Migration for Marriage*

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Abstract

Policymakers are concerned about permanent migration and are enforcing policies to tighten it. Marriage migration, wherein citizens marry foreigners, stands out as a significant pathway to permanent residency in OECD countries, particularly among Muslim communities. Notably, about half of British Muslims marry someone from their ancestral country of origin. This trend could be rooted in the desire to marry within one's ethnicity or faith (endogamy preferences) or a pathway to gain residency in a developed country (migration gains). To disentangle these factors, I develop a novel marriage matching model in which I embed the choice of marrying someone from the country of origin. I structurally estimate the model using data from UK Census 2011. I find that 80% of Muslim marriage migration is explained by their preference for endogamy, driven by the ease of finding partners who share the same ethnicity and religious background in the country of origin. Therefore, raising the costs of marriage migration by policymakers does not increase their integration through intermarriage; instead, it leads to a higher rate of singlehood among Muslims.

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1 Introduction

Spouse visa restrictions have been implemented in many high-income countries with two main objectives: reducing net migration, particularly of low-skilled migrants; and, promoting domestic integration for minority groups. To understand whether such policies can achieve their goals requires knowledge of why a country's minority groups choose to import their spouses. I infer motives for marriage migration from data on who marries whom in the UK using a structural matching model. I find that while the visa restrictions do reduce migration, they neither target the intended low-skilled migrants nor foster integration through intermarriage.

Marriage migration is an increasingly important driver of migration in many OECD countries (OECD, 2017). In the United Kingdom, it accounts for about 30% of total immigration (Labour Force Survey, 2011).[1] This trend is primarily driven by ethnic minorities seeking spouses from their ancestral countries of origin (Charsley et al., 2020). Policymakers have expressed concerns that marriage migration may impede integration, creating "A first generation in every generation" (Goodhart, 2013; Casey, 2016; Charsley et al., 2017). These concerns are reinforced by low intermarriage rates among groups with high marriage migration[2], intermarriage being a widely recognized indicator and facilitator of social integration (Gould and Klor, 2016).

The impact of marriage migration policies depends on the motivations driving these unions. If economic benefits of moving to a higher-income country (migration gains) primarily drive marriage migration, restrictive policies would decrease such migrations and boost intermarriage rates, aligning with policymakers' intentions. However, the main driver may be a strong preference for ethnically and religiously similar spouses (endogamy preferences), who are often more easily found in the country of origin. In this case, restrictive policies would have limited impact on marriage migration and fail to increase intermarriage rates; instead, they can lead to a higher share of singlehood. The key distinction is the different welfare implications of the two scenarios.

Marriage choices are the equilibrium outcome of an endogenous matching process, influenced by both partners' preferences and the availability of potential mates. Therefore, a reduced-form partial equilibrium analysis is insufficient to capture all

[1] The long-term stay rate for marriage migrants is 89%, substantially higher than the 18% for migrant students and 57% for migrant workers, contributing significantly more to the overall immigrant population (Hall et al., 2023).

[2] Figure A1

aspects of the marriage market. The majority of existing work on marriage choices focuses on closed marriage markets (Becker, 1973; Choo and Siow, 2006; Hitsch et al., 2010; Chiappori, 2017; Chiappori et al., 2018; Adda et al., 2024; Beauchamp et al., 2017; Galichon and Salanié, 2022a,b). These models implicitly assume prohibitively high costs for cross-border marriages. This assumption leads to two significant limitations: first, they cannot explain and predict marriage migration; and second, these models tend to overestimate preferences for endogamy by neglecting the possibility that some intra-group marriages occur due to migration gains rather than solely by cultural or religious preferences.

In this paper, I study the marriage migration of ethnic minorities to high-income countries for the first time in the economics literature. I develop a methodology to separately identify determinants of the marriage migration. I then estimate these factors, focusing on British Muslims. They stand out due to their significantly higher rate of marriage migration compared to other groups. About half of British Muslims marry partners born in their country of origin, in contrast to the rate of 20% or less for other religious groups. Examining this phenomenon is crucial, as Muslims are a significant and growing population that face challenges related to integration in Western countries (Adida et al., 2016).

My novel marriage matching model incorporates the option to marry someone from one's country of origin. This model is structured as a two-sided matching system with transferable utilities, offering individuals three choices: marrying locally, marrying someone from their country of origin, or remaining single. Two critical factors influence marriage migration within this framework: "endogamy preferences" and "migration gains". Endogamy preferences reflect the inclination to marry partners of the same religion and ethnicity. Migration gains arise from two factors: (1) access to a large outside market, and (2) utility generated from migration. This utility captures benefits linked to moving from lower-income to higher-income countries for the migrant spouse, leading them to accept trade-offs by prioritizing their partner's marital benefits over their own.

The marriage market model incorporates both observable and unobservable factors influencing marital decisions. I assume that unobserved heterogeneities on both sides of a match do not interact in producing the matching surplus. In addition, I adopt the distributional assumption from Choo and Siow (2006), where unobserved heterogeneities follow an independent and identically distributed (iid) type I extreme value distribution. This assumption transforms the model into a tractable two-sided

Logit framework. The resulting Independence of Irrelevant Alternatives (IIA) property, which is less restrictive in a two-sided model compared to a one-sided model (Galichon and Salanié, 2017), allows for estimation of endogamy preferences using only local market data. The main identification assumption needed for distinguishing the impact of endogamy preferences and migration gains on marriage migration is the separability between the utility of migration and the other components of the marriage surplus. The estimation section discusses implications of relaxing the model assumptions.

These assumptions effectively create two parallel markets. Endogamy preferences are determined from local inter-marriage to intra-marriage ratio; and, migration gains are identified from the ratio of cross-border to local marriages. To parametrically estimate the marriage surplus, I extend the minimum distance estimation method developed by Galichon and Salanié (2022b). This approach leverages optimal transport theory to estimate preferences based on observed matching and availabilities. Furthermore, to compute the matching function in equilibrium, I develop an Iterative Proportional Fitting Procedure (IPFP) technique building upon the method introduced by Galichon and Salanié (2022a).

To estimate the model, I use data from the 2011 Census for England and Wales. The UK's unique practice of collecting both ethnicity and religion data enables separate identification of ethnic and religious preferences, which is crucial in analyzing the Muslim marriage market where these factors are highly correlated. Data patterns show that ethnic minorities from the bottom of the education distribution in the UK tend to import spouses from the top of the education distribution in their countries of origin. This observation suggests that lower-educated UK ethnic minorities trade off their citizenship against the higher education of the partners from their countries of origin. This finding contradicts the assumption held by many policymakers that marriage migrants are predominantly low-educated (Charsley, 2013).

The structural estimation results corroborate the well-established preference for positive assortative marriage (Siow, 2015). My novel contribution is the quantification of marital surplus across various dimensions of endogamy. Specifically, the findings demonstrate that couples derive substantially higher surplus from ethnic and religious endogamy compared to age or educational endogamy. Religious minorities in the UK—specifically Muslims, Hindus, and Sikhs—show strong and comparable preferences for marrying within their faith. This contrasts sharply with the majority groups, namely Christians and those without religious affiliation, who display signif-

icantly weaker preferences for religious endogamy.

Dividing the reasons behind marriage migration shows that approximately 80% of Muslim marriage migration is attributed to preferences for ethnic and religious endogamy. In a counterfactual scenario where these endogamy preferences are absent, the marriage migration rate among Muslims would likely decrease from the observed 50% to about 10%, aligning closely with the rate observed among non-Muslim groups. The primary difference between Muslims and other religious minorities (Hindus and Sikhs) lies not in their endogamy preferences, but in their migration gains. When these differing migration gains interact with the strong endogamy preferences common to all these groups, it results in significant disparities in marriage patterns. A potential explanation for the disparity in migration gains is the varying strength of transnational networks. Stronger connections with countries of origin could provide Muslims access to a larger pool of potential spouses abroad, effectively expanding their outside market compared to other groups.

My structural estimation enables counterfactual simulations to evaluate the impact of potential policies. In the UK, a series of policies, including increased minimum income requirements, English language tests, and higher visa fees, have raised the costs of marriage migration. I conduct a counterfactual analysis by introducing a marriage migration tax, which reflects an increase in spouse visa costs. I incorporate these taxes into my structural model as a lump-sum deduction from the migration utility, assuming no change in preferences in the short-run. My findings show that a marriage migration tax reduces marriage migration for both Muslims and non-Muslims. However, strong religious endogamy preferences result in only a slight increase in inter-religious marriage rates. Even a complete ban on marriage migration would increase interreligious marriages among Muslims by less than 2 percentage points.

When faced with higher costs, Muslims tend to compromise on characteristics other than religion, increasing inter-ethnic marriages. Conversely, inter-education marriages decline as low-educated Muslims lose access to the cheap option of marrying high-educated individuals from their country of origin; hence, the decline in migration would not target low-educated immigrants. Many Muslims gain significantly low utility from compromising on their partners' characteristics; hence, they opt to remain single, significantly increasing the number of single Muslims. Therefore, while restrictive marriage migration policies may achieve their goal of reducing migrant numbers by increasing costs, they are unlikely to induce integration through

the marriage market, as this is primarily driven by individual preferences.

The second set of counterfactual analyses examines the effects of Muslim population changes on the marriage market equilibrium. This analysis is particularly important given the significantly higher population growth rates of Muslims compared to other groups in several OECD countries. Results indicate that an increase in the Muslim population leads to a substantial decrease in marriage migration rates, as individuals more easily find partners with similar ethnicity and religion locally. Specifically, doubling the Muslim population in the UK reduces marriage migration by 20%. Despite the decline in marriage migration, the rate of intermarriage remains relatively unchanged due to Muslims' endogamy preferences.

My study makes several contributions to the literature. First, I introduce an open matching model that extends existing closed-market matching models focused on within-country marriage markets (Becker, 1974; Choo and Siow, 2006; Chiappori, 2017; Galichon and Salanié, 2022a; Adda et al., 2024). This open matching model can be extended to other domains such as worker-firm matching and student migration across regions or countries. Second, unlike prior studies on marriage migration that focus on brokered cross-border marriages in Asian countries due to unbalanced sex ratios (Kawaguchi and Lee, 2017; Weiss et al., 2018; Ahn et al., 2020), this paper investigates intra-ethnic marriage migration in Western countries driven by preferences for similar cultural backgrounds.

Third, it advances the marriage market literature by highlighting the significantly greater importance of religion and ethnicity in marriage decisions, compared to traditionally emphasized characteristics like education and income (Hitsch et al., 2010; Banerjee et al., 2013; Eika et al., 2019; Chiappori et al., 2022; Anderberg and Vickery, 2021). Finally, I contribute to the literature on integration by providing new insights into the impact of religious preferences on the integration of Muslims, a relatively understudied group (Manning and Roy, 2010; Georgiadis and Manning, 2011; Bisin et al., 2004, 2008; Gould and Klor, 2016; Jacquet and Montpetit, 2022).

The paper is structured as follows. Section 2 offers an overview of the data and presents a reduced-form analysis of marriage migration. Section 3 introduces the model. Section 4 outlines the estimation method, followed by a discussion of the results in Section 5 and counterfactual analyses in Section 6. Section 7 concludes.

2 Data

2.1 Data description

This study analyzes data from the 10% household-level sample of the 2011 Census for England and Wales (Office for National Statistics, 2011). The key advantage of this dataset is its inclusion of questions about both ethnicity and religion, and its large number of observations from various ethnic and religious groups. The sample is restricted to individuals of marriageable age: women aged 23 to 53 and men aged 25 to 55 years. This age range ensures that most participants have completed their college education while accounting for typical marital age gaps. To focus on individuals who likely made their marital decisions in the UK, the sample includes only those born in the UK or who arrived before their 18th birthday. For the main analysis, cohabiting couples (Figure A3) are considered single, while separated, divorced, and widowed individuals are excluded.[3] The analysis focuses on heterosexual matches due to insufficient data on same-sex couples in the dataset.

The Census includes an optional question on religious affiliation.[4] While approximately 7% of all individuals do not report their religion, South Asians, who constitute the majority of Muslims in the UK, have the lowest non-reporting rate ($\sim 4\%$). Therefore, potential attrition bias due to Muslims being less likely to report their religion is unlikely to impact the study's findings.

The reported religion in the Census, however, does not necessarily reflect active religious practice and may instead indicate ethno-religious identity. A recent study by Humanists UK (2021) suggests that most individuals choose their reported religion based on upbringing rather than current religious practices. Data from the Citizenship Survey (2010-11) support this, showing that while 97.6% of people raised as Muslims report Islam as their religion, only 76% actively practice it. Although Muslims have a higher rate of religious practice compared to Christians (Figure A4), their practice rates are not significantly different from other religions (62% for Buddhists, 68% for Hindus, 62% for Sikhs, and 43% for Jewish people).

A potential concern regarding religion and marriage is the endogeneity of religious affiliation in marriage. While addressing this issue with cross-sectional data is challenging, Scotland's 2001 Census provides some insights. Among married Muslims in Scotland, 9.5% had non-Muslim spouses in 2001, and 16.7% of these non-Muslim

[3] In the robustness checks (Appendix H), results are estimated by including cohabiting couples in the married group.

[4] The question is phrased as follows: "What is your religion? (This question is voluntary)"

spouses were raised as Muslims. Conversely, among Muslims who married within their group, 5.3% had spouses who were not Muslims in childhood. It remains unclear whether these individuals converted to Islam due to their marriage or married a Muslim following their conversion. However, if conversion rates to Islam in England and Wales are comparable to those in Scotland and have remained stable over the past decade, these rates alone cannot fully account for the substantial differences in intermarriage and marriage migration patterns between Muslims and non-Muslims.

Table 1. Summary Statistics

	Non-Muslim					
	White British		Other		Muslim	
	Male	Female	Male	Female	Male	Female
Age	39.1	36.9	37.3	35.0	35.2	32.4
College education (%)	34.4	36.8	46.8	51.7	38.5	36.9
UK-born (%)	98.4	98.3	73.7	74.0	54.2	62.0
Married (%)	52.1	53.1	41.5	37.7	64.6	66.5
Marriage						
Marriage migration (%)	0.0	0.0	22.8	19.5	49.6	51.5
Inter-religious^{+} (%)	20.2	20.5	18.2	20.7	6.0	4.7
Inter-ethnic^{++} (%)	1.9	1.3	19.3	19.9	12.4	12.0
Number of observations	666,377	646,837	57,328	60,178	20,181	20,498

Notes. $^{+}$Inter-religious marriage is measured based on the following religious groups: No religion, Christian, Buddhist, Hindu, Jewish, Muslim, Sikh, and others. $^{++}$Inter-ethnic marriage is measured based on the following ethnic groups: White, Black, Indian, Pakistani, Bangladeshi, Chinese, Other Asians, and Others. Mixed ethnicities are excluded. *Source.* Census for England and Wales, 2011.

Table 1 presents summary statistics of the sample. Muslims in the UK have distinct demographic characteristics compared to the rest of the population. They are generally younger, reflecting their more recent immigration history, which primarily occurred after the Second World War. Muslims also have lower educational attainment compared to other minority groups. Regarding marriage patterns, Muslims tend to marry at a younger age than non-Muslims. By age 40, 90% of Muslims are married, compared to only 69% of non-Muslims.[5]

[5]Additionally, Muslim men marry spouses who are 4.5 years younger than themselves, while non-Muslim men marry spouses who are 2.4 years younger.

Measuring marriage migration is challenging, as large datasets usually lack information on the intention for migration. For this study, I measure marriage migration as the union between two types of individuals: (1) a person born in the UK or who arrived in the UK before age 18, and (2) someone who migrated to the UK after age 18.

To assess potential overestimation, I compare my measure with data from the UK Labour Force Survey, which includes questions about the main reason for migration. This comparison reveals that my measure may overestimate marriage migration by approximately 4 and 14 percentage points for Muslim men and women, and 8 and 10 percentage points for non-Muslim men and women, respectively. It is important to note that part of the gender gap in these estimates may be attributed to men being less likely to report migrating for marriage. Despite this potential overestimation, my definition is suitable for studying policies considering long-term migration. It includes some marriages where the immigrant partner was already residing in the UK before the union. Even in these cases, the migrant spouse benefits from citizenship advantages and can attain settlement status.

This study exclusively focuses on marriage migration within the same ethnic group for ethnic minorities[6], as the majority White British population in the UK lacks significant ties to other countries for importing spouses. The decision to limit marriage migration to intra-ethnic marriages is justified by two factors: approximately 93% of estimated marriage migration occurs within the same ethnic group, and removing inter-ethnic marriages increases the share of couples who likely met as adults in the UK.

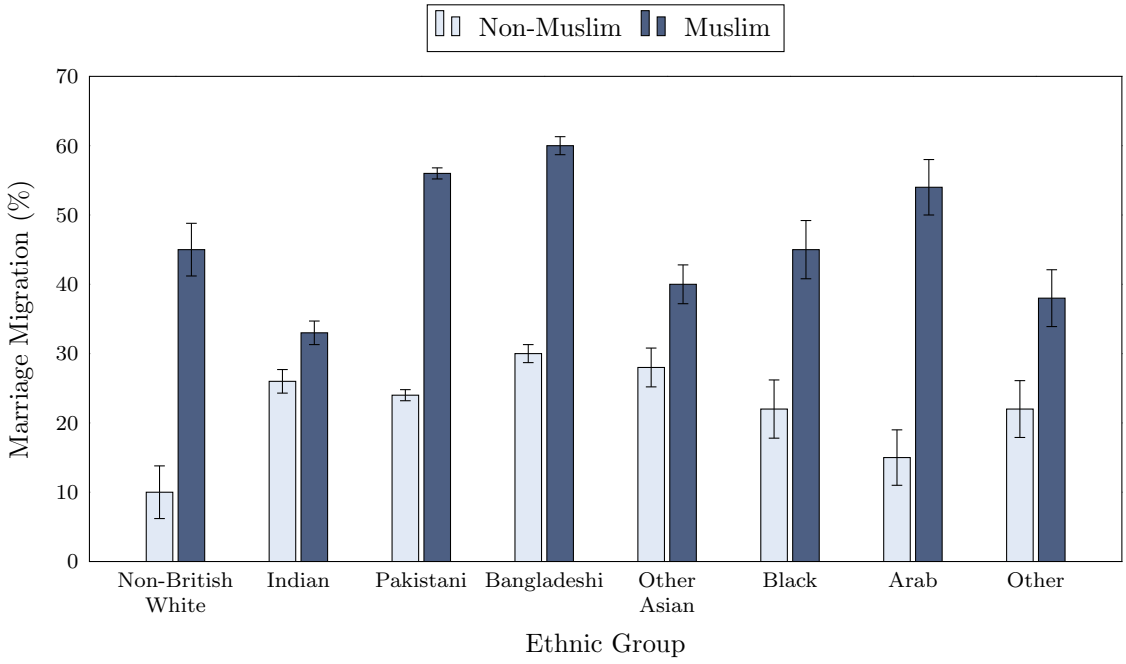
Muslims exhibit significantly higher rates of marriage migration, approximately double those observed among non-Muslim ethnic minorities. This pattern persists even when controlling for ethnicity (Figure 1). Notably, marriage migration rates for Muslim men and women do not differ significantly (Table 1).[7] This phenomenon can be attributed to several intersecting factors. Arranged marriages mitigate costs and provide security through family connections when marrying abroad. Women may benefit from reduced in-law influence, a feature common in some Muslim communities. Furthermore, as more individuals marry from abroad, those preferring endogamy may seek partners overseas to avoid remaining single, potentially perpetuating the trend.

Gains from migration are primarily influenced by the income disparity between the

[6]Ethnic minority ≡ Not White British

[7]Research on marriage-related migration has primarily focused on migrant wives, with limited exploration of male marriage migration (Charsley and Liversage, 2015).

Figure 1. Marriage Migration Rates by Ethnic and Religious Groups



Notes. Each bar represents the percentage of married British individuals within each ethnic and religious group who married a migrant spouse. *Source.* Census for England and Wales, 2011.

host and home countries.[8] A wider income gap corresponds to greater migration gains. This relationship is evident in Table 2, which shows the proportion of individuals marrying abroad based on their country of origin[9]. Lower income levels in the country of origin correlate with higher migration gains, increasing the likelihood of individuals marrying abroad. However, this data does not distinguish whether these patterns result from supply or demand factors.

Muslims, in addition to having a higher marriage migration rate, have a lower intermarriage rate. The marriage data presented in Table 1 indicate strong endogamy preferences within the marriage market, evidenced by a high prevalence of marriages within the same ethnic and religious groups. This pattern persists even when controlling for ethnicity (Figure A5a). Similar trends are observed for inter-ethnic marriages (Figure A5b).

[8]There are additional factors influencing migration gains, for example, the social costs associated with being separated from family.

[9]The country of origin is determined from Understanding Society Survey (2010-11) as follows: it is the country of birth for individuals born outside the UK, the father's birth country for those born in the UK, and the grandfather's birth country when both the father and the individual were born in the UK.

Table 2. Marriage Migration Rates by Country of Origin's Income Level

Income level of ancestral country of origin	Marrying abroad (% of married)
Low income	49%
Lower middle income	41%
Upper middle income	27%
High income	12%

Notes. The sample is limited to people with a country of origin different from the UK. The country of origin is determined by the birthplace of the individual, their father, or their grandfather, whichever was first born outside the UK. *Source.* Understanding Society, 2010-11, and World Bank Data, 2011.

2.2 Sorting into marriage migration

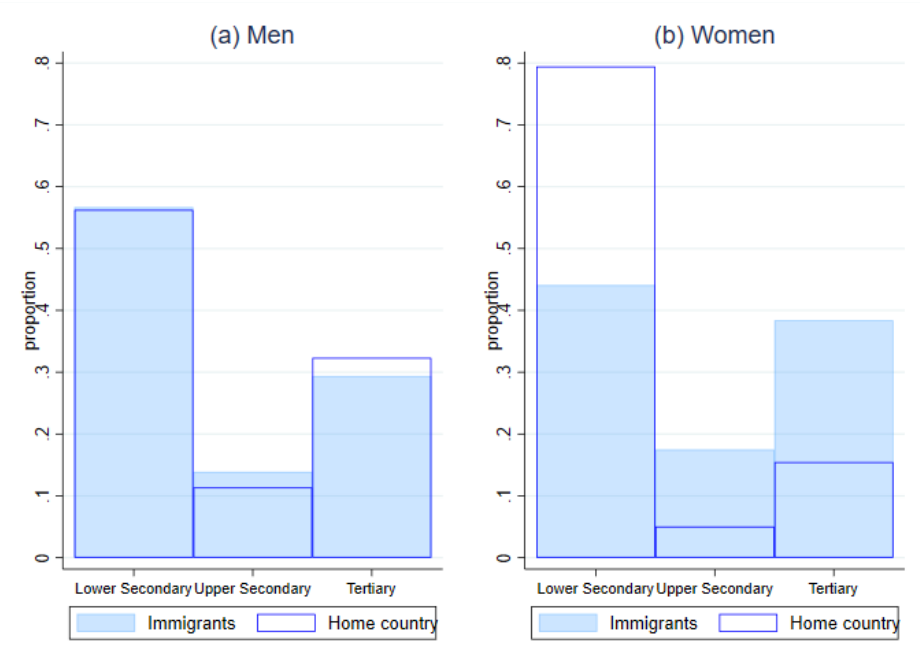
To enhance statistical power for the analyses, I aggregate several of the ethnic groups in the data. The majority of Muslims in the UK are of Pakistani, Bangladeshi, or Indian ethnicity. I combine the Pakistani and Bangladeshi populations into a single group due to their comparable share of the Muslim population, shared Islamic practices, and similar income per capita over recent decades. As a result, the ethnic groups used in this analysis are: White British, Other White, Indian, Pakistani/Bangladeshi, and Others.

The sorting of individuals into marriage migration is not random but rather depends on their characteristics. Table 3 compares the educational levels of those who marry abroad versus those who marry locally. Education level is represented by a binary variable: 1 for college education, 0 otherwise. The coefficients indicate that individuals who marry abroad, regardless of their religion or gender, have lower educational attainment compared to those who marry locally. This finding persists even when controlling for spouse's characteristics.

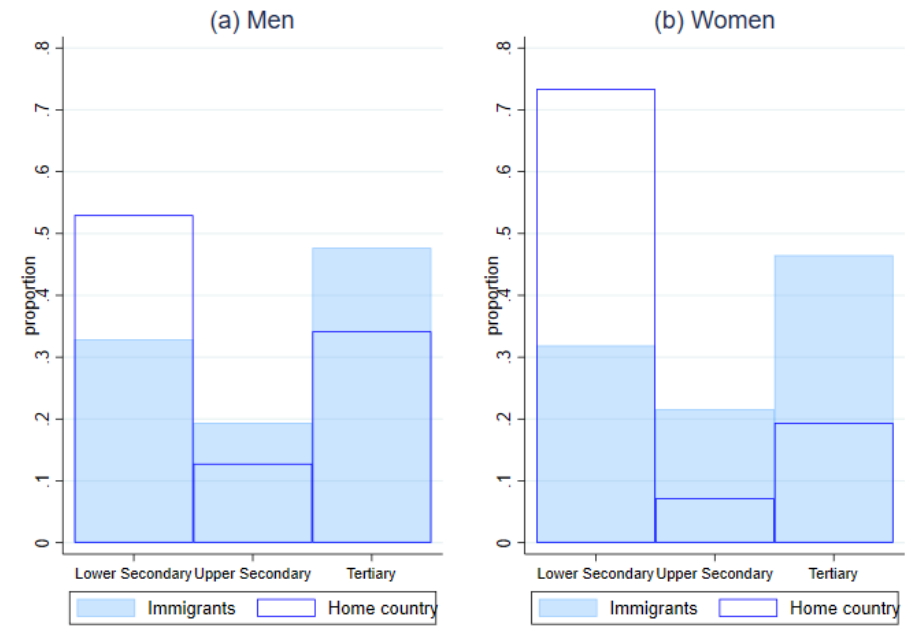
Marriage migrants are not a random selection of individuals from their countries of origin. Comparing India, Pakistan, and Bangladesh - countries from which most marriage migrants in the UK originate - reveals that these migrants tend to have higher educational attainment compared to the average in their home countries. This educational disparity is more pronounced among women than men.

Figure 2. Education Distribution: Marriage Migrants vs. Population in the Country of Origin

(a) Pakistani/Bangladeshi



(b) Indian



Notes. The figure compares the overall distribution of education of marriage migrants from India, Pakistan, and Bangladesh with their country of origin. *Source.* Census for England and Wales, 2011 & World Bank Data, 2011.

Table 3. Sorting into Marrying Abroad

	Dependant variable: College education			
	Muslim		Non-Muslim	
	Male	Female	Male	Female
without controls				
Marriage migration	-0.097***	-0.137***	-0.052***	-0.114***
	(-11.4)	(-17.2)	(-6.3)	(-12.8)
Region & cohort FE	Y	Y	Y	Y
R^2	0.038	0.056	0.038	0.047
N	12,458	12,857	21,060	19,687
with controls				
Marriage migration	-0.090***	-0.121***	-0.052***	-0.083***
	(-10.3)	(-14.9)	(-6.0)	(-8.9)
Region & cohort FE	Y	Y	Y	Y
R^2	0.041	0.064	0.040	0.059
N	12,245	12,634	20,567	19,128

Notes. Table shows results of the linear regression of education level (dummy variable equal to one if individual has college education and zero otherwise) on marriage migration. All regressions control for ethnic group, region, and 10 year age cohort. Regressions with controls also control for age, spouse's religion and ethnicity. Sample is limited to ethnic minorities. t statistics in parentheses. *p<0.10, **p<0.05, ***p<0.001. *Source.* Census for England and Wales, 2011.

2.3 Trade-offs in marriage migration

To assess how individuals trade off partner characteristics against marrying someone from abroad, we need to compare the attributes of spouses chosen from abroad with those of potential local matches, keeping everything else fixed. This comparison can be achieved by examining individuals with similar characteristics who make different marriage choices - one marrying abroad and the other marrying locally.

Table 4 compares spouses' educational levels between individuals in international and local marriages. Less-educated individuals in the UK who marry migrants tend to "marry up," selecting spouses with higher educational qualifications than those they could potentially match in local marriages. Those who marry migrants show a 3 to 6% greater likelihood of marrying a spouse with a higher educational background. This pattern is more pronounced among non-Muslims. Conversely, highly educated

individuals who choose international marriages tend to marry spouses with lower education compared to their counterparts who opt for local marriages. These findings persist even when controlling for other spousal characteristics.

Table 4. Trade-offs in Marrying Abroad: Education

	Dependant variable: Spouse's college education			
	Muslim		Non-Muslim	
	Male	Female	Male	Female
without controls				
Marriage migration × High education	-0.095***	-0.057***	-0.036***	-0.044***
	(-7.1)	(-3.7)	(-3.4)	(-3.7)
Marriage migration × Low education	0.018	0.046***	0.062***	0.052***
	(1.8)	(4.6)	(5.9)	(4.5)
Region & cohort FE	Y	Y	Y	Y
R^2	0.135	0.118	0.171	0.158
N	12,450	12,847	21,042	19,668
with controls				
Marriage migration × High education	-0.080***	-0.046**	-0.037**	-0.042***
	(-5.9)	(-3.0)	(-3.3)	(-3.3)
Marriage migration × Low education	0.027**	0.048***	0.060***	0.054***
	(2.7)	(4.8)	(5.4)	(4.5)
Region & cohort FE	Y	Y	Y	Y
R^2	0.139	0.118	0.170	0.160
N	12,237	12,625	20,549	19,109

Notes. Table shows results of the linear regression of spouse's education on marriage migration interacted with own education, controlling for own education, ethnic group, region, and 10-year age cohort. Regressions with controls also control for spouse's religion, ethnicity, and age gap in the marriage. t statistics in parentheses. *p<0.10, **p<0.05, ***p<0.001. *Source.* Census for England and Wales, 2011.

International marriages exhibit a distinct pattern of larger age differentials compared to domestic unions (Table A1). In the context of Muslim marriage migration, husbands tend to be approximately 0.5 years older than their wives relative to local marriages. For non-Muslim couples, the age gap varies significantly depending on whether the husband or wife is the migrant. When the wife is the migrant, the age gap between spouses is approximately 1.5 years greater than that observed in local marriages. These findings are consistent with established psychological research on

mate preferences, which indicates a tendency for men to seek younger partners and women to prefer older partners (Buss, 1989; Kenrick and Keefe, 1992; Bech-Sørensen and Pollet, 2016).

To summarize the reduced-form findings, the data reveals a consistent pattern whereby UK residents appear to leverage their nationality and the GDP differential between countries to secure partners from their country of origin who might be considered "higher quality" in terms of certain attributes. However, it is challenging to determine whether these patterns stem from marriage market availability or personal preferences. A reduced-form study cannot effectively separate these factors because marriage patterns result from a balance of forces on both demand and supply sides of the market. To disentangle the effects of market-level forces and individual-level preferences, I develop a structural model. The following section presents this model.

3 Model

This section introduces an open matching model that allows for migration in pursuit of a match. In this model, individuals can choose to match across borders not only for direct migration gains but also due to a higher abundance of desirable matches elsewhere. While this study primarily focuses on the marriage market context, where only one-to-one matching is possible, the model's applications extend well beyond this domain. It can be effectively employed to examine various types of two-sided matching, such as between CEOs and firms. Moreover, the model's framework can be adapted to analyze one-to-many matching scenarios (Corblet, 2022), enabling the study of matches between students and schools or workers and firms. This adaptability is particularly valuable in contexts where individuals relocate to secure more favorable matches, offering insights into a wide range of social and economic phenomena characterized by matching processes and geographic mobility.

The model is characterized as a static, frictionless, two-sided matching framework with transferable utilities, incorporating cross-border matching. In this frictionless context, individuals possess perfect and costless information about all potential partners, which is equivalent to assuming that each person selects from a representative distribution of the population. This assumption is particularly suitable when the primary focus is on analyzing partner selection patterns rather than modeling search frictions. Furthermore, given its inherent two-sided nature, the model exclusively

considers heterosexual marriages.[10]

Transfers allow individuals to compete for preferred partners by accepting lower personal gains from the match, thus increasing their partner's welfare (Chiappori, 2017). These transfers can take various forms, including monetary transfers such as bride price or dowry, and non-monetary transfers, like the allocation of time and resources post-marriage. The transferable utility model effectively captures the complexities of the marriage market by accounting for the exchange of benefits between partners. Moreover, incorporating transfers enables a comprehensive examination of the costs and benefits associated with marriage migration.

The model consists of a finite number of markets, each representing a different country. Due to typical data availability constraints, the analysis primarily focuses on decision-making within one market, referred to as "inside the country" . Individuals are characterized by observable characteristics, denoted as x for women and y for men. These characteristics determine an individual's type within the model. In this paper's context, these characteristics are:

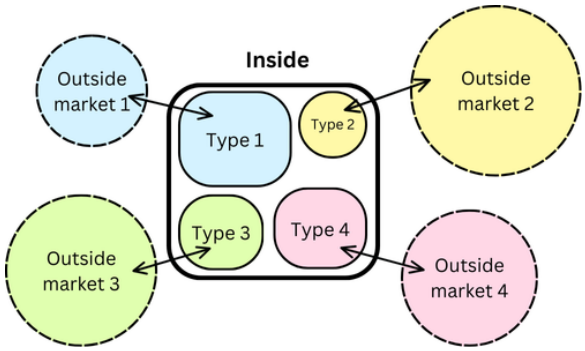
1. *Age group*, categorized in 10-year intervals:
    - Young: women aged 23-32, men aged 25-33
    - Middle-aged: women aged 33-42, men aged 35-43
    - Old: women aged 43-52, men aged 45-53
2. *Educational level*: a binary variable indicating college degree or higher. This factor is significant in the marriage market, as Chiappori et al. (2017) established its positive correlation with match payoff.
3. *Ethnicity*: a categorical variable including White British (majority), Other White, Indian, Pakistani/Bangladeshi, or Other.
4. *Religion*: a binary variable where 1 represents Muslim identification and 0 indicates non-Muslim affiliation.

There are X types of women and Y types of men, with their distribution varying by location (n_x^l and n_y^l). Each type of individual inside the country has access to a distinct outside market, implying that the characteristics of the outside market are type-specific (Figure 3). In the context of this study, each ethnic group is associated with a different outside market. However, all individuals within the same ethnic group have access to an identical outside market. This framework effectively captures people's connections to their countries of origin rather than to other countries, and

[10]The analysis of same-sex marriages requires a different framework, such as the model proposed by Ciscato et al. (2020).

aligns well with the observed data.

Figure 3. Inside and Outside Markets



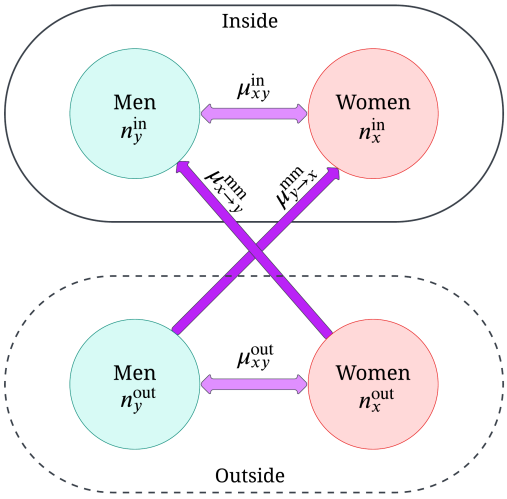
Notes: This graph shows four sample external markets for illustration.

Individuals inside the country can choose to (1) marry locally - with someone inside the country, (2) marry abroad - import a spouse, or (3) remain single. Individuals outside the country can choose to (1) marry locally - with someone outside the country, (2) migrate for marriage, or (3) remain single. In other words, the model assumes that marriage migration occurs only from outside to inside the country, as the study's primary focus is on immigration rather than out-migration, which is the more common scenario in developed countries. The model uses following notation to represent different types of matches:

1. μ_{xy}^{in}: Number of matches between women of type x and men of type y inside the country
2. μ_{xy}^{out}: Number of matches between women of type x and men of type y outside the country
3. $\mu_{x\to y}^{\text{m}}$: Number of matches where women of type x from outside the country marry men of type y within the country (woman is the migrant spouse)
4. $\mu_{y\to x}^{\text{m}}$: Number of matches where men of type y from outside the country marry women of type x within the country (man is the migrant spouse)
5. μ_{x0}^{in}: Number of single women of type x inside the country
6. μ_{0y}^{in}: Number of single men of type y inside the country
7. μ_{x0}^{out}: Number of single women of type x outside the country
8. μ_{0y}^{out}: Number of single men of type y outside the country

In this study, the analyst only observes distribution and matches that occur within the country, plus marriage migrations ($\mu_{x0}^{\text{in}}, \mu_{0y}^{\text{in}}, \mu_{xy}^{\text{in}}, \mu_{x\to y}^{\text{m}}, \mu_{y\to x}^{\text{m}}, n_x^{\text{in}}$, and n_y^{in} for each

Figure 4. Matching Depiction



Notes. Migration is one-way; from outside to inside of the country. Only marriage migration and matching inside the country are observed.

x and y). Feasible matching occurs when each individual is paired with a maximum of one partner. Therefore, the feasibility conditions are:

$$n_x^{\text{in}} = \sum_{y=1}^{Y} \mu_{xy}^{\text{in}} + \sum_{y=1}^{Y} \mu_{y\to x}^{\text{m}} + \mu_{x0}^{\text{in}}, \quad x = 1, ..., X \tag{1}$$

$$n_y^{\text{in}} = \sum_{x=1}^{X} \mu_{xy}^{\text{in}} + \sum_{x=1}^{X} \mu_{x\to y}^{\text{m}} + \mu_{0y}^{\text{in}}, \quad y = 1, ..., Y \tag{2}$$

A feasible matching is considered stable if two conditions are met: (1) no pair of individuals would prefer to match with each other over their current situations, and (2) no matched individual would prefer to remain single rather than maintain their current match.

The marriage payoff is represented by a random utility function comprising a deterministic component and a random unobserved taste shock (McFadden, 1974). Following common practice in the literature, I assume that the deterministic and stochastic components of utility are separable.[11] Consequently, these components enter the utility function additively, without interaction between observable and un-

[11]This assumption may be challenged if individuals have idiosyncratic preferences for unobserved characteristics of their potential partners. However, Chiappori et al. (2019) demonstrates that even when the assumption is only approximately correct, it generates only small biases.

observable factors. Thus, the utility of a woman i of type x who matches with a man of type y is:

$$U^l_{ixym} = U^l(x, y, m) + \varepsilon^l_{ixym}, \quad x = 1, ..., X; \; y = 1, ..., Y; \; l = \{\text{in}, \text{out}\} \tag{3}$$

Similarly, utility of the type y man j who marries type x woman is:

$$V^l_{jyxm} = V^l(y, x, m) + \eta^l_{jyxm}, \quad x = 1, ..., X; \; y = 1, ..., Y; \quad l = \{\text{in}, \text{out}\} \tag{4}$$

$U^l(x, y, m)$ and $V^l(y, x, m)$ represent the deterministic components of utilities, dependent on observed characteristics, individual location, and whether the marriage involves migration. Here, m is a binary variable: 1 if the marriage involves migration, 0 otherwise. The deterministic utility of remaining single is normalized to zero for each type: $U^l(x, 0, 0) = V^l(y, 0, 0) = 0$. ε_{ixym} and η_{jyxm} denote unobserved, idiosyncratic group-specific taste shocks. Specifically, ε_{ixym} represents the idiosyncratic preference of woman i of type x for man type y, while η_{jyxm} represents the idiosyncratic preference of man j of type y for woman type x. These taste shocks are identically distributed and independent of the individuals' observable characteristics (i.i.d.). Consequently, the deterministic part of the utility function indicates the relative importance of observed characteristics compared to the unobserved component.

If the researcher does not fully know the taste shock distribution, the one-to-one transferable utility model is underidentified (Galichon and Salanié, 2022a). Without constraints on this distribution, the model provides no information about the systematic match surplus, as any surplus value can be rationalized by a corresponding taste shock distribution that fits the observed data (Gualdani and Sinha, 2023). To address this identification issue and for simplicity, I follow the approach of Choo and Siow (2006), assuming that taste shocks are drawn from an extreme value type I distribution.[12] This assumption transforms the model into a convenient two-sided just-identified Logit model, suitable for studying the primary mechanisms of marriage migration.

Galichon and Salanié (2017) demonstrates that the Logit assumption leads to a modified Independence of Irrelevant Alternatives (IIA) for separable matching models: double odds ratios ($\mu_{xy}\mu_{zt}/\mu_{xt}\mu_{zy}$) are independent of all subpopulation sizes.[13]

[12]The probability distribution function of random variable x with extreme value type I distribution is $f(x) = \exp(x)\exp(-\exp(x))$.

[13]In a one-sided Logit model, the IIA property implies that single odds ratios are independent of population size.

Further details and proofs regarding the IIA property are provided in Appendix C. The potential consequences of violating this assumption are addressed in the estimation section of this paper.

The deterministic part of the marriage payoff consists of three components: (1) the utility derived from observable characteristics of partners in the match. (2) an equilibrium transfer between partners. This transfer can be positive or negative and depends on the location and types of individuals involved. (3) a migration utility, applicable only when the marriage involves relocation. The main assumption is that the utility from observed characteristics is separable from the migration utility. In other words, endogamy preferences do not interact with the utility gain from migration. The implications of violating this assumption are discussed in the estimation section.

For a woman of type x located inside the country, her utility of a match is equal to:

$$U^{\text{in}}(x, y, m) = f(x, y) + b^1_{y \to x} \times m - \tau^{\text{in}}_{xy} \times (1 - m) - \tau^{\text{m}}_{y \to x} \times m$$

$f(x, y)$ represents the utility derived from observable characteristics for women in a match between types x and y. The term $b^1_{y \to x}$ denotes the migration utility for the local partner, which becomes non-zero if the local spouse has a preference for a partner who grew up outside the country (a migrant partner). As for transfers, τ^{in}_{xy} signifies the equilibrium transfer from a man of type y to a woman of type x in a local match, while $\tau^{\text{m}}_{y \to x}$ represents the equilibrium transfer in cases where the spouse is a migrant, specifically from a migrant man of type y to a local woman of type x.

If a woman of type x is located outside the country, her marriage utility is:

$$U^{\text{out}}(x, y, m) = f(x, y) + b^2_{x \to y} \times m - \tau^{\text{out}}_{xy} \times (1 - m) - \tau^{\text{m}}_{x \to y} \times m$$

The migration utility for the migrant spouse, $b^2_{x \to y}$, encompasses both the costs and benefits of relocating.[14]

Utility of marriage can be written similarly for men of type y inside and outside the country:

$$V^{\text{in}}(y, x, m) = g(y, x) + b^1_{x \to y} \times m + \tau^{\text{in}}_{xy} \times (1 - m) + \tau^{\text{m}}_{x \to y} \times m$$
$$V^{\text{out}}(y, x, m) = g(y, x) + b^2_{y \to x} \times m + \tau^{\text{out}}_{xy} \times (1 - m) + \tau^{\text{m}}_{x \to y} \times m$$

[14]The migration utility can be negative or positive.

Here, $g(x, y)$ represents the utility derived from observable characteristics for men. The migration utilities and transfers for men are defined analogously to those in the women's utility functions, but from the men's perspective. Given that transfers occur between partners, transfers for men mirror those of women but with an opposite sign[15].

In the equilibrium, each individual maximizes their utility. Following the approach of McFadden (1974) and Choo and Siow (2006), The probability of a match between a woman type x and a man type y inside the country is:[16]

$$P\{y, 0 = \underset{z=1,...Y;m=0,1}{\arg\max} U^{\text{in}}_{ixzm}\} = \frac{\exp\left[U^{\text{in}}(x, y, 0)\right]}{\sum_{z=0}^{Y} \exp\left[U^{\text{in}}(x, z, 0)\right] + \sum_{z=0}^{Y} \exp\left[U^{\text{in}}(x, z, 1)\right]}$$

This equation demonstrates that the probability of a match is a function of the exponential of the utility of that specific match, divided by the sum of the exponentials of the utilities of all possible matches, including those with partners both inside and outside the country. In equilibrium, transfers (prices) clear the market; therefore:

$$\Phi_{xy} \equiv U^{\text{in}}(x, y, 0) + V^{\text{in}}(y, x, 0) = f(x, y) + g(y, x) = 2 \ln \left[\frac{\mu^{\text{in}}_{xy}}{\sqrt{\mu^{\text{in}}_{x0} \mu^{\text{in}}_{0y}}} \right] \tag{5}$$

Here, Φ_{xy} represents the value of a match between a woman of type x and a man of type y when they marry locally. This value is identifiable from the relative share of local matches. The equation shows that Φ_{xy} is equal to the sum of utilities for both partners in a local marriage, which in turn is equivalent to a function of the ratio of matched couples to the geometric mean of singles of each type. For marriages that involve migration we have:

$$\Phi^{\text{mm}}_{y \to x} \equiv \Phi_{xy} + b_{y \to x} = 2 \ln \left[\frac{\mu^{\text{mm}}_{y \to x}}{\sqrt{\mu^{\text{in}}_{x0} \mu^{\text{out}}_{0y}}} \right]$$

$$\Phi^{\text{mm}}_{x \to y} \equiv \Phi_{xy} + b_{x \to y} = 2 \ln \left[\frac{\mu^{\text{mm}}_{x \to y}}{\sqrt{\mu^{\text{out}}_{x0} \mu^{\text{in}}_{0y}}} \right]$$

[15]The selection of sign is arbitrary, as transfers can be either positive or negative for both men and women.

[16]Derivations are provided in Appendix B

Where $\Phi^{\text{mm}}_{y\to x}$ and $\Phi^{\text{mm}}_{x\to y}$ represent the match values when the husband and wife are migrants, respectively. Parameters $b_{y\to x}$ and $b_{x\to y}$ represent the joint migration utility of the migrant and the native spouse ($b_{y\to x} = b^1_{y\to x} + b^2_{y\to x}$ and $b_{x\to y} = b^1_{x\to y} + b^2_{x\to y}$). From this point forward, the joint migration utility will be referred to simply as migration utility. Combining the above equations with Equation 5 gives migration gains that are identifiable from data:

$$B_{y\to x} \equiv b_{y\to x} + \ln[\mu^{\text{out}}_{0y}] = 2\ln\left[\frac{\mu^{\text{mm}}_{y\to x}}{\mu^{\text{in}}_{xy}}\right] + \ln[\mu^{\text{in}}_{0y}], \tag{6}$$

$$B_{x\to y} \equiv b_{x\to y} + \ln[\mu^{\text{out}}_{x0}] = 2\ln\left[\frac{\mu^{\text{mm}}_{x\to y}}{\mu^{\text{in}}_{xy}}\right] + \ln[\mu^{\text{in}}_{x0}] \tag{7}$$

These equations define the identifiable migration gains $B_{y\to x}$ and $B_{x\to y}$. These gains encompass the combined impact of two factors: (1) the utility derived from relocation and (2) the access to a broader market (outside market). The right-hand sides of these equations show how these gains can be calculated from observable match data. If a dataset includes observations of the outside market, the migration utility can be identified independently. However, even with access to data from only one market, we are still able to identify migration gains.

Endogamy preferences and migration gains contribute to the difference between the utility of marrying from abroad and local marriage. The utility gap can be directly measured by the following equations:

$$\Delta U^{\text{in}}(x,y) = U^{\text{in}}(x,y,1) - U^{\text{in}}(x,y,0) = b^1_{y\to x} + \tau_{xy,0} - \tau_{xy,1} = \ln\left[\frac{\mu^{\text{m}}_{y\to x}}{\mu^{\text{in}}_{xy}}\right], \tag{8}$$

$$\Delta V^{\text{in}}(y,x) = V^{\text{in}}(y,x,1) - V^{\text{in}}(y,x,0) = b^1_{x\to y} + \tau_{xy,1} + \tau_{xy,0} = \ln\left[\frac{\mu^{\text{m}}_{x\to y}}{\mu^{\text{in}}_{xy}}\right] \tag{9}$$

To summarize, the intuition underlying the equilibrium equations of the model is that people choose among alternative possible spouses based on their relative attractiveness. The probability of choosing a spouse is determined by comparing the systematic utility of that choice to the sum of the systematic utilities of all available options. The probability of selecting a spouse is determined by comparing the systematic utility of that choice to the sum of systematic utilities of all available options. The utility gap between marrying locally and marrying abroad arises from two factors: migration gains and endogamy preferences. Migration gains include both utility from migration and impact of access to an additional outside market. Endogamy

preferences encourage marriage migration, as individuals are more likely to find partners from their own group in the outside market where such individuals are more abundant. These factors interact, with higher endogamy preferences amplifying the influence of migration gains.

To conduct simulation and counterfactual analyses, it is crucial to compute the equilibrium based on various model parameters. For this purpose, I employ the Iterative Proportional Fitting Procedure (IPFP). The details of this algorithm, as applied to the model in this section, are provided in Appendix D. The primary advantage of the IPFP algorithm is its computational efficiency compared to alternative solving methods. To demonstrate the model's capabilities, Appendix E presents simulation results using a toy model. These simulations illustrate how changes in utility parameters influence intermarriage and marriage migration rates, providing valuable insights into the model's behavior under different scenarios.

4 Estimation

The observed distribution of matches across different types reflects individuals' preferences. That is, the proportion of individuals in each type corresponds to the probability of selecting that option, directly reflecting their preferences. By inverting this process, preferences can be identified from observed realized matches. This section presents the methodology for estimating preferences and migration gains from observed matching patterns and type availabilities.

One approach to parametrically estimate the model is through Entropic Regularization, as recommended in optimal transport theory (Cuturi, 2013). This method offers substantial computational advantages, particularly for high-dimensional data. Under the model's assumptions, the stable matching is unique and maximizes social surplus. Galichon and Salanié (2022a) shows that stable matching solves the following welfare-maximizing problem:

$$\max_{\boldsymbol{\mu}} \left(\sum_{x,y} \mu_{xy} \Phi_{xy}^{\boldsymbol{\beta}} + \mathcal{E}(\boldsymbol{\mu}, \boldsymbol{n}) \right)$$

Here, $\boldsymbol{\beta}$ represents preference parameters, and $\mathcal{E}(\boldsymbol{\mu}, \boldsymbol{n})$ is the generalized entropy of the matching pattern, depending solely on the matching patterns $\boldsymbol{\mu}$ and availabilities $\boldsymbol{n} = (\boldsymbol{n_x}, \boldsymbol{n_y})$. The generalized entropy quantifies the contribution of unobservables to the social surplus in matching, with its functional form determined by the distri-

butional assumption of unobservables.

To maximize welfare, the following equation must be satisfied:

$$\Phi^{\boldsymbol{\beta}}_{xy} = -\frac{\partial \mathcal{E}(\boldsymbol{\mu}, \boldsymbol{n})}{\partial \mu_{xy}}, \quad \forall x, y$$

The welfare maximization condition provides a foundation for implementing Minimum Distance Estimation (MDE) to estimate the parameters of the joint surplus function ($\boldsymbol{\beta}$). This approach is chosen due to its superior fitting performance when dealing with a large number of types, compared to the alternative Moment-based Estimation by Poisson Regression proposed by Galichon and Salanié (2022b). Given the availabilities ($\boldsymbol{n}$), the MDE technique estimates parameter values that best align with the welfare maximizing conditions:

$$\boldsymbol{D}^{\boldsymbol{\beta}}(\boldsymbol{\mu}, \boldsymbol{n}) \equiv \boldsymbol{\Phi}^{\boldsymbol{\beta}} + \frac{\partial \mathcal{E}(\boldsymbol{\mu}, \boldsymbol{n})}{\partial \boldsymbol{\mu}} = \mathbf{0}$$

The observed counterparts of the population values $\boldsymbol{\mu}$ and $\boldsymbol{n}$ are denoted as $\hat{\boldsymbol{\mu}}$ and $\hat{\boldsymbol{n}}$, respectively. Given a known distribution of unobservables, a consistent estimator for the parameters $\boldsymbol{\beta}$ can be obtained using the following procedure (Galichon and Salanié, 2022b):[17]

1. Choose any positive definite matrix ($\boldsymbol{S}$) and minimize over $\boldsymbol{\beta} \in \mathbb{R}^d$ (d is the number of parameters):

$$\left|\left|\boldsymbol{D}^{\boldsymbol{\beta}}(\hat{\boldsymbol{\mu}}, \hat{\boldsymbol{n}})\right|\right|^2_{\boldsymbol{S}} = \sum_{x,y,z,t} S_{xy,zt} \left(\Phi^{\boldsymbol{\beta}}_{xy} + \frac{\partial \mathcal{E}(\hat{\boldsymbol{\mu}}, \hat{\boldsymbol{n}})}{\partial \mu_{xy}}\right) \left(\Phi^{\boldsymbol{\beta}}_{zt} + \frac{\partial \mathcal{E}(\hat{\boldsymbol{\mu}}, \hat{\boldsymbol{n}})}{\partial \mu_{zt}}\right)$$

   This gives a consistent estimator $\hat{\boldsymbol{\beta}}$.

2. Use the delta method to estimate the variance $\hat{\boldsymbol{\Omega}}$ at $\boldsymbol{\beta} = \hat{\boldsymbol{\beta}}$; let $\hat{\boldsymbol{S}} = (\hat{\boldsymbol{\Omega}})^{-1}$.

3. Repeat step 1 to obtain another consistent estimator $\hat{\boldsymbol{\beta}}$. The variance-covariance estimator of this estimator can be consistently estimated by $(\hat{\boldsymbol{F}}'\hat{\boldsymbol{S}}\hat{\boldsymbol{F}})^{-1}$, where $\hat{\boldsymbol{F}}$ is the Jacobian of $\boldsymbol{D}^{\boldsymbol{\beta}}$ with respect to $\boldsymbol{\beta}$ at $\hat{\boldsymbol{\beta}}$.

Following the common approach in the literature, I assume that the joint surplus is linear in the parameters: $\boldsymbol{\Phi}^{\boldsymbol{\beta}} = \boldsymbol{\beta}\boldsymbol{\phi}$. This assumption simplifies the procedure

[17] Refer to Galichon and Salanié (2022b) for the formal proof.

mentioned above to a quasi-generalized least squares (QGLS). After imposing the Logit assumption on the taste shock distribution, the generalized entropy is equal to:

$$\frac{\partial \mathcal{E}(\boldsymbol{\mu}, \boldsymbol{n})}{\partial \mu_{xy}} = -\ln\left[\frac{\mu_{xy}}{\mu_{x0}}\right] - \ln\left[\frac{\mu_{xy}}{\mu_{0y}}\right]$$

Since the general entropy for the Logit distribution is independent of subpopulation sizes, the model can be estimated by dividing it into two parallel markets. Therefore, the minimum distance estimation for preference estimation simplifies to the following least square regression:

$$2\ln\left[\hat{\mu}^{\text{in}}_{xy}/\sqrt{\hat{\mu}^{\text{in}}_{x0}\hat{\mu}^{\text{in}}_{0y}}\right] \text{ on } \phi_{xy}$$

where observations are the complete set of combinations of x and y. Migration gains can be directly estimated from Equations (6) and (7) for each type combination (x and y). This approach allows for a simplified estimation process, leveraging the properties of the Logit distribution and the structure of the model to estimate both preferences and migration gains.

A common challenge in these estimations is the occurrence of cells with zero observations, especially when dealing with numerous observable characteristics. This scenario leads to partial derivatives of the generalized entropy yielding infinite values, consequently rendering $\boldsymbol{\beta}$ indeterminate. A straightforward solution is to introduce a small positive increment (δ) to the $\hat{\boldsymbol{\mu}}$ values. This adjustment is implemented as follows:

$$\tilde{\boldsymbol{\mu}} = \frac{\hat{\boldsymbol{\mu}} + \delta}{N + \delta} N$$

Where N represents the sample size. This modification preserves the total number of households in the sample and corrects for finite-sample bias (Galichon and Salanié, 2022b).

The model relies on two key assumptions for estimation: (1) Independence of Irrelevant Alternatives (IIA), derived from the Logit assumption for heterogeneities, and (2) the separability of migration utility. If IIA does not hold, endogamy preferences might depend on population sizes in addition to the ratio of inside versus outside group marriages. This implies that larger populations could suggest reduced endogamy preferences, as individuals in larger markets may find it easier to locate partners with similar characteristics. Consequently, estimated endogamy preferences under these circumstances could represent an upper limit. When separability is vi-

olated, it suggests that endogamy preferences may either complement (resulting in a positive interaction) or or be substituted for (yielding a negative interaction) with migration utility. Depending on the nature of this interaction, estimated endogamy preferences could be either under- or over-estimated. These considerations highlight the potential limitations of the model and the importance of interpreting the results with these assumptions in mind.

5 Results

This section presents the findings in four parts. First, I report the estimated preferences derived from the methodology described in the estimation section. Second, I examine the evolution of these preferences over time. Third, I decompose the observed marriage migration rate into its primary determinants: endogamy preferences and migration gains. Finally, I compare estimates for Muslims with those of other religious groups.

5.1 Preferences

The estimated parameters ($\boldsymbol{\beta}$) of the joint marriage surplus show how various attributes increase the systematic component of the marriage payoff. Specifically, these parameters quantify the relative importance of these attributes compared to idiosyncratic taste shocks, which encompass the effects of all unobservable variables, including factors such as emotional connection or compatibility. Consequently, we can interpret the coefficients of the utility function as the marginal rate of substitution between an observable attribute in the marriage market and love. A larger coefficient for a given attribute implies that an individual requires a higher degree of love to offset a deficiency in that specific observable characteristic of their potential partner.

My primary focus regarding the utility parameters is the value individuals assign to endogamy. I can quantify this value by comparing the surplus generated from an endogamous match between types z and z' to that of an exogamous match. This comparison is achieved through the following double difference:

$$\mathcal{D}_{zz'} = \Phi(x = z, y = z) + \Phi(x = z', y = z') - \Phi(x = z, y = z') - \Phi(x = z', y = z)$$

This equation calculates the difference in surplus between two endogamous matches (where partners are of the same type) and two exogamous matches (where partners

are of different types). A positive value of $\mathcal{D}_{zz'}$ indicates a preference for endogamy, as it shows that the combined surplus from endogamous matches exceeds that of exogamous matches.

For instance, consider the case where z represents Muslims and z' represents non-Muslims. In this context, $\mathcal{D}_{zz'}$ quantifies the difference in total utility between two scenarios: (1) a Muslim man marrying a Muslim woman and a non-Muslim man marrying a non-Muslim woman, versus (2) a Muslim man marrying a non-Muslim woman and a non-Muslim man marrying a Muslim woman. It is important to note that it is not feasible to identify preferences separately for men and women with data only on realized matches. The observed probability of intermarriage is a result of the interaction between both partners, as they both need to agree on the match.

Table 5. Estimated Endogamy Preferences

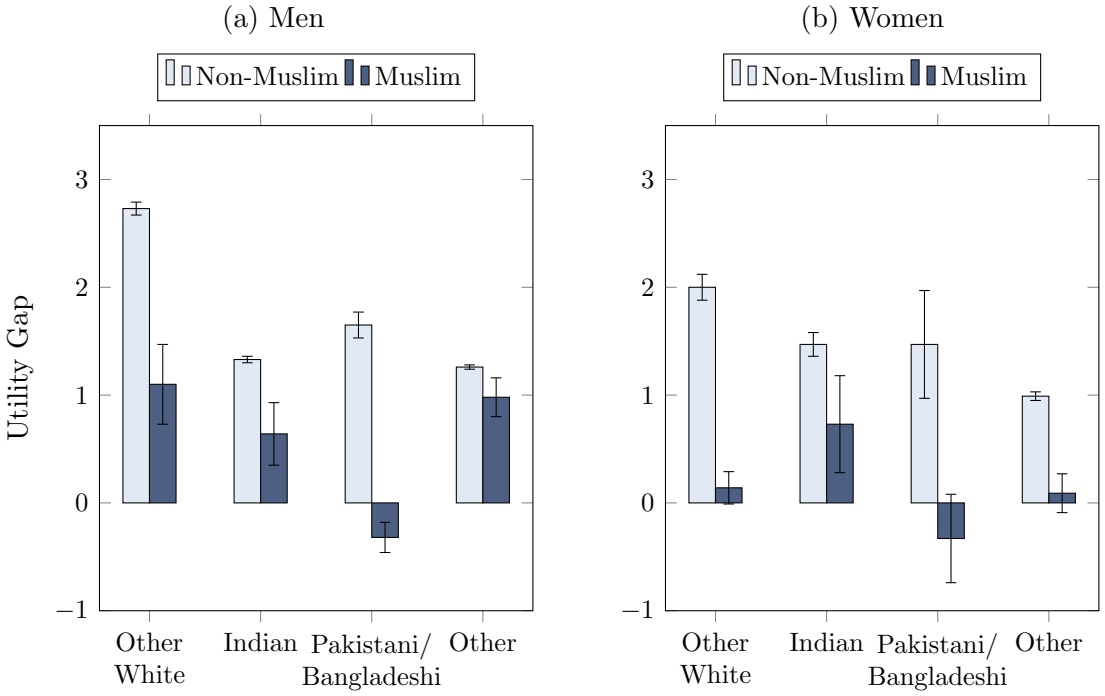
	$\mathcal{D}_{zz'} = \Phi_{zz} + \Phi_{z'z'} - \Phi_{zz'} - \Phi_{z'z}$	
Groups (z & z')	Non-Muslim	Muslim
Age		
Young & Middle-aged	6.50	7.93
	(0.47)	(0.47)
Young & Old	9.89	9.73
	(0.47)	(0.47)
Middle-aged & Old	5.59	7.49
	(0.47)	(0.47)
Education		
Low & High	4.04	3.40
	(0.21)	(0.21)
Ethnicity		
Other White & White British	5.85	4.18
	(1.31)	(1.31)
Indian & White British	14.93	13.41
	(1.31)	(1.31)
Pak/Bng & White British	14.05	7.67
	(1.31)	(1.31)
Other & White British	10.11	2.82
	(1.31)	(1.31)
Religion		
Muslim & Non-Muslim	22.67	22.67
	(1.15)	(1.15)

Notes. This table presents the estimated surplus generated from endogamous marriages compared to exogamous marriages for various groups, ceteris paribus. Standard errors in parenthesis.

Table 5 presents utility gain from various forms of endogamy. It shows that Mus-

lims exhibit a stronger aversion to significant age gaps compared to non-Muslims. By examining endogamy across different characteristics, we find that individuals prioritize matching by religion first, followed by ethnicity, and then education. The surplus associated with ethnic endogamy is notably higher for non-Muslims than for Muslims, suggesting that Muslims exhibit less resistance to ethnic mixing. Moreover, among all ethnic combinations, White British and Other White individuals show the least aversion to intermarriage, likely due to their greater cultural and ethnic affinities.

Figure 5. Utility Gap: Local Marriage vs. Marriage Migration by Religion



Notes. The figure illustrates the difference in utility of marrying from abroad and marrying locally while holding all other characteristics constant. Error bars show 95% confidence intervals.

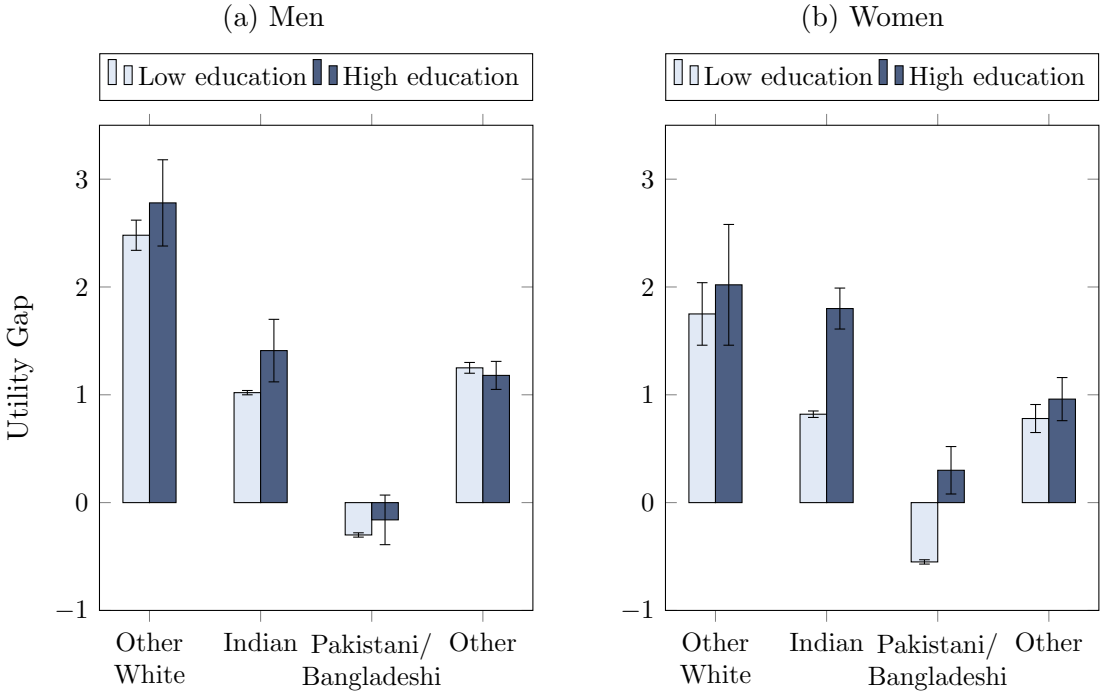
Utility gaps – defined as the difference between the utility of marrying abroad versus locally, controlling for observed characteristics – are estimated using equations (8) and (9). They are presented in Figure 5. Muslims have a lower utility gap in comparison to non-Muslims. Notably, for Pakistani and Bangladeshi Muslims, the negative value of the utility gap indicates that their first choice is to find a spouse from their country of origin rather than in the UK. Furthermore, the data indicates that women, on average, derive greater utility from importing a spouse than men do.

Since the 'Other' category encompasses multiple ethnicities, and the observed disparity between Muslims and non-Muslims within this group is largely attributable to

the distinction between individuals from Muslim-majority and non-Muslim-majority countries. Notably, women from Muslim-majority countries derive significantly greater benefits from importing spouses than men do.

Variations in utility gaps across ethnicities can be partially attributed to differences in their educational distributions. As illustrated in Figure 6, individuals with lower levels of education gain more from marrying abroad. This advantage stems from their ability to find more educated spouses overseas, a phenomenon discussed in Section 2. For instance, Muslim Indians, with a higher rate of college education (40%) compared to Muslim Pakistani/Bangladeshis (35%), exhibit a lower propensity for marrying abroad.

Figure 6. Utility Gap: Local Marriage vs. Marriage Migration by Education Level



Notes. The figure illustrates the difference in utility of marrying from abroad and marrying locally while holding all other characteristics constant. High education is defined as a college education or more, while low education is defined as less than a college education. Error bars show 95% confidence intervals.

To assess the model's goodness of fit, Table A2 compares the model predictions with observed matching outcomes. This comparison, based on estimated parameters, evaluates how well the model aligns with the observed matching equilibrium. The results demonstrate that the estimated parameters successfully capture all major patterns evident in the data.

The primary contribution of this paper's model is the incorporation of marriage migration. To demonstrate how neglecting this aspect introduces bias in estimating marriage preferences among ethnic minorities, Table A3 presents preference estimates from a classical matching model that excludes marriage migration. These estimates reveal a significant overestimation of the utility derived from ethnic endogamy. This bias arises from failing to account for ethnic minorities' access to a cheaper external marriage market, which explains a portion of their intra-ethnic marriages.

5.1.1 Temporal Comparison

In this subsection, I explore how preferences for endogamy vary between different cohorts and periods.

Table 6. Estimated Endogamy Preferences by Age Cohort

	$\mathcal{D}_{zz'} = \Phi_{zz} + \Phi_{z'z'} - \Phi_{zz'} - \Phi_{z'z}$					
	Muslim			Non-Muslim		
Groups (z & z')	Young	Middle-aged	Old	Young	Middle-aged	Old
Education						
Low & High	5.74	5.93	5.30	5.10	1.94	4.66
	(0.59)	(0.59)	(0.59)	(0.59)	(0.59)	(0.59)
Ethnicity						
Other White & White British	8.03	7.04	7.26	6.35	5.37	5.59
	(3.7)	(3.7)	(3.7)	(3.7)	(3.7)	(3.7)
Indian & White British	18.20	18.50	18.36	16.68	16.97	16.84
	(3.7)	(3.7)	(3.7)	(3.7)	(3.7)	(3.7)
Pak/Bng & White British	17.48	14.07	15.68	11.10	7.70	9.30
	(3.7)	(3.7)	(3.7)	(3.7)	(3.7)	(3.7)
Other & White British	13.07	13.78	12.47	5.78	6.49	5.18
	(3.7)	(3.7)	(3.7)	(3.7)	(3.7)	(3.7)
Religion						
Muslim & Non-Muslim	24.46	23.62	22.45	24.46	23.62	22.45
	(1.43)	(1.43)	(1.43)	(1.43)	(1.43)	(1.43)

Notes. The table shows the estimated surplus generated from marrying within a group rather than mixing by age cohort. [1]Young: women aged 23-32 and men aged 25-34. [2]Middle-aged: women aged 33-42 and men aged 35-44. [3]Old: women aged 43-52 and men aged 45-54. Standard errors in parenthesis.

Using data from the 2011 Census, I estimate coefficients by age cohort by introducing interactions between endogamy preferences and age. Table 6 presents these

Table 7. Estimated Endogamy Preferences by Year

	$\mathcal{D}_{zz'} = \Phi_{zz} + \Phi_{z'z'} - \Phi_{zz'} - \Phi_{z'z}$			
	2011		2001	
Groups (z & z')	Muslim	Non-Muslim	Muslim	Non-Muslim
Education				
Low & High	3.21	2.12	4.09	2.81
	(0.14)	(0.15)	(0.21)	(0.21)
Religion				
Muslim & Non-Muslim	22.31	22.31	20.9	20.9
	(0.76)	(0.76)	(1.19)	(1.19)

Notes. The table shows the estimated surplus generated from endogamy rather than mixing by year. For estimation, marriage migration is redefined as marriage between an individual born in the UK and an individual born outside the UK. Coefficients for ethnic endogamy preferences are not reported due to the low number of observations. Standard errors in parenthesis.

results, revealing a negative relationship between ethnic and religious endogamy preferences and age. Specifically, younger individuals exhibit stronger religious and ethnic endogamy preferences compared to older cohorts. This trend could be attributed to either inherently stronger preferences among young individuals or a selection effect where those with stronger endogamy preferences tend to marry earlier. It is important to note that the model estimates only the average effect, ignoring heterogeneity in religious preferences within religious groups.

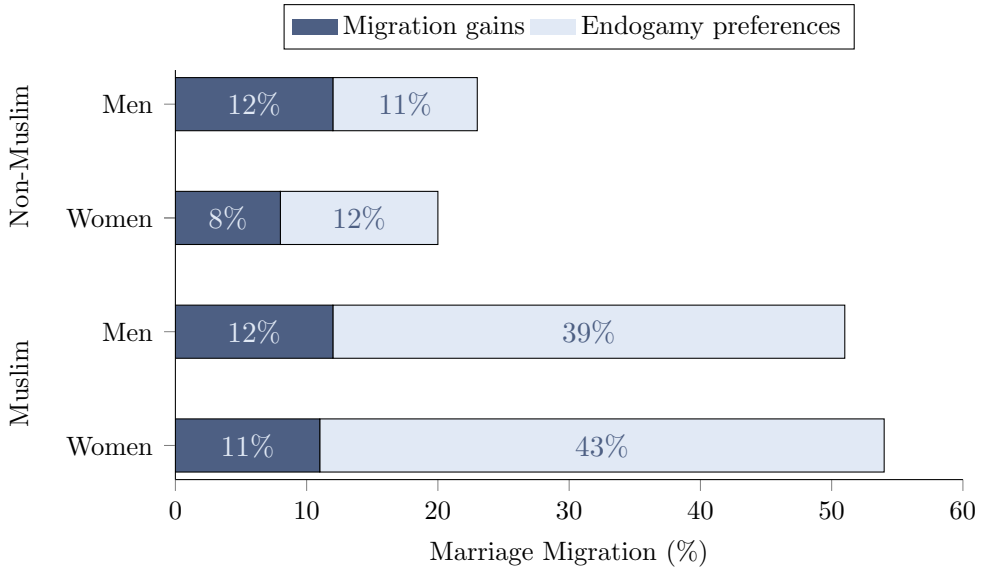
To compare estimates over time, I analyze data from both the 2011 and 2001 Censuses. Due to the 2001 Census lacking information on migration year, I adjust the definition of marriage migration for this comparison. Specifically, marriage migration is redefined as marriages between UK-born ethnic minorities and those born abroad. Table 7 presents these findings.

The results show that gains from religious endogamy in 2001 are smaller than in 2011, indicating an increase in preferences for religious endogamy over time. This trend aligns with the stronger endogamy preferences observed among younger demographics. Additionally, the importance of educational homogamy appears to decrease over time. The rise in religious endogamy preferences across cohorts and time may be attributed to increasing Islamophobia and recent terrorist attacks, which have led to a backlash against Muslims in various Western countries (Gould and Klor, 2016; Allen, 2016).

5.2 Determinants of Marriage Migration

To disentangle the effects of endogamy preferences from migration gains, I compute a marriage migration equilibrium assuming no preferences for ethnic or religious homogamy. Under these conditions, any observed marriage migration is solely attributed to migration gains, without the influence of endogamy preferences. The difference between this calculated rate and the actual observed marriage migration rate thus quantifies the effect of endogamy preferences.

Figure 7. Determinants of Marriage Migration



Notes. Each bar shows the contribution of migration gains and endogamy preferences to the overall observed marriage migration rate. The sample is limited to ethnic minorities (not White British).

Figure 7 illustrate the contributions of migration gains and endogamy preferences to marriage migration of ethnic minorities. While only about 20% of Muslim marriage migration can be attributed to migration gains, this factor explains approximately half of the marriage migration rate among non-Muslims. Endogamy preferences are higher for women than for men. If endogamy preferences were absent, marriage migration rates for both Muslims and non-Muslims would decline to about 11%.

Table A4 presents extended results of the counterfactual analysis. Without endogamy preferences, the utility gap for Muslims increases to a level comparable to that of non-Muslims. In this scenario, approximately 86% of Muslims would engage in interreligious marriages, while the rate of interethnic marriages among ethnic minorities would surge to between 80% and 90%. These findings strongly suggest that

the low incidence of intermarriages and the high rate of marriage migration among Muslims are primarily attributed to their preference for endogamy, rather than to gains derived from migration.

The definition of marriage migration provided in this paper may potentially overestimate the marriage migration rate (as discussed in the data section). This is because some immigrant individuals who married a British partner in the UK may have already had residency in the UK before the marriage. Consequently, these individuals gain fewer or no migration benefits compared to those who come to the UK solely for marriage. As a result, the migration gains estimated in the results section should be interpreted as an upper bound.

Appendix H presents a series of robustness checks for the results:

- Including cohabiting couples: For local marriages, cohabiting couples are included in the married group. This is not possible for marriage migration due to spouse visa requirements. While this slightly lowers religious intermarriage preferences, the main findings on marriage migration determinants remain consistent.

- Limiting the geographic area: Results remain robust across different geographical scopes.

- Focusing on UK-born individuals: By removing first-generation immigrants, I find that the main results do not change significantly for second-generation immigrants.

- Refining the marriage migration definition: To reduce potential overestimation, individuals who arrived in the UK as adults and obtained a university degree in the UK are excluded from the migrant spouse group. This adjustment decreases the estimated impact of migration gains on overall marriage migration by 2 percentage points.

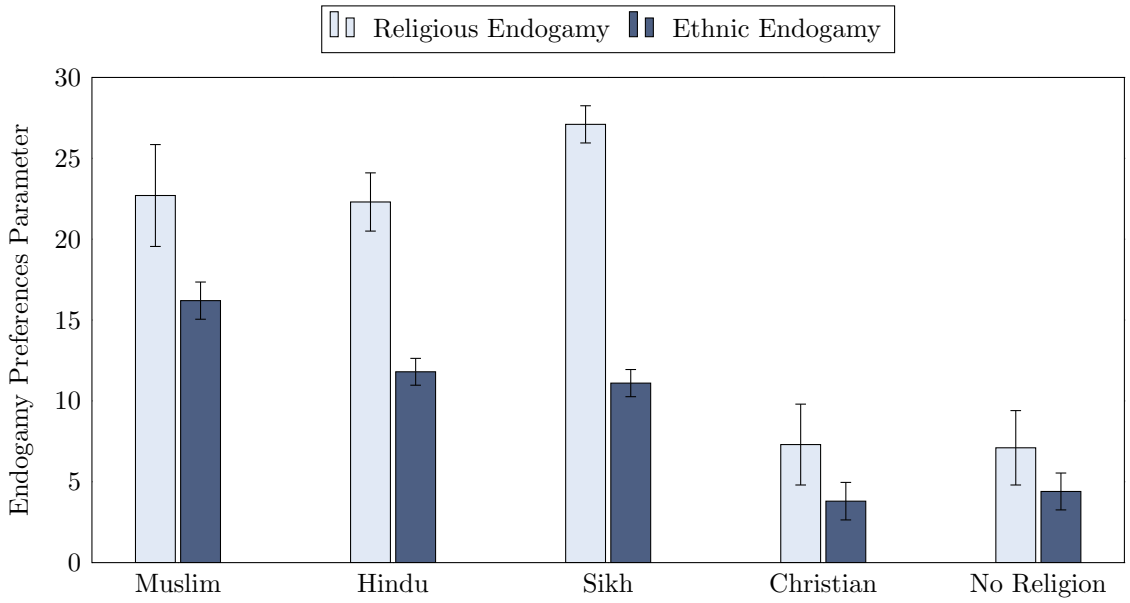
- Sensitivity to age threshold: Results remain robust to changes in the 18-year cutoff for defining marriage migration.

5.3 Comparison with Other Religious Groups

To compare Muslims with other major religious groups in the UK, I estimate separate models for Christians, Hindus, Sikhs, and those with no religious affiliation. In each

model, I adjust the religion variable accordingly.[18] These groups represent the largest religious populations in the UK.

Figure 8. Estimated Endogamy Preferences by Religion



Notes. Each bar shows estimated ethnic or religious endogamy preferences for the respective religious group.

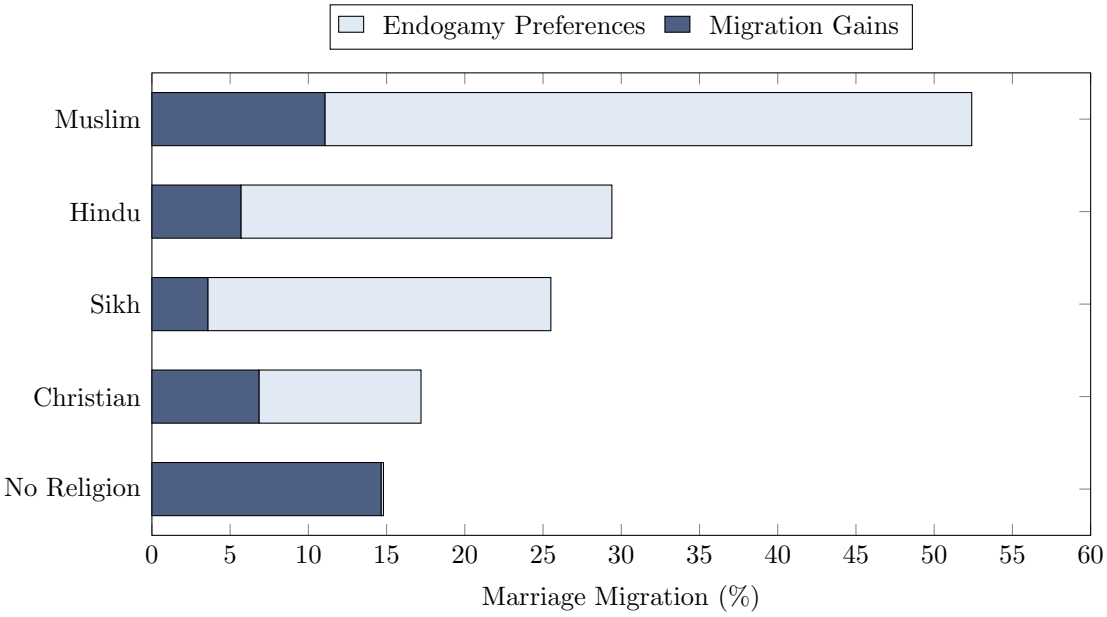
Figure 8 presents the estimated preferences by religious group, with detailed regression results available in Table A5. Religious majorities—Christians and individuals with no religious affiliation—derive the least utility from marrying within their religion. In contrast, religious minorities (Muslims, Hindus, and Sikhs) gain a significantly higher utility from religious endogamy.

The difference in gains from marrying within ethnicity between minorities and non-minorities is smaller compared to religious endogamy. However, a similar pattern emerges, with religious minorities benefiting more from ethnic endogamy. This trend is unsurprising, given that religious minorities predominantly belong to non-White groups, whereas most Christians and those without religious affiliation are White, sharing more similarities with White British. Muslims show slightly higher gains from intra-ethnic marriages. In contrast, Hindus and Sikhs, who primarily belong to the Indian ethnic group, display similar preferences for ethnic endogamy.

Figure 9 illustrates that the contribution of migration gains to overall marriage

[18]Simultaneously including multiple religious categories in the model significantly reduces estimation power; therefore, I focus on one religious group at a time.

Figure 9. Estimated Endogamy Preferences and Migration Gains by Religion

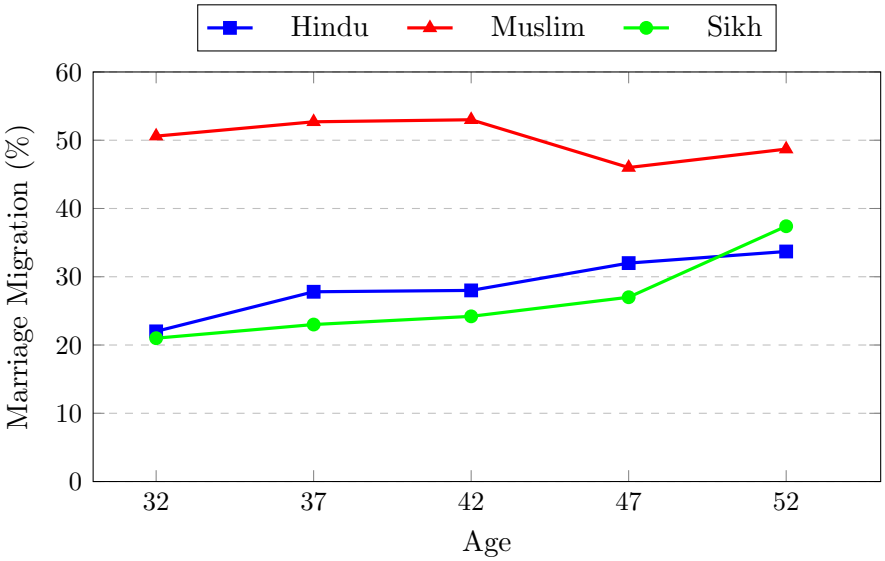


Notes. Each bar shows the contribution of migration gains and endogamy preference to the overall observed marriage migration rate. The sample is limited to ethnic minorities (not White British).

migration varies significantly across religious groups. For those with a religious affiliation, migration gains account for only a small proportion of their marriage migration. In contrast, for those without religious affiliation, migration gains emerge as the primary driver of marriage migration.

Two factors contribute to migration gains: (1) higher migration utility and (2) availability of individuals in the outside market. The latter is not solely determined by the country of origin's total population. It depends on various factors, a key one being the strength of an individual's connection to their country of origin. Muslims, as relatively recent immigrants to the UK, have consistently chosen to marry individuals from their home countries. This enduring practice strengthens their connections with their country of origin over generations, effectively creating a "first generation within every generation," as noted by Goodhart (2013). This phenomenon aligns with observed trends in marriage migration rates over time. As shown in Figure 10, marriage migration among Muslims has remained consistent across various age cohorts, while for Hindus and Sikhs, it decreases in younger generations.

Figure 10. Marriage Migration Across Age Cohorts for Religious Minorities



Source. Census for England and Wales, 2011.

6 Policy Analysis

This section examines two key counterfactuals that are important for policy makers: first, the impact of policies that increase marriage migration costs on the marriage market equilibrium and integration; and second, the implications of an increase in the Muslim population for marriage migration. Since the available data is limited to the UK, I assume that the number of individuals residing outside the country significantly exceeds those who migrate for marriage. Consequently, any changes in marriage migration rates are presumed to have a negligible impact on the population distribution outside the UK.[19]

6.1 Effect of Marriage Migration Tax

Governments are increasingly implementing stricter immigration policies for marriage-based migration, citing integration concerns as justification (Bonjour and Kraler, 2015). The UK, for instance, has imposed various regulations on the marriage migration process, including minimum income requirements, pre-entry language tests, age restrictions, increased fees, and extended processing times. These policy approaches

[19]The annual out-migration from Pakistan and Bangladesh, which show the highest rates of marriage migration in the data, is less than 100,000. This figure is negligible relative to their large populations.

are not unique to the UK. In Denmark, marriage visa applicants must be at least 24 years old, and both the applicant and their Danish spouse or partner are subject to integration requirements that consider factors such as education, work experience, and language proficiency. As part of the visa application process, both parties must declare their commitment to actively learning Danish and integrating into Danish society. The United States, in contrast, employs a quota-based approach rather than taxation. A predefined numerical limitation exists for the immediate family members of green card holders[20], with an annual cap of 114,200 family preference visas.

In this section, I estimate the equilibrium matching in the counterfactual case where the government introduces a marriage migration tax. This tax directly reduces the utility of migration while leaving endogamy preferences unchanged, at least in the short run. In the model, the tax decreases migration utility; Equations (6) and (7):

$$\tilde{B}_{y\to x} = b_{y\to x} - T + \ln[\mu_{0y}^{\text{out}}] = B_{y\to x} - T$$
$$\tilde{B}_{x\to y} = b_{x\to y} - T + \ln[\mu_{x0}^{\text{out}}] = B_{x\to y} - T$$

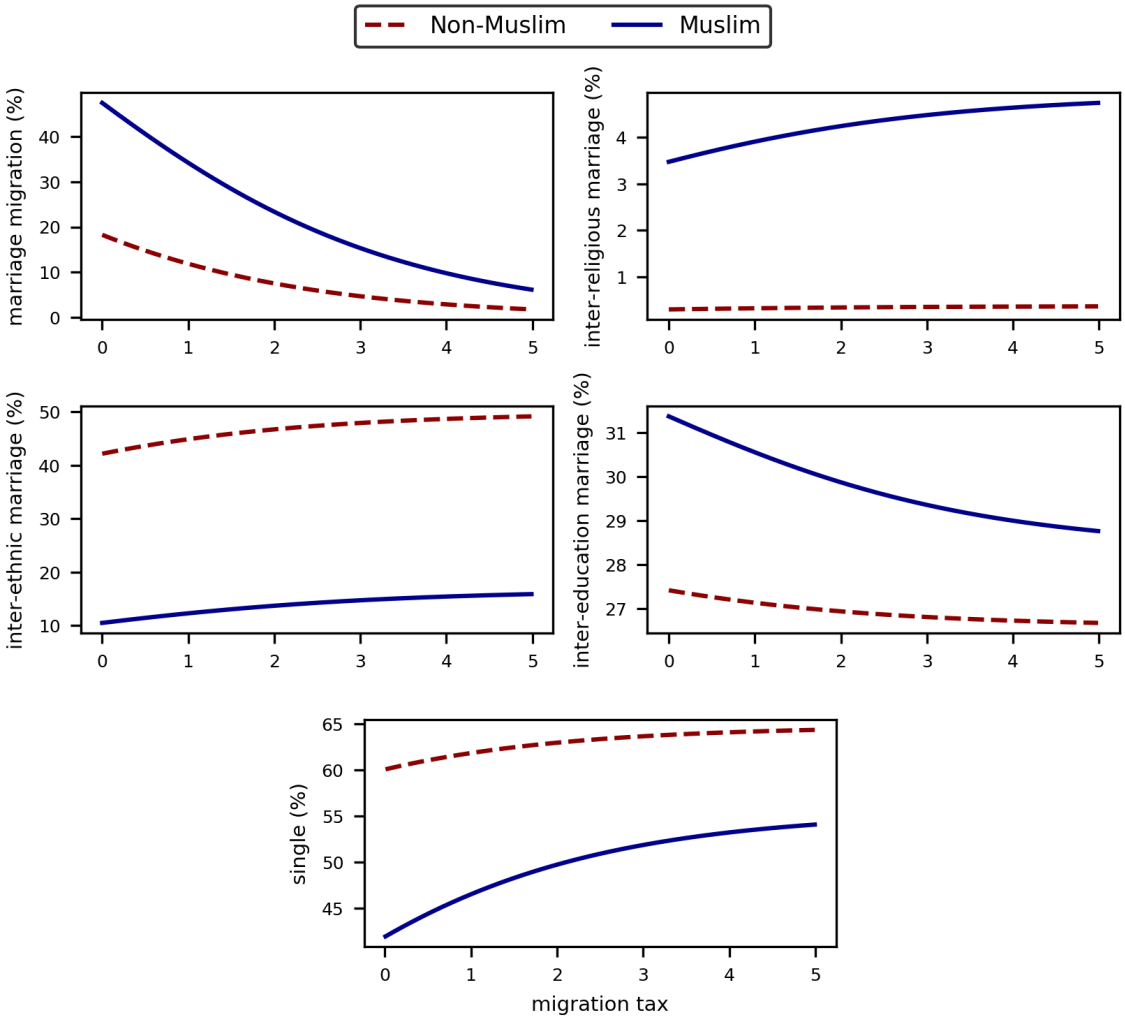
T denotes a lump-sum tax that reduces the marriage surplus for all marriages involving a migrant partner. $\tilde{B}_{y\to x}$ and $\tilde{B}_{x\to y}$ show migration gains after implementation of the tax. The tax is implemented in the same units as the surplus, thus lacking a direct monetary equivalent. Importantly, the decrease in migration benefits—or equivalently, the increase in migration costs—produces effects analogous to a reduction in the number of available partners in the outside market.

The impact of a marriage migration tax is measured by calculating counterfactual matching equilibrium for various tax levels, as illustrated in Figure 11. As the tax increases, making it more expensive to marry individuals from one's country of origin, the degree of education-based mixing in the UK marriage market significantly decreases. This outcome can be attributed to individuals with lower education levels losing the opportunity to marry more highly educated partners from their country of origin—a scenario where they essentially exchanged a British passport for a more educated spouse. With rising migration costs due to the tax, their options become restricted to a smaller, costlier pool of potential partners, thus reducing their chances of marrying someone with higher education.

In contrast to education, ethnic minorities show an increased tendency for mixing based on religion as the migration tax rises. This trend is particularly pronounced

[20]Defined as spouses, minor children, and unmarried children aged 21 years and older

Figure 11. Effect of Migration Tax on Marriage Migration Equilibrium



Notes. Figures show the effect of an increase in immigration cost on marriage market equilibrium. The horizontal axis is a lump-sum migration tax.

among Muslims, who exhibit a notably higher increase in inter-ethnic marriage rates compared to non-Muslims. This difference can be primarily attributed to Muslims placing less value on ethnic endogamy.

The interreligious marriage rate among Muslims increases by approximately 1.2 percentage points from its initial baseline of 3.8%, reaching a final rate of 5%. This remains substantially below the 94% rate of interreligious marriage that would occur under random matching on religion. Consequently, given the strong endogamy preferences driving intragroup marriages, the expected impact on Muslim integration within the marriage market is modest. Instead, as finding a spouse of the same

ethnicity and religion becomes more costly, a significant proportion of Muslims may choose to remain single.

These results show that marriage migration taxes are unlikely to significantly increase Muslim integration through intermarriage. When faced with the choice between marrying outside their religion and remaining single, many Muslims opt for singlehood. If governments aim to achieve integration, they should focus on alternative policies that promote social interaction and mixing among diverse groups in society.

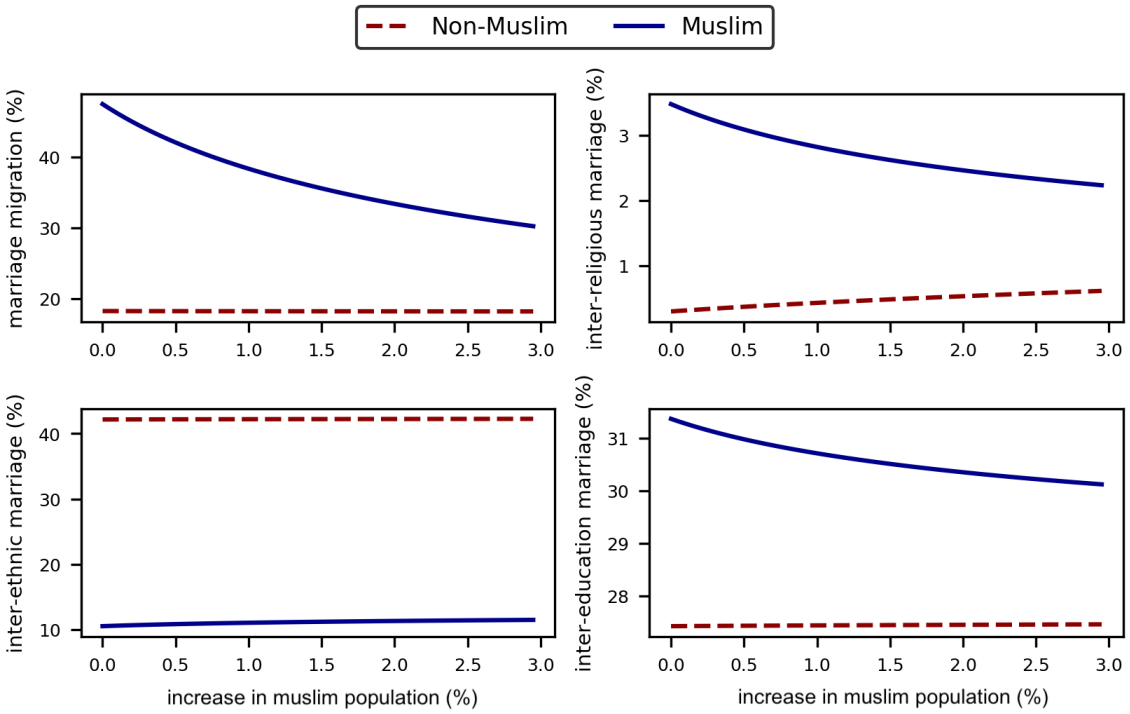
In analyzing the effect of the migration tax, I assumed that preferences, including endogamy preferences, would remain constant. However, it is important to note that the migration tax could potentially alter individuals' preferences and weaken their ties to their country of origin over time. This could result in a more rapid decline in the marriage migration rate than currently estimated.

6.2 Effect of Increase in Muslim Population

The Muslim population in the UK has experienced substantial growth over the past decade, increasing by 44% from 2011 to 2021 (Census, 2021). This significant expansion can be attributed to three primary factors: the relatively young median age of Muslims, their higher fertility rates compared to other religious groups, and continued immigration from Muslim-majority countries. To assess the implications of this population increase, I conduct a counterfactual analysis that maintains constant preferences and migration gains while adjusting the proportion of Muslims in the UK population. Figure 12 illustrates the results of this analysis.

If the Muslim population were to double from its 2011 level, finding a spouse within the same group would become easier within the UK, reducing the need for marriage migration. Consequently, marriage migration among Muslims would decline by 20% (10 percentage point). Inter-educational marriages would also decrease, as individuals would have less need to compromise on educational qualifications to marry within their religion. Inter-religious marriages would decrease due to the increased availability of potential partners from the same religion. However, the inter-ethnic marriage rate would remain largely unchanged, which is due to strong within-ethnicity and religious marriage preferences.

Figure 12. Effect of Increase in Muslim Population on Marriage Market Equilibrium



Notes. Figures show the effect of an increase in the Muslim population on marriage market equilibrium. The horizontal axis is the percent increase in the Muslim population from the current level.

7 Conclusion

This study provides the first economic analysis of the factors driving marriage migration among ethnic minorities. It specifically focuses on explaining the significantly higher rates among Muslims, and informs policymakers about the potential effects of marriage migration policies.

The notably high rate of marriage migration among Muslims in the UK is primarily driven by their substantial gains from marrying within their ethnicity and religion, rather than by economic migration benefits. These gains from religious and ethnic endogamy are comparable across all religious minorities, with Muslims not significantly differing from Hindus and Sikhs in this aspect. However, Muslims experience larger migration gains, which, when combined with their high rates of within-group marriages, result in a markedly higher marriage migration rate.

The increased migration gains for Muslims are primarily attributable to the greater availability of potential partners among Pakistani and Bangladeshi Muslims, likely due to their stronger connections with their countries of origin. A strong connection to

one's country of origin reduces the cost of marrying abroad, leading more individuals to opt for marriage migration. This, in turn, strengthens their ties to their country of origin, potentially increasing marriage migration in subsequent generations. This self-reinforcing cycle could perpetuate a consistently high rate of marriage migration.

This paper introduces a novel approach to studying marriage migration, offering valuable insights despite data constraints. The model employs specific assumptions about random shock distribution and migration utility separability, which enable a tractable analysis of the main patterns in marriage migration. This foundational work opens up avenues for future research. With improved data from multiple markets, future studies could refine the model by relaxing distributional and separability assumptions. Additionally, exploring the dynamics of marriage migration and the long-term effects of related policies on preferences and network connections presents intriguing opportunities for further investigation.

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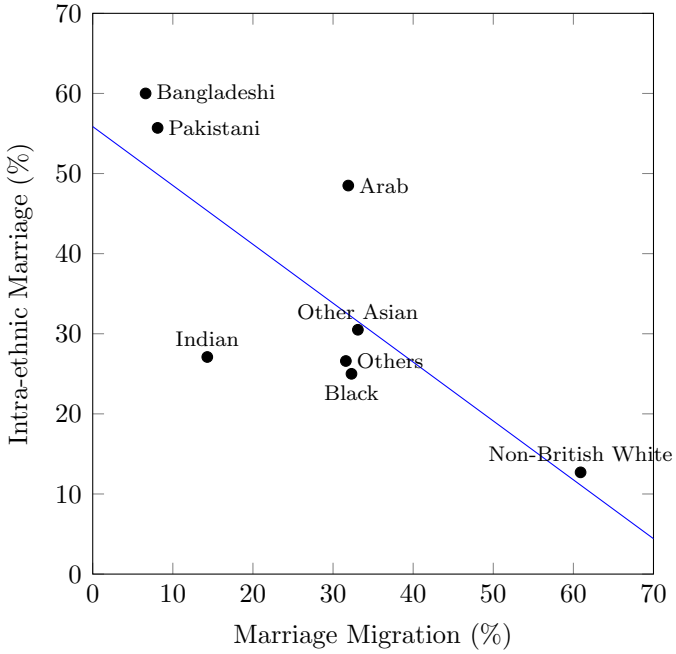
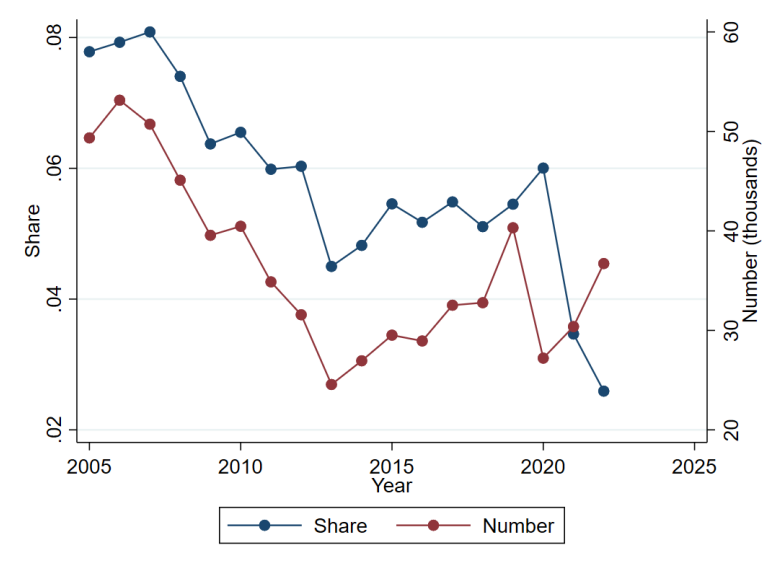
A Appendix Tables and Figures

Figure A1. Marriage Migration and Inter-ethnic Marriages



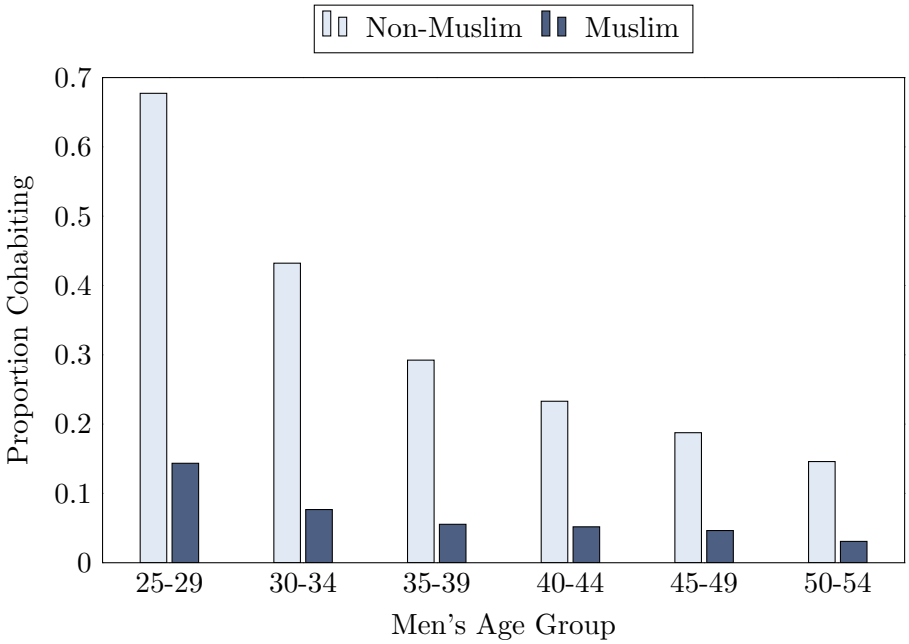
Source. Census for England and Wales, 2011

Figure A2. Spouse Visa Numbers and Share of UK Non-Temporary Visas



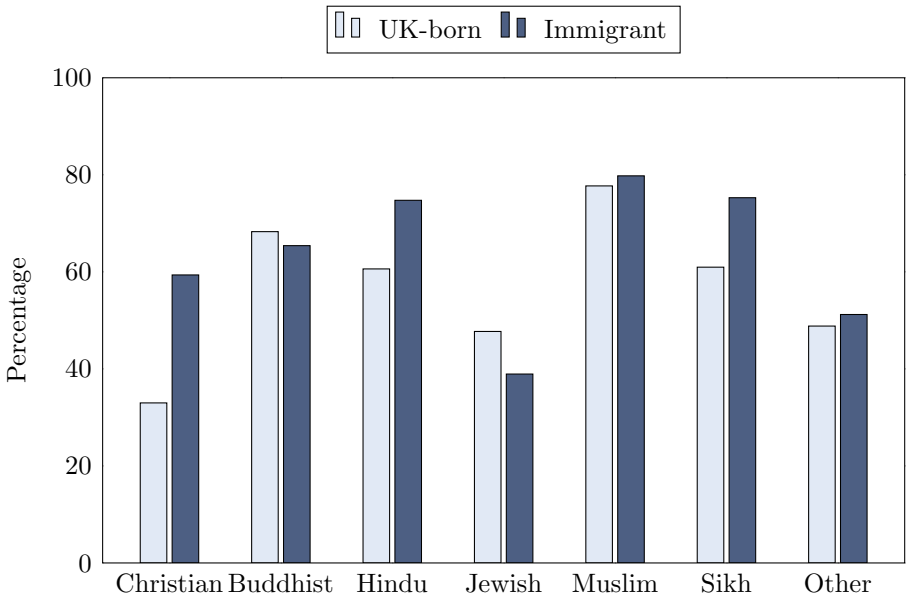
Source. Home Office Visa Statistics

Figure A3. Proportion of Cohabiting Couples



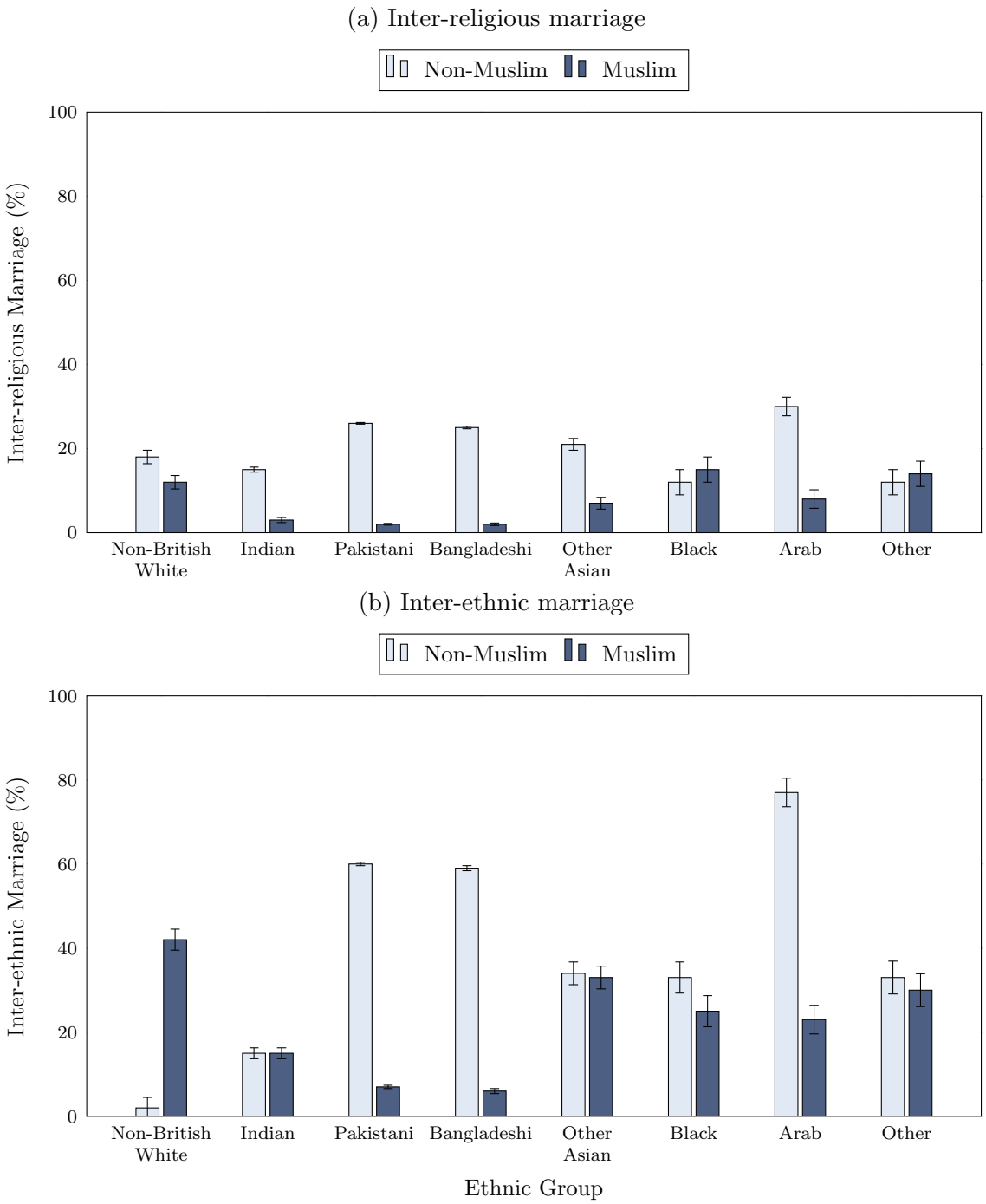
Source: Census for England and Wales, 2011

Figure A4. Proportion of Actively Practicing Muslims



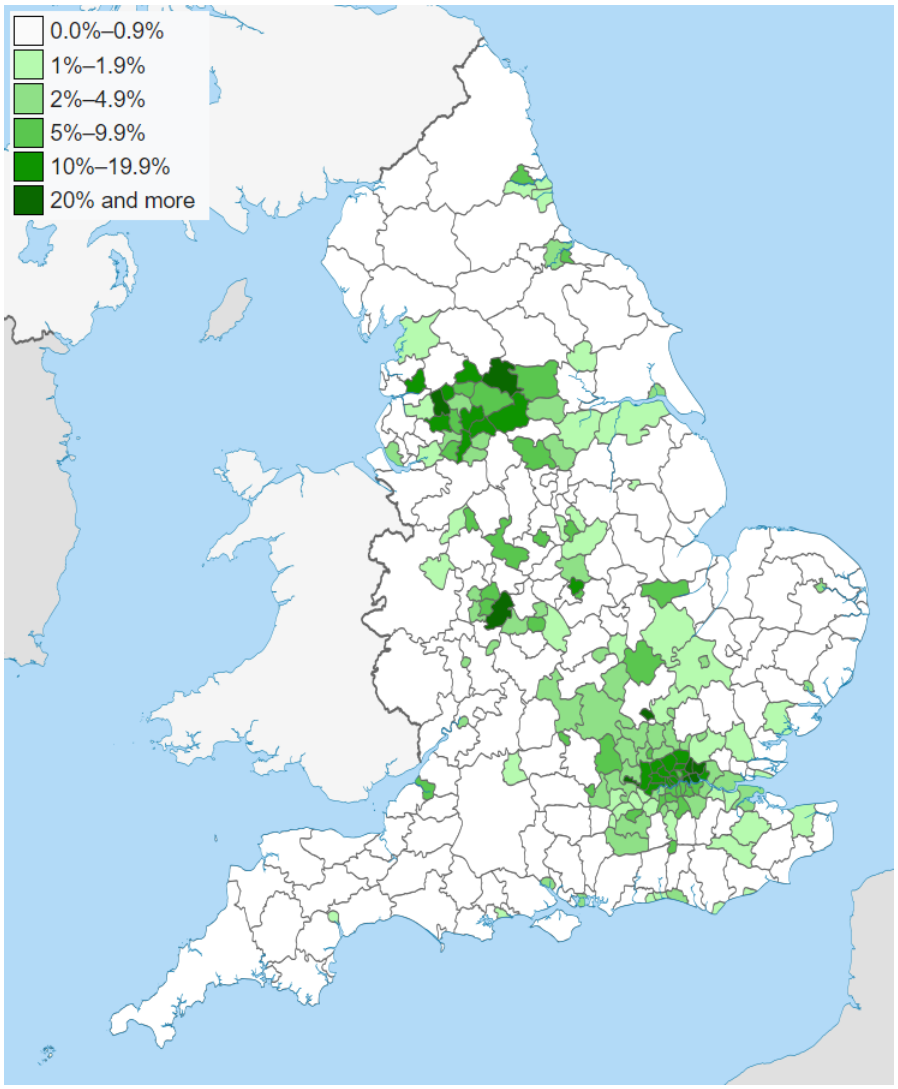
Source. Citizenship Survey, 2011

Figure A5. Intermarriage Rates by Ethnic and Religious Groups



Source. Census for England and Wales, 2011

Figure A6. Distribution of Muslim Population in England and Wales



Source. Census for England and Wales, 2011

Table A1. Trade-offs in Marrying Abroad: Age

	Dependant variable: Spouse's age			
	Muslim		Non-Muslim	
	Male	Female	Male	Female
without controls				
Marriage migration	-0.486***	0.579***	-1.679***	0.684***
	(-6.9)	(7.9)	(-26.1)	(9.6)
Region & cohort FE	Y	Y	Y	Y
R^2	0.72	0.688	0.724	0.729
N	12,458	12,857	21,060	19,687
with controls				
Marriage migration	-0.330***	0.488***	-1.594***	0.655***
	(-4.6)	(6.6)	(-23.3)	(8.8)
Region & cohort FE	Y	Y	Y	Y
R^2	0.724	0.691	0.726	0.732
N	12,237	12,625	20,549	19,109

Notes. Table shows results of the linear regression of spouse's age on marriage migration, controlling for age, ethnic group, region, and 10-year age cohort. Regressions with controls also control for spouse's religion, ethnicity, and education gap in the marriage. t statistics in parentheses. *p<0.10, **p<0.05, ***p<0.001. *Source.* Census for England and Wales, 2011

Table A2. Goodness of Fit of the Model

	Observed Matching		Simulated Matching	
	Non-Muslim	Muslim	Non-Muslim	Muslim
Inter-education (%)				
Low-educated	23.8	26.6	22.7	26.9
High-educated	37.9	40.3	31.0	39.7
Inter-ethnic (%)				
White British	4.1	72.5	2.5	68.1
Other White	63.3	25.4	73.0	42.1
Indian	14.3	14.8	16.8	13.0
Pakistani/Bangladeshi	58.7	5.6	75.1	4.6
Other	30.8	22.4	37.2	39.3
Inter-religious (%)				
All	0.3	3.3	0.1	3.6
Marriage Migration (%)				
Other White	10.5	45.9	10.0	34.9
Indian	25.9	33.3	20.9	27.5
Pakistani/Bangladeshi	27.1	57.5	12.7	52.3
Other	24.9	44.6	23.3	35.3
Single (%)				
All	48.9	34.4	51.8	42.6

Notes. The table compares observed matching with the simulated matching from the model using estimated parameters.

Table A3. Estimated Preferences in Models with and without Migration

	With Migration^{+}		Without Migration^{++}	
	Non-Muslim	Muslim	Non-Muslim	Muslim
Age				
Young & Middle-aged	6.54	7.59	6.5	7.93
	(0.47)	(0.47)	(0.47)	(0.47)
Young & Old	9.9	9.66	9.89	9.73
	(0.47)	(0.47)	(0.47)	(0.47)
Middle-aged & Old	5.81	7.28	5.59	7.49
	(0.47)	(0.47)	(0.47)	(0.47)
Education				
Low & High	3.78	3.41	4.04	3.4
	(0.21)	(0.21)	(0.21)	(0.21)
Ethnicity				
Other White & White British	6.59	7.06	5.85	4.18
	(1.31)	(1.31)	(1.31)	(1.31)
Indian & White British	16.1	14.88	14.93	13.41
	(1.31)	(1.31)	(1.31)	(1.31)
Pak/Bng & White British	16.3	9.97	14.05	7.67
	(1.31)	(1.31)	(1.31)	(1.31)
Other & White British	11.35	5.20	10.11	2.82
	(1.31)	(1.31)	(1.31)	(1.31)
Religion				
Muslim & Non-Muslim	22.59	22.59	22.67	22.67
	(1.10)	(1.10)	(1.15)	(1.15)

Notes. The table shows the estimated surplus generated from endogamy rather than mixing for different groups for the model with and without the possibility of marriage migration. $^{++}$ Classic Choo and Siow (2006) model. $^{+}$ Model presented in Chapter 1.

Table A4. Simulated Outcomes Without Religious or Ethnic Preferences

		Counterfactual		
	Original	No Ethnic Preferences	No Religious Preferences	No Ethnic or Religious Preferences
Non-Muslims				
Price Gap				
Other White	1.9	2.7	1.9	2.7
Indian	1.4	3.3	1.5	3.3
Pakistani/Bangladeshi	1.7	3.4	0.7	2.8
Other	1.0	2.3	0.9	2.1
Mariage Migration	18.3	7.6	19.4	8.4
Inter-religious Marriage	0.3	0.2	15.7	6.3
Inter-ethnic Marriage				
White British	2.5	11.3	2.6	14.6
Other White	73.0	90.3	72.4	90.4
Indian	16.8	92.1	15.1	91.7
Pakistani/Bangladeshi	75.1	94.0	10.1	89.3
Other	37.2	84.7	35.4	82.8
Muslims				
Utility Gap				
Other White	0.3	1.7	2.2	2.9
Indian	1.1	2.4	2.0	3.8
Pakistani/Bangladeshi	-0.1	0.6	0.0	2.2
Other	0.2	0.9	0.7	1.8
Mariage Migration	47.4	29.2	41.0	10.0
Inter-religious Marriage	3.5	0.5	26.6	86.0
Inter-ethnic Marriage				
White British	68.1	88.7	2.8	18.5
Other White	42.1	80.1	71.9	90.6
Indian	13.0	77.5	15.9	92.9
Pakistani/Bangladeshi	4.6	31.1	8.2	86.5
Other	39.3	59.7	32.2	78.3

Table A5. Estimated Endogamy Preferences by Religious Group

	$\mathcal{D}_{zz'} = \Phi_{zz} + \Phi_{z'z'} - \Phi_{zz'} - \Phi_{z'z}$				
Groups (z & z')	Muslim	Hindu	Sikh	Christian	No Religion
Age					
Young & Middle-aged	7.93	3.20	3.80	5.71	5.54
	(0.47)	(0.34)	(0.38)	(0.47)	(0.47)
Young & Old	9.73	5.28		7.97	7.74
	(0.47)	(0.34)		(0.47)	(0.47)
Middle-aged & Old	7.49	2.78	5.31	4.79	5.03
	(0.47)	(0.34)	(0.38)	(0.47)	(0.47)
Education					
Low & High	3.40	2.07	1.98	3.13	3.49
	(0.21)	(0.18)	(0.22)	(0.21)	(0.21)
Ethnicity					
Other White & White British	4.18			6.70	3.18
	(1.31)			(1.32)	(1.3)
Indian & White British	13.41	10.71	11.93	13.71	11.37
	(1.31)	(0.94)	(0.91)	(1.32)	(1.3)
Pak/Bng & White British	7.67			18.31	14.3
	(1.31)			(1.32)	(1.3)
Other & White British	2.82	5.30	10.97	11.15	10.01
	(1.31)	(0.94)	(0.91)	(1.32)	(1.3)
Religion					
Different religions	22.67	22.27	26.87	7.66	7.43
	(1.15)	(0.83)	(0.84)	(1.16)	(1.14)

Notes. The table shows the estimated surplus generated from endogamous versus exogamous marriage. Coefficients are estimated by structural estimation of the model for different groups separately. Empty cells are not reported due to a low number of observations. Standard errors in parenthesis.

B Derivations

This appendix shows how to calculate the probability of a match between a woman type x and a man type y within the country when the random taste shock has an extreme-value distribution $f(\varepsilon) = \exp[-\varepsilon - \exp[-\varepsilon]]$. The probability of matches between different locations (i.e., marriage migration) can be calculated similarly.

$$
\begin{aligned}
P\{y,0 = & \underset{z=1,\ldots Y;m=0,1}{\arg\max} U^{\text{in}}_{ixzm}\} \\
&= P\{U^{\text{in}}(x,y,0) + \varepsilon^{\text{in}}_{ixy0} > U^{\text{in}}(x,z,m) + \varepsilon^{\text{in}}_{ixzm}, \forall z, m \neq y, 0\} \\
&= P\{\varepsilon^{\text{in}}_{ixzm} < U^{\text{in}}(x,y,0) - U^{\text{in}}(x,z,m) + \varepsilon^{\text{in}}_{ixy0}, \forall z \neq y \cup m \neq 0\} \\
&= \int_{-\infty}^{\infty} \prod_{z,m\neq y,0} F(U^{\text{in}}(x,z,m) - U^{\text{in}}(x,y,0) + \varepsilon^{\text{in}}_{ixy0}) f(\varepsilon^{\text{in}}_{ixy0}) d\varepsilon^{\text{in}}_{ixy0} \\
&= \int_{-\infty}^{\infty} \prod_{z,m\neq y,0} \exp\left[\exp[-(U^{\text{in}}(x,z,m) - U^{\text{in}}(x,y,0) + \varepsilon^{\text{in}}_{ixy0})]\right] \\
&\qquad\qquad \times \exp\left[-\varepsilon^{\text{in}}_{ixy0} - \exp[-\varepsilon^{\text{in}}_{ixy0}]\right] d\varepsilon^{\text{in}}_{ixy0} \\
&= \int_{-\infty}^{\infty} \exp\left[\sum_{z,m\neq y,0} \exp[-(U^{\text{in}}(x,z,m) - U^{\text{in}}(x,y,0))] \exp[\varepsilon^{\text{in}}_{ixy0}]\right] \\
&\qquad\qquad \times \exp\left[-\varepsilon^{\text{in}}_{ixy0} - \exp[-\varepsilon^{\text{in}}_{ixy0}]\right] d\varepsilon^{\text{in}}_{ixy0}
\end{aligned}
$$

Defining $t \equiv \exp[-\varepsilon^{\text{in}}_{ixy0}]$ and $\alpha \equiv \sum_{z,m\neq y,0} \exp[-(U^{\text{in}}(x,z,m) - U^{\text{in}}(x,y,0))]$, simplifies the equation to:

$$\int_0^{\infty} \exp[-\alpha t] dt = \frac{1}{\alpha}$$

Therefore:

$$
\begin{aligned}
P\{y,0 = \underset{z,m}{\arg\max} U^{\text{in}}_{ixzm}\} &= \frac{1}{\sum_{z,m\neq y,0} \exp[-(U^{\text{in}}(x,z,m) - U^{\text{in}}(x,y,0))]} \\
&= \frac{\exp\left[U^{\text{in}}(x,y,0)\right]}{\sum_{z=0}^{Y} \exp\left[U^{\text{in}}(x,z,0)\right] + \sum_{z=0}^{Y} \exp\left[U^{\text{in}}(x,z,1)\right]}
\end{aligned}
$$

C IIA in Two-sided Matching Models

This appendix explains the concept of Independence of Irrelevant Alternatives (IIA) as it applies to the two-sided matching model presented in this paper.

In its simplest form, IIA posits that if an individual prefers option A over option B, introducing a third option C should not alter this preference ordering. In one-sided discrete choice models, IIA implies that the ratio of probabilities for choosing one alternative over another remains constant, regardless of other available options. With logit assumptions, this property naturally arises from the model's mathematical structure. However, this straightforward interpretation of IIA cannot hold in a matching market due to its two-sided nature.

In a two-sided matching model with transferable utilities IIA is satisfied if and only if, for all types of men x and z in X and all types of women y and t in Y, the double odds ratio: $\mu_{xy}\mu_{zt}/\mu_{xt}\mu_{zy}$ is independent of all subpopulation sizes.

When assuming logit distribution for heterogeneities, this condition holds. We know from the model section that:

$$\Phi(x,y) = 2\ln\left[\frac{\mu_{xy}}{\sqrt{\mu_{x0}\mu_{0y}}}\right]$$

Using this, I can express the double odds ratio as:

$$\frac{\mu_{xy}\mu_{zt}}{\mu_{xt}\mu_{zy}} = \frac{\Phi(x,y)\sqrt{\mu_{x0}\mu_{0y}} \times \Phi(z,t)\sqrt{\mu_{z0}\mu_{0t}}}{\Phi(x,t)\sqrt{\mu_{x0}\mu_{0t}} \times \Phi(z,y)\sqrt{\mu_{z0}\mu_{0y}}} = \frac{\Phi(x,y)\Phi(z,t)}{\Phi(x,t)\Phi(z,y)}$$

This final expression is independent of all subpopulation sizes, thus satisfying the IIA condition for the two-sided matching model.

D IPFP Method

The primary challenge in finding a matching equilibrium arises from the unavailability of data on the distribution of characteristics outside of the country. Specifically, observations are usually confined to individuals inside the country and those who have migrated for marriage. I assume that the number of people outside the country compared to those who migrate for marriage is substantial enough that any alterations in the rate of marriage migration would not have a major effect on the distribution outside.

From the model, the equations that explain the equilibrium matching from the preference parameters are:

$$\begin{aligned}
\Phi_{xy} &= 2\ln\left[\mu^{\text{in}}_{xy}/\sqrt{\mu^{\text{in}}_{x0}\mu^{\text{in}}_{0y}}\right] \\
\Phi_{xy} &= 2\ln\left[\mu^{\text{out}}_{xy}/\sqrt{\mu^{\text{out}}_{x0}\mu^{\text{out}}_{0y}}\right] \\
\Phi_{xy}+b_{y\to x} &= 2\ln\left[\mu^{\text{m}}_{y\to x}/\sqrt{\mu^{\text{in}}_{x0}\mu^{\text{out}}_{0y}}\right] \\
\Phi_{xy}+b_{x\to y} &= 2\ln\left[\mu^{\text{m}}_{x\to y}/\sqrt{\mu^{\text{out}}_{x0}\mu^{\text{in}}_{0y}}\right]
\end{aligned}$$

By rewriting these equations, the number of matches inside the country and the number of matches involving migration are equal to:

$$\begin{aligned}
\mu^{\text{in}}_{xy} &= \exp\left[\frac{\Phi_{xy}}{2}\right]\sqrt{\mu^{\text{in}}_{x0}\mu^{\text{in}}_{0y}} \\
\mu^{\text{m}}_{y\to x} &= \exp\left[\frac{\Phi_{xy}}{2}\right]\exp\left[\frac{b_{y\to x}}{2}\right]\sqrt{\mu^{\text{in}}_{x0}\mu^{\text{out}}_{0y}} \\
\mu^{\text{m}}_{x\to y} &= \exp\left[\frac{\Phi_{xy}}{2}\right]\exp\left[\frac{b_{x\to y}}{2}\right]\sqrt{\mu^{\text{out}}_{x0}\mu^{\text{in}}_{0y}}
\end{aligned}$$

Given the substantial size of the outside market, I can reasonably assume that alterations in counterfactual analysis that affect preferences and distributions inside the country do not change $b_{y\to x}$, $b_{x\to y}$, μ^{out}_{x0} and μ^{out}_{0y}. Therefore:

$$\begin{aligned}
\mu^{\text{m}}_{y\to x} &= \exp\left[\frac{\Phi_{xy}}{2}\right]A_{y\to x}\sqrt{\mu^{\text{in}}_{x0}},\ \text{where } A_{y\to x}\equiv\exp\left[\frac{b_{y\to x}}{2}\right]\sqrt{\mu^{\text{out}}_{0y}} \\
\mu^{\text{m}}_{x\to y} &= \exp\left[\frac{\Phi_{xy}}{2}\right]A_{x\to y}\sqrt{\mu^{\text{in}}_{0y}},\ \text{where } A_{x\to y}\equiv\exp\left[\frac{b_{x\to y}}{2}\right]\sqrt{\mu^{\text{out}}_{x0}}
\end{aligned}$$

Where $A_{y\to x}$ and $A_{x\to y}$ can be estimated directly from the data:

$$\hat{A}_{y\to x} = \frac{\hat{\mu}^m_{y\to x}}{\hat{\mu}^{\text{in}}_{xy}}\sqrt{\hat{\mu}^{\text{in}}_{x0}}, \quad \hat{A}_{x\to y} = \frac{\hat{\mu}^m_{x\to y}}{\hat{\mu}^{\text{in}}_{xy}}\sqrt{\hat{\mu}^{\text{in}}_{0y}}$$

Hence, for any given preferences, n^{in}_x and n^{in}_y counterfactual matching can be found by solving the following equations simultaneously:

$$\begin{aligned}
\mu^{\text{in}}_{xy} &= \exp\left[\Phi_{xy}/2\right]\sqrt{\mu^{\text{in}}_{x0}\mu^{\text{in}}_{0y}} \\
\mu^{\text{m}}_{y\to x} &= \exp\left[\Phi_{xy}/2\right]\hat{A}_{x\to y}\sqrt{\mu^{\text{in}}_{x0}} \\
\mu^{\text{m}}_{x\to y} &= \exp\left[\Phi_{xy}/2\right]\hat{A}_{y\to x}\sqrt{\mu^{\text{in}}_{0y}} \\
n_x &= \sum_y \mu^{\text{in}}_{xy} + \sum_y \mu^y_{xy,\text{m}} + \mu_{x0} \\
n_y &= \sum_x \mu^{\text{in}}_{xy} + \sum_x \mu^x_{xy,\text{m}} + \mu_{0y}
\end{aligned}$$

These equations can be solved using standard optimization or equation-solving methods. However, one of the fastest ways to solve these equations simultaneously is the Iterative Projection Fitting Procedure (IPFP)[21]. I modify the IPFP algorithm developed by Galichon and Salanié (2022a) to make it suitable for the model with the possibility of marriage migration.

Stability conditions for the equilibrium matching of the model are:

$$\mu^{\text{in}}_{xy} = \sqrt{\mu^{\text{in}}_{x0}\mu^{\text{in}}_{0y}}\exp\left[\frac{\Phi_{xy}}{2}\right]$$

$$\mu^{\text{m}}_{y\to x} = \exp\left[\frac{\Phi_{xy}}{2}\right]\frac{\sqrt{\mu^{\text{in}}_{x0}}}{\hat{A}_{x\to y}}, \quad \mu^{\text{m}}_{x\to y} = \exp\left[\frac{\Phi_{xy}}{2}\right]\frac{\sqrt{\mu^{\text{in}}_{0y}}}{D_{xy}}$$

The feasibility conditions are:

$$\begin{aligned}
n_x &= \sum_y \mu^{\text{in}}_{xy} + \sum_y \mu^{\text{m}}_{y\to x} + \mu_{x0} \\
n_y &= \sum_x \mu^{\text{in}}_{xy} + \sum_x \mu^{\text{m}}_{x\to y} + \mu_{0y}
\end{aligned}$$

[21] See Galichon and Salanié (2022a) for the proof of convergence.

These equations can be combined and simplified to the following equations:

$$\mu_{x0}^{\text{in}} + \left(\sum_{y \in Y} \exp\left[\frac{\Phi_{xy}}{2} \right] \sqrt{\mu_{0y}^{\text{in}}} \right) \sqrt{\mu_{x0}^{\text{in}}} + \left(\sum_{y \in Y} \exp\left[\frac{\Phi_{xy}}{2} \right] C_{xy} \right) \sqrt{\mu_{x0}^{\text{in}}} = n_x$$

$$\mu_{0y}^{\text{in}} + \left(\sum_{x \in X} \exp\left[\frac{\Phi_{xy}}{2} \right] \sqrt{\mu_{0y}^{\text{in}}} \right) \sqrt{\mu_{0y}^{\text{in}}} + \left(\sum_{x \in X} \exp\left[\frac{\Phi_{xy}}{2} \right] D_{xy} \right) \sqrt{\mu_{0y}^{\text{in}}} = n_y$$

From these equations, unknowns μ_{x0}^{in} and μ_{0y}^{in} can be calculated using the following iterative proportional fitting procedure (IPFP):

$$\mu_{x0}^{\text{in},(2k+1)} = \left(\sqrt{n_x + \frac{A_x}{4}} - \frac{A_x}{2} \right)^2 \quad \text{with} \quad A_x = \sum_{y \in Y} \exp\left[\frac{\Phi_{xy}}{2} \right] \left(C_{xy} + \sqrt{\mu_{0y}^{\text{in},(2k)}} \right)$$

$$\mu_{0y}^{\text{in},(2k+2)} = \left(\sqrt{n_y + \frac{B_y}{4}} - \frac{B_y}{2} \right)^2 \quad \text{with} \quad B_y = \sum_{x \in X} \exp\left[\frac{\Phi_{xy}}{2} \right] \left(D_{xy} + \sqrt{\mu_{x0}^{\text{in},(2k+1)}} \right)$$

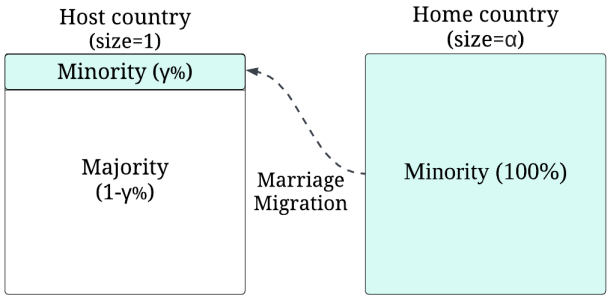
The IPFP method involves an iterative solution of the aforementioned system. Starting with an arbitrary guess $\mu_{x0}^{\text{in},(0)}$ and $\mu_{0y}^{\text{in},(0)}$, in each iteration, the equations are calculated and, subsequently, the values of $\mu_{x0}^{\text{in},(2k)}$ and $\mu_{0y}^{\text{in},(2k+1)}$ are updated. This process is repeated until convergence is achieved between the left-hand and right-hand sides of the equations.

E Toy Model

In this section, I present a toy model to illustrate the primary mechanisms influencing marriage migration. The figures presented in this section are the outcomes of simulations based on a data-generating process rather than observations from real-world data.

I simplify the model to a case where the populations of men and women are symmetric, and I focus on a single characteristic: group = {majority, minority}. In this context, the variables x and y denote the group assignment for men and women, where M represents the majority group, and N shows the minority group. Inside the host country, $(1-\gamma)\%$ of the total population belongs to the majority group, while $\gamma\%$ are from the minority group. The minority group also has the option of marrying someone from their country of origin, which is exclusively populated by minorities. The population of the host country is normalized to 1, and the population of the country of origin is equal to α (Figure E1).

Figure E1. Toy Model



Notes. The only characteristic is group = {majority, minority}.

The simplified deterministic utility function of marriage country is equal to:

$$\Phi(x, y, m) = a + bm - c(x - y)^2$$

The parameter a; marriage utility; signifies the benefits individuals receive from marriage compared to staying single, regardless of their partner's characteristics. The parameter b; migration utility; represents the utility generated from relocating. In other words, if an individual migrates for marriage ($m = 1$), the couple receives an additional utility. Last, the parameter c, which represents endogamy utility, captures the utility individuals gain from marrying within their group (or forfeit when inter-

marrying). The matching equilibrium can be found by simultaneously solving the following equations:

Stability constraints:

$$\mu_{xy}^{\text{in}} = \exp\left[\frac{a - c(x-y)^2}{2}\right]\sqrt{\mu_{x0}^{\text{in}}\mu_{0y}^{\text{in}}}$$
$$\mu_{xy}^{\text{out}} = \exp\left[\frac{a - c(x-y)^2}{2}\right]\sqrt{\mu_{x0}^{\text{out}}\mu_{0y}^{\text{out}}}$$
$$\mu_{x\to y}^{\text{m}} = \exp\left[\frac{a + b - c(x-y)^2}{2}\right]\sqrt{\mu_{x0}^{\text{out}}\mu_{0y}^{\text{in}}}$$
$$\mu_{y\to x}^{\text{m}} = \exp\left[\frac{a + b - c(x-y)^2}{2}\right]\sqrt{\mu_{x0}^{\text{in}}\mu_{0y}^{\text{out}}}$$

Feasibility constraints:

$$n_x^{\text{in}} = \mu_{x0}^{\text{in}} + \sum_{y=0,1}\mu_{xy}^{\text{in}} + \sum_{y=0,1}\mu_{y\to x}^{\text{m}}$$
$$n_y^{\text{in}} = \mu_{0y}^{\text{in}} + \sum_{x=0,1}\mu_{xy}^{\text{in}} + \sum_{x=0,1}\mu_{x\to y}^{\text{m}}$$
$$n_x^{\text{out}} = \mu_{x0}^{\text{out}} + \sum_{y=0,1}\mu_{xy}^{\text{out}} + \sum_{y=0,1}\mu_{x\to y}^{\text{m}}$$
$$n_y^{\text{out}} = \mu_{0y}^{\text{out}} + \sum_{x=0,1}\mu_{xy}^{\text{out}} + \sum_{x=0,1}\mu_{y\to x}^{\text{m}}$$

Where $n_x^{\text{in}} = n_y^{\text{in}} = (1-\gamma, \gamma)$ and $n_x^{\text{out}} = n_y^{\text{out}} = (0, \alpha)$. The main two equations resulting from the equilibrium equations are:

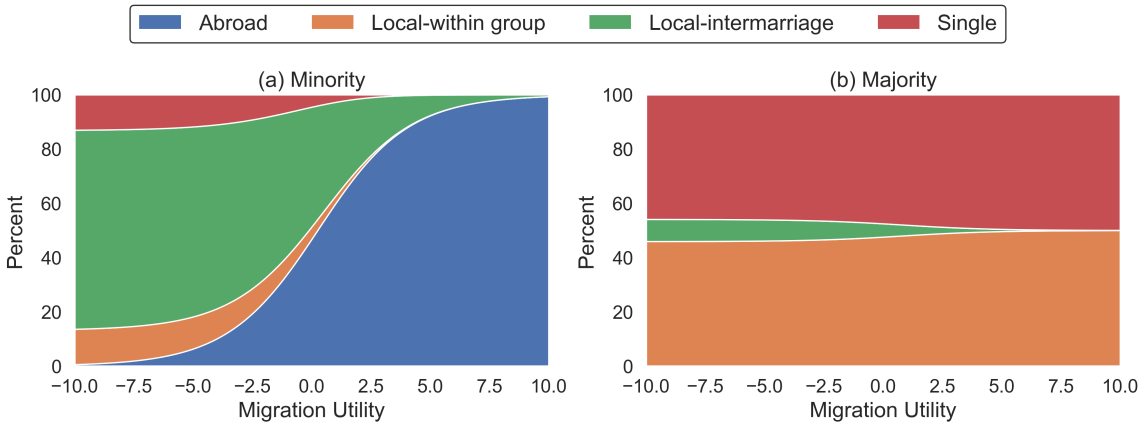
$$\frac{\mu_{JN}^{\text{in}}\mu_{NJ}^{\text{in}}}{\mu_{JJ}^{\text{in}}\mu_{NN}^{\text{in}}} = \exp[c], \quad \frac{\mu_{NN}^{\text{mm}}}{\mu_{NN}^{\text{in}}} = \exp\left[\frac{b}{2}\right]\sqrt{\frac{\mu_{0N}^{\text{out}}}{\mu_{N0}^{\text{in}}}}$$

The first equation illustrates that the relative ratio of inter-married to intra-married individuals indicates the extent of the utility of endogamy. The second equation demonstrates that the relative ratio of people marrying from abroad to those marrying locally encapsulates the combined impact of migration utility and the number of single individuals inside and outside. The number of single individuals inside the country is affected by endogamy preferences (c). Because I assume no gender heterogeneity, marriage migration and intermarriage rates of men and women are equal.

Through simulations of the model and aligning the equilibrium for various param-

eters, I can observe how the mechanisms within the model drive specific equilibrium outcomes. In Figure E2, the impact of migration utility (b) on the equilibrium of the marriage market is illustrated under the condition of $a = c = 0$ (absence of endogamy preferences). When individuals experience substantial disutility from migration, they only match within the country. As the utility of migration rises, there is a corresponding increase in the proportion of minorities choosing to marry abroad, leading to a decline in the intermarriage rate between minorities and majorities. Additionally, a high migration utility increases the attractiveness of marriage compared to remaining single for minorities, consequently reducing the proportion of minorities who remain single. In cases where the benefit of migration is exceptionally high, almost all minorities opt for marriages abroad. In summary, the utility of migration acts as a deterrent to intermarriage rates, even in the absence of preferences for endogamy.

Figure E2. Equilibrium Matching Patterns Across Varied Levels of Migration Utility

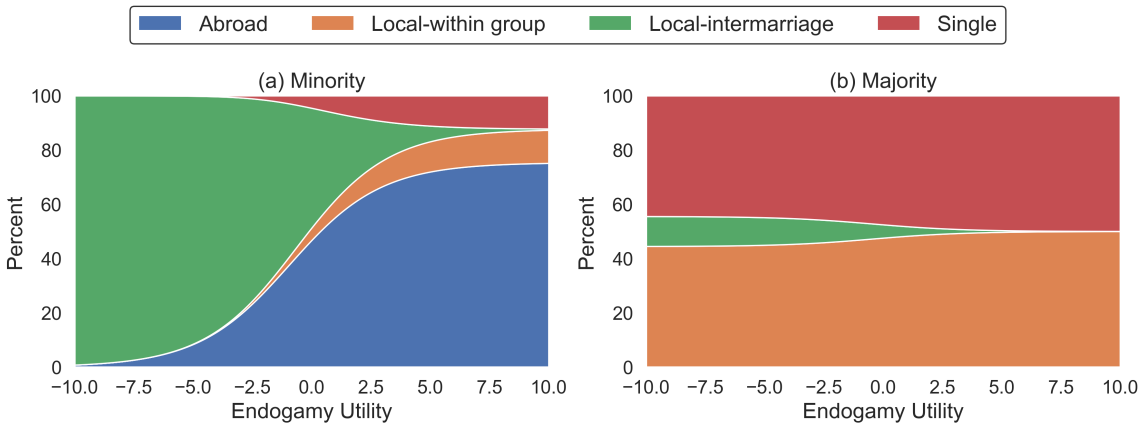


Notes. Utility function: $\Phi(x, y, m) = a + bm - c(x - y)^2$. The figure shows the response of the marriage equilibrium to changes in the migration utility (b) when there is no utility from the partners' characteristics ($a = c = 0$).

Figure E3 shows the effect of an increase in endogamy utility while maintaining a zero migration utility ($a = b = 0$). Negative endogamy utility implies a preference for mixing (intermarriage), whereas positive values indicate a preference for intragroup marriages. When the utility of endogamy is low, the share of people who marry abroad remains low, while the prevalence of intermarriage is high. However, when endogamy utility becomes positive, a pattern emerges wherein everyone primarily marries individuals from their own group. Notably, due to the greater availability of potential partners from their communities abroad, an increasing number of minorities opt for marrying abroad. Therefore, high endogamy preferences lead to higher

marriage migration.

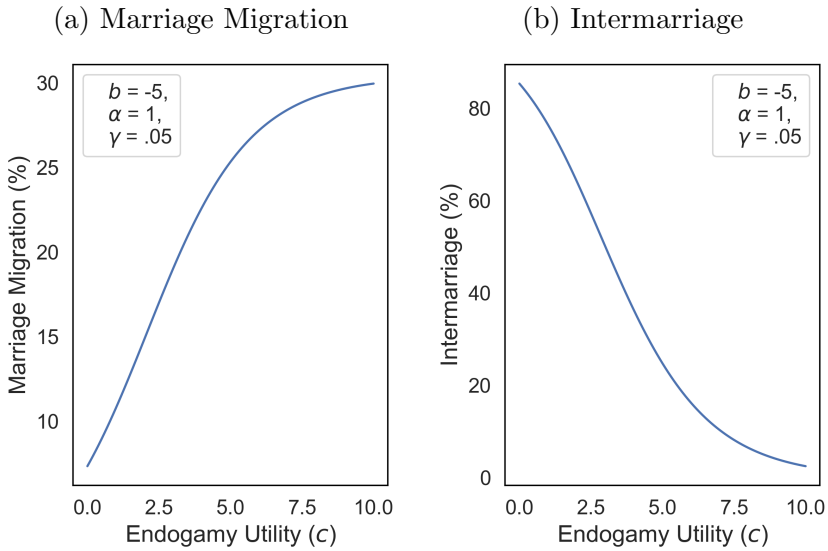
Figure E3. Equilibrium Matching Patterns Across Varied Levels of Endogamy Utility



Notes. Utility function: $\Phi(x, y, m) = a + bm - c(x - y)^2$. The figure shows the response of the marriage equilibrium to changes in the endogamy utility (c) when there is no utility from the characteristics of the partners ($a = b = 0$).

In the final set of simulations, I concentrate on examining the impact of variations in different parameters on the marriage migration and intermarriage rate for minorities. Marriage migration arises either due to endogamy preferences or migration gains.

Figure E4. Effect of Endogamy Gains

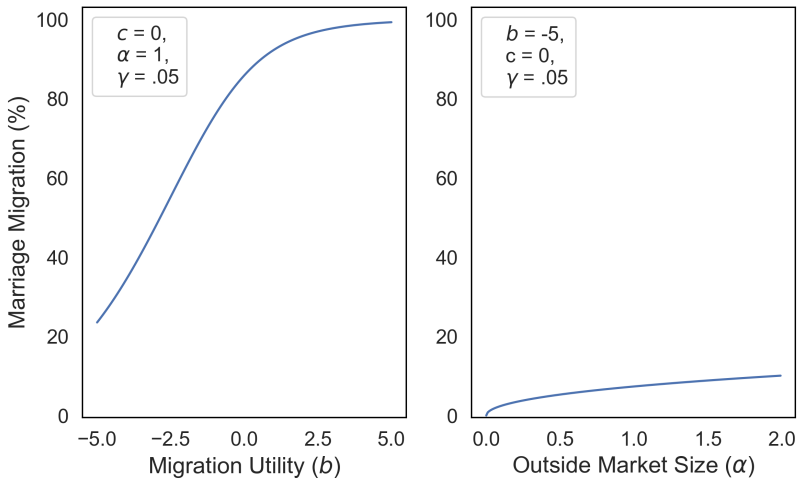


1. **Endogamy preferences:** An increase in the utility derived from marrying

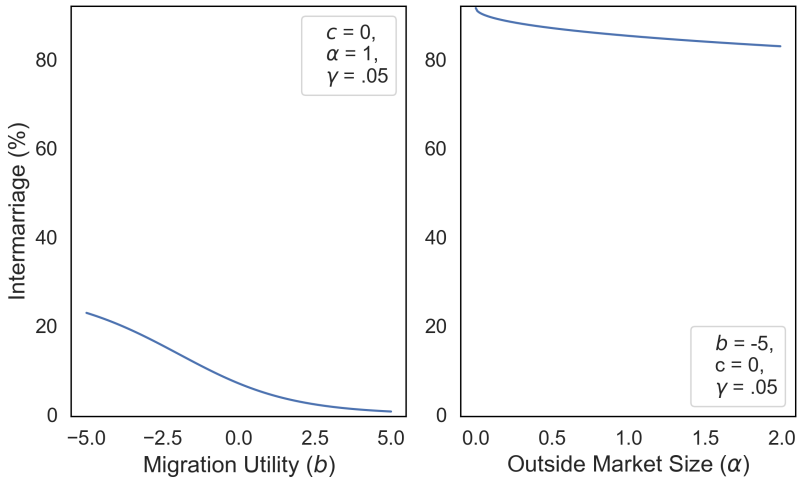
within one's group directly reduces the intermarriage rate. This is because individuals now require greater compensation to be willing to marry outside their group. Endogamy preferences affect marriage migration through the advantage gained from having access to a larger pool of individuals who share the same characteristics. A rise in endogamy utility leads to greater gains from marrying similar people across borders, consequently increasing the demand for marriage migration (Figure E4).

Figure E5. Effect of Migration Utility

(a) Marriage Migration



(b) Intermarriage



2. Migration gains: Migration gains represent gains from relocating, either direct effect on the utility of each partner or indirect effect through changing prices. Two key parameters in the model affect marriage migration (Figure E5):

- Migration utility (b): Increased utility for migration, or stronger preferences for

individuals who grew up in the country of origin, directly elevates the utility of marriage migration compared to local marriages. Consequently, marriage migration rises. As the frequency of individuals marrying partners from outside the country increases, it consequently leads to a higher probability of marriages occurring within their own ethnic groups. This, in turn, indirectly reduces the intermarriage rate, even in the absence of changes in preferences for endogamy.

- Outside market's size (α): A larger outside marriage market implies that minorities have access to a broader pool of potential spouses. Consequently, the cost associated with finding a spouse abroad decreases. Thus, even without preferences for endogamy, an increase in the size of the outside market increases marriage migration, albeit to a lower extent. Since minorities marry within their group more, intermarriage decreases.

In summary, both a higher endogamy preference and higher migration gains lead to increased marriage migration and decreased intermarriage rates. However, the magnitude of these effects depends on which factor is affected.

F Monte-Carlo Simulations

In this section, I use Monte Carlo simulation to assess the accuracy of the estimation method. This involves creating a simulated matching process based on predefined preferences and random utilities, and then iterating this process multiple times to estimate parameters using the proposed estimation strategy. The goal is to evaluate whether the estimation method provides unbiased estimates of parameters across numerous iterations.

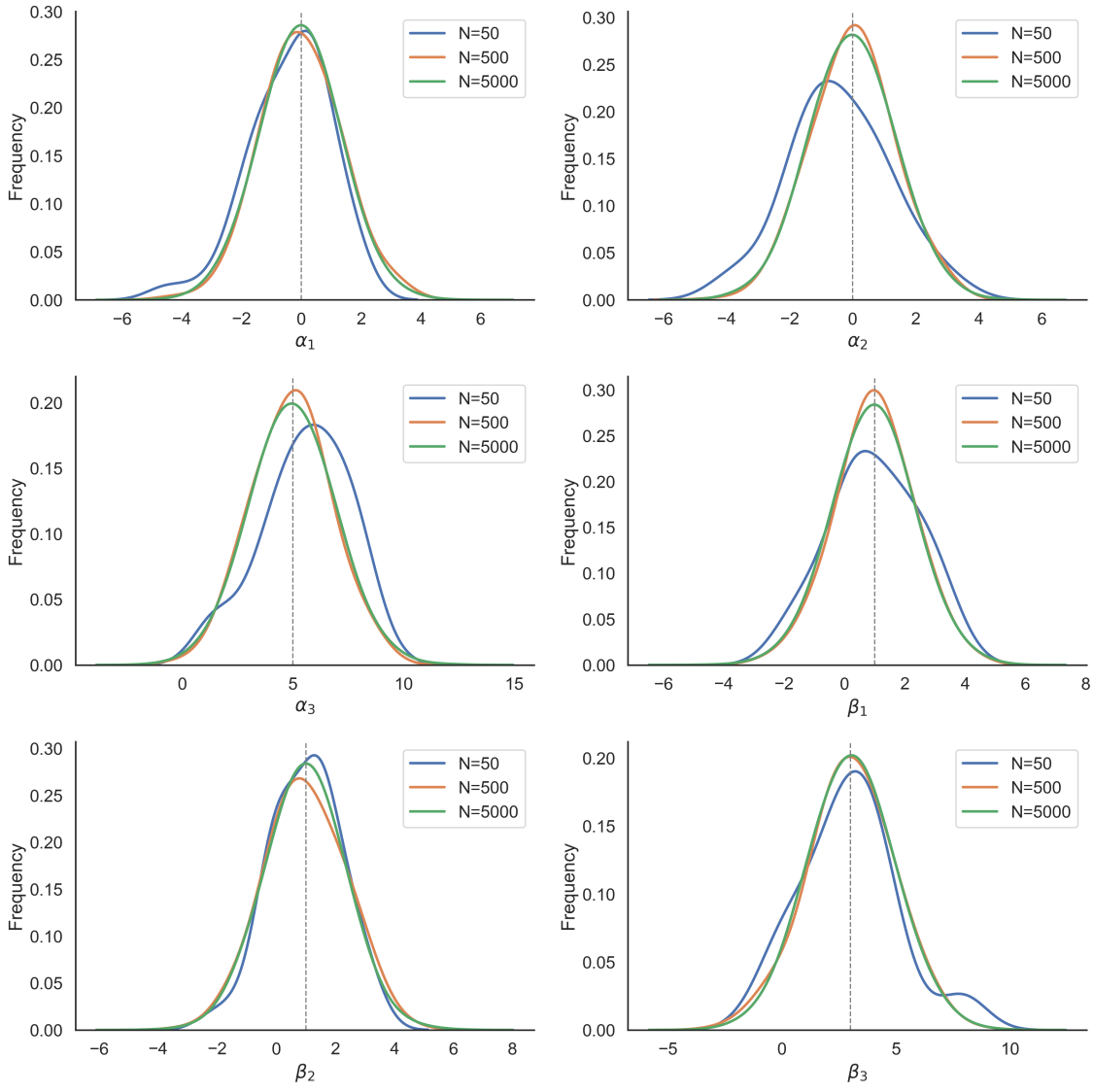
People are divided into two groups: Majority and minority. Minorities constitute 5% of the population. The utility of a match between woman i of type x_i and man j of type y_j is assumed to be:

$$\Phi = \alpha_0 + \alpha_1 r_i + \alpha_2 r_j + \alpha_3 r_i r_j + \beta_1 s_i + \beta_2 s_j + \beta_3 s_i s_j + \varepsilon_{x_i y_j}$$

where r represents education and s represents income of each person. Random shocks are type-specific, varying based on the types of individuals in the match. Minorities have the option of marrying someone from abroad. The size of the outside country is the same as the inside country, and the benefit of migration is b.

To generate a sample, I draw random utilities N times from a multinomial probability distribution. I then use minimum distance estimation on each sample. The minimum distance estimator employs linear regression. Figure F1 shows the estimates for $\alpha_1 = 0$, $\alpha_2 = 0$, $\alpha_3 = 5$, $\beta_1 = 1$, $\beta_2 = 1$, $\beta_3 = 3$, and $b = 2$. As the number of repetitions (N) increases, the accuracy of the estimates improves. This approach yields unbiased and consistent estimates of the endogamy preferences.

Figure F1. Monte-Carlo Simulation of Estimation Methodology



G The Sample

In the 10% sample of the Census for England and Wales in 2011 there are 5,693,850 observations. In the process of matching spouses, the following people were excluded:

- partners could not be found (3,626 observations),
- same-sex couples (10,242 observations),
- divorced, widowed, or separated (815,349 observations).

These adjustments reduce the number of observations by about 14.6%. In the next step, only men aged 25-55 and women aged 23-53 stay in the dataset. For couples, if one of the partners is outside the age range, the couple is removed from the sample. Thus, the number of observations becomes 1,850,766.

To deal with missing variables, I do not consider observations with missing education and their spouses (0.15% of observations) and people who refuse to report their religion (8.5% of observations). Since I want to make sure that everyone in the sample made a marriage decision within the UK not before arriving in the UK, and many Muslims are first-generation immigrants; I limit the sample to non-Muslims plus Muslims who were born in the UK or arrived in the UK before their 18^{th} birthday. This excludes 54% of Muslim observations. Therefore, the final sample used to estimate the model comprises 1,423,555 observations, with 38,938 individuals (2.7%) identified as Muslim.

H Robustness Checks

In this section, I present the results of the model using alternative methods for constructing the sample.

H.1 Cohabitation

For the main analysis, I categorized cohabiting individuals as single. However, cohabiting individuals form a substantial proportion of couples, particularly among younger non-Muslims (Figure A3). In this section, I assume that individuals have the option to either marry or cohabit with someone within the country or marry someone from abroad. Given that presenting a marriage certificate is necessary for importing a partner, it is reasonable to disregard cohabitation in the case of marriage migration.

Table H1. Comparison of Results with and without Cohabitation

	With Cohabitation^{+}		Without Cohabitation^{++}	
	Non-Muslim	Muslim	Non-Muslim	Muslim
Endogamy preferences				
Ethnicity	10.2	7.3	10.4	7.4
Religion	21.9	21.9	22.7	22.7
Marriage migration (%)				
Overall	19.6	51.3	21.7	53.0
Migration gains	9.8	11.3	10.0	11.2
Endogamy preferences	9.8	40.1	11.8	41.8

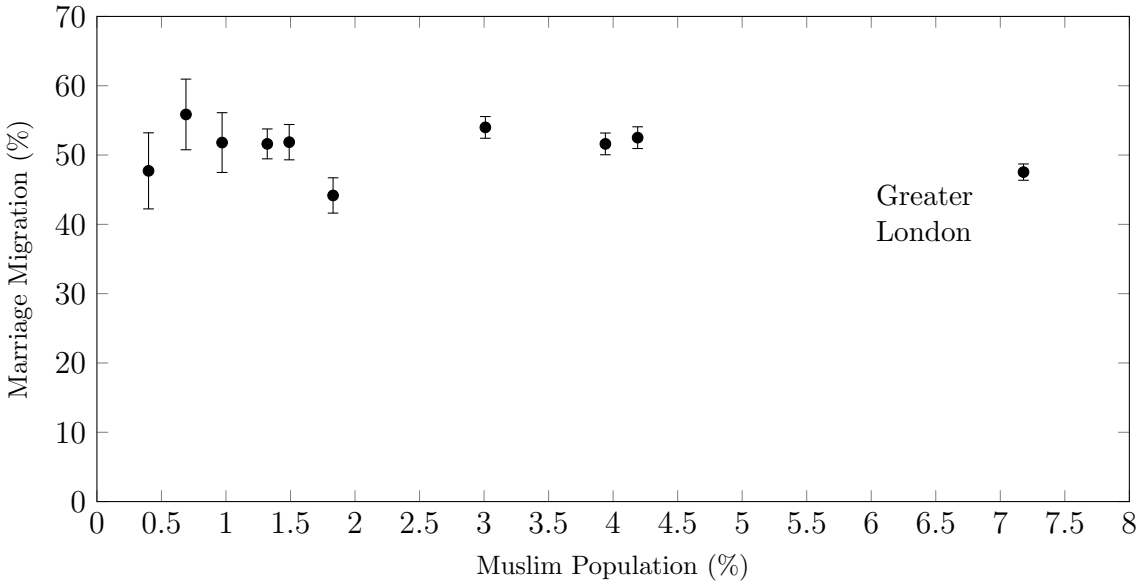
Notes. The table shows the comparison of the results for the sample with and without cohabitation. $^{+}$ Cohabiting couples are included in the married groups. $^{++}$ Cohabiting individuals are considered single (original sample).

Comparing the results with those obtained from the original sample (Table H1), I find that preferences for endogamy remain robust. Due to the higher prevalence of mixing on religion among cohabiting couples, estimated religious endogamy preferences are 4% lower, but not significantly different from the previous results. Moreover, the overall marriage migration rate decreases by approximately 2 percentage points because the category of local couples includes cohabiting couples, thereby increasing their size. Despite these changes, the shares of endogamy and migration gains in the overall marriage migration rate remain consistent.

H.2 Geography

The main analysis assumes that everyone has access to all people in the UK, or equivalently, a representative distribution of the population, ignoring the geographical heterogeneities. Muslims in the UK are not evenly distributed, some areas have higher Muslim populations than others (Figure A6). However, these heterogeneities do not pose an issue for studying marriage migration, as the share of the Muslim population does not predict marriage migration rates (Figure H1).

Figure H1. Regional Share of Muslims and their Marriage Migration



To address concerns about geographical distribution heterogeneities, I conduct a robustness check by focusing on regions with larger Muslim populations that are in close proximity. Specifically, the analysis concentrates on the East Midlands, West Midlands, East of England, Greater London, and South East of England regions. The overall estimates do not show significant differences when compared to the original sample. This suggests that the results remain robust, even when accounting for variations by geographical region (Table H2).

H.3 UK-born vs First generation

In the sample, I focus on people who are either UK-born or UK-bred (those who arrived in the UK before their 18th birthday). However, there might be concerns that the results of the estimates might be different for these groups. The marriage

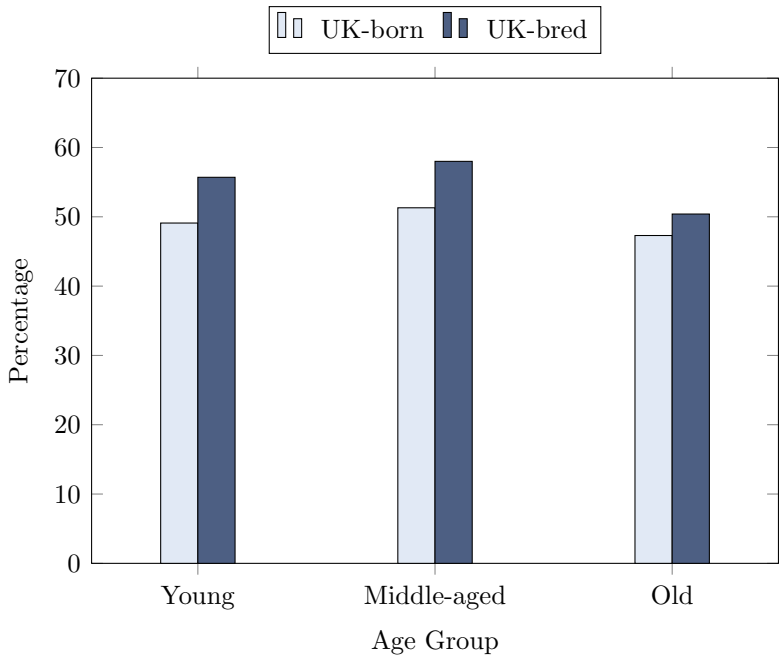
Table H2. Comparison of Results with and without Limitation on Geography

	Limited Geography^{+}		England & Wales^{++}	
	Non-Muslim	Muslim	Non-Muslim	Muslim
Endogamy preferences				
Ethnicity	10.5	7.4	10.4	7.4
Religion	23.1	23.1	22.7	22.7
Marriage migration (%)				
Overall	22.7	52.0	21.7	53.0
Migration gains	10.7	11.4	10.0	11.2
Endogamy preferences	12.0	40.6	11.8	41.8

Notes. The table shows the comparison of the results for the model with and without limited geography. $^{+}$ Sample limited to East Midlands, West Midlands, East of England, Greater London, and South East of England. $^{++}$ Original sample.

migration rate data shows that there's not much variation in marriage migration rates between UK-born and UK-bred Muslims across different age groups (Figure H2).

Figure H2. Comparison of Muslim Marriage Migration for UK-born and UK-bred



There might still be differences in the preferences of UK-born and UK-bred Muslims. I compare the preferences of the original sample with a redefinition of marriage migration as marriage between UK-borns and first-generation immigrants. The re-

sults, presented in Table H3, show that religious endogamy preferences remain robust to this change. The new definition of marriage migration notably increases the overall marriage migration rate (2pp for non-Muslims and 8pp for Muslims), as it includes instances where UK-born Muslims marry individuals who migrated to the UK before the age of 18. Moreover, the share of marriage migration explained by migration gains and endogamy preferences remains unchanged.

Table H3. Comparison of Results with and without UK-bred

	UK-born^{+}		UK-born or UK-bred^{++}	
	Non-Muslim	Muslim	Non-Muslim	Muslim
Endogamy preferences				
Ethnicity	10.2	6.1	10.4	7.4
Religion	22.4	22.4	22.7	22.7
Marriage migration (%)				
Overall	23.7	61.1	21.7	53.0
Migration gains	8.9	13.6	10.0	11.2
Endogamy preferences	14.8	47.4	11.8	41.8

Notes. The table shows the comparison of the results for UK-born versus UK-born or bred samples. $^{+}$ Sample is limited to UK-born. $^{++}$ Original sample.

H.4 Marriage Migration Definition: Sensitivity Analysis

In this subsection, I explore the sensitivity of the primary findings to variations in the definition of marriage migration. One concern regarding the marriage migration definition is that it includes individuals who initially arrived in the UK for study and subsequently married, rather than those who migrated specifically for marriage. Their migration gains might differ from those who migrated specifically for marriage. As a robustness check, I exclude marriages in which the migrant spouse holds a university degree in the UK from the marriage migration category, considering them local marriages instead. The results presented in Table H4 show that, with this adjusted definition, marriage migration decreases by about 3 percentage points. The endogamy preferences are robust. Moreover, the contribution of migration gains to overall marriage migration decreases, reaffirming previous findings that emphasize the significance of endogamy preferences in comparison to migration gains.

In this paper, I defined marriage migration as a match between a UK-born indi-

Table H4. Comparison of Results with Different Definitions of Marriage Migration

	Excluding Migrants with UK Degree^{+}		Original Definition^{++}	
	Non-Muslim	Muslim	Non-Muslim	Muslim
Endogamy preferences				
Ethnicity	10.6	7.9	10.4	7.4
Religion	22.6	22.6	22.7	22.7
Marriage migration (%)				
Overall	18.0	49.8	21.7	53.0
Migration gains	8.0	9.2	10.0	11.2
Endogamy preferences	10.0	40.6	11.8	41.8

Notes. The table shows the comparison of the results for UK-born versus UK-born or bred samples. $^{+}$ Immigrants who have a university degree from the UK are not included in marriage migration. $^{++}$ Original definition.

vidual or someone who arrived in the UK before turning 18 (UK-born or bred) and someone who migrated to the UK after reaching the age of 18. The age 18 threshold was chosen to ensure that individuals made their marriage decisions in the UK. However, it is possible that some individuals have marriage arrangements before reaching 18. Hence, Table H5 compares results with different age thresholds (16, 18, and 20). As the threshold age rises, the marriage migration rate decreases, as it excludes older Muslims who marry at younger ages. Nevertheless, the consistent proportionate contribution of migration gains to the overall marriage migration across these thresholds provides further reassurance regarding the robustness of the main results. Religious endogamy preferences remain robust; however, as the threshold age increases, ethnic endogamy preferences increase. This is primarily due to the inclusion of interethnic marriages that were previously considered marriage migration and are now classified as local marriages.

Table H5. Results Sensitivity to Marriage Migration Age Threshold

	Threshold = 16		Threshold = 18		Threshold = 20	
	Non-Muslim	Muslim	Non-Muslim	Muslim	Non-Muslim	Muslim
Endogamy preferences						
Ethnicity	10.4	6.7	10.4	7.4	10.4	8.3
Religion	22.4	22.4	22.7	22.7	22.2	22.2
Marriage migration (%)						
Overall	22.1	58.1	21.7	53.0	20.6	39.5
Migration gains	10.0	12.0	10.0	11.2	9.7	7.9
Endogamy preferences	12.1	46.1	11.8	41.8	10.9	31.7

Notes. Marriage migration is defined as a union between a UK-born individual or someone who arrived in the UK before the age threshold and someone who migrated to the UK after reaching the age threshold.