partners, women roughly between 25 and 35 showed the strongest preference for same-age partners. Considering the dynamics with online dating sites, where men outnumber women, it is likely that women's preferences guide the final outcome. Men may prefer younger mates, but if their contact is not reciprocated, they choose their peers rather than older women. This seems to have been the case in other online dating samples in terms of going beyond the first contact (i.e., Kreager et al. 2014), but we lacked the data to explore such a dynamic on our Czech dating site.

To summarize, our research largely confirmed expectations from both evolutionary and sociological theories. Men strongly preferred young women, and women preferred partners of their age and slightly older. Men were restrictive toward older women, as posited in evolutionary theory and expectations arising from social norms. We did not anticipate older women's strong readiness to contact younger men, although this might be a sign that Czech gender norms are relaxing or that women, too, are willing to trade social status for men's youth and attractiveness. Homogamous tendencies occurred more often than by chance, and they seemed to be stronger among younger users and women in general. Future mating processes will probably encourage homogamous pairings. Although our analysis was constrained by

important limitations—it was restricted to one dating service, limited by information about first user contacts only, and the analysis was rather descriptive—we believe that it represents a useful introduction to online dating research in the context of the Czech Republic.

6 It Takes Two to Tango: Desirability on a mobile dating app

6.1 Introduction

Online dating is the fastest-growing way for couples to meet. For instance, recent studies in the US find that almost one-third of newlyweds met online (Cacioppo et al., 2013). The percentage of long-term couples that originated online steadily rises, with the most recent studies reporting almost 40 % of new heterosexual couples meeting online, making it the most frequent way to meet a romantic partner (Rosenfeld & Thomas, 2019). Thus, it is safe to assume that online dating is no longer marginal and is here to stay. Even though more and more couples meet online, the conditions and mechanisms of how it happens are still not completely understood. One of the persistent patterns in partnership formation research is homophily, i.e., the fact that the partners tend to resemble each other in terms of various characteristics (McPherson et al., 2001). While there are studies investigating the effect of online dating on educational homogamy (Potarca, 2021; Skopek, Schulz, et al., 2011), racial homophily (Jakobsson & Lindholm, 2014; Lin & Lundquist, 2013; Lundquist & Lin, 2015; Potarca & Mills, 2015), or homophily on desirability (Bruch & Newman, 2018), these come mostly from the United States or Western Europe, and it is unclear whether these results hold in different contexts (Schwartz, 2013). Our study contributes to the research on online dating by examining the structure of an online dating market and its underlying mechanisms (preference, structure, and non-reciprocity/competition) in a Central European area, namely Czechia.

Online dating presents us not only with a new way of meeting partners, but also with entirely new data that allow us to examine the search for a partner in its earliest stages, including the initial trials and failures in forming an intimate partnership. Exploring these initial stages of searching for a partner is usually not possible in a traditional survey design for several reasons.

First, surveys usually lack the information about available romantic partners, therefore cannot control for the structure of opportunities. Second, there may be a gap between stated preferences and individuals' behavior. Third, the description of an ideal partner's characteristics may be confounded by current partner's characteristics (Sprecher et al., 2019). And fourth, it is often difficult to disentangle whether individuals got together as a result of their similarity, or they became more similar over time ("adaptive socialization"; Oppenheimer 1988). The difficulties of studying the initial stages of the mating process can be overcome by utilizing digital trace data from online dating. Using this data gives us access to a large number of individuals interested in pursuing intimate relationships regardless of their relationship status; it allows us to observe users' behavior rather than their stated preferences; and it provides us with information regarding the number and characteristics of the available romantic partners.

Our study makes use of digital trace data from a Czech online dating app from July 2017 to examine the patterns of homophily on desirability, i.e., their attractiveness in the context of the online dating app. In particular, we aim to answer the following questions: Is there a hierarchy of users in the online dating market? How does the position of women and men differ in its structure? Do users contact similarly desirable counterparts, or do they aim for more desirable ones? Are the successful matches more often between similar or dissimilar users? And, do users employ different strategies based on their own desirability? In this app, users interact by swiping their counterparts to state interest. Unlike on the well-known dating app Tinder, the swiping is not double-blind, meaning that if one party swipes the other, the pursued party is immediately notified of the fact. Therefore, unlike on Tinder, users receive immediate feedback on their desirability as every time someone likes them, they receive a notification and an opportunity to reciprocate. The interaction between users on online dating sites, i.e., sending and receiving swipes, gives rise to a network structure of the online dating market. Within this network, some users receive more swipes than others, which results in a hierarchy of users'

desirability, that is, the hierarchy of how desirable they are for their counterparts in the dating market.

We examine users' search patterns in two major cities in Czechia (Prague and Brno) using social network analysis (SNA; (Borgatti et al., 2013; Robins, 2015)). SNA is an approach that focuses explicitly on the structure of networks emerging from interactions among individuals and their positions within these networks. Thus, SNA allows us to assess the dating market structure, identify the desirable actors, examine who contacts them, and whom they contact.

6.2 Theoretical background

Homophily is the tendency to associate with individuals who are similar to us (McPherson et al., 2001). If the end point of this process translates into a marriage, we refer to it as homogamy (Kalmijn, 1991a). Indeed, decades of research show that spouses often share the same level of education (Kalmijn, 1991a; Schwartz & Mare, 2005), status (Kalmijn, 1991b), ethnicity (Fu & Heaton, 2008), or age (Katrňák, 2008). These patterns were also observed in dating or cohabitating couples (Blackwell & Lichter, 2004b), and initial stages of online dating, e.g., in case of ethnicity (Potarca & Mills, 2015; Rudder, 2014b), smoking or other lifestyle choices (Fiore & Donath, 2005; Hitsch et al., 2010b).

The origin of homogamy is usually explained by either individual preference or by structural constraints (Kalmijn, 1998; McPherson et al., 2001). First, individuals prefer to match with someone like them, as they may have more in common and share interests, which in turn makes it easier to fall in love (matching hypothesis, Walster et al. (1966)). Second, the structural constraints of the real world such as geographical proximity, social distance, or educational system make similar individuals more likely to meet (e.g., Bossard, 1932; Ellsworth, 1948).

Despite the importance of those two mechanisms in mate choice, data on the opportunity structure are rarely available, and thus it remains difficult to disentangle the two mechanisms (Lewis, 2016b).

However, formed unions do not always correspond to individuals' initial preferences or structural constraints. For example, even though we observe age homogamy, with the most common age difference between spouses being one year in Czechia (Katrňák, 2008), data from online research clearly show that this is neither the initial preference of individuals nor the result of structural constraints imposed on them (Šetinová & Topinková, 2021). This brings us to another explanation of homogamy origins – the competition (Schwartz, 2013) or non-reciprocity (Schaefer, 2012). Even though individuals may prefer someone with a higher market value than themselves (i.e., younger or more attractive), if neither partner is willing to partner down, the resulting couples will be homophilic regardless of the initial preference (Schwartz, 2013). Schaefer (2012) views non-reciprocity as an ongoing exchange, in which heterogenous couples are more likely to dissolve with each additional exchange between partners (e.g., additional messages between online daters). The mechanisms of competition or non-reciprocity can be especially pronounced in the online dating environment, as the costs of approaching someone more desirable than oneself can be lower, and the expansion of one's dating pool also brings the expansion of one's competition.

The online environment modifies some aspects of dating, which we outline in this section. These specificities of online dating in turn affect the behavior of users in their mating pursuits online. The first of the distinct features of online dating is that it weakens the structural constraints. In more traditional settings, one can only physically encounter a limited number of prospective partners. In contrast, online dating significantly widens the dating pool both in size and variety. Since it does not require singles to share the same physical space or have mutual acquaintances, there is a possibility of encountering and matching with a more dissimilar mate

than in more traditional meeting ways (Ortega & Hergovitch, 2017; Rosenfeld & Thomas, 2012).

The second specific aspect of online dating is that to express interest online, users send each other messages or indicate their interest through specific features of a particular dating site, such as likes or swipes. In comparison to real-life settings, expressing interest online requires fewer resources in terms of time and money to approach a prospective mate. This is especially true in mobile dating apps that enable dating anytime and anywhere. It is, however, important to note that although online dating should be less time-consuming, users often remark their exhaustion from online dating, some even calling it a "second job" (Ansari & Klinenberg, 2015). Furthermore, it may be less intimidating to approach a prospective mate online as it does not require face-to-face interaction at the time of the first message, eliminating the potential social stigma of rejection and decreasing the impact of negative emotions related to rejection face-to-face (Ansari & Klinenberg, 2015; Rosenfeld & Thomas, 2012). Moreover, the lack of face-to-face interaction and often indirect rejection (e.g., "ghosting") allows for alternative rationalizations of rejection by a potential mate (e.g., "they have not seen my message"; Rosenfeld & Thomas, 2012). Lastly, online dating eliminates rejection due to the unavailability of mates, as everyone who joins an online dating site is presumably looking for some kind of relationship, regardless of their actual relationship status. The lower costs of initiating a contact online can translate into users being more ambitious while pursuing a partner than they would have been in a more traditional setting.

By engaging in online dating, users not only send but also receive swipes or other expressions of interest (e.g., messages) from others. The number of swipes users receive reflects their overall desirability on the dating market. These messages may give rise to a hierarchy among users as some receive many swipes, indicating their high desirability, while others receive a low number of swipes, indicating low desirability. Indeed, previous research shows that the

distribution of received contacts is skewed: a few users receive a disproportionate amount of interest, while most users receive only a few (Rudder, 2014b). It is difficult to say what constitutes being desirable online, but it is safe to assume it reflects various underlying characteristics, such as the user's age, status, or attractiveness. Studies show that similar hierarchy exists in offline mating pursuits; however, one could argue that such hierarchy is even more pronounced online (Bruch & Newman, 2018) due to the large pool of available partners and the low costs of sending additional messages.

Although users typically cannot observe such hierarchy directly and do not know how many messages others receive, research shows they can assess their desirability and act accordingly (Bruch & Newman, 2018; Heino et al., 2010). Online dating itself presents users with numerous ways to assess their own desirability. For example, many dating sites and apps allow users to share their dating profiles with others to solicit advice to improve their chances online (e.g., Reddit's Tinder subreddit features weekly profile reviews). Additionally, many sites allow users to browse all profiles, allowing them to assess their competition, and men often admit to creating female profiles to see how "things are on the other side" (Ansari & Klinenberg, 2015). Most importantly, users can directly evaluate their desirability based on the interest (i.e., messages, swipes) they receive and the response rate from users they have pursued. Furthermore, users are good judges of the desirability of others, as research has shown users adapt their behavior if they perceive the prospective partner to be highly desirable, e.g., engage in a higher level of deception (Lo et al., 2013) or send longer messages (Bruch & Newman, 2018).

6.3 Structure of the dating market

In the previous section, we described the features distinguishing online dating from its offline counterpart. How do these specificities translate into the structure of the dating market and individuals' positions in it? In this section, we formulate research questions based on what is known about dating markets in general, what we outlined as specific for online dating, and how it translates into the structure of online dating. Note that when we observe the similarity of existing couples, we observe the end product of a long and often tedious mating process. In the initial stages, individuals may make many unsuccessful attempts that remain hidden while examining the already formed unions such as married couples. Therefore, we focus not only on the successful matches but also on the unsuccessful attempts.

Previous research shows that there is a variance in the number of likes that online dating users receive (e.g., Bruch & Newman, 2018; Kreager et al., 2014b; Rudder, 2015). This variance results in a hierarchy among users and that users display some awareness of this hierarchy and their position within it (Bruch & Newman, 2018; Heino et al., 2010). The position of each user within the hierarchy has a profound effect on how they experience online dating. While those at the top of the hierarchy receive many likes and may choose from a large pool of available partners, users at the bottom may find very little or even no matches (Rudder, 2014b). For this reason, we first want to verify whether the dating app in our data displays a hierarchical structure or not. If the structure is hierarchical, it should exhibit considerable variance in the desirability among the users, with a few highly desirable users attracting a vast amount of swipes and a relatively high number of users receiving only a few swipes.

Related to the hierarchy of users' desirability, there is ample evidence that women enjoy a better position on online dating sites than men. Nearly every dating site and app reports a skewed men-to-women ratio, with men outnumbering women significantly (Kreager et al., 2014a;

McGrath, 2015; Rudder, 2014b). The lower proportion of female users puts women inherently under more interest from the more numerous men, placing them higher in the hierarchy. It also appears that there is a prevailing gender norm in terms of who is expected to contact whom, placing the burden of the first move on men (Morr Serewicz & Gale, 2008; Rose & Frieze, 1993), or in this case, to swipe first. In terms of violating this gendered expectation online, there is mixed evidence: Kreager et al. (2014a) show that women who initiate the first contact are rewarded with higher-value partners, while Dinh et al. (2021) show these attempts are penalized. Since the experience of online dating is quite different for men and women, they may also employ different strategies in their pursuits. In line with this reasoning, all the subsequent research questions also examine men and women separately.

RQ1: Are there differences between men and women regarding their desirability (number of swipes)?

Previous research on online dating shows that users seek similarity in some characteristics, such as education or ethnicity (Fiore & Donath, 2005; Hitsch et al., 2010a), but aspire to maximize on others, such as attractiveness (Rudder, 2014b). In line with this, studies show that initial messages in online dating are not directed towards similarly desirable mates but more often towards higher-value mates (Bruch & Newman, 2018; Kreager et al., 2014a). This phenomenon is referred to as aspirational pursuit (Bruch & Newman, 2018), vertical preferences (Hitsch et al., 2010a), or the mechanism of competition (Lewis, 2016b; Schwartz & Mare, 2005). As stated earlier, the aspirational pursuit may be more pronounced in online dating due to the lower costs of contacting a prospective mate. In the network, this would be manifested as a large difference between the desirability of the pursuer (sender of the swipe) and the pursued (receiver of the swipe).

RQ2: Do users exhibit aspirational pursuit or preference for similarity?

Although preference and aspirational pursuit are two very different mechanisms, they can generate the same outcome: homophily. This paradox can be explained by the mechanism of non-reciprocity (Schaefer, 2012). Non-reciprocity refers to a situation in which individuals desire relationships with more desirable counterparts. However, these counterparts, themselves aiming for more desirable partners, reject those attempts while being rejected by those more desirable than them. When this behavior aggregates at the level of the whole market, individuals reject their less desirable pursuers and are rejected by more desirable individuals whom they pursue. According to Schaefer (2012), the exchange of being repeatedly rejected and repeatedly rejecting ultimately leaves individuals to pair off with similarly desirable mates. Kreager et al. (2014a) confirm that dissimilar matches are more likely to dissolve, and thus the resulting pairs are more similar. The reciprocated contacts, that is contacts between mutually attracted users, should therefore be more homophilic in their desirability. In other words, users in the reciprocated mutually-interested pairs would have similar amounts of received swipes.

RQ3: Are the successful (reciprocated) attempts more often homophilous?

Given users' self-awareness found in previous online dating research (Heino et al., 2010), i.e., the ability to place oneself and others in the hierarchy of desirability, we can expect users to engage in different strategies based on their desirability. One of such strategies can be a sort of quality-quantity tradeoff: lower desirability users can try to cast wider nets to compensate for their lower desirability and thus to increase their chances of a successful match. In this tradeoff, lower desirability users would send more messages to a more heterogeneous pool of potential partners: some more desirable than themselves and some equally or even less desirable. This strategy may be more common for men (Ansari & Klinenberg, 2015) who may be generally lower in the hierarchy, as we have explained above. Another strategy employed by any user can be to narrow their search by contacting only a limited number of users they are particularly interested in. The latter one was found by Kreager et al. (2014a) and was particularly common

among women. This is because women tend to receive far more interest than men in online dating. In turn, the high desirability allows women to be more selective. From the individual users' point of view, the quality-quantity tradeoff would manifest in the tendency of individuals with a high number of received swipes to send a few swipes themselves and vice versa. In other words, there would be a negative correlation between the number of sent and received likes. We must note that this mechanism is inherently dynamic, i.e., receiving low number of swipes can trigger users to be more active on the app (sending more swipes) and vice versa. Since our data is cross-sectional, we can, however, observe only the “traces” of the mechanism in the form of correlations.

RQ4: Is there a quality-quantity tradeoff based on users' desirability?

6.4 Data

We use data from a Czech online mobile dating app operating between 2016 and 2019. The data was obtained upon an agreement with the app providers in an anonymized form. It includes 10 528 users who were active in July 2017. Each user is represented by a unique ID. Only the first swipes and the responses to them, if any, were collected. We focus solely on heterosexual searches, i.e., men searching for women and vice versa, as there were not sufficient data on same-sex search patterns. We only include active users in the analysis, i.e., users who sent or received at least one swipe during the collection period. According to the app provider, the app was downloaded over 50 000 times at the time of data collection. Downloading and using the app was free, although it did offer a paid membership. However, out of more than 10 000 users who were actively using it in July 2017, less than 100 users had a paid membership.

The app's main purpose was to eliminate long exchanges of messages and quickly facilitate meetings offline instead. To do so, it presented users in the closest geographical proximity. As far as we know, there was no other, more sophisticated algorithm that matches users (e.g., desirability score, past choices)²³. The app showed one user at a time, forcing users to make a decision about each presented user. If interested, users could swipe a "Date now" button, which subsequently sent the other user a notification that someone was interested in them. These notifications were shown one at a time forcing users to make a decision about each user to see other notifications they have received. Moreover, users had to decide within 24 hours whether they are interested or not. If they chose to accept, a chat window opened where users could communicate with their chosen counterpart. The app primarily targeted young, highly educated Czechs living in big cities (mean age 28, 64 % men). We selected data from two of the major cities, Prague and Brno, for the analyses. The reason for selecting the two cities were twofold: first, they are the two most populated cities in the country as well as in the dataset; second, it is reasonable to assume that each city is its own dating market within which users have a real chance to meet in person, and thus be shown to each other by the app.

One of the main advantages of using data from online dating is that it allows us to observe users' actual behavior online. This way, we can observe the initial stages of online dating, including the part that is inevitable, yet usually hidden in more traditional types of research: the rejection. Moreover, since users are not aware that they are being observed, they can express their preferences more freely. A vast majority of studies on partner preferences has been done via surveys which may be prone to social desirability (e.g., individuals may not want to admit who they contact, or how often they get rejected), assume that stated preferences translate into actual behavior, or are otherwise affected by problems with recollection or simply by not reflecting

²³ Here, we rely on the information we received from the app providers. The reason for the lack of a more sophisticated algorithm is its purpose of facilitating offline dates as quickly as possible, and that the app was relatively new at the time.

'one's true preferences. Other studies focus on explaining the similarities between spouses. It is, however, difficult to disentangle whether couples got together as a result of their similarity, or they became more similar over time ("adaptive socialization", Oppenheimer 1988). Additionally, unlike other data sources, online dating provides us also with a snapshot of the opportunity structure of available partners (Lewis 2016).

Despite these advantages, utilizing online dating data has several limitations. First, this data is ready-made. Ready-made means that the data was not collected for the purpose of academic research but rather as a byproduct of the app (Salganik, 2018). Consequentially, the data only provides limited information about users. In our case, we have information about users' gender, age, whom they contacted, and whether this contact was reciprocated (accepted) or not. Thus, we lack any information regarding other sociodemographic variables (e.g., education, income), technical information about profiles (e.g., date of registration on the app, time spent using it), motivations or whether the matches met offline or not. While we have the information about users' age, we do not include in further analyses as it has been analyzed in previous research based on this dataset (Šetinová & Topinková, 2021).

Second, there is always the possibility of algorithmic confounding while working with online generated data (Salganik, 2018). Algorithmic confounding refers to the fact that websites and apps follow their own goals (e.g., financial gain), which influences users' behavior on the app, and can thus introduce patterns that would not have been observed otherwise (Salganik, 2018). In turn, data obtained from these sources may reflect not only users' true behavior but also the technical settings of the given app such as its graphical layout or the way the information is presented to users. As we stated above, the only operating algorithm on the app was matching the users of geographical proximity, i.e., users were shown profiles of others only if they were geographically close to them. To account for this, we selected users from two major Czech

cities (Prague and Brno) and analyzed those two cities separately as users within each of these two cities were likely to see the profiles of other users from their area.

Third, bots are ubiquitous on online dating. Bots are "automated third-party programs trying to make users engage into contact and eventually into an over-priced and useless external product" (Schmitz & Yanenko 2010, p.320). In online dating, bots typically pose as attractive young women trying to lure men outside the app, where they then solicit money (Schmitz & Yanenko, 2010), and can account for a large part of the traffic on online dating sites. As such, they can distort the sociodemographic distribution and induce artificial behavioral patterns – for example, reducing the selectivity of attractive young women. We took several measures to limit the bias that could be introduced by bots. We tried to identify possible bots in the following way: we filtered out women who accepted (reciprocated) all the swipes they received, given that they have received at least 30 messages. We chose to have both of these criteria because there may be women who accepted all swipes because they had received only a few of them, and because women who received a lot of swipes do not have to be necessarily bots, they could only be highly desirable. After identifying such users, we omitted them from further analysis (Prague: $n = 49$, Brno: $n = 5$).

6.5 Methods

To answer our research questions, we use methods from social network analysis (SNA; further see Borgatti et al., 2013; Prell, 2011; Robins, 2015). SNA is concerned with analyzing networks consisting of nodes and ties among them. In our case, the nodes represent the users of the dating app and the ties represent the swipes users send to others to express their interest. Our data contains only the heterosexual part of the dating market, i.e., men choosing women and vice versa. Thus, there can be no same gender swipes. This means our networks are directed two-

mode networks. In a directed two-mode network, there are two distinct classes of nodes (modes, in our case men and women) with ties permitted only across the modes, not within them, insuring no same gender swipes. Directed two-mode networks are a special class of networks for which standard SNA methods cannot be readily applied. For this reason, we had to modify traditional measures in the following manner.

Indegree and outdegree refer to the number of ties a node has received or sent respectively. Thus, indegree is our measure of desirability as it captures how many users are interested in a given user, while outdegree refers to the activity of each user. Since there are different numbers of men and women in each network, indegrees and outdegrees had to be standardized for the calculations that require comparability between men and women. The standardization was done by dividing the in/outdegree by the maximum possible, i.e., by the number of users of the opposite gender on the platform. For instance, if there is a woman with standardized indegree of 0.5, it means that she received swipes from exactly half of the male users.

To describe the entire structure of the networks and the extent to which they might be hierarchical, we used average, standard deviation, and skewness of in/outdegrees together with density, centralization, reciprocity. Large standard deviations of indegrees relative to their average and their positive skewness indicate focus of swipes on a handful of particularly desirable users. Density is the ratio of the observed ties to all the possible ties. In traditional two-mode networks, the number of possible ties is calculated as number of nodes in the first mode (number of men) x number of nodes in the second mode (number of women). In our case, we need to account for the possibility of ties going in both direction and thus we calculated the number of possible ties as number of men x number of women x 2. For instance, a density of 0.1 would indicate that 10% of all possible ties are actually present in the network. Indegree (desirability) centralization denotes the ratio of the observed dispersion of ties to their maximum possible dispersion and it was separately calculated for men and women. The

observed dispersion is calculated as standard deviation of indegrees, while the maximum possible dispersion is calculated as standard deviation of a network with the same number of nodes and ties in which all the ties are directed towards a single node. Consequently, a centralization of for instance 0.3 would mean that the ties in the network are centralized to 30% from their hypothetical maximum centralization. Lastly, reciprocity is the ratio of reciprocated ties (i.e., ties that have their counterpart in the opposite direction) to all the ties in the network.

To answer our four research questions, we used non-parametric randomization-based methods, because we do not study a sample from a population, but rather the entire population of the dating app users in the two cities. Thus, our inference does not aim to generalize to an underlying population, but rather to infer whether our results are likely to arise by random chance under given circumstances or not. This is a common scenario in SNA (cf. Borgatti et al., 2013; Mochtak & Diviak, 2019; Robins, 2015). For RQ1 about the differences in desirability between men and women, we used a two-sample randomization test comparing both standardized and unstandardized indegrees of both genders. For the remaining three research questions, we calculated the difference between the standardized indegrees of senders and receivers of all ties (RQ2), the difference between the standardized indegrees of senders and receivers of reciprocated ties only (RQ3), and the difference between the standardized indegrees and outdegrees each user (RQ4). In order to test whether the given difference could be equal to zero, and thus could have possibly arisen by chance, we resampled the distribution of receivers with replacement (or for RQ4, the distribution of outdegrees) 1,000 times and calculated the difference in each resampled case. This procedure yields a distribution of possible outcomes in networks similar to our empirical ones while conditioning on their size and density. We used the resulting distribution to calculate confidence intervals and z-scores that allow us to establish how likely the observed difference is to be zero.

6.6 Results

6.6.1 Network structure

We first describe the structure of the two dating networks in our study. In the Brno case, there are 624 users, 127 (20.4%) of which are women. In total, users in Brno reached to others with 5,260 swipes. On average, users receive 8.43 incoming swipes from others. However, this number displays a very high variability indicated by its standard deviation of 24.01 and skewness of 5, suggesting that some users may even have triple the average amount of received swipes. The maximum is 204 received swipes, which indicates that outliers may receive an order of magnitude more swipes than the average users. The distribution of desirability (indegree) in this market is strongly positively skewed with a few highly desirable users receiving a disproportionate amount of swipes and a lot of users receiving none or almost none. In terms of the outdegree (sent swipes), the average is again 8.43, as every received swipe must be sent by someone. Even in outgoing swipes we can see certain variance across users with a standard deviation of the average being 8.79. This means that on the one hand some users sent almost no swipes, whereas on the other hand some other users were highly active in searching for a partner. The density of the network is 0.02, indicating that about 2% of all possible ties are actually present in the network. We also calculated the indegree centralization separately for men and for women. The value of 0.03 for men suggests the incoming swipes are centralized for about 3% of their maximum possible centralization, while this reaches 0.22 for women, pointing at substantially steeper hierarchy among women than among men as the differences in the number of incoming swipes is much more pronounced among women. Lastly, the reciprocity in the Brno network is 0.27 indicating that in a bit over one quarter of the swipes the interest is mutual. Overall, these results suggest that the dating network is considerably hierarchically structured.

The Prague dating network is almost four times the size of the Brno market with 2,321 users (24.9 % women) and 36,665 swipes among them. The average amount of swipes per user (both incoming and outgoing) is 15.8 – users contact on average almost sixteen others. Similarly to the Brno case, we see high variability in both the amount of sent as well as received swipes. The standard deviation of the number of outgoing swipes per user in Prague is 18.79, indicating again that some users sent almost no swipes, whereas others were considerably more active. The standard deviation of the number of incoming swipes is 42.56 pointing out to large differences across users similarly to Brno. Some of the users in Prague received as much as 418 swipes and thus clearly represent outlying cases. This is supported by highly positive skewness (5.13). Regarding the density of the network, it reaches a value of 0.04 indicating that 4% of possible ties are actually present in the network. Similarly to the Brno network, the indegree centralization among women is far higher (0.11, i.e., at 11% of the maximum) than among men (0.02), showing higher hierarchization among women. The reciprocity in the Prague network is 0.38, which means that 38% of sent contacts are reciprocated. We can therefore conclude that there is a hierarchy of desirability among users in the Prague network as well.

Table 6.1 Sample descriptives

<i>Brno</i>	mean	SD	median	skewness
age	28,14	6,75	27	0,99
indegree	8,43	24,01	1	5
men	1,58	2,27	1	3,17
women	35,23	43,83	18	2,01
outdegree	8,43	8,79	5	1,45
men	9	8,98	6	1,44
women	6,19	7,64	3	1,4
<hr/>				
<i>Prague</i>	mean	SD	median	skewness
age	28,93	6,52	28	0,75
indegree	15,8	42,56	3	5,23
men	4,22	6,16	22,5	3,17

women	52,71	75,41	2	2,37
outdegree	15,8	18,79	9	2,34
men	16,53	18,18	10	1,8
women	13,47	20,45	7	3,66

Table 6.2 Network descriptives

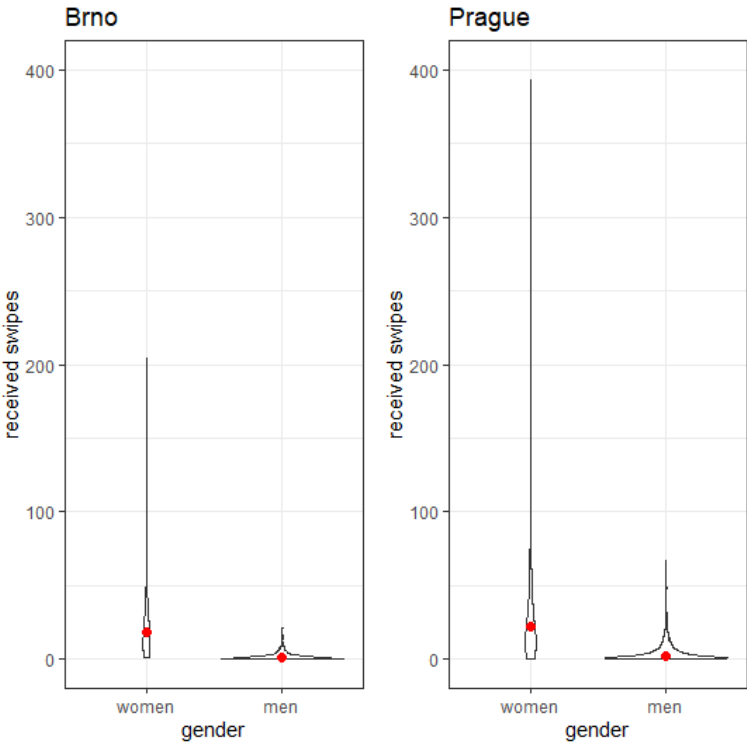
Network descriptives		
	Brno	Prague
density	0.019	0.042
centralization		
men	0.033	0.019
women	0.218	0.109
reciprocity	0.273	0.381

6.6.2 Received swipes comparison of men and women

Figure 6.1 displays violin plots comparing the desirability (the amount of received swipes) of men and women in the two markets. Both the markets display a similar pattern that is in line with previous research on online dating (e.g., Rudder, 2014b): while there is a considerable heterogeneity within both genders in terms of their desirability, female users receive far more swipes than their male counterparts. Even the least desirable women receive more swipes than the most desirable men. This difference holds even when we normalize the amount of received swipes by the number of users of opposite gender in the given area. The Cohen's d value for the comparison of men and women on the standardized number of received swipes is 1.37 in Brno and 0.97 in Prague, suggesting a difference of one standard deviation between the genders in both markets. Therefore, the response to RQ1 is that there are high differences between the desirability of men and women in our data in both locations. Women are thus in a better position than men, as they receive substantially more swipes putting them in the "choosing" position. This can be caused by the skewed ratio of men and women since the scarcity of women on the

app makes them automatically more desirable and some women may be flooded with attention. Another explanation could be prevailing gender norms. Traditionally, men are expected to make the first move, i.e., initiate the conversation (Rose & Frieze, 1993).

Figure 6.1 Violin plots of desirability (indegree)



Note: Red dots represent median.

6.6.3 Aspirational pursuit

Figure 6.1Error! Reference source not found. gives an answer to RQ2 of whether there is an aspirational pursuit in the online dating app. The aspirational pursuit would be manifested by users contacting prospective mates who are more desirable, i.e., by a negative difference between senders' and receivers' standardized indegrees. In the Brno network, this difference is on average 0.06 for ties send by women, indicating that women tend to nominate on average

slightly less desirable mates (by about 6% of the possible maximum). The situation is very different for ties sent by male users, because the difference there is -0.68, indicating that men tend to send ties to women who are on average more than two thirds more desirable than them. Both of these figures can be seen as very salient patterns that cannot be attributed to random chance as it is seen from the simulated confidence intervals and z-scores. In the Prague network, the situation is less extreme but rather similar with the difference for ties sent by women being 0.03, while reaching -0.27 for ties sent by men indicating slight dating “down” tendencies for women and clear aspirational tendencies among men. Simulated confidence intervals and z-scores again show that these results are highly unlikely to arise by random chance. All these findings together point toward strong signs of the presence of aspirational pursuit among men, but not among women. Thus, we respond to RQ2 by stating that there is aspirational pursuit with regard to desirability among men in both locations. These results suggest that in terms of desirability, men do not seek similarity but rather attempt to pursue the most desirable users on the app regardless of their own position in the hierarchy. Unlike Bruch & Newman (2018) we do not observe the same pattern for women – on the contrary, they “swipe down”, pursuing slightly less desirable men than themselves. This can be an artifact of the data as there is low variability in men’s desirability. However, an alternative explanation can be that women tend to prefer similarity in desirability more than men. For instance, previous research in online dating shows that compared to men, women pursue partners closer in age (Šetinová & Topinková, 2021) or ethnicity (Rudder, 2014b).

Table 6.3 Network simulation results

	Brno		z-score	Prague		
	average	simulated CI		average	simulated CI	z-score
indegree sender - indegree receiver						
<i>sender is woman</i>	0.059	(0.059; 0.06)	188.05	0.036	(0.035; 0.036)	476.07

<i>sender is man</i>	-0.681	(-0.695; -0.667)	-96.88	-0.274	(-0.276; -0.271)	222.88
<i>reciprocated</i>	-0.240	(-0.268; -0.217)	-18.62	-0.115	(-0.118; -0.112)	-68.95
indegree sender - outdegree sender						
<i>sender is woman</i>	0.058	(0.056; 0.061)	42.47	0.022	(0.021; 0.023)	44.73
<i>sender is man</i>	-0.058	(-0.065; -0.052)	-18.45	-0.022	(-0.024; -0.021)	-28.71

6.6.4 Homophily of reciprocated swipes

In order to answer RQ3, we filtered out only the mutually attracted pairs of users from both networks, that is pairs with reciprocated ties. Table 6.3 shows the results in the same way as for the previous research question. The average difference of standardized indegrees between the senders' and receivers' of reciprocated ties is -0.24 in the Brno network with its z-score being -18.62 suggesting that the matches on the dating site are not homophilic with regard to desirability, as there are still non-random signs of aspirational pursuit. However, this difference reaches only about a one third of its magnitude in comparison to its value for all the ties, indicating that mutually attracted users are considerably more similar on desirability than users connected by both reciprocal and non-reciprocal ties. The situation is quite similar in the Prague network with the average difference of standardized indegrees between the senders' and receivers' of reciprocated ties reaching -0.11 (z-score = -68.95), which is again indicating some aspirational pursuit, but weaker compared to all ties combined. We therefore respond to RQ3 by concluding that homophily on desirability is not as strong as we would expect even when the users are mutually attracted. However, the successful matches are more similar in terms of desirability than the initial matches, suggesting that a lot of the swipes fail to develop beyond the initial attempt. Schaefer's (2012) mechanism of homophily based on non-reciprocity suggests that more dissimilar matches are more likely to dissolve with each additional exchange (message) between the partners, however, since we lack the information beyond the initial swipe and the initial (non)reply, we cannot verify whether this is the case.

6.6.5 Indegree-outdegree tradeoff

The last research question (RQ4) relates to the trade-off users may be conducting between high desirability (indegree) and high activity (outdegree) on the platform. In the Brno network, this trade-off is not large in terms of its effect size (0.05 for women, -0.05 for men), but the associated simulated confidence intervals as well as z-scores suggest that it is not attributable to chance alone. The value suggests that women usually have a 5% higher standardized indegree than outdegree, while for men it is the other way around. In other words, women receive more swipes than they send relative to the number of available men while the opposite is true for men given the number of available women. The Prague network again shows similar patterns and again with lower effect sizes (0.02 for women, -0.02 for men), still very unlikely to arise by random chance as evidenced by the corresponding confidence intervals and z-scores. In response to RQ4, we therefore state that there are weak signs of indegree-outdegree tradeoff in both networks with women being on average more desirable and less active, while men being less desirable and more active. However, our cross-sectional data do not allow us to investigate what is the temporal ordering of the two components of the trade-off and thus we cannot conclude anything about whether less desirable users tend to compensate by increasing their activity or whether highly desirable users decrease their activity in response to an influx of swipes they receive. This is in line with the traditional dating scripts in which men are supposed to be the “pursuers”, while women should wait to be pursued (Morr Serewicz & Gale, 2008; Rose & Frieze, 1993). Furthermore, due to the overall scarcity of women on the app, women are automatically put in the position of choosers regardless of the prevailing dating scripts.

6.7 Discussion

Our research corroborates previous studies regarding women's higher desirability on online dating apps. Given the skewed gender ratio on the app, and the prevailing dating scripts, men were in the position of pursuers (sending more messages than receiving) and women in the position of "choosers" (receiving more messages than sending). Men pursued more (up to by two-thirds on average) desirable women than themselves, in line with the mechanisms of competition and non-reciprocity. We do not see the same pattern for women, who tended to slightly partner down on average. Here, our results differ from Bruch and Newman (2018) who found aspirational pursuit for both men and women. Yet, these results are in line with previous research indicating that men put more emphasis on women's attractiveness, while women tend to value men's status and resources (Buss & Schmitt, 1993). However, women's willingness to partner down should be taken with a grain of salt due to the low variability in men's desirability. Since pursuing mates and being successful in doing so are two inherently different things, we also looked at reciprocal matches. Even though the successful matches were still aspirational, mutually attracted users were considerably more similar in desirability compared to all swipes. This result is again in line with the mechanism of competition or non-reciprocity. Given that we only observe the initial swipe and its acceptance/rejection, heterogenous matches may dissolve with an ongoing exchange, as suggested by Schaefer (2012) and observed by Kreager et al. (2014a).

Ultimately, the analysis is based on a single dating app, which may be biased somehow. In general, dating apps are not representative of the general public, as they often include younger, more educated users from larger cities. In this case, the app was fairly new at the time of the data collection and was developed by two college students in a city with a major university. Thus, it is likely that it is biased towards more educated users who were early adopters of the

app. Nevertheless, we believe that our study is a needed contribution to the literature on online dating and homophily. As all online dating studies share the same issue of being constrained to a specific online site, cumulative knowledge is the only way to assess whether the patterns they observe are truly happening or are merely results of the particular online dating websites/apps' designs. Moreover, most studies concerning online dating currently rely on data from the US (e.g., Bruch & Newman, 2018; Fiore & Donath, 2005; Hitsch et al., 2010a; Kreager et al., 2014a; Lewis, 2016b; Rudder, 2014b) or Western Europe (Dinh et al., 2021), a notable exception being Potarca & Mills (2015). Thus, we are not only replicating previous findings, we are also extending their geographical scope.

As with any digital trace data, the amount of information about the behavior of users is limited (Salganik, 2018). The specific app we used in this study did not record any information about the motivation of the users, yet these motivations may vary significantly among users from seeking one-night stands to searching for a life partner. Similarly, the analysis is limited by the scope of the data as we only have a handful of information about users. Previous studies (Lewis, 2016b; Whyte & Torgler, 2017) controlled for factors such as education or religion. Since the app in our study did not record either of these pieces of information, we couldn't control for it in our analyses, but on the other hand, this information was also not accessible for users viewing the profiles and so it had no direct way of affecting their partner selection.

Another limitation is that short-lived profiles could have influenced our results. Some of the users we classified as having low desirability, i.e., receiving few or no messages, could have downloaded the app out of curiosity and quickly abandoned their profiles. Had the longevity of profiles been available for analysis, it could again be introduced as a control variable or more specifically, the temporal dynamics of the users' usage of the app could be fully investigated in a longitudinal study. Longitudinal data could then in turn open an avenue for studying the adaptation of users' strategies over time. This is potentially very important, as some studies

suggest that users often update their profiles based on the "feedback" they receive from other users (Heino et al., 2010). Moreover, longitudinal data could also provide a more fine-grained picture of the indegree-outdegree tradeoff.

Additionally, we only included heterosexual searches in the analysis. The reason for omitting same-sex searches was their low number in the sample as there are other dating sites that are specialized for the LGBT community operating in the Czech Republic. This is a limitation we share with many previous studies utilizing digital trace data from online dating sites (e.g., Bruch & Newman, 2018; Hitsch et al., 2010a; Kreager et al., 2014a). It is important to note that the structure of same-sex dating markets may be substantially different from what we see in the heterosexual markets, because in same-sex markets everyone can contact and be contacted by everyone else, potentially giving rise to a more complex network structure and more complex hierarchy among users (e.g., manifested by transitive or cyclic triangles).

In summary, our study shows that there is a hierarchy of users on online dating apps in terms of their desirability, with women being on top of this hierarchy. Furthermore, we provide evidence of men pursuing more desirable women, yet most of the mutually interested matches ending up more similar in terms of desirability as a result of rejection by the more desirable counterparts. Our results highlight the usefulness of network perspective as it allowed us to characterize both the overall structure as well as the behavioral tendencies of users within it. Still, our results may be specific to our geographic context (Czechia) or to the specific dating app. This in turn opens avenues for future research that may help us in increasing our knowledge of online dating and of online behavior in general.

7 Conclusion

The aim of this dissertation was to examine online dating in Czechia. First, it provided much-needed data on the online dating experience, opinions, and outcomes in Czechia. Second, it examined homophily on age and desirability on a Czech mobile dating app.

Chapter 3 shows that online dating is prevalent in the Czech society, mirroring results from Western countries. The practice itself doesn't seem to carry much stigma as most Czechs do not think dating online is something to be ashamed of, or that online daters are desperate. However, other beliefs about online dating are a mixed bag and do not always correspond well with the experiences online daters report having. While most Czechs think that online daters look for sexual encounters, online daters themselves reported finding friends, short- or long-term partners on a similar rate as finding someone solely for sex.

Meeting online is currently the most common way to find a romantic partner in Czechia and the proportion of couples who met this way is steadily rising. Between 2020 and 2022, almost half of couples reported meeting online, likely due to social distancing imposed by the covid-19 pandemic. Unlike findings from the US (Cacioppo et al., 2013), individuals who met their partners online report the same levels of satisfaction with their relationship as those who met in other ways.

Chapters 4, 5 and 6 examine homophily on age (4, 5) and desirability (6) utilizing data from Czech mobile dating app. The key finding of this thesis is that the preference for homophily does not show in the initial pursuits, rather, homophily is the result of rejection. Regarding age, the results suggest that the preferences expected by evolutionary theory, men looking for young women and women looking for men their age or older, are present but for older women, there is a preference for younger men too. However, as in case of desirability, the successful matches, i.e., pursuit attempts that received a reply, are between individuals who are closer to age than

the initial pursuits. The initial pursuit can be characterized as aspirational, i.e., users aim to date those more attractive than themselves in terms of age or desirability, but they get rejected by them. It is likely that this process repeats until they match with those of similar characteristics, a process that eventually results in homophilous couplings.

More research comparing couples which originated online and offline is needed. Thomas (2020, p. 1257) found that US couples who met online are more likely to be interracial, interreligious, of different college degree status, but more similar in age. Similarly Potarca (2020) finds that Swiss couples which met online are more educationally and geographically diverse. In contrast, research utilizing online dating data generally finds different patterns. Skopek et al. (2011) found the opposite when looking at data from online dating site – educational homophily was the dominant mechanism of online choice, particularly for women. Similarly, online daters were shown to prefer same-race partners, and having a clear idea of hierarchy in terms of race of partners they pursued (Lin & Lundquist, 2013; Potarca & Mills, 2015; Rudder, 2014a). As shown in Chapters 3 and 4, this disparity is also evident for age. While most spouses in Czechia are very close in age (Katrňák, 2008), and US couples who met online being closer to age than couples who met offline (Thomas, 2020), our data shows that this preference is not visible in the initial messages, and is rather a result of an ongoing process in which dissimilar matches may get eliminated (Kreager et al., 2014a come to similar conclusion). Our understanding of this process is currently very limited since most surveys do not ask respondents about the way they met their partner.

Additionally, there is some early research that suggest that some users benefit from online dating more than others – for instance, Potarca (2021) shows that college educated women have higher chance to marry if they date online, partly due to increasing their chances to find a more egalitarian men to marry. However, this line of research is still in its infancy due to the relative novelty of online dating apps.

In order to delve deeper into online dating apps and their effect on resulting unions, academic research would benefit from a closer cooperation with the private sector. There is much value in the data collected by the online dating sites and apps as it captures users' behavior in real-stakes scenario in an unobtrusive way (as opposed to surveys or mock-up dating sites experiments). Although there are decades of research in partner preferences, there is often a gap between the declared preferences and whom individuals find desirable in a real-life scenario (Eastwick & Finkel, 2008). For example, while users may claim to have no preference for racial homogamy, they still tend to frequently choose same-race partners (A. Anderson et al., 2014; Rudder, 2014a). This gap between declared preference and behavior is likely one of the reasons why matching algorithms in online dating perform poorly.

As stated throughout the dissertation, one major advantage of studying online dating with the use of data provided by the online dating companies, is that we can easily observe the initial stages of mating. However, current studies are limited by the cross-sectionality of the data. Longitudinal data is needed to assess the process of dating online. One of such question that could be explored with longitudinal data would be: Do individuals change their preferences and behavior over time in response to being rejected? As users experience different outcomes from online dating, some raising their self-esteem by being pursued by many, others may experience the opposite. Given the current discussions about so-called incels, i.e., involuntary celibates, and their radicalization (e.g., O'Donnell & Shor, 2022), understanding the process of pursuing and being rejected by mates online seems more important than ever (Sparks et al., 2022).

Furthermore, we have little information how affordances of certain online dating sites and apps contribute to users' behavior. For instance, mobile dating app Bumble turns the traditional gender norms upside down – the first message must be sent by a woman, disrupting the norm that men should be the 'pursuers', not the 'pursued'. This may seem like a subtle change, however, as shown previously in speed dating experiments, such change can significantly alter

users' behavior and possibly the resulting pairings. When women were rotating from one man's table to another, instead of men doing so, the tendency of women to be more selective than men disappeared (Finkel & Eastwick, 2009).

Questions regarding how the affordances of dating sites and app influence on users' behavior and resulting pairings, and questions regarding change over time, open numerous questions that call for examining causality. Such questions are well suited for computational social science, particularly experiments, and agent-based models, both of which are explicitly designed to tackle the concept of causality. There are some early promises in simulating how different interventions could affect users' behavior. For instance, Ionescu et al. (2021) look at the effects of filtering on race on the level of racial heterogamy. While they find a small positive effect in racial heterogamy when filtering options are weakened, they also conclude that the impact of the intervention may quickly reach a saturation point, and that the number of successful pairings would decrease as users would find it harder to find a suitable match for themselves because users want to filter on race. Huang et al. (2022) examine the effect of interventions on market congestion, a common issue in online dating which happens when the attention of users focuses on a few desirable users, especially in cases where gender ratio is skewed (as shown in Chapter 6). They conclude that disclosing the popularity of users may improve the market congestion but only for those who rely on sending messages themselves, i.e., for men. This line of research can help to not only understand the effect of different affordances and behavior in time, but also help to alter "troubling patterns of social interaction, without unduly interfering with individual intimate choices" (Hutson et al., 2018, p. 1).

Many questions regarding online dating remain unresolved. For many countries, we still lack even basic information on online dating prevalence, attitudes, experience, or outcomes. Another area where current research is lacking is quantitative data on the LGBT+ communities. Although LGBT+ communities were among the early adopters of online dating, and that most

same-sex couples originated online, research examining couples that originated online is limited to heterosexual pairings. This omission is not out of disinterest or malice but more a result of low number of observations in national surveys, and that LGBT+ communities often use specialized sites to date online. As suggested in chapter 6, same-sex online dating apps may reveal very different patterns of interactions and resulting hierarchies due to the possibility of every user being able to nominate everyone else (in contrast to heterosexual dating markets wherein only between-gender nominations can be made).

Online dating is an important factor for the formation of intimate relationships in modern societies and its impact should not be underestimated by researchers. It is not only an important part in explaining how couples meet and unions form, but its study also contributes to our understanding of the effects of technology on human life and interactions between humans and information and communication technology.

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