

Returns to Size in Local Marriage Markets

Ana Moreno-Maldonado*

Olatz Román[†]

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Abstract

This paper studies whether there are returns to size in local marriage markets. Using a stylized search model of couple formation, we show that rates of couple formation and dissolution are insufficient to identify returns to market size when meeting technologies differ across locations. This is because higher meeting rates increase not only the frequency of encounters but also the option value of remaining single, raising the minimum match quality individuals are willing to accept to enter a relationship. We show how a measure of match quality can be used to identify returns to size in some circumstances. Guided by the model, we empirically study marriage markets using a novel measure of relationship quality. Adapting methods from the labour economics literature to account for endogenous sorting into cities, we find evidence of constant returns to size. Not only formation and dissolution rates do not change with city size, but also match quality displays a flat profile.

Keywords: Marriage markets, Match quality, Market size, Spatial sorting

JEL Codes: J12, J11, R12, R23

*IAE-CSIC & BSE, ana.moreno@iae.csic.es.

[†]University of Mannheim, olatz.roman@uni-mannheim.de.

1 Introduction

Large spatial inequalities in labour market outcomes are a defining feature of modern economies. Workers in larger cities are more productive and earn higher wages, reflecting the benefits of agglomeration and the sorting of workers across locations (Glaeser and Maré, 2001; Duranton and Puga, 2004). Yet differences in labour market outcomes alone provide an incomplete account of spatial inequality. Welfare disparities across cities depend critically on non-market factors, such as urban amenities, which can substantially amplify welfare differences relative to those implied by wages alone (Couture et al., 2024). This broader perspective highlights that spatial inequality is shaped by the full set of markets and interactions that affect individual well-being. One important dimension that has received comparatively little attention is the possibility that agglomeration economies also operate in local marriage markets, shaping welfare through both the likelihood of forming a relationship and the characteristics of the relationships individuals form across cities.

Long-term partnerships play a central role in individual welfare, shaping consumption, risk sharing, and economic outcomes over the life cycle (Becker, 1973; Weiss, 1997; Stevenson and Wolfers, 2007). Because partner search is inherently local, spatial sorting across cities generates systematic differences in the set of potential partners that individuals encounter. Moving to a larger city may therefore improve not only labour market opportunities but also marriage market prospects. If access to higher quality matches differs across locations, spatial inequality may be reinforced through family formation. However, evidence on whether marriage markets differ by city size remains scarce. Existing work has studied geographic differences in marriage markets exclusively through rates of couple formation and separation (Gould and Paserman, 2003; Drewianka, 2003; Botticini and Siow, 2008), which provide only an incomplete picture of marriage market dynamics.

In this paper, we argue that formation and dissolution rates alone are insufficient to identify the gains from market size in local marriage markets. The key insight is that meeting rates not only determine the frequency at which potential partners are met but also affect the value of remaining single. For instance, if meeting rates were higher in some locations, this would raise the minimum match quality individuals require to enter a relationship. Higher meeting rates and higher reservation quality exert opposing forces on observed formation rates, so that markets with more frequent meetings may not exhibit higher formation. We formalize this idea using a simple search model of couple formation across locations. Using the model, we derive the conditions under which adding a measure of match quality to the analysis is enough to infer the existence of return to size in marriage markets. Lastly, we bring the model to the data using a novel measure of match quality (Rodríguez-Moro and Román, 2026).

Understanding whether larger marriage markets generate higher quality matches is central to interpreting spatial differences in family formation and inequality. If observed formation

and dissolution rates are taken as sufficient statistics for marriage market performance, larger markets may appear no different from smaller ones. This can be misleading in two ways. First, it may lead to the wrong conclusion that meeting rates do not differ across cities of different sizes. Second, it may hide meaningful differences in marriage markets even when larger markets deliver substantial gains in match quality. As a result, relying solely on formation outcomes risks understating the role of location in shaping long-run welfare.

To illustrate this mechanism, we first develop a stylized two-period search model of marriage decisions with endogenous divorce. Individuals meet potential partners with a probability that may depend on city size, and decide whether to marry based on match quality and the value of remaining single. Higher meeting probabilities increase the option value of continued search, raising the minimum match quality individuals are willing to accept to marry. As a result, couple formation rates may increase, decrease, or remain unchanged with city size, even when larger markets generate more frequent meetings. By contrast, higher meeting rates unambiguously lead to higher average match quality among formed couples, all else equal. The model therefore clarifies why marriage rates alone are insufficient to identify the returns to market size and motivates the need for a direct measure of match quality.

In the second part of the paper, we study how local marriage markets differ across locations. We estimate the association between the size of travel-to-work areas (TTWA)¹ and three outcomes: couple formation, dissolution and match quality. We combine population data from the United Kingdom census with longitudinal survey data from the British Household Panel Survey and Understanding Society. Crucially, we make use of a novel measure of match quality introduced by [Rodríguez-Moro and Román \(2026\)](#) and referred to as relationship quality (RQ). This measure serves as a proxy for the non-material gains from being in a relationship. It is constructed from responses to a questionnaire administered biannually to all individuals cohabiting with a partner. Using factor analysis, we combine these responses into a single index, which has been shown to serve as a reliable proxy for match quality.

We first document systematic differences in the composition of marriage markets by city size. Larger cities are populated by younger and more educated individuals, who are more active in the labour market and earn higher incomes. These patterns raise two concerns for the interpretation of city-size gradients in marriage outcomes. First, individuals may sort across locations based on observed and unobserved characteristics that are correlated with their matching outcomes. Second, differences in local population composition may themselves affect aggregate matching outcomes, even in the absence of differences in meeting opportunities.

To address these concerns and empirically identify the returns to size in local marriage markets, we adopt a two-step approach that builds on the labour economics literature ([Abowd et al., 1999](#); [Combes et al., 2008](#)). In the first step, we regress each outcome on individual fixed

¹TTWAs are the United Kingdom equivalent of commuting zones in the United States. Throughout the paper, we use the terms city, marriage market and TTWA interchangeably.

effects, location fixed effects, period effects and time-varying individual controls. Individual fixed effects absorb time-invariant observed and unobserved heterogeneity, while location fixed effects capture differences in outcomes across marriage markets net of this heterogeneity. Therefore, location effects are identified from individuals who move between TTWAs. In the second step, we regress the estimated location effects on log population and city-level measures of composition. The resulting city-size coefficient captures the gradient in each outcome after accounting for individual sorting and compositional differences across locations. These coefficients provide the empirical counterparts of the model’s city-size gradients and allow us to assess the direction of returns to size in local marriage markets.

The resulting estimates reveal no statistically significant association between city size and any of the three marriage market outcomes. The estimated city-size gradient in RQ is substantially smaller than the negative raw association observed in the descriptive analysis, highlighting the importance of individual sorting in shaping spatial differences in match quality. We find similar patterns for couple formation and dissolution. Interpreted through the lens of the model, these results imply that meeting rates in smaller cities are as high as in larger ones. The absence of a city-size gradient in RQ among couples formed later in life, combined with the absence of a gradient in couple formation, is inconsistent with increasing returns to size under the model’s conditions. Instead, the results are consistent with constant returns to size in local marriage markets.

We conduct several robustness checks to assess the sensitivity of our results to weakly connected cities, selective migration and the potential endogeneity of city size. Our findings are broadly robust across specifications. Restricting the analysis to cities with a minimum number of mover connections leaves the estimates statistically indistinguishable from zero. Assigning individuals to their place of origin rather than their current place of residence yields similar results for all three outcomes, suggesting that selective migration does not drive the baseline patterns. Finally, instrumenting city size with the size of the corresponding child cohort in the 1991 Census to account for potential endogeneity of city size produces estimates similar to the baseline results. Overall, these checks reinforce our main conclusion that, after accounting for individual sorting and city-level composition, we find no robust evidence of increasing returns to size in local marriage markets.

Related literature. This paper relates most directly to the small literature that studies how the size of local marriage markets affects marital outcomes. Existing work has examined geographic differences in marriage markets primarily through rates of couple formation and dissolution, interpreting these outcomes as proxies for returns to market size ([Gould and Paserman, 2003](#); [Drewianka, 2003](#); [Botticini and Siow, 2008](#)). Our first contribution to this literature is to show formally that formation and dissolution rates are not sufficient statistics for identifying returns to market size when meeting technologies differ across locations, and that a measure of

match quality is required to assess market performance. We then use a novel measure of match quality to directly quantify the gains from market size in local marriage markets.

A second limitation of this literature is that estimates may be confounded by endogenous sorting across cities. This is a concern because relocation decisions may be driven not only by labour market considerations but also by marital prospects. A growing body of evidence shows that individuals, especially higher-educated singles and women, sort into larger cities in part for marriage market reasons (Costa and Kahn, 2000; Edlund, 2005; Compton and Pollak, 2007; Gautier et al., 2010; Alonzo, 2022; Fang et al., 2025; Koh et al., 2025). We contribute to this literature by explicitly addressing sorting into cities of different sizes. Adapting a methodology developed in the labour economics literature, we separate the role of individual sorting from location effects, which allows us to identify the returns to market size net of observed and unobserved sorting across cities.

Our analysis builds on the extensive literature documenting returns to size in local labour markets. Larger cities have been shown to be associated with higher productivity (Behrens et al., 2014), higher wages (Glaeser and Maré, 2001; Combes et al., 2008; Baum-Snow and Pavan, 2012), and greater labour market churning (Bleakley and Lin, 2012). A large body of work studies these patterns through agglomeration economies (Ellison and Glaeser, 1999; Duranton and Puga, 2004; Combes and Gobillon, 2015). Theoretical and empirical contributions emphasize that thicker markets improve match quality by increasing the frequency and diversity of meetings (Petrongolo, 2001; Petrongolo and Pissarides, 2001, 2006; Di Addario, 2011; Harmon, 2013), as well as the efficiency of matching between workers and firms (Andersson et al., 2007; Mion and Naticchioni, 2009; Baum-Snow et al., 2018; Dauth et al., 2022; Moretti and Yi, 2024). We adapt tools developed in this literature (Abowd et al., 1999; Combes et al., 2008) to study marriage markets, but find no evidence that similar forces operate in marriage markets.

Finally, this paper contributes to the broader literature on spatial disparities in economic and social outcomes. A large literature documents substantial spatial inequalities in income, consumption, living standards, and housing costs (Roback, 1982; Glaeser et al., 2001; Baum-Snow and Pavan, 2013; Moretti, 2013; Diamond and Moretti, 2021). More recent work shows that these disparities extend beyond monetary outcomes to non-monetary dimensions of welfare, including amenities and quality of life (Desmet and Rossi-Hansberg, 2013; Ahlfeldt et al., 2020; Diamond and Moretti, 2021; Couture et al., 2024). We add to this literature by highlighting couple formation as an additional, previously underexplored channel through which location shapes inequality and long-run welfare. Through differential formation of couples across cities, our results imply that spatial inequality may be reinforced through mechanisms operating within families, increasing the persistence of initial location choices over the life cycle.

Roadmap. The remainder of this paper is structured as follows. [Section 3](#) describes the data sources and the empirical measures of returns to size. [Section 4](#) presents a set of stylized facts. [Section 2](#) presents the model. [Section 5](#) empirically pins down returns to size in the marriage market. [Section 7](#) concludes.

2 The Model

In this section we present a two-period random-search model of marriage markets with endogenous divorce. Cities differ both in the effective size of the dating pool and in the flow utility of being single. We use the model to establish that the city-size coefficients of couple formation and dissolution rates are jointly insufficient to identify returns to scale in the meeting technology, and to show how a measure of relationship quality can be used to identify the existence of returns to scale in some cases.

2.1 Environment

Population. We consider a continuum of homogeneous individuals of mass N_l in each city l .² Individuals live for two periods.

Cities. There are L cities, indexed by l . Cities differ in the effective size of their dating pool, $N_l > 0$, and in the flow utility of being single, U_l^s . This variable captures reasons why singlehood may be more or less attractive in larger cities relative to being in a couple.³ For instance, big cities may offer more amenities that singles consume disproportionately, such as nightclubs. Conversely, high housing costs in big cities may raise the value of cohabitation, making singlehood relatively less attractive there.

Meeting technology. Individuals living in city l meet a potential partner in a given period with probability λ_l . The underlying meeting technology is unknown and may exhibit constant (CRS) or increasing returns to scale (IRS). Under increasing returns, the number of meetings grows with city size and $\lambda_l = \lambda_l(N_l)$. Under constant returns, $\lambda_l = \lambda$ for all l . We write λ_l throughout and allow for both cases.

²In the empirical analysis, individual characteristics and fixed effects are controlled for, which justifies the absence of heterogeneity in the model.

³We normalize the location-specific component of couple utility that is common across relevant match qualities to zero. Thus, U_l^s should be interpreted as the value of singlehood relative to being in a couple. This normalization is without loss of generality for the comparative statics considered here as long as city size does not change the marginal value of match quality among accepted matches; formally, $\frac{\partial^2 U_l^c(q)}{\partial q \partial N_l} = 0$ over the relevant range of q . Under this restriction, any direct effect of city size on couple utility enters the cut-off conditions only through its effect on the relative value of singlehood versus couplehood.

Marriage market. All households start period 1 as singles and face a probability λ_l of meeting a potential partner. Upon meeting, the pair draws an idiosyncratic match quality q from a distribution $G(q)$ with density $g(q)$. Match quality is common to both partners. Let U_l^s denote the flow utility of being single in city l , and $U^c(q)$ the flow utility of being married with match quality q . We assume $U^c(q)$ is strictly increasing in q and does not depend on the city of residence.

Individuals who meet a potential partner in the first period observe their match quality and decide whether to marry or remain single. If they marry, they enjoy $U^c(q)$ in period 1. Individuals who do not marry enjoy U_l^s in period 1 and enter period 2 as singles, when they meet again a potential partner with probability λ_l .

In the second period, existing couples draw a match quality update ϵ from a distribution $F(\epsilon)$ with density $f(\epsilon)$ and mean zero, and decide whether to remain married or divorce. If they remain married, they enjoy $U^c(q + \epsilon)$. The assumption $\mathbb{E}[\epsilon] = 0$ implies that, absent divorce, match quality does not systematically improve or deteriorate over time, isolating endogenous dissolution as arising from idiosyncratic shocks and outside options rather than from a deterministic trend in relationship quality.

2.2 Equilibrium Characterisation

We solve the model by backward induction.

2.2.1 Period 2

Since the horizon ends after period 2, a period-2 single who meets a potential partner marries if and only if the utility of marrying that partner is at least as high as the utility of being single that last period, that is, $U^c(q) \geq U_l^s$. Let $\bar{q}_{2,l}$ denote the associated acceptance threshold in city l :

$$\bar{q}_{2,l} = U^{c-1}(U_l^s).$$

This threshold establishes the minimum quality drawn such that individuals prefer to marry, which depends on the city the individual lives in because the flow utility of being single changes with location.

The expected value of entering period 2 as a single reflects the three potential outcomes for that period: not having a meeting, having a meeting but drawing a quality too low to marry, and

having a meeting and drawing a high enough quality to form a match.

$$V_{2,l}^s = \underbrace{(1 - \lambda_l)U_l^s}_{\text{no meeting}} + \lambda_l \left[\underbrace{G(\bar{q}_{2,l})U_l^s}_{\text{meeting, no match}} + \underbrace{(1 - G(\bar{q}_{2,l})) \mathbb{E}[U^c(q) \mid q > \bar{q}_{2,l}]}_{\text{meeting and match}} \right].$$

This expression can be rewritten as the sum of the utility of being single and the gains from marriage, the latter being scaled by the probability of marrying.

$$V_{2,l}^s = U_l^s + \underbrace{\lambda_l(1 - G(\bar{q}_{2,l}))}_{\text{prob. of marrying}} \underbrace{[\mathbb{E}[U^c(q) \mid q > \bar{q}_{2,l}] - U_l^s]}_{\text{gains from marriage}}. \quad (1)$$

Divorce. At the beginning of period 2, married couples draw a quality shock ϵ . A couple with initial match quality q divorces if and only if the resulting quality is lower than the expected value of entering the second period as a single, that is, $U^c(q + \epsilon) < V_{2,l}^s$. Therefore, the divorce cut-off $\bar{\epsilon}_l(q)$ satisfies

$$U^c(q + \bar{\epsilon}_l(q)) = V_{2,l}^s \quad \implies \quad \bar{\epsilon}_l(q) = U^{c-1}(V_{2,l}^s) - q,$$

so couples remain married if and only if $\epsilon > \bar{\epsilon}_l(q)$.⁴ The couple-specific divorce probability is

$$\delta_l(q) \equiv P(\epsilon < \bar{\epsilon}_l(q)) = F(\bar{\epsilon}_l(q)).$$

2.2.2 Period 1

The value of marrying with match quality q for a period-1 single is the sum of the flow utility of marrying that partner, the expected value of remaining married over period 2 (scaled by the probability of remaining married), and the expected value of entering the second period as a single (scaled by the probability of divorce):

$$V_1^c(q) = U^c(q) + \underbrace{(1 - \delta_l(q)) \mathbb{E}[U^c(q + \epsilon) \mid \epsilon > \bar{\epsilon}(q)]}_{\text{remain married}} + \underbrace{\delta_l(q) V_{2,l}^s}_{\text{divorce}},$$

where $\delta_l(q)$ is the couple-specific divorce probability.⁵ Rejecting marriage yields

$$V_{1,l}^s = U_l^s + V_{2,l}^s,$$

that is, individuals who do not marry enjoy the flow utility of being single that period and the expected value of entering the second period as a single.

⁴The cut-off $\bar{\epsilon}_l(q)$ is decreasing in q : higher initial match quality requires a larger adverse shock to trigger divorce.

⁵Individuals know their match quality when making the period-1 marriage decision and therefore use their couple-specific divorce probability.

Let $\bar{q}_{1,l}$ denote the period-1 acceptance threshold, defined by $V_1^c(\bar{q}_{1,l}) = V_{1,l}^s$:

$$\bar{q}_{1,l} = U^{c-1} \left(U_l^s - (1 - \delta_l(\bar{q}_{1,l})) \left(\mathbb{E}[U^c(\bar{q}_{1,l} + \epsilon) \mid \epsilon > \bar{\epsilon}_l(\bar{q}_{1,l})] - V_{2,l}^s \right) \right),$$

which is the minimum quality drawn in the first period such that individuals prefer to form a match. This threshold increases with the utility of being single and decreases with the expected gains from marriage in the second period, weighted by the survival probability of the couple.

2.2.3 Aggregate Outcomes

The average relationship quality among couples newly formed in period t is the expected quality among draws high enough to form matches:

$$\overline{RQ}_{t,l} = \mathbb{E}[q \mid q > \bar{q}_{t,l}], \quad t = 1, 2 \quad (2)$$

This expression varies across cities because the threshold to marry is location-specific.

A single in city l and period t marries with probability

$$p_{t,l} = \underbrace{\lambda_l}_{P(\text{meeting})} \underbrace{(1 - G(\bar{q}_{t,l}))}_{P(\text{match}|\text{meeting})}, \quad t = 1, 2.$$

Thus, the probability of marrying in a location l depends on the meeting technology in that location and on the location-specific quality threshold for marriage.

The aggregate divorce rate in city l is the average couple-specific divorce probability over the distribution of match qualities among married couples:

$$D_l = \frac{1}{1 - G(\bar{q}_{1,l})} \int_{\bar{q}_{1,l}}^{q^{\max}} F(U^{c-1}(V_{2,l}^s) - q) g(q) dq. \quad (3)$$

2.3 Comparative Statics

This section illustrates how relationship quality, couple formation, and couple dissolution change with city size. Two forces govern how these aggregate outcomes respond to city size. The first is the direct effect of city size on the flow utility of singlehood, $\partial U_l^s / \partial N_l$, which shifts the acceptance threshold each period and the divorce cut-off. The second is the effect of the meeting technology, $\partial \lambda_l / \partial N_l$, which operates indirectly by raising the option value of future search, $V_{2,l}^s$. The following lemma characterises how these two forces combine to determine the sign of $\partial V_{2,l}^s / \partial N_l$, the key intermediate object for all period-1 outcomes.

Lemma 1 (Option value of singlehood). *The city-size gradient of the option value of singlehood*

is

$$\frac{\partial V_{2,l}^s}{\partial N_l} = \underbrace{\frac{\partial U_l^s}{\partial N_l} (1 - \lambda_l(1 - G(\bar{q}_{2,l})))}_{\text{direct effect}} + \underbrace{\frac{\partial \lambda_l}{\partial N_l} (1 - G(\bar{q}_{2,l})) [\mathbb{E}[U^c(q) \mid q > \bar{q}_{2,l}] - U_l^s]}_{\text{scale effect on future search}}. \quad (4)$$

The direct term has the sign of $\partial U_l^s / \partial N_l$. The scale effect term is non-negative by assumption. Consequently, $\partial V_{2,l}^s / \partial N_l \geq 0$ whenever $\partial U_l^s / \partial N_l \geq 0$; when $\partial U_l^s / \partial N_l < 0$, the sign depends on whether the scale effect dominates.

Proof. See [Appendix A.2.1](#). □

Lemma 1 illustrates the two channels through which city size may affect search in the marriage market. On the one hand, there is a direct effect arising from city-size differences in the value of singlehood that make individuals more or less willing to form a couple. The importance of this effect depends on the likelihood of remaining single in the second period. On the other hand, there is an indirect effect that operates through the meeting technology: if larger cities facilitate meetings through higher arrival rates, finding a partner in the next period is more likely there. This indirect effect takes a higher weight the larger the gains from marriage and the probability of accepting a match.

As shown in the proof in [Appendix A.2.1](#), any rise in the acceptance threshold that reduces the probability of matching is exactly offset by the improvement in expected match quality conditional on matching. Thus, the net effect on $V_{2,l}^s$ operates only through the meeting rate and the direct value of singlehood.

The city-size gradient of the period-1 acceptance threshold inherits both forces through $V_{2,l}^s$. Applying the implicit function theorem to $V_1^c(\bar{q}_{1,l}) = V_{1,l}^s$ yields (see [Appendix A.3](#)):

$$\frac{\partial \bar{q}_{1,l}}{\partial N_l} = \frac{\frac{\partial U_l^s}{\partial N_l} + (1 - \delta_l(\bar{q}_{1,l})) \frac{\partial V_{2,l}^s}{\partial N_l}}{U^{c'}(\bar{q}_{1,l}) + (1 - \delta_l(\bar{q}_{1,l})) \mathbb{E}[U^{c'}(\bar{q}_{1,l} + \epsilon) \mid \epsilon > \bar{\epsilon}_l(\bar{q}_{1,l})]}. \quad (5)$$

The denominator is strictly positive. Substituting (4), the sign of the numerator equals the sign of

$$\frac{\partial U_l^s}{\partial N_l} [1 + (1 - \delta_l(\bar{q}_{1,l}))(1 - \lambda_l(1 - G(\bar{q}_{2,l})))] + (1 - \delta_l(\bar{q}_{1,l})) \frac{\partial \lambda_l}{\partial N_l} (1 - G(\bar{q}_{2,l})) [\mathbb{E}[q \mid q > \bar{q}_{2,l}] - \bar{q}_{2,l}]. \quad (6)$$

Therefore, the derivative of the period-1 threshold with respect to city size captures how selective individuals become in thicker marriage markets. The numerator reflects how city size affects the value of remaining single, both in the current period and through future search opportunities. The denominator measures how sensitive the value of marriage is to match quality at the margin. Larger cities increase selectivity when they raise the value of waiting relative

to marrying immediately. The sign of this derivative determines whether average relationship quality among couples formed in this period increases or decreases with city size, which, as shown above, is a function of the city-size gradient of the flow utility of singlehood and the meeting technology.

Proposition 1 (Relationship quality).

- (i) The city-size gradient of $\overline{RQ}_{2,l}$ has the sign of $\partial U_l^s / \partial N_l$, independently of the meeting technology.
- (ii) The city-size gradient of $\overline{RQ}_{1,l}$ has the same sign as $\partial U_l^s / \partial N_l$ under CRS, and also under IRS provided

$$\frac{\partial \lambda_l}{\partial N_l} (1 - G(\bar{q}_{2,l})) [\mathbb{E}[q \mid q > \bar{q}_{2,l}] - \bar{q}_{2,l}] \leq -\frac{\partial U_l^s}{\partial N_l} \left(\frac{1}{1 - \delta_l(\bar{q}_{1,l})} + 1 - \lambda_l(1 - G(\bar{q}_{2,l})) \right). \quad (7)$$

When $\partial U_l^s / \partial N_l < 0$ and (7) is violated, the gradient of $\overline{RQ}_{1,l}$ is positive.

Proof. See [Appendix A.2.2](#). □

Because period 2 is the last one, the only reason why individuals in larger cities would reject more or less matches in that period than their counterparts in smaller ones is city-size difference in the relative value of singlehood. In contrast, in the first period, individuals may prefer to remain single to be able to search in the second period. Therefore, the city-size gradient of average relationship quality in the first period reflects not only city-size differences in the relative value of singlehood but also differences in the likelihood of a meeting, which, in the presence of IRS, increases with city size.

Proposition 2 (Couple formation). *The city-size gradient of the couple formation rate in each period is*

$$\frac{\partial p_{t,l}}{\partial N_l} = \frac{\partial \lambda_l}{\partial N_l} (1 - G(\bar{q}_{t,l})) - \lambda_l g(\bar{q}_{t,l}) \frac{\partial \bar{q}_{t,l}}{\partial N_l}, \quad t = 1, 2. \quad (8)$$

The first term is the thick-market effect of IRS; the second is the selectivity effect. When $\partial \bar{q}_{t,l} / \partial N_l > 0$ the two effects work in opposite directions and the sign is generically ambiguous. When $\partial \bar{q}_{t,l} / \partial N_l < 0$ both effects are positive, so $\partial p_{t,l} / \partial N_l > 0$.

Proof. See [Appendix A.2.3](#). □

[Proposition 2](#) shows that couple formation increases with city size in the presence of IRS in the meeting technology ($\frac{\partial \lambda_l}{\partial N_l} > 0$), scaled by the probability of drawing a high enough match quality ($1 - G(\bar{q}_{t,l})$); and decreases with the city-size change in the cut-off (how much more selective people get), scaled by the probability of a meeting (λ_l) and the slope of the match quality distribution at the cut-off ($g(\bar{q}_{t,l})$).

Proposition 3 (Divorce rate). *The city-size gradient of the divorce rate decomposes as*

$$\begin{aligned} \frac{\partial D_l}{\partial N_l} = & \underbrace{\frac{\partial \bar{q}_{1,l}}{\partial N_l} \cdot \frac{g(\bar{q}_{1,l})}{1 - G(\bar{q}_{1,l})} \cdot [D_l - \delta_l(\bar{q}_{1,l})]}_{\text{selection channel}} \\ & + \underbrace{\frac{\partial V_{2,l}^s}{\partial N_l} \cdot \frac{1}{U^{c'}(U^{c-1}(V_{2,l}^s))} \cdot \frac{\int_{\bar{q}_{1,l}}^{q^{\max}} f(U^{c-1}(V_{2,l}^s) - q) g(q) dq}{1 - G(\bar{q}_{1,l})}}_{\text{outside-option channel}}. \end{aligned} \quad (9)$$

Since $D_l - \delta_l(\bar{q}_{1,l}) < 0$ always, the selection channel has the opposite sign to $\partial \bar{q}_{1,l} / \partial N_l$. The outside-option channel has the sign of $\partial V_{2,l}^s / \partial N_l$. The two channels therefore reinforce each other—and $\partial D_l / \partial N_l > 0$ unambiguously—when $\partial \bar{q}_{1,l} / \partial N_l < 0$ and $\partial V_{2,l}^s / \partial N_l > 0$ simultaneously.

Proof. See [Appendix A.2.4](#). □

The divorce rate in a city is lower the higher the acceptance threshold, as marriages with higher quality are less likely to dissolve (selection channel). In contrast, divorce rates are higher in cities where the value of entering the second period as a single is larger (outside option channel). [Proposition 3](#) shows that the city-size gradient of the divorce rate is the sum of the city-size change in these two channels. Therefore, if individuals in larger cities are more selective, the selection channel implies that divorce rates decrease with city size. In contrast, if the option value of entering the second period as a single increases with city size, the outside option channel implies that divorce rates increase with city size. Which channel dominates is ambiguous, except for the case when IRS increase the value of search in the second period but are not strong enough to generate a positive city-size gradient of relationship quality in the first period. In this case, both channels reinforce each other and divorce rates unambiguously increase with city size.

2.4 Identification

This section discusses how the sign of each city-size gradient can be used to identify the nature of returns to scale in the meeting technology, under some circumstances. We collect the empirical implications of the propositions in the previous section in [Corollary 1](#). Hence, this corollary constitutes our main guide when designing the empirical strategy in [Section 4](#). We use β_{RQ}^t , β_{CF}^t , and β_{CD} to denote the coefficients of regressions of average relationship quality, couple formation, and couple dissolution on city size, respectively.

Proposition 4 (Couple formation rates alone do not identify returns to scale). *For $t = 1, 2$, the sign of β_{CF}^t is generically ambiguous regardless of the sign of $\partial U_l^s / \partial N_l$ and regardless of whether the meeting technology exhibits CRS or IRS.*

Proof. From (8), $\partial p_{t,l}/\partial N_l$ is the sum of a non-negative thick-market term and a selectivity term whose sign is opposite to $\partial \bar{q}_{t,l}/\partial N_l$. When $\partial \bar{q}_{t,l}/\partial N_l > 0$, the two terms have opposite signs and neither dominates in general. When $\partial \bar{q}_{t,l}/\partial N_l < 0$ both terms are positive and $\partial p_{t,l}/\partial N_l > 0$, but the same positive sign is also consistent with $\partial \bar{q}_{t,l}/\partial N_l < 0$ under CRS (where the thick-market term vanishes and the positive sign comes entirely from the selectivity term). In neither case does the sign of β_{CF}^t alone pin down $\partial \lambda_l/\partial N_l$. $\square$

The ambiguity in [Proposition 4](#) is the central identification challenge that motivates using relationship quality. A higher meeting rate in larger cities raises couple formation (thick-market effect), but also raises the option value of continued search, making individuals more selective (selectivity effect). When the latter dominates, couple formation can fall with city size even under strong IRS, and conversely a positive couple formation gradient does not rule out CRS. Neither the sign nor the magnitude of β_{CF}^t is therefore informative about returns to scale without additional moments. Hence, [Proposition 4](#) establishes that couple formation rates, taken alone, contribute nothing to identify the nature of returns to scale in the meeting technology: the thick-market and selectivity effects are always in tension, and the net sign of β_{CF}^t can be positive or negative under both CRS and IRS.

The following corollary builds on [Propositions 1 to 4](#) to gather all the cases in which the city-size gradients of local marriage market measures allows us to establish the existence or absence of IRS.

Corollary 1 (Identification of $\partial U_l^s/\partial N_l$ and $\partial \lambda_l/\partial N_l$).

- (i) *The sign of β_{RQ}^2 equals the sign of $\partial U_l^s/\partial N_l$ under all returns-to-scale regimes.*
- (ii) *Observing $\beta_{RQ}^2 > 0$ and $\beta_{CF}^2 > 0$ implies $\partial \lambda_l/\partial N_l > 0$.*
- (iii) *Observing $\beta_{RQ}^2 < 0$ and $\beta_{RQ}^1 > 0$ implies $\partial \lambda_l/\partial N_l > 0$.*
- (iv) *Observing $\beta_{RQ}^2 < 0$ and $\beta_{CD} > 0$ implies $\partial \lambda_l/\partial N_l > 0$.*
- (v) *Observing $\beta_{RQ}^2 = 0$ and $\beta_{CF}^2 = 0$ implies $\partial \lambda_l/\partial N_l = 0$.*

Proof. See [Appendix A.2.5](#). $\square$

Therefore, the identification strategy that arises from the model proceeds in two steps. The first step uses $\hat{\beta}_{RQ}^2$ to determine the sign of $\partial U_l^s/\partial N_l$ ([Corollary 1](#) (i)). This is the anchor of the entire strategy: because the period-2 acceptance threshold $\bar{q}_{2,l} = U^{c-1}(U_l^s)$ depends only on U_l^s and not on λ_l , second-period relationship quality is a clean signal of the city-size premium to singlehood, free of any assumption about returns to scale. All other moments depend on U_l^s and λ_l jointly, so they can only be interpreted once $\hat{\beta}_{RQ}^2$ has been read.

The second step uses the remaining moments to detect or rule out IRS, conditional on the sign of $\partial U_l^s / \partial N_l$ established in the first step. Combining $\hat{\beta}_{CF}^t$ with the city-size gradient of relationship quality is enough to identify the returns to scale in some cases. The first of such cases is summarized in [Corollary 1](#) (ii): observing a higher couple formation rate in big cities in spite of individuals being more selective due to a larger value of singlehood is indicative of IRS. Similarly, for the case in which singlehood is less attractive in big cities, observing that relationship quality among couples formed in the first period increases with city size reveals the role of IRS in increasing the value of search: without it, relationship quality would also be decreasing in city size in the first period ([Corollary 1](#) (iii)). Observing a higher divorce rate in large cities when the value of singlehood decreases with city size signals the existence of IRS ([Corollary 1](#) (iv)). This happens whenever IRS increase the value of search –making existing couples more willing to dissolve through the outside option channel– but are not strong enough for the selection channel to dominate– average relationship quality in the first period does not increase with city size. Lastly, [Corollary 1](#) (v) shows that, while observing $\hat{\beta}_{CF}^2 = 0$ was not informative of the returns to scale, it is indicative of CRS whenever $\hat{\beta}_{RQ}^2 = 0$: if there are no differences in how selective individuals are in large cities, then an IRS technology should result in a higher rate of couple formation.

3 Data and Measures

3.1 Data Sources

Our analysis combines population data from the 2011 United Kingdom Census with individual-level panel data from the British Household Panel Survey (BHPS) and Understanding Society. The census provides comprehensive coverage of the resident population of England, Wales, Scotland and Northern Ireland, and provides measures of local population size and density. We use these to characterise the size of local marriage markets.

To study returns to size at the individual level, we use longitudinal data from the BHPS and its successor Understanding Society, household surveys representative of the UK population ([University of Essex and Research, 2024](#)). The BHPS ran from 1991 to 2008 and provides detailed individual-level information on socio-economic characteristics and couple relationship histories for about 10,000 households. Understanding Society began in 2009, replacing the BHPS, and remains ongoing. It includes a subsample of around 8,000 voluntary BHPS households and 40,000 new ones. In addition to similar socio-economic information, it collects respondents’ self-assessments of their relationships. Combining both surveys allows us to track couple formation and dissolution since 1991 and to construct a measure of relationship quality from 2009 onward.

3.2 Local Marriage Markets

The geographic units used in the analysis are travel to work areas (TTWAs), as defined by the 2011 UK Census. TTWAs are the UK equivalent of commuting zones in the United States.⁶ There are 228 TTWAs in the UK, covering the entire national territory.⁷ Because TTWAs capture both individuals' places of residence and commuting patterns, they provide an accurate representation of local marriage markets.

City size is defined based on total population, using data from the 2011 Census. [Figure 1](#) (a) displays the distribution of log population across TTWAs. The median size is 142,738 inhabitants and the mean is 277,566, reflecting a right-skewed distribution driven by a few large cities. London is the largest with 8,051,635 inhabitants.

[Figure 1](#) (b) maps the spatial distribution city size across three categories: small (fewer than 250,000 inhabitants), medium-sized (250,000–950,000 inhabitants), and large (more than 950,000 inhabitants). Lighter colours denote smaller cities and darker colours denote larger ones. Most large cities are located in England, with the exception of Glasgow, which is in Scotland.⁸ [Table B.2](#) summarizes geographic characteristics by size category. The seven large TTWAs account for roughly 27% of the UK population, while the smallest comprise about 25%. The majority of the population resides in medium-sized cities. In contrast, small cities cover around 67% of the total land area of the UK, whereas large cities account for barely 4%, implying that population density in large cities is over ten times higher than in small ones.

3.3 Measures of Returns to Scale

Relationship Quality. The main novelty of the paper is to use an explicit measure of match quality — the non-material gains from being in a couple — to study returns to size in marriage markets. To do so, we construct the relationship quality (RQ) measure proposed by [Rodríguez-Moro and Román \(2026\)](#), following the same procedure.

The measure is based on the Partner Questionnaire of Understanding Society. Every other survey wave includes a ten-item module on respondents' relationships with cohabiting partners, administered to all individuals living with a partner regardless of marital status.⁹ The items, listed in [Table 1](#), capture the frequency of specific interactions (e.g., “How often do you

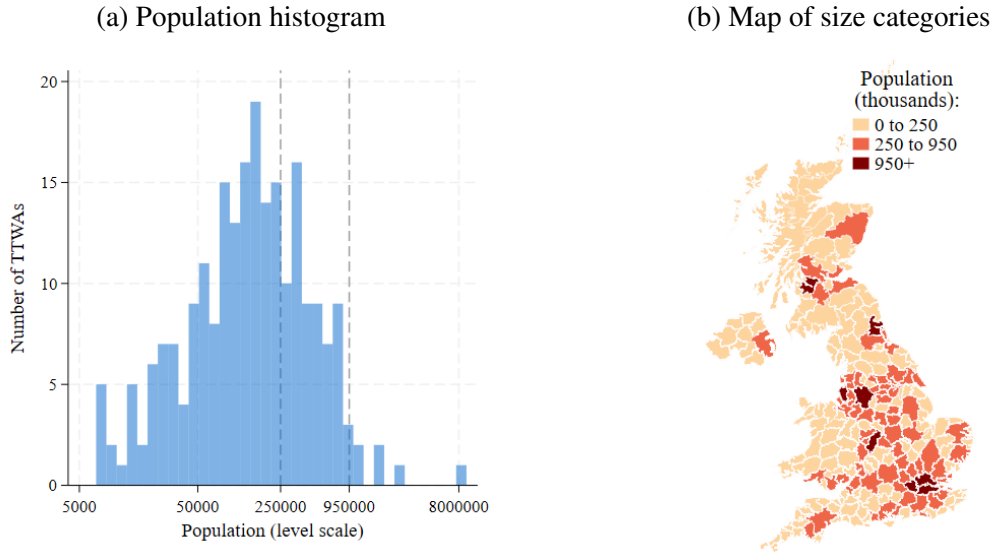
⁶According to [Office for National Statistics \(2016\)](#), each TTWA comprises a set of wards in which at least 75% of the resident active population work within the area and at least 75% of the local workforce also reside there.

⁷Specifically, there are 149 TTWAs in England, 45 in Scotland, 18 in Wales, 10 in Northern Ireland and 6 that cross country borders.

⁸The remaining large cities are London, Manchester, Birmingham, Slough and Heathrow, Newcastle, and Liverpool.

⁹Specifically, this information is available for waves 1, 3, 5, 7, 9, 11, 13 and 15, spanning the period from 2009 to 2024. However, due to an error in how responses were recorded in wave 3, we exclude this wave from the analysis.

Figure 1: Population across travel-to-work areas.



Notes: This figure shows the distribution of population across travel-to-work areas (TTWAs) in the United Kingdom. Panel (a) plots the histogram of log population, with the horizontal axis shown in levels (number of inhabitants). The median size is 142,738 inhabitants and the mean is 277,566. Panel (b) maps the spatial distribution of TTWAs by population size. TTWAs follow the 2011 definitions, and there are 228 in total, covering the entire UK. Population data comes from the 2011 UK Census, and the map is constructed using shape-files provided by the Office for National Statistics.

and your partner quarrel?”), overall relationship happiness, and the number of shared hobbies, responded on Likert scales of varying length. To construct RQ, all responses are rescaled so that zero corresponds to the worst relationship experiences and higher values indicate better ones. A factor analysis is then performed on the transformed items, retaining the first factor as the measure of RQ. Further details on the construction of the measure are provided in [Appendix B.1](#). The resulting measure is standardized, so coefficients can be interpreted in terms of standard deviations, and increasing, so higher values indicate better quality relationships.

Couple Formation and Dissolution. The other outcomes we use to describe local marriage markets are the rates of formation and dissolution of cohabiting relationships, which are standard in the literature. We construct individuals’ full marital histories by combining BHPS and Understanding Society data. These histories cover all cohabitation spells, regardless of marital status, and include information on start and end dates as well as the reason for ending. Although full marital histories can be reconstructed, we restrict the sample to spells ending after the survey began in 1991 to ensure that both partners are observed in the data. Therefore, information on couple formation and dissolution is available for the period 1991-2024.

Sample. Throughout the analysis, we consider individuals aged 20-65, which we refer to as marriageable ages. For the analysis of couple formation, we focus on single individuals, while for the analyses of couple dissolution and RQ, we focus on individuals in a cohabiting

Table 1: Questions in the Understanding Society Partner module.

(a) Subjective assessment	(b) Couple time use
<i>How often do you... ?</i>	<i>How often do you... ?</i>
discuss or consider splitting	work together on a project
regret that you married or lived together	have stimulating exchanges of ideas
quarrel	calmly discuss something
get on each other's nerves	kiss your partner
<i>What is the... ?</i>	<i>Do you and your partner... ?</i>
degree of happiness of your relationship	engage in outside interests together

Notes: This table lists the items in the Understanding Society Partner Questionnaire, used to construct the relationship quality measure (RQ). This module is administered in waves 1, 3, 5, 7, 9, 11, 13 and 15 (2009 to 2024), but due to a data collection error we exclude the information in wave 3. As classified by [Rodríguez-Moro and Román \(2026\)](#), (a) includes items on subjective assessments of the relationship and (b) contains items about couples' joint time use. The frequency questions are responded in a six-point Likert scale, the happiness question in a seven-point scale, and the outside interests item in a five-point scale.

couple. In all analyses, we restrict the sample to observations for which all relevant variables are available.

4 Empirical Strategy

We estimate the reduced-form coefficients β_{RQ} , β_{CF} , and β_{CD} that, according to [Subsection 2.4](#), determine the direction of returns to size in local marriage markets. The model in [Section 2](#) attributes differences in matching outcomes across marriage markets of different sizes to two city-level primitives. First, the meeting technology λ_l may differ across locations, with larger cities potentially offering more frequent meetings. Second, the flow value of being single U_l^s may vary across locations. For example, if housing costs are substantially higher in large cities, the economic burden of living alone may be greater, potentially making individuals less selective. Both are place-level objects, common to everyone living in a given location.

In the data, however, differences across marriage markets may also reflect who lives in them. Individuals with different observed or unobserved characteristics may sort across locations, generating differences in the composition of marriage markets. The model abstracts from such heterogeneity: its comparative statics describe how a given individual's outcomes respond to the characteristics of the marriage market where they reside. The corresponding city-size gradients in the data instead capture both this place effect and compositional differences across cities. For example, if individuals who place a higher value on independence disproportionately locate in larger cities, marriage outcomes may differ across cities even when they face identical meeting opportunities and the same value of being single. In that case, the estimated gradients would no longer have the structural interpretation implied by the model. Whether such differences are quantitatively important is therefore a central empirical question.

4.1 Compositional Differences across Local Marriage Markets

We first assess whether the composition of local marriage markets varies systematically with city size. [Table 2](#) column (1) reports results from regressing several socio-economic characteristics on log population at the TTWA level. Larger cities are younger, more racially diverse, more educated, and have higher monthly labour income. Columns (2) and (3) estimate the same associations separately for singles and cohabiting individuals, and column (4) tests whether the city-size gradients differ across the two groups. Single women are more likely to live in larger cities, while the opposite is true for older singles. We also find that the city-size gradient in the probability of being employed is smaller for singles and that they receive a lower earnings premium with city size.

Overall, these results provide evidence of differences in observable characteristics across marriage markets of different sizes. Consistent with these patterns, [Table B.3](#) shows that the share of the local population that is single is significantly higher in larger cities, while the share cohabiting is significantly lower. The asymmetric city-size gradients across singles and cohabiting individuals further suggest that the effects of city size may differ between singles and couples, consistent with [Gautier et al. \(2010\)](#). The model in [Section 2](#) explicitly allows for such differences.

These compositional differences have two implications for our empirical strategy. First, the analysis above captures only city-size differences on observables. Individuals may also differ on persistent unobserved characteristics that are correlated with both location and matching outcomes. The systematic differences we observe in characteristics that are measurable therefore raises concerns about selection on characteristics that are not. Second, differences in the composition of local marriage markets may themselves affect aggregate matching outcomes, even absent differences in the meeting technology. The empirical strategy must therefore account for both individual-level sorting and for differences in local population composition.

4.2 AKM Estimator

A large body of work in labour economics seeks to identify returns to city size (e.g., [Combes and Gobillon, 2015](#); [De La Roca and Puga, 2017](#); [Dauth et al., 2022](#); [Card et al., 2025](#)). A central challenge in this literature is to disentangle the different sources of spatial disparities. This provides a natural empirical framework for our setting: as with spatial wage disparities, differences in marriage-market outcomes across locations reflect both the characteristics of individuals and those of the places in which they live.

The standard approach in the labour literature builds on the two-step framework developed by [Abowd et al. \(1999\)](#) and extended by [Combes et al. \(2008\)](#) to study spatial disparities. In the first stage, a Mincer regression of log wages on worker characteristics, individual fixed effects,

Table 2: Compositional differences by city size.

	By marital status			
	(1) Full sample	(2) Single	(3) Cohabiting	(4) Difference
Women (%)	0.015 (0.165)	1.190** (0.487)	-0.128 (0.112)	-1.318*** (0.499)
Non-white (%)	5.740*** (0.554)	5.785*** (0.617)	5.618*** (0.546)	-0.168 (0.824)
Young population 25-35 (%)	3.712*** (0.344)	4.018*** (0.615)	2.968*** (0.378)	-1.050 (0.722)
Middle-aged population 36-55 (%)	-0.221 (0.263)	-1.502*** (0.444)	0.594* (0.352)	2.096*** (0.567)
Older population 56+ (%)	-3.490*** (0.332)	-2.516*** (0.374)	-3.562*** (0.391)	-1.046* (0.541)
College educated (%)	2.837*** (0.512)	3.434*** (0.577)	3.059*** (0.596)	-0.375 (0.830)
Active in labour mkt (%)	-0.228 (0.358)	-1.796*** (0.506)	0.846** (0.414)	2.642*** (0.654)
Employed (%)	-0.077 (0.398)	-1.313** (0.530)	0.788 (0.478)	2.101*** (0.714)
Monthly labour income (£)	68.739*** (16.385)	18.774 (17.658)	104.230*** (19.080)	85.456*** (25.997)
Observations	220	220	220	440

Notes: This table reports results from regressing various socio-economic outcomes on the log population of each travel-to-work area (TTWA). Each row corresponds to a separate regression, with the outcome presented in the first column. Column (1) reports results for the full sample. Columns (2) and (3) restrict the sample to single individuals and to those in a relationship (cohabiting or married), respectively. Column (4) tests for differences in the single and couple coefficients, interacting log population with a couple dummy. Standard errors are reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

and location fixed effects is estimated. In the second stage, the estimated location effects are regressed on a measure of city size to recover returns to scale. We adapt this framework by replacing wages with our three marriage market outcomes.

In the first stage, we estimate the following regression:

$$y_{i,t} = \alpha_i + \gamma_{l(i,t)} + \mu_t + \mathbf{X}_{i,t}\boldsymbol{\delta} + u_{i,t} \quad (10)$$

where $y_{i,t}$ denotes the outcome of individual i at survey wave t . We estimate this regression separately for the three outcomes defined in [Subsection 3.3](#): couple formation (among singles), couple dissolution (among cohabiting individuals), and RQ (among cohabiting individuals). The term α_i denotes individual fixed effects, μ_t period effects, and $\gamma_{l(i,t)}$ TTWA fixed effects. The vector $\mathbf{X}_{i,t}$ includes education and a quadratic in age.¹⁰

¹⁰In alternative specifications, we additionally control for an employment indicator, log monthly labour earnings, the number of children, and tenure (as single or as a couple, depending on the outcome). We exclude these

The individual fixed effects α_i therefore address the first concern raised above by absorbing time-invariant individual characteristics, whether observed or unobserved, that may be correlated with both location and marriage-market outcomes. The location effects γ_l are therefore identified from within-individual changes in location, that is, from individuals who are observed in more than one TTWA. As a result, the estimated location effects should be interpreted in relative rather than absolute terms. Individuals who never change TTWA do not contribute to the identification of the location effects.

Because γ_l and α_i are estimated jointly, the location effects are only comparable within groups of TTWAs that are connected through movers. If there were multiple groups of TTWAs that are internally connected but have no movers between them, the location effects across groups would not be comparable because they would be identified relative to different baselines. Following the literature, we restrict the estimation to the largest group of TTWAs linked to one another through movers, referred to as the Largest Connected Set (LCS). Since the pool of movers differs across our three outcomes, we compute the LCS separately for couple formation, dissolution, and RQ. Thus, the set of TTWAs entering the second stage differs slightly across outcomes. [Appendix C.1](#) describes how the LCS is constructed and reports results using a common LCS across all three outcomes.

Estimating [Equation 10](#) yields estimates of the location effects $\hat{\gamma}_l$, which capture differences in outcomes across TTWAs after accounting for individual characteristics and period effects. In the second stage, we regress these estimated location effects on city size:

$$\hat{\gamma}_l = \beta_0 + \beta_1 \text{size}_l + \mathbf{X}_l \boldsymbol{\theta} + \nu_l \quad (11)$$

where size_l denotes log population and $\mathbf{X}_l$ contains the city-level composition variables from [Table 2](#), which address the second concern raised above. The coefficient β_1 captures the city-size gradient in the location component of the outcome, conditional on individual sorting and local population composition. It provides the empirical counterpart of the city-size gradients β_{RQ} , β_{CF} , and β_{CD} defined in [Subsection 2.4](#).

5 Main Results

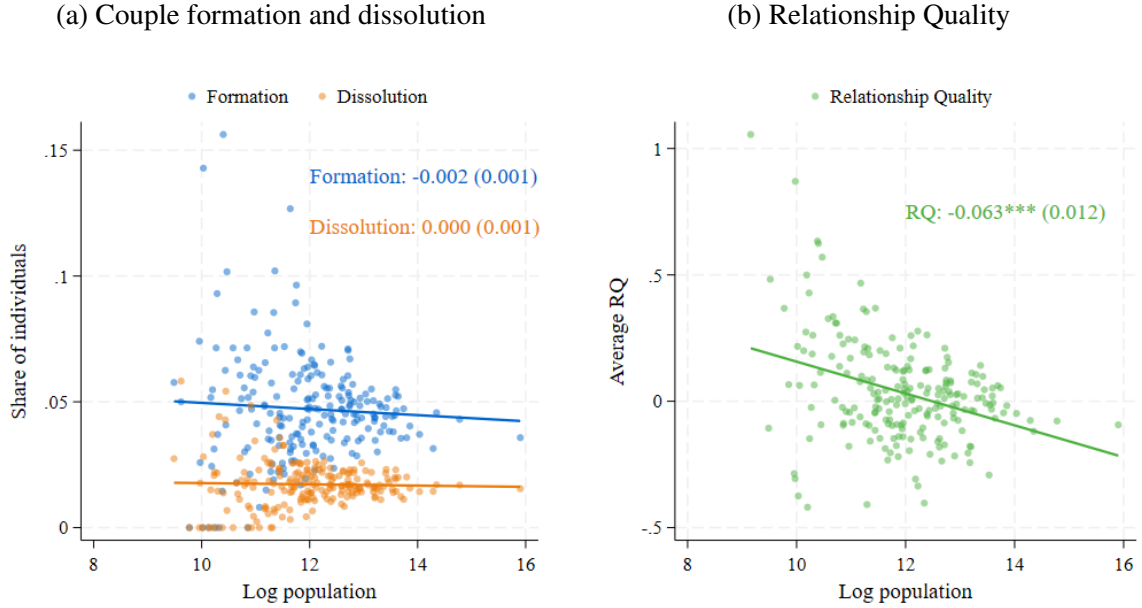
Naïve benchmark. We begin by documenting the raw association between our three marriage-market outcomes and city size, providing a benchmark for the AKM estimates below. We use the same sample as in the main analysis: individuals residing in TTWAs belonging to the outcome-specific LCS, with non-missing values for all relevant variables and observed in more than one survey wave. For each outcome, we compute its TTWA-level mean and regress these

variables from our preferred specification because they may themselves respond to location and marriage market outcomes, constituting endogenous controls.

averages on log population without additional controls.

Figure 2 (a) plots the average rates of couple formation and dissolution against city size. The city-size gradient is slightly negative for formation and slightly positive for dissolution, but neither association is statistically significant. Figure 2 (b) reports the corresponding relationship for RQ. In this case, the gradient is clearly negative and statistically significant. Thus, the raw associations provide no evidence of increasing returns to city size. These naïve gradients, however, conflate differences in locations with differences in the composition of individuals across cities, motivating the AKM estimates below.

Figure 2: Naïve associations between marriage market outcomes and city size.



Notes: This figure shows the average of all our outcomes by TTWA against city size, restricted to the sample used in the main analysis. Panel (a) plots the average share of single individuals who enter a cohabiting relationship and the average share of cohabiting individuals whose relationship dissolves. Panel (b) plots the average RQ per city. Lines report the naïve linear association, with the estimated slope and standard error annotated on each panel. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

AKM estimation results. Table 3 reports the results from the AKM estimation procedure described in Subsection 4.2. For each outcome, odd-numbered columns report the first-stage estimates, from which we recover the TTWA fixed effects $\hat{\gamma}_c$ after accounting for individual characteristics and individual fixed effects. Even-numbered columns report the second-stage regressions of these location effects on city size and local marriage market composition.

The first-stage estimates show that individual characteristics are systematically correlated with marriage market outcomes. Age has a hump-shaped association with couple formation, with a positive linear term and a small negative quadratic term. It is not significantly correlated with dissolution, while its association with RQ is negative and flattens at older ages. Education is associated with couple formation but not with the other two outcomes: relative to primary

education, tertiary education is associated with a higher probability of forming a couple, while secondary education is associated with a lower probability.¹¹

Turning to the second stage, none of the three city-size coefficients is statistically different from zero. However, the signs are consistent with the naïve estimates: the coefficients for couple formation and RQ remain negative, while that for dissolution remains positive. Among the local composition controls, none is significantly associated with RQ. Dissolution rates are higher in cities with larger shares of middle-aged and older individuals, and with a larger share of college-educated individuals. A larger share of college-educated individuals is also negatively associated with couple formation.

The absence of a significant city-size gradient in RQ stands in contrast to [Figure 2](#), where we found a strong negative association between average city-level RQ and log population. This difference is not driven simply by a loss of precision. The magnitude of the city-size coefficient is substantially smaller, which highlights the importance of sorting. As discussed above, individuals may sort across cities on both observable characteristics and persistent unobserved traits, and the first-stage estimates in [Table 3](#) show that observable characteristics are significantly related to marriage market outcomes. The negative raw city-size gradient in RQ can therefore partly reflect differences in the composition of individuals across cities rather than differences in the relationship quality associated with living in those cities.

To assess the role of unobserved heterogeneity, [Table C.3](#) repeats the analysis without individual fixed effects in the first stage. The estimates change substantially: the city-size gradients for both RQ and couple formation become negative and statistically significant. This pattern provides evidence that unobserved individual heterogeneity plays an important role in sorting across cities. Failing to account for such heterogeneity would lead to substantially more negative estimates of the association between city size and both RQ and couple formation.

Returns to size through the lens of the model. As shown through the lens of the model, the absence of a city-size gradient in couple formation alone does not determine the direction of returns to size. It could be consistent with constant returns to size. Alternatively, larger cities could generate increasing returns to size that do not translate into higher formation rates because individuals become more selective in their partner search. In the model, greater selectivity in larger cities can arise either because increasing returns raise the value of search or because the relative value of remaining single, U_t^s , increases with city size. Thus, formation rates alone cannot distinguish between these possibilities. As shown in [Corollary 1](#), relationship quality provides additional information that allows us to distinguish between these cases.

¹¹In [Table C.2](#), we additionally control for employment status, monthly labour earnings, number of children, and tenure (as single or in a couple). The correlations with education become weaker. Tenure as a single is positively associated with couple formation. For dissolution and RQ, we find the opposite relationship between age and relationship tenure: both are positively associated with dissolution and negatively with RQ. The presence of children is associated with both a lower dissolution rate and lower RQ.

Table 3: AKM estimation results.

	Formation		Dissolution		RQ	
	(1) 1 st stage	(2) 2 nd stage	(3) 1 st stage	(4) 2 nd stage	(5) 1 st stage	(6) 2 nd stage
Log population		-0.0193 (0.0153)		0.0052 (0.0087)		-0.0031 (0.0276)
Age	0.0067*** (0.0025)		0.0008 (0.0014)		-0.0341** (0.0165)	
Age squared	-0.0001*** (0.0000)		0.0000** (0.0000)		0.0007*** (0.0000)	
Secondary educ.	-0.0126** (0.0058)		0.0097 (0.0061)		-0.0433 (0.0581)	
Tertiary educ.	0.0253*** (0.0063)		0.0063 (0.0045)		-0.0401 (0.0387)	
Women-to-men ratio		-0.0545 (0.0411)		-0.0142 (0.0426)		-0.0749 (0.1366)
Middle-aged population 36-55 (%)		-0.0001 (0.0025)		0.0028** (0.0014)		0.0023 (0.0045)
Older population 56-65 (%)		-0.0014 (0.0027)		0.0052*** (0.0014)		-0.0006 (0.0046)
College educated (%)		-0.0034** (0.0014)		0.0018** (0.0008)		0.0032 (0.0026)
Active in labour mkt (%)		-0.0055 (0.0064)		-0.0022 (0.0037)		0.0130 (0.0118)
Employed (%)		0.0059 (0.0058)		-0.0003 (0.0034)		-0.0138 (0.0108)
Non-white (%)		0.0015 (0.0012)		0.0000 (0.0007)		-0.0030 (0.0023)
Number of observations	138007		281875		98636	
Number of TTWAs		213		216		213
R-squared	0.024	0.054	0.006	0.120	0.068	0.024

Notes: This table presents results from carrying out the estimation procedure described in [Subsection 4.2](#) for the three measures of returns to size in local marriage markets. Columns (1) and (2) report estimates for couple formation within the sample of single individuals; columns (3) and (4) for couple dissolution within the sample of couples; and columns (5) and (6) report results for RQ, as proposed by [Rodríguez-Moro and Román \(2026\)](#), in the sample of couples. Odd-numbered columns report first-stage estimates ([Equation 10](#)), with observations at the individual-wave level; controls include period dummies, a quadratic in age and dummies for secondary and tertiary education (with primary education as the reference). Even-numbered columns report second-stage estimates ([Equation 11](#)), with observations at the TTWA level; controls include the women-to-men ratio, the share of middle-aged population (36–55), the share of older population (56+), the share of college-educated individuals, the share active in the labour market, the share employed, and the share non-white. Standard errors clustered at the TTWA level are reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

To closely mirror the two periods in the model, we split the sample in an early and a late period. For couple dissolution and RQ, we define the early period as relationships formed when individuals were younger than 35 and the late period as relationships formed at age 35 or older. To make the two groups comparable, we restrict relationship tenure to at most 15 years. For couple formation, we analogously compare the probability of finding a partner before and after age 35. We repeat the estimation procedure described in [Subsection 4.2](#) separately for the two periods.

[Table 4](#) reports the second-stage estimates.¹² Panel A reports the late-period estimates and Panel B the early-period estimates. While the estimates for the early period closely resemble those for the full sample in [Table 3](#), the late-period estimates differ somewhat. The coefficient on couple formation remains negative, while those on dissolution and RQ change sign, becoming negative and positive, respectively. However, none of the city-size coefficients is statistically different from zero in either period or for any of the outcomes.

The results are consistent with the constant-returns case described in [Corollary 1](#) (v). In particular, the absence of a city-size gradient in RQ among couples formed in the late period indicates that, conditional on the other model components, relationship quality does not systematically vary with city size. In the model, this implies that there is no city-size gradient in the relative value of being single that would induce greater selectivity in larger cities.¹³ The absence of a relationship quality gradient rules out greater selectivity in larger cities. Combined with the absence of a city-size gradient in couple formation, this evidence is not compatible with increasing returns to size.

6 Robustness

Our empirical strategy raises three main concerns. First, because in the AKM city effects are identified using only individuals who move across TTWAs, the resulting estimates may be sensitive to cities that are weakly connected to others. Second, the association between city size and marriage market outcomes may partly reflect selective migration, if individuals sort into cities of different sizes based on their marriage market characteristics. Third, city size itself may be endogenous to marriage market outcomes. We address these concerns in turn. We first restrict the AKM estimation to cities with at least five mover connections, excluding weakly identified cities. Next, we reassign individuals to their place of origin rather than their current place of residence, reducing the role of selective adult migration. Finally, we instrument our

¹²The full first and second stage results are reported in [Table C.4](#) and [Table C.5](#) for the early and late periods, respectively.

¹³This does not imply that separate channels affecting the relative value of being single are not at play. For instance, higher housing costs could make remaining single relatively less attractive in larger cities, while greater city amenities could make it relatively more attractive. These effects could offset each other, leaving the relative value of being single unchanged with city size.

Table 4: Second stage AKM estimation results, two periods.

	(1) Formation	(2) Dissolution	(3) RQ
Panel A: Late period (after 35)			
Log population	-0.0164 (0.0258)	-0.0276 (0.0318)	0.0978 (0.2146)
First stage: Indiv. FE	✓	✓	✓
Second stage: Controls	✓	✓	✓
R-squared	0.041	0.029	0.143
Observations	184	160	121
Panel B: Early period (before 35)			
Log population	-0.0078 (0.0160)	0.0104 (0.0121)	-0.0709 (0.0743)
First stage: Indiv. FE	✓	✓	✓
Second stage: Controls	✓	✓	✓
R-squared	0.021	0.137	0.072
Observations	184	160	121

Notes: This table presents results from estimating Equation 11 separately for the early and the late period. The outcomes are the city fixed effects estimated in Equation 10 for the three measures of returns to size in local marriage markets. Column reports estimates for couple formation within the sample of single individuals; column (2) for couple dissolution within the sample of couples; and column (3) reports results for RQ, as proposed by Rodríguez-Moro and Román (2026), in the sample of couples. Panel A presents the results for the late period and Panel B for the early period. For dissolution and RQ, the early period consists of relationships formed when individuals were younger than 35, while the late period consists of relationships formed at age 35 or older; relationship tenure is capped at 15 years in both periods. For couple formation, we compare the probability of finding a partner before and after age 35. The second-stage controls for the city-level women-to-men ratio, share of middle-aged population (36–55), share of older population (56+), share of college-educated individuals, share active in the labour market, share employed, and share non-white. Standard errors are reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

main city size variable, 2011 adult population, with the size of the corresponding child cohort in the 1991 Census, which provides variation predetermined city size.

6.1 Sensitivity to Weakly Connected Cities

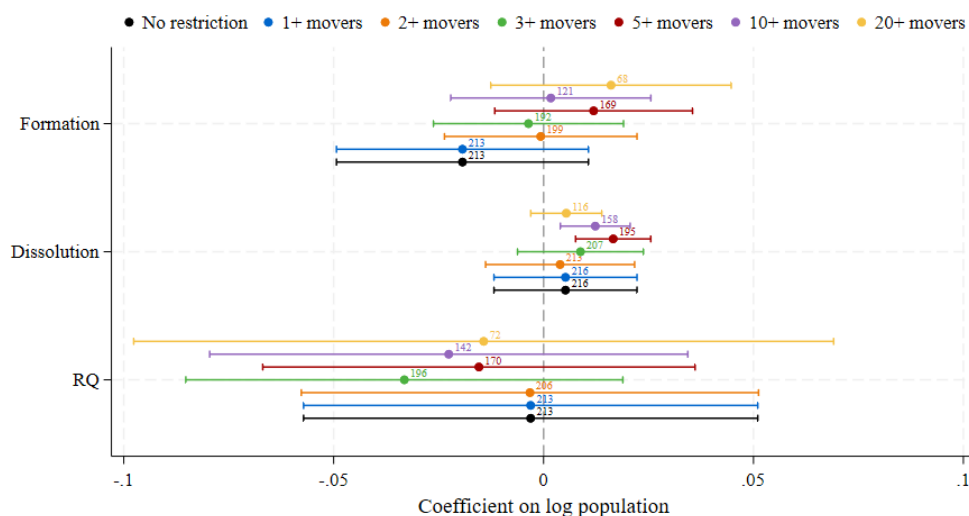
We check whether our results are driven by weakly connected cities. Because city effects are identified from individuals who move across TTWAs, the reliability of the estimates may depend on the number of movers connecting each pair of cities. Table C.6 summarizes the number of moves between TTTWA pairs in the samples used for our main estimation of each outcome. Across outcomes, approximately 6% of individuals ever relocate across TTWAs. The number of moves ranges from 2,223 for RQ to nearly 4,000 for dissolution. The mover network is also relatively sparse: most TTTWA pairs in the formation sample are connected by a single mover, while most pairs in the dissolution and RQ samples are connected by two movers. London is the TTTWA with the largest number of in- and out-moves across all outcomes.

Figure C.1 displays the distribution of moves across TTTWA pairs. For formation, moves

are concentrated among larger markets, with relatively few moves between small TTWAs. For dissolution, moves are concentrated from the largest markets into medium-sized markets, and smaller markets are more represented than in the formation sample. The RQ sample provides more complete coverage of the TTWA network. This suggests that some city effects, particularly for smaller markets, may be identified from limited mobility across markets.

To assess whether this sparsity affects our estimates, we reconstruct the outcome-specific LCS after imposing minimum thresholds of one, two, three, five, ten, and twenty movers per TTWA. Increasing the threshold progressively reduces the number of TTWAs in the outcome-specific LCS, particularly for formation. [Figure 3](#) reports the resulting estimates. The coefficients for formation remain statistically indistinguishable from zero, although the point estimate changes sign for thresholds above three movers. The RQ estimates remain negative and statistically insignificant throughout and, if anything, increase in magnitude as the threshold rises. Finally, the estimates for dissolution are positive across all thresholds. They become statistically significant at the five and ten mover thresholds only. Overall, the estimates do not appear to be driven by weakly connected cities.

Figure 3: Second stage AKM estimates under alternative connectivity thresholds



Notes: This figure reports estimates from estimating [Equation 11](#) after imposing minimum connectivity thresholds of one, two, three, five, ten, and twenty movers per TTWA. Moving upward within each outcome corresponds to progressively more restrictive connectivity thresholds. The numbers next to the estimates report the number of TTWAs in the outcome-specific LCS used for each estimation. First stage controls include period dummies, a quadratic in age and dummies for secondary and tertiary education (with primary education as the reference) at the individual level. Second stage controls include the women-to-men ratio, the share of middle-aged population (36–55), the share of older population (56+), the share of college-educated individuals, the share active in the labour market, the share employed, and the share non-white at the TTWA level. Standard errors are clustered at the TTWA level. 95% confidence intervals are also plotted.

6.2 Selective Migration

We assess whether selective migration could account for the association between city size and marriage market outcomes. Individuals who move across TTWAs may differ systematically from those who remain in their original location, and these differences may be correlated with city size. In that case, our main estimates could partly reflect selective migration rather than differences in marriage market outcomes across markets.

We first compare movers and stayers along observable characteristics. [Table C.7](#) panel A reports the association between city size and the city composition characteristics used in the main analysis separately for movers and stayers, and tests whether the corresponding coefficients differ across the two groups. The city size gradients are similar for most characteristics. We find that movers are relatively less likely to be female in larger cities, while they are more likely to be young, active in the labour market and employed. We then ask whether such differences in composition translate into differences in the association between city size and our marriage market outcomes. The estimated associations between city size and formation, dissolution and RQ are statistically indistinguishable between movers and stayers.

To more directly address selective migration, we assign individuals to their place of origin rather than their current place of residence. Since neither the BHPS nor Understanding Society provide information on individuals' TTWA of birth, we construct two proxies for place of origin. First, we assign individuals observed before age 21 to the first TTWA in which they are observed.¹⁴ Second, we use the first observed TTWA of an individual's parents when the parents are observed. We restrict the parent observations to those recorded before age 65 to reduce the possibility of capturing parents who moved to their adult children's location later in life. The first measure covers only the younger cohort in our sample, while the second extends the analysis to the full age range. [Table C.8](#) shows that the origin and current residence TTWAs differ for 8% of individuals in the formation sample, 25% in the dissolution sample, and 12% in the RQ sample. Across proxies and outcomes, individuals' current residential TTWAs are on average about 3% larger than their origin TTWAs.

We then estimate the cross-sectional association between city size and each marriage market outcome using these origin measures. We restrict the analysis to cities included in the original outcome-specific LCS used for the main analysis, and control for both individual-level characteristics and city composition. [Table 5](#) shows that the resulting estimates have the same signs as our main AKM estimates. Only the formation coefficients are statistically significant and negative across specifications. The coefficient for RQ is negative throughout, while those for

¹⁴According to [Office for National Statistics \(2019\)](#), more than half of individuals below age 21 lived with their parents in the 1990s, and the age at which individuals leave the parental home has increased over time. This makes the first observed TTWA a plausible proxy for childhood location. We obtain similar results when restricting to individuals observed at least once before age 18. However, this restriction substantially limits the age coverage of the sample.

dissolution are positive. These results suggest that the baseline associations are not primarily driven by selective adult migration.

Table 5: Cross-sectional analysis by city of origin.

	(1) Formation	(2) Dissolution	(3) RQ
Panel A: Earliest TTWA (age ≤ 21)			
Log population	-0.0048* (0.0020)	0.0016 (0.0028)	-0.0109 (0.0245)
R-squared	0.015	0.023	0.034
Number of TTWAs	210	199	193
Observations	47762	13725	4960
Panel B: Parent TTWA			
Log population	-0.0048** (0.0016)	0.0038 (0.0023)	-0.0259 (0.0206)
R-squared	0.011	0.029	0.022
Number of TTWAs	212	203	197
Observations	61694	21159	7592

Notes: This table reports cross-sectional regressions of each marriage market outcome on log population, assigning individuals to their TTWA of origin rather than their current residence. Since the data does not provide information on place of birth, we use two proxies. In Panel A, we assign individuals observed before age 21 to their first observed TTWA. In Panel B, we assign individuals to the first observed TTWA of their parents, restricting parent observations to those recorded before age 65. All specifications are restricted to TTWAs in the original outcome-specific LCS. Individual controls include period dummies, a quadratic in age and dummies for secondary and tertiary education (with primary education as the reference). City composition controls include the women-to-men ratio, the share of middle-aged population (36–55), the share of older population (56+), the share of college-educated individuals, the share active in the labour market, the share employed, and the share non-white. Standard errors clustered at the TTWA level are reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

6.3 Endogeneity of City Size

A remaining concern is that city size may be endogenous to marriage market outcomes. Cities with different marriage market conditions, such as high average RQ, may attract or retain individuals, making current population partly a consequence of marriage market conditions. In this case, the association between city size and marriage market outcomes could reflect reverse causality rather than the effect of market size. We address this concern using a cohort-size instrument following [Botticini and Siow \(2008\)](#). The idea is to exploit variation in the size of the local adult population that is predetermined with respect to the marriage market outcomes we study. For 2011, part of the population aged 20–65 consists of cohorts that were children in the 1991 Census. Thus, a TTWA with a relatively large child cohort in 1991 will have a larger population of these cohorts twenty years later, before accounting for subsequent migration.

Specifically, our instrument is the log number of individuals aged 0–15 in each TTWA in the 1991 Census. These individuals were aged 20–35 in 2011 and therefore constitute the younger

half of the 20-65 population used to measure the marriageable local population.¹⁵ Thus, the instrument captures predetermined differences in cohort size across TTWAs that translate into differences in the size of the local adult population twenty years later.

We implement this strategy using two-stage least squares (2SLS). The first stage estimates how much of the variation in 2011 city size can be attributed to differences in the predetermined size of the 1991 child cohort. Specifically, we estimate

$$\text{size}_{l,2011} = \pi_0 + \pi_1 Z_{l,1991} + \mathbf{X}'_{l,2011} \boldsymbol{\phi} + u_l$$

where $\text{size}_{l,2011}$ denotes the log population aged 20-65 in TTWA l in the 2011 Census, $Z_{l,1991}$ denotes the log number of 0-15 year-olds in TTWA l in the 1991 Census (the instrument), and $\mathbf{X}_{l,2011}$ contains the city-level controls used in the main analysis. We then compute the fitted values $\widehat{\text{size}}_{l,2011}$ from this regression to isolate the component of city size predicted by the predetermined cohort and estimate the following second stage regression:

$$\hat{\gamma}_l = \beta_0 + \beta_1 \widehat{\text{size}}_{l,2011} + \mathbf{X}'_{l,2011} \boldsymbol{\theta} + \nu_l$$

where $\hat{\gamma}_l$ denotes the estimated city fixed effect for couple formation, dissolution or RQ from the AKM in Equation 10. Thus, the second stage is analogous to Equation 11, but replaces observed city size with the component predicted by the predetermined cohort size.

This strategy requires two conditions. First, the instrument must be relevant, meaning that the 1991 child cohort must predict the size of the 2011 adult population conditional on the controls. Table 6 column (1) provides strong evidence for this condition, with an F -statistic of 13,725. The estimated coefficient is close to one, reflecting the close association between the size of the 1991 child cohort and the subsequent size of the corresponding adult population.

Second, the instrument must satisfy the exclusion restriction: conditional on the controls, the 1991 child cohort should affect the marriage market outcomes only through its effect on city size. Although this restriction cannot be tested directly, we assess its plausibility by examining whether the instrument is systematically related to the estimated city effects through predetermined city characteristics. Specifically, we regress the estimated city effects on the 1991 child cohort, controlling for total 1991 population and 1991 city composition characteristics, including the sex ratio, age structure, the share active in the labour market, the share employed, and the share non white. We report the results in Table C.9. Across specifications, the coefficient on the 1991 child cohort is statistically insignificant for each outcome. Thus, conditional on initial city size and observable characteristics, we find no evidence that the instrument is systematically related to subsequent marriage market outcomes through other observable channels. This

¹⁵We also considered two alternative instruments: the number of 5-15 year-olds in the 1981 Census and the sum of the 1981 and 1991 cohorts. Because the 1981 Census does not provide information for all TTWAs, we focus on the 1991 Census instrument.

provides supporting evidence for the exclusion restriction.

Table 6 columns (2) to (7) report the second-stage estimates and the baseline OLS results for reference. The IV estimates are similar in sign and magnitude to the main estimates. None of the coefficients gain significance using the IV strategy, although the coefficients are somewhat larger in magnitude and more precise. The coefficient is negative for formation and RQ and positive for dissolution. Thus, accounting for the potential endogeneity of city size does not materially alter the estimated city size gradients.

Table 6: 2SLS results comparison, individual FE, with controls.

		Formation		Dissolution		RQ	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Log population	Main	IV	Main	IV	Main	IV
Instrument	0.9990*** (0.0085)						
Log population		-0.0208 (0.0157)	-0.0195 (0.0154)	0.0058 (0.0088)	0.0090 (0.0087)	-0.0071 (0.0279)	-0.0105 (0.0275)
First stage F	13725.22						
Indiv. FE		✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓	✓
R-squared	0.993	0.061	0.061	0.122	0.121	0.022	0.022
Observations	209	203	203	207	207	204	204

Notes: This table displays the results from an instrumental variable design using the log population aged 0-15 in the 1991 Census to instrument for the 20-65 log population in the 2011 Census. Column (1) reports the first stage results. F reports the F -statistic from a test of exclusion of the instrument from the first stage. In columns (2) to (7) the dependent variables are the city fixed effects estimated with individual fixed effects in Equation 10. The endogenous variable of interest log population aged 20-65 in the 2011 census. Controls include women-to-men ratio, shares of middle-aged and older population, college educated, active in the labour market, employed, and non-white. Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

7 Concluding Remarks

This paper studies whether agglomeration economies extend to local marriage markets and how they shape spatial differences in welfare. We show that commonly used indicators of marriage market performance—rates of couple formation and dissolution—are insufficient to identify the gains from market size when meeting technologies differ across locations, because higher meeting rates also raise the option value of remaining single and increase selectivity. Guided by a simple search model, we argue that match quality provides a more informative measure of returns to market size.

Using a novel measure of relationship quality and rich longitudinal data for the United Kingdom, we document that raw differences in marriage outcomes across cities largely reflect sorting and composition effects. Once these are accounted for, our evidence is consistent with

constant returns to size in marriage markets: couple formation, couple dissolution, and relationship quality do not significantly change with city size.

Spatial differences in marriage markets thus appear to be driven primarily by who lives where, rather than by how the local market itself operates. This finding has implications for how we think about spatial inequality more broadly. While larger cities generate well-documented gains in labour market outcomes, our evidence suggests that these advantages do not extend to the marriage market. Family formation is therefore unlikely to amplify spatial inequality through differential match quality across cities.

Several directions remain open for future research. First, while our framework identifies the existence or absence of returns to scale, it does not pin down the precise magnitude of meeting rates across cities, which would require additional structural assumptions. Second, the model assumes homogeneous individuals; incorporating heterogeneity in preferences or productivity could generate richer predictions about sorting and match quality at different points of the distribution. We leave these extensions to future work.

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A Model Appendix

A.1 Micro-Foundations Functional Form of Meeting Technology

There are two possible **micro-foundations** for this functional form:

1. Law-of-Rare-Events derivation

- *Potential partners.* In a city of effective size N , label the $N - 1$ other singles by $i = 1, \dots, N - 1$.
- *Tiny independent meeting chances.* During the period, each pair (you, i) meets with probability

$$\varepsilon_N = N^{\gamma-1}, \quad 0 < \varepsilon_N \ll 1 \text{ for large } N.$$

- *No-meeting probability.*

$$\Pr(\text{no meetings}) = (1 - \varepsilon_N)^{N-1} \xrightarrow{N \rightarrow \infty} \exp[-(N-1)\varepsilon_N] = \exp[-N^\gamma].$$

- *Meeting probability.*

$$\lambda(N) = 1 - \Pr(\text{no meetings}) = 1 - \exp[-N^\gamma].$$

2. Continuous-time Poisson derivation

- *Encounter process.* Contacts arrive according to a Poisson process with rate

$$\Lambda(N) = N^\gamma \text{ per period.}$$

- *Zero-event probability.*

$$\Pr(M = 0) = \exp[-\Lambda(N)] = \exp[-N^\gamma].$$

- *Meeting probability (at least one contact).*

$$\lambda(N) = \Pr(M \geq 1) = 1 - \exp[-N^\gamma].$$

A.2 Proofs

A.2.1 Proof of Lemma 1: Option value of singlehood

Differentiate (1) with respect to N_l via the product rule. The city-size derivative of the conditional expectation $\mathbb{E}[U^c(q) \mid q > \bar{q}_{2,l}]$ follows from the identity

$$\frac{\partial}{\partial \bar{q}} \mathbb{E}[U^c(q) \mid q > \bar{q}] = \frac{g(\bar{q})}{1 - G(\bar{q})} [\mathbb{E}[U^c(q) \mid q > \bar{q}] - U^c(\bar{q})],$$

together with the boundary condition $U^c(\bar{q}_{2,l}) = U_l^s$. The two terms involving $\partial \bar{q}_{2,l} / \partial N_l$ then collect as

$$\lambda_l \frac{\partial \bar{q}_{2,l}}{\partial N_l} \left\{ -g(\bar{q}_{2,l}) [\mathbb{E}[U^c(q) \mid q > \bar{q}_{2,l}] - U_l^s] + g(\bar{q}_{2,l}) [\mathbb{E}[U^c(q) \mid q > \bar{q}_{2,l}] - U_l^s] \right\} = 0.$$

A rise in the acceptance threshold reduces the probability of matching but raises average match quality conditional on matching; by the envelope theorem, these two effects cancel exactly because the marginal match yields zero surplus above singlehood. The surviving terms are (4).

A.2.2 Proof of Proposition 1: Relationship quality

Since $\overline{RQ}_{t,l} = \mathbb{E}[q \mid q > \bar{q}_{t,l}]$ depends on N_l only through $\bar{q}_{t,l}$, the chain rule and the quotient-rule identity $\partial \mathbb{E}[q \mid q > \bar{q}] / \partial \bar{q} = [g(\bar{q}) / (1 - G(\bar{q}))] (\mathbb{E}[q \mid q > \bar{q}] - \bar{q}) > 0$ give $\partial \overline{RQ}_{t,l} / \partial N_l \propto \partial \bar{q}_{t,l} / \partial N_l$ for both $t = 1, 2$. For $t = 2$: differentiating $U^c(\bar{q}_{2,l}) = U_l^s$ gives $\partial \bar{q}_{2,l} / \partial N_l = (U^{c'})^{-1} \partial U_l^s / \partial N_l$, which has the sign of $\partial U_l^s / \partial N_l$ and does not involve λ_l , establishing part (i). For $t = 1$: of (6). Under CRS the second term of (6) vanishes and the sign equals that of $\partial U_l^s / \partial N_l$. Under IRS with $\partial U_l^s / \partial N_l > 0$ both terms are positive so the sign is unchanged. Under IRS with $\partial U_l^s / \partial N_l < 0$, the numerator remains negative (same sign as $\partial U_l^s / \partial N_l$) as long as the IRS term does not exceed the absolute value of the first term, which is exactly condition (7); when (7) is violated the numerator is positive, establishing part (ii).

A.2.3 Proof of Proposition 2: Couple formation

Differentiate $p_{t,l} = \lambda_l(1 - G(\bar{q}_{t,l}))$ with respect to N_l using the product rule.

A.2.4 Proof of Proposition 3: Divorce rate

Write $D_l = (1 - G(\bar{q}_{1,l}))^{-1} B_l$ with $B_l \equiv \int_{\bar{q}_{1,l}}^{q^{\max}} F(U^{c-1}(V_{2,l}^s) - q) g(q) dq$. Differentiating by the quotient rule and expanding $\partial B_l / \partial N_l$ under the integral (one term from the moving lower limit, one from $U^{c-1}(V_{2,l}^s)$) yields the two-channel decomposition. Since $\delta_l(q) = F(U^{c-1}(V_{2,l}^s) - q)$ is strictly decreasing in q , we have $D_l = \mathbb{E}[\delta_l(q) \mid q > \bar{q}_{1,l}] < \delta_l(\bar{q}_{1,l})$, so the selection bracket

is negative. The sign of the outside-option channel follows from $U^{c'} > 0$ and the integral being positive.

A.2.5 Proof of [Corollary 1](#): Identification of $\partial U_l^s / \partial N_l$ and $\partial \lambda_l / \partial N_l$

Part (i). Direct from [Proposition 1](#) (i): the sign of $\partial \overline{RQ}_{2,l} / \partial N_l$ equals the sign of $\partial U_l^s / \partial N_l$ regardless of λ_l . *Part (ii).* $\hat{\beta}_{RQ}^2 > 0$ implies $\partial U_l^s / \partial N_l > 0$ by (i), hence $\partial \bar{q}_{2,l} / \partial N_l > 0$. From (8) the selectivity term is then strictly negative, so $\partial p_{2,l} / \partial N_l > 0$ requires the thick-market term to be positive, i.e. $\partial \lambda_l / \partial N_l > 0$. *Part (iii).* $\hat{\beta}_{RQ}^2 < 0$ implies $\partial U_l^s / \partial N_l < 0$ by (i). By [Proposition 1](#) (ii), $\partial \overline{RQ}_{1,l} / \partial N_l > 0$ when $\partial U_l^s / \partial N_l < 0$ requires the violation of (7), which requires $\partial \lambda_l / \partial N_l > 0$. *Part (iv).* $\hat{\beta}_{RQ}^2 < 0$ implies $\partial U_l^s / \partial N_l < 0$ by (i). Under CRS, [Lemma 1](#) gives $\partial V_{2,l}^s / \partial N_l < 0$ and [Proposition 1](#) (ii) gives $\partial \bar{q}_{1,l} / \partial N_l < 0$; [Proposition 3](#) then implies both channels of $\partial D_l / \partial N_l$ are non-positive, contradicting $\hat{\beta}_{CD} > 0$. Hence $\partial \lambda_l / \partial N_l > 0$. $\hat{\beta}_{CD} > 0$ then requires both channels to be positive ([Proposition 3](#)), which requires $\partial V_{2,l}^s / \partial N_l > 0$ and $\partial \bar{q}_{1,l} / \partial N_l < 0$ simultaneously. *Part (v).* From [Proposition 1](#) (i): $\hat{\beta}_{RQ}^2 = 0$ implies $\partial U_l^s / \partial N_l = 0$ regardless of λ_l . Combined with $\hat{\beta}_{CF}^2 = 0$ implies $\partial \lambda_l / \partial N_l = 0$ ([Proposition 2](#)).

A.3 Implicit function theorem derivation of $\partial \bar{q}_{1,l}/\partial N_l$

We derive (5) and verify that the violation of (7) implies $\partial V_{2,l}^s/\partial N_l > 0$.

Deriving (5). Define $\Phi(\bar{q}, N_l) \equiv V_1^c(\bar{q}) - V_{1,l}^s = 0$. By the implicit function theorem, $\partial \bar{q}_{1,l}/\partial N_l = -\Phi_{N_l}/\Phi_{\bar{q}}$. Write $\bar{\epsilon} \equiv U^{c-1}(V_{2,l}^s) - \bar{q}$ and $M \equiv \mathbb{E}[U^c(\bar{q} + \epsilon) \mid \epsilon > \bar{\epsilon}]$. Differentiating V_1^c with respect to $\bar{q}$ and applying the truncated-expectation identity $\partial M/\partial \bar{\epsilon} = [f(\bar{\epsilon})/(1 - F(\bar{\epsilon}))][M - V_{2,l}^s]$ (using $U^c(\bar{q} + \bar{\epsilon}) = V_{2,l}^s$), the $f(\bar{\epsilon})$ terms cancel and $\Phi_{\bar{q}} = U^{c'}(\bar{q}) + (1 - F(\bar{\epsilon})) \mathbb{E}[U^{c'}(\bar{q} + \epsilon) \mid \epsilon > \bar{\epsilon}] > 0$. Differentiating Φ with respect to N_l at fixed $\bar{q}$, the terms involving $\partial \bar{\epsilon}/\partial N_l$ cancel by the same identity, giving $\Phi_{N_l} = -\partial U_l^s/\partial N_l - (1 - \delta_l(\bar{q}_{1,l}))\partial V_{2,l}^s/\partial N_l$. Forming $-\Phi_{N_l}/\Phi_{\bar{q}}$ yields (5).

Violation of (7) implies $\partial V_{2,l}^s/\partial N_l > 0$. From Lemma 1, $\partial V_{2,l}^s/\partial N_l > 0$ when $\partial U_l^s/\partial N_l < 0$ requires the IRS term to exceed $-(\partial U_l^s/\partial N_l)(1 - \lambda_l(1 - G(\bar{q}_{2,l})))$. The violation of (7) requires the same IRS term to exceed $-(\partial U_l^s/\partial N_l)[1/(1 - \delta_l(\bar{q}_{1,l})) + 1 - \lambda_l(1 - G(\bar{q}_{2,l}))]$, which is strictly larger by $-(\partial U_l^s/\partial N_l)/(1 - \delta_l(\bar{q}_{1,l})) > 0$. Hence the violation of (7) implies $\partial V_{2,l}^s/\partial N_l > 0$.

B Measurement Appendix

B.1 Construction of the RQ measure

Following [Rodríguez-Moro and Román \(2026\)](#), we build the measure of RQ from the ten survey items listed in [Table 1](#). We start by recoding the responses to each question so that higher values consistently correspond to more favourable reported relationship behaviours and habits, such as never considering separation or frequently engaging in stimulating exchanges. This harmonization places all items on a common scale and ensures that the constructed measure is increasing in relationship quality.

We then use the recoded items as inputs to a factor analysis. This method identifies the common patterns across the items by summarizing their shared variation into a small number of underlying factors. It produces a set of factor loadings that map these latent components into the observed responses, indicating how strongly each item is linked to each factor. We determine how many factors to retain using standard criteria, including the drop in explanatory power across successive factors and the requirement that retained factors have eigenvalues larger than one.

In our setting, the first factor explains 40.64 percent of the overall variation in the items and has an eigenvalue of 4.06, far exceeding the explanatory power of subsequent factors: the second factor captures nearly one third of the variation explained by the first, and the eigenvalues of all remaining factors lie below one. We therefore retain this first factor as our RQ measure. [Table B.1](#) reports the associated loadings. All are positive and exceed 0.5, indicating that the factor captures substantial common variation across all items.

Table B.1: Factor loadings of RQ.

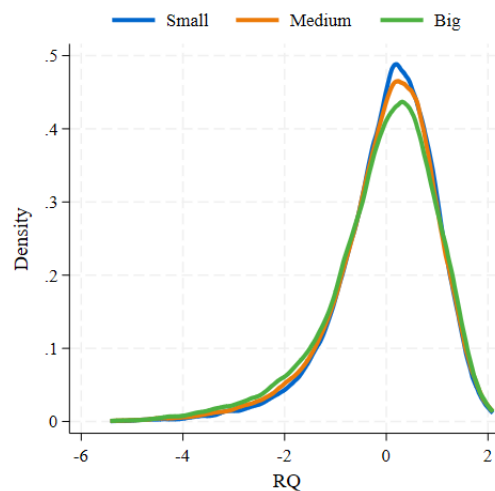
(a) Subjective assessment		(b) Couple time use	
Question	Loading	Question	Loading
<i>How often do you... ?</i>		<i>How often do you... ?</i>	
discuss or consider splitting	0.652	work together on a project	0.626
regret that you married or lived together	0.706	have stimulating exchanges of ideas	0.645
quarrel	0.620	calmly discuss something	0.701
get on each other's nerves	0.675	kiss your partner	0.531
<i>What is the... ?</i>		<i>Do you and your partner... ?</i>	
degree of happiness of your relationship	0.676	engage in outside interests together	0.512

Notes: This table reports the factor loadings used to construct the measure of relationship quality (RQ). The measure is based on responses to the ten questions in the Understanding Society Partner module, a self-completion questionnaire administered in waves 1, 5, 7, 9, 11, 13 and 15, covering 2009-2024. We perform a factor analysis on all available responses and retain the first factor as the RQ measure. The reported factor loadings correspond to this first factor, which has an eigenvalue of 4.06 and explains 40.64% of the variation in the data. Panel (a) presents items on subjective assessments of the relationship, and panel (b) contains items about how couples spend their time together.

The resulting measure is standardized to have mean zero and unit variance. Higher val-

ues correspond to better quality relationships and the scale is expressed in standard deviation units. Figure B.1 shows the distribution of RQ across the same city-size categories used in Figure 1 (b): small cities have fewer than 250,000 inhabitants, medium-sized cities have 250,000–950,000 inhabitants, and large cities are inhabited by more than 950,000 individuals. All distributions are centred at zero and have standard deviations close to one, indicating no stark differences in overall spread. Smaller cities exhibit the lowest dispersion, while larger cities display a noticeably thicker left tail, indicating a higher prevalence of low-quality relationships in big urban areas.

Figure B.1: Distribution of RQ across cities of different sizes.



Notes: This figure plots the distribution of the RQ measure across cities of different sizes. Small cities correspond to TTWAs with fewer than 250,000 inhabitants, medium-sized cities have between 250,000 and 950,000 inhabitants, and large cities have more than 950,000 inhabitants. The RQ measure in the full sample is standardized to have mean zero and standard deviation one, larger values correspond to higher quality relationships, and the scale is expressed in standard deviation units.

B.2 City Size Characterisation

Table B.2: City size descriptives.

	(1) Small	(2) Medium	(3) Big
(a) Census data averages			
Population	99213.6 (66844.8)	475933.7 (183791.9)	2464122.6 (2525265.4)
Density	166.5 (181.9)	615.7 (418.8)	1773.5 (972.8)
Area (square km)	1029.4 (805.0)	1125.5 (796.3)	1276.0 (568.9)
(b) Census data shares			
Share of the population (%)	24.61	48.13	27.26
Share of area (%)	66.62	29.69	3.682
(c) Sample descriptives			
Total observations	11379	20642	12087
Share of observations (%)	25.11	45.56	26.68

Notes: This table provides geographic and demographic descriptives across cities of different sizes. Each column corresponds to a different city size: (1) small cities (fewer than 250,000 inhabitants), (2) medium-sized cities (between 250,000 and 950,000 inhabitants), and (3) large cities (more than 950,000 inhabitants). Panels (a) and (b) summarize data from the 2011 UK Census. Panel (c) summarizes the survey data obtained from the BHPS and Understanding Society.

Table B.3: Differences in couple formation and dissolution by city size.

	Single (%)		Cohabiting (%)		Couple forms		Couple breaks	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log population	2.243*** (0.178)	1.206*** (0.311)	-1.733*** (0.215)	-0.665* (0.354)	-0.002 (0.001)	-0.002** (0.001)	-0.000 (0.001)	-0.001 (0.001)
Controls		✓		✓		✓		✓
Observations	173	172	173	172	227	221	226	221
R-squared	0.482	0.588	0.276	0.496	0.011	0.211	0.000	0.214

Notes: This table presents the results from regressing several outcomes on log population. Regressions are estimated at the TTWA–period level, and period fixed effects are included in all specifications. Columns (1) to (4) use the 2011 UK Census and report results for the stock of single and cohabiting individuals as a share of the local population, respectively. Columns (5) to (8) use data from the BHPS and Understanding Society. Columns (5) and (6) report regression results for couple formations among single individuals, and columns (7) and (8) for dissolutions among cohabiting individuals. Controls include the women-to-men ratio, young, middle-aged and old population shares, share of non-white population, share college educated, share active in the labour market, share employed and average monthly labour income at the TTWA level. Standard errors are reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

C Empirics Appendix

C.1 Largest Connected Set

C.1.1 Outcome-specific LCS

In the main analysis, we construct the LCS separately for each of the three outcomes: couple formation, couple dissolution, and RQ. For each outcome, we first restrict the full sample to observations with non-missing values for all variables entering the corresponding first-stage regression: the outcome, TTTWA, survey wave, and individual-level controls. We additionally exclude TTWAs for which our data cover less than 2% of the local population, since we cannot reliably identify their local marriage market characteristics. We also exclude individuals who are observed in only one survey wave or who never change TTTWA, as they do not contribute to the connections between TTWAs.

Using the resulting sample, we identify groups of TTWAs that are connected through individual moves. Two TTWAs belong to the same connected group if they are linked by a sequence of observed moves, either directly or through other TTWAs. We retain only the largest such group, which constitutes the LCS. Restricting the estimation to the LCS ensures that the TTTWA fixed effects are identified within a common connected set and are therefore comparable across locations.

Finally, we return to the full data and construct the estimation sample by retaining observations that have non-missing values for all variables required for the first-stage regression, are observed in more than one wave, and reside in a TTTWA belonging to the outcome-specific LCS. The resulting sample is used to estimate the first stage regression in [Equation 10](#). Because the set of movers and the availability of the relevant outcomes and controls differ across samples, the set of TTWAs entering the second stage estimation can differ across the analyses of couple formation, dissolution, and RQ.

C.1.2 Unique LCS

As a robustness check, we construct a common LCS containing the same set of TTWAs across all three outcomes. We start from the outcome-specific LCSs and iteratively remove TTWAs that are included in the LCS for one outcome but not in the LCSs for the other outcomes, retaining only removals that preserve connectivity of the remaining set. This yields a common set of TTWAs that is connected through observed moves across all outcomes. We then re-estimate the first and second stage regressions using this unique LCS.

Using our preferred set of controls, [Table C.1](#) reports the corresponding first and second stage estimates. The sign of the estimated point coefficients is the same as in the main analysis. The main difference is that the coefficient on couple dissolution is positive and statistically

significant, whereas it is not significant in the main results. This difference is driven by the exclusion of some smaller cities from the left tail of the city size distribution when constructing the unique LCS.

Table C.1: AKM estimation results, unique LCS.

	Formation		Dissolution		RQ	
	(1) 1 st stage	(2) 2 nd stage	(3) 1 st stage	(4) 2 nd stage	(5) 1 st stage	(6) 2 nd stage
Log population		-0.0237 (0.0158)		0.0164*** (0.0044)		-0.0024 (0.0281)
Age	0.0069*** (0.0025)		0.0008 (0.0014)		-0.0339** (0.0166)	
Age squared	-0.0001*** (0.0000)		0.0000** (0.0000)		0.0007*** (0.0000)	
Secondary educ.	-0.0123** (0.0058)		0.0098 (0.0061)		-0.0390 (0.0582)	
Tertiary educ.	0.0254*** (0.0064)		0.0063 (0.0045)		-0.0385 (0.0388)	
Women-to-men ratio		-0.1018 (0.0875)		0.0366 (0.0243)		-0.0927 (0.1561)
Middle-aged population 36-55 (%)		-0.0001 (0.0026)		0.0011 (0.0007)		0.0016 (0.0046)
Older population 56-65 (%)		-0.0015 (0.0027)		0.0012 (0.0008)		0.0041 (0.0049)
College educated (%)		-0.0032** (0.0015)		0.0003 (0.0004)		0.0026 (0.0026)
Active in labour mkt (%)		-0.0063 (0.0065)		-0.0025 (0.0018)		0.0099 (0.0116)
Employed (%)		0.0061 (0.0059)		0.0016 (0.0016)		-0.0089 (0.0105)
Non-white (%)		0.0014 (0.0012)		-0.0006 (0.0003)		-0.0021 (0.0022)
Number of observations	137413		281298		98535	
Number of TTWAs		208		208		208
R-squared	0.024	0.054	0.005	0.098	0.068	0.020

Notes: This table presents results from carrying out the estimation procedure described in [Subsection 4.2](#) for the three measures of returns to size in local marriage markets. This estimation is restricted to TTWAs in the unique LCS. Columns (1) and (2) report estimates for couple formation within the sample of single individuals; columns (3) and (4) for couple dissolution within the sample of couples; and columns (5) and (6) report results for RQ, as proposed by [Rodríguez-Moro and Román \(2026\)](#), in the sample of couples. Odd-numbered columns report first-stage estimates ([Equation 10](#)), with observations at the individual-wave level; controls include period dummies, a quadratic in age and dummies for secondary and tertiary education (with primary education as the reference). Even-numbered columns report second-stage estimates ([Equation 11](#)), with observations at the TTTWA level; controls include the women-to-men ratio, the share of middle-aged population (36–55), the share of older population (56+), the share of college-educated individuals, the share active in the labour market, the share employed, and the share non-white. Standard errors clustered at the TTTWA level are reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

C.2 Alternative Sets of Controls

Table C.2: AKM estimation with additional controls on the first stage.

	Formation		Dissolution		RQ	
	(1) 1 st stage	(2) 2 nd stage	(3) 1 st stage	(4) 2 nd stage	(5) 1 st stage	(6) 2 nd stage
Log population		0.0220 (0.0206)		0.0050 (0.0086)		0.0059 (0.0314)
Age	0.0360*** (0.0059)		0.0029* (0.0017)		-0.0336** (0.0164)	
Age squared	-0.0003*** (0.0000)		-0.0000** (0.0000)		0.0006*** (0.0001)	
Secondary educ.	-0.0005 (0.0250)		0.0034 (0.0071)		-0.0177 (0.0663)	
Tertiary educ.	0.0000 (0.0154)		0.0044 (0.0057)		-0.0075 (0.0417)	
Employed	-0.0080 (0.0101)		-0.0009 (0.0025)		0.0107 (0.0277)	
Log monthly income	0.0001 (0.0023)		-0.0007 (0.0006)		0.0017 (0.0046)	
Children	0.0166* (0.0085)		-0.0089*** (0.0014)		-0.1515*** (0.0109)	
Tenure	0.0280*** (0.0015)		0.0076*** (0.0006)		-0.0297*** (0.0024)	
Women-to-men ratio		-0.0142 (0.1238)		-0.0447 (0.0444)		-0.1758 (0.1674)
Middle-aged population 36-55 (%)		-0.0012 (0.0039)		0.0019 (0.0014)		-0.0021 (0.0051)
Older population 56-65 (%)		0.0056 (0.0043)		0.0012 (0.0015)		0.0025 (0.0054)
College educated (%)		-0.0007 (0.0019)		-0.0013* (0.0008)		-0.0010 (0.0029)
Active in labour mkt (%)		-0.0038 (0.0087)		-0.0008 (0.0035)		0.0068 (0.0130)
Employed (%)		0.0064 (0.0081)		0.0002 (0.0032)		-0.0006 (0.0118)
Non-white (%)		0.0013 (0.0016)		0.0001 (0.0007)		-0.0031 (0.0025)
Number of observations	33411		179117		68936	
Number of TTWAs		168		212		206
R-squared	0.085	0.026	0.021	0.038	0.088	0.033

Notes: This table presents estimation results from the procedure in [Subsection 4.2](#) for the three measures of returns to size in local marriage markets. Columns (1) and (2) report estimates for couple formation within the sample of single individuals; columns (3) and (4) for couple dissolution within the sample of couples; and columns (5) and (6) report results for RQ, as proposed by [Rodríguez-Moro and Román \(2026\)](#), in the sample of couples. Odd-numbered columns report first-stage estimates ([Equation 10](#)), with observations at the individual-wave level; controls include period dummies, a quadratic in age, dummies for secondary and tertiary education (with primary education as the reference), an employment indicator, log monthly labour income, a dummy for child presence, and tenure. Even-numbered columns report second-stage estimates ([Equation 11](#)), with observations at the TTWA level; controls include the women-to-men ratio, the share of middle-aged population (36–55), the share of older population (56+), the share of college-educated individuals, the share active in the labour market, the share employed, and the share non-white. Standard errors clustered at the TTWA level are reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table C.3: AKM-style estimation without individual fixed effects.

	Formation		Dissolution		RQ	
	(1) 1 st stage	(2) 2 nd stage	(3) 1 st stage	(4) 2 nd stage	(5) 1 st stage	(6) 2 nd stage
Log population		-0.0043** (0.0019)		0.0004 (0.0008)		-0.0596*** (0.0119)
Age	0.0041*** (0.0004)		-0.0041*** (0.0002)		-0.0512*** (0.0040)	
Age squared	-0.0001*** (0.0000)		0.0000*** (0.0000)		0.0006*** (0.0000)	
Secondary educ.	-0.0019 (0.0017)		-0.0013 (0.0011)		0.0789*** (0.0218)	
Tertiary educ.	0.0165*** (0.0015)		-0.0049*** (0.0008)		0.1581*** (0.0130)	
Women-to-men ratio		-0.0135*** (0.0051)		-0.0149*** (0.0041)		0.0548 (0.0591)
Middle-aged population 36-55 (%)		-0.0011*** (0.0003)		-0.0002* (0.0001)		0.0006 (0.0020)
Older population 56-65 (%)		0.0001 (0.0003)		0.0004*** (0.0001)		-0.0004 (0.0020)
College educated (%)		-0.0003 (0.0002)		0.0000 (0.0001)		0.0040*** (0.0011)
Active in labour mkt (%)		-0.0013 (0.0008)		0.0005 (0.0004)		-0.0039 (0.0051)
Employed (%)		0.0020*** (0.0007)		-0.0003 (0.0003)		0.0052 (0.0047)
Non-white (%)		0.0001 (0.0002)		0.0000 (0.0001)		-0.0009 (0.0010)
Number of observations	138007		281875		98636	
Number of TTWAs		213		216		213
R-squared	0.016	0.161	0.010	0.160	0.033	0.238

Notes: This table presents results from carrying out the estimation procedure described in [Subsection 4.2](#) for the three measures of returns to size in local marriage markets, excluding individual fixed effects on the first stage. Columns (1) and (2) report estimates for couple formation within the sample of single individuals; columns (3) and (4) for couple dissolution within the sample of couples; and columns (5) and (6) report results for RQ, as proposed by [Rodríguez-Moro and Román \(2026\)](#), in the sample of couples. Odd-numbered columns report first-stage estimates ([Equation 10](#)), with observations at the individual-wave level; controls include period dummies, a quadratic in age and dummies for secondary and tertiary education (with primary education as the reference). Even-numbered columns report second-stage estimates ([Equation 11](#)), with observations at the TTTWA level; controls include the women-to-men ratio, the share of middle-aged population (36–55), the share of older population (56+), the share of college-educated individuals, the share active in the labour market, the share employed, and the share non-white. Standard errors clustered at the TTTWA level are reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

C.3 Model-to-Data Full Tables

Table C.4: AKM estimation for the early period.

	Formation		Dissolution		RQ	
	(1) 1 st stage	(2) 2 nd stage	(3) 1 st stage	(4) 2 nd stage	(5) 1 st stage	(6) 2 nd stage
Log population		-0.0078 (0.0160)		0.0104 (0.0121)		-0.0709 (0.0743)
Age	0.0273*** (0.0047)		-0.0058* (0.0035)		0.0100 (0.0293)	
Age squared	-0.0006*** (0.0001)		0.0001*** (0.0000)		0.0001 (0.0002)	
Secondary educ.	-0.0071 (0.0076)		0.0152 (0.0114)		-0.0534 (0.0961)	
Tertiary educ.	0.0197** (0.0076)		0.0109 (0.0094)		0.0305 (0.0785)	
Women-to-men ratio		-0.0740 (0.0939)		-0.0411 (0.0692)		-0.5362 (0.4491)
Middle-aged population 36-55 (%)		-0.0027 (0.0029)		0.0065*** (0.0019)		0.0190 (0.0117)
Older population 56+ (%)		-0.0049 (0.0031)		0.0036 (0.0022)		0.0079 (0.0136)
College educated (%)		0.0005 (0.0015)		0.0000 (0.0011)		-0.0050 (0.0068)
Active in labour mkt (%)		-0.0031 (0.0075)		-0.0080 (0.0057)		-0.0056 (0.0442)
Employed (%)		0.0031 (0.0071)		0.0099* (0.0050)		0.0232 (0.0388)
Non-white (%)		-0.0003 (0.0012)		0.0011 (0.0009)		0.0079 (0.0055)
Number of observations	72436		84762		25132	
Number of TTWAs		184		160		121
R-squared	0.034	0.021	0.010	0.137	0.112	0.072

Notes: This table presents results from carrying out the estimation procedure described in [Subsection 4.2](#) for the three measures of returns to size in local marriage markets, for the early period. Columns (1) and (2) report estimates for couple formation within the sample of single individuals; columns (3) and (4) for couple dissolution within the sample of couples; and columns (5) and (6) report results for RQ, as proposed by [Rodríguez-Moro and Román \(2026\)](#), in the sample of couples. The early sample of singles is formed by individuals aged 20-35, and early couples are those formed at ages 20-35 with less than 15 years of tenure. Odd-numbered columns report first-stage estimates ([Equation 10](#)), with observations at the individual-wave level and controlling non-parametrically for period. Even-numbered columns report second-stage estimates ([Equation 11](#)), with observations at the TTWA level. Standard errors clustered at the TTWA level are reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table C.5: AKM estimation for the late period.

	Formation		Dissolution		RQ	
	(1) 1 st stage	(2) 2 nd stage	(3) 1 st stage	(4) 2 nd stage	(5) 1 st stage	(6) 2 nd stage
Log population		-0.0164 (0.0258)		-0.0276 (0.0318)		0.0978 (0.2146)
Age	0.0154*** (0.0037)		0.0123** (0.0060)		-0.0070 (0.0547)	
Age squared	-0.0001*** (0.0000)		-0.0001** (0.0000)		0.0006** (0.0003)	
Secondary educ.	-0.0070 (0.0197)		-0.0637* (0.0351)		-0.1210 (0.2284)	
Tertiary educ.	0.0142 (0.0128)		-0.0280 (0.0283)		-0.0821 (0.1283)	
Women-to-men ratio		-0.0870 (0.1518)		0.0108 (0.1827)		-0.0499 (1.2982)
Middle-aged population 36-55 (%)		-0.0093** (0.0047)		0.0010 (0.0050)		0.0201 (0.0338)
Older population 56+ (%)		0.0015 (0.0051)		0.0001 (0.0059)		0.0608 (0.0392)
College educated (%)		0.0005 (0.0024)		0.0001 (0.0028)		0.0512** (0.0196)
Active in labour mkt (%)		-0.0128 (0.0121)		-0.0224 (0.0150)		-0.1019 (0.1278)
Employed (%)		0.0133 (0.0115)		0.0219 (0.0133)		0.1351 (0.1121)
Non-white (%)		0.0025 (0.0019)		0.0022 (0.0023)		0.0179 (0.0159)
Number of observations	62822		28293		8413	
Number of TTWAs		184		160		121
R-squared	0.031	0.041	0.027	0.029	0.140	0.143

Notes: This table presents results from carrying out the estimation procedure described in [Subsection 4.2](#) for the three measures of returns to size in local marriage markets, for the early period. Columns (1) and (2) report estimates for couple formation within the sample of single individuals; columns (3) and (4) for couple dissolution within the sample of couples; and columns (5) and (6) report results for RQ, as proposed by [Rodríguez-Moro and Román \(2026\)](#), in the sample of couples. The early sample of singles is formed by individuals aged 36-65, and early couples are those formed at ages 36-65 with less than 15 years of tenure. Odd-numbered columns report first-stage estimates ([Equation 10](#)), with observations at the individual-wave level and controlling non-parametrically for period. Even-numbered columns report second-stage estimates ([Equation 11](#)), with observations at the TTWA level. Standard errors clustered at the TTWA level are reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

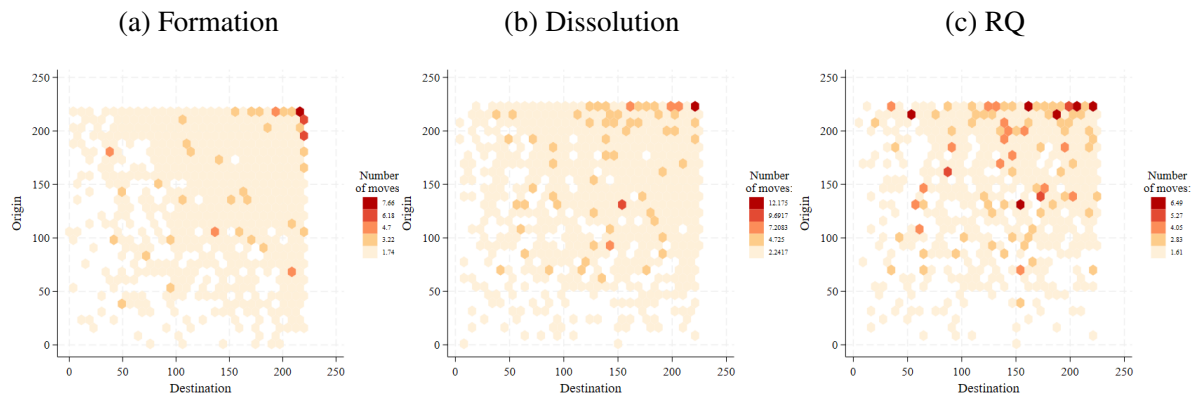
C.4 Movers Characterisation

Table C.6: Cross-TTWA movers in sample.

	(1) Formation	(2) Dissolution	(3) RQ
Movers	2,099	3,161	1,966
Movers (%)	6.5	6.6	5.5
Moves	2,811	3,898	2,223
Moves per individual	0.09	0.08	0.06
Connected TTWA pairs	1,338	1,279	923
Moves per TTWA pair:			
Minimum	1	1	1
Maximum	68	111	49
Mean	2.1	3.0	2.4
Median	1	2	2
TTWA with most in-moves	London	London	London
Number of moves	330	180	75
TTWA with most out-moves	London	London	London
Number of moves	259	475	275

Notes: This table describes the nature of the moves between TTWAs used in the main AKM estimation for each of the three marriage market outcomes. We provide a summary of moves and movers separately within the analysis sample of each outcome.

Figure C.1: Number of moves per origin-destination pair.



Notes: This figure plots the number of moves for each origin-destination TTWA pair. Origin TTWAs are displayed on the vertical axis and destination TTWAs on the horizontal axis. TTWAs are ordered by size, with larger TTWAs denoted by larger numbers. Lighter colours indicate fewer moves, while darker colours indicate more moves. The number of moves is grouped into 30 bins.

C.5 Alternative Analyses

C.5.1 Mover Selection

Table C.7: Compositional and outcome differences of movers and stayers.

	(1) Stayers	(2) Movers	(3) Difference
Panel A: City-size gradient in observable characteristics			
Women (%)	0.712*** (0.242)	-1.362** (0.606)	-2.074* (1.079)
Non-white (%)	5.613*** (0.593)	4.632*** (0.568)	-0.980 (0.630)
Young population 25-35 (%)	2.860*** (0.377)	5.687*** (0.864)	2.826*** (1.085)
Middle-aged population 36-55 (%)	0.396 (0.421)	-1.056 (0.846)	-1.451 (1.309)
Older population 56+ (%)	-3.256*** (0.392)	-4.631*** (0.875)	-1.375 (1.532)
College educated (%)	2.875*** (0.604)	3.271*** (1.020)	0.396 (1.345)
Active in labour mkt (%)	0.618* (0.373)	3.340*** (0.794)	2.722** (1.289)
Employed (%)	0.487 (0.430)	3.831*** (0.777)	3.344*** (1.131)
Monthly labour income (£)	73.809*** (17.030)	107.359*** (35.311)	33.551 (48.526)
Panel B: City-size gradient in outcomes			
Formation	-0.0020 (0.0016)	-0.0247*** (0.0088)	-0.0227 (0.0152)
Dissolution	-0.0010 (0.0010)	-0.0014 (0.0020)	-0.0004 (0.0032)
RQ	-0.0570*** (0.0108)	-0.0206 (0.0228)	0.0364 (0.0316)

Notes: This table reports results from regressions of various socio-economic outcomes (panel A) and our three marriage market outcomes (panel B) on TTWA log population. Columns (1) and (2) report results separately for stayers and movers, respectively. Movers are individuals observed living in more than one TTWA in our sample, while stayers are individuals observed living in only one TTWA. Each row corresponds to a separate regression, with the outcome reported in the first column. Column (3) tests for differences between the stayer and mover coefficients by interacting log population with a mover indicator. Standard errors are reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table C.8: Differences in origin and residence TTWAs.

	(1) Formation	(2) Dissolution	(3) RQ
Panel A: Earliest TTWA (age ≤ 21)			
Different TTWA (%)	8.3827 (27.7131)	24.6986 (43.1276)	11.9487 (32.4363)
Log population gap (residence - origin)	0.0290 (0.5122)	0.0331 (0.8178)	0.0288 (0.5920)
Panel B: Parent TTWA			
Different TTWA (%)	7.8592 (26.9102)	25.4103 (43.5364)	12.5584 (33.1381)
Log population gap (residence - origin)	0.0297 (0.4992)	0.0314 (0.8187)	0.0291 (0.6000)

Notes: This table compares individuals' origin and residence TTWAs for the three marriage market outcomes, using two alternative proxies for origin TTWA. Panel A uses individuals' first observed TTWA as their origin when they are first observed before age 21. Panel B uses the first observed TTWA of individuals' parents as their origin when the parents are first observed before age 65. For each outcome, we use the corresponding analysis sample. We report the share of individuals whose origin and residence TTWAs differ and the average difference in log population between their residence and origin TTWAs.

C.5.2 Endogeneity of City Size

Table C.9: Exclusion restriction placebo check.

	Formation		Dissolution		RQ	
	(1)	(2)	(3)	(4)	(5)	(6)
Instrument	-0.0147 (0.0114)	0.4426 (2.0877)	-0.0078 (0.0066)	-0.6313 (1.2113)	-0.0134 (0.0203)	-2.7992 (3.7657)
Log population 1991		-0.4543 (2.0905)		0.6141 (1.2131)		2.7972 (3.7715)
Women-to-men ratio		-1.6161*** (0.5784)		0.4671 (0.3513)		-0.3484 (1.0929)
Young population 18-34 (%)		0.0139 (0.0948)		-0.0400 (0.0550)		-0.0955 (0.1714)
Middle-aged population 35-54 (%)		-0.0231 (0.1014)		-0.0672 (0.0585)		-0.1169 (0.1830)
Older population 55+ (%)		0.0158 (0.0964)		-0.0443 (0.0558)		-0.1015 (0.1738)
Active in labour mkt (%)		0.0047 (0.0165)		0.0137 (0.0097)		0.0040 (0.0309)
Employed (%)		-0.0064 (0.0100)		-0.0035 (0.0059)		-0.0012 (0.0187)
Non-white (%)		-0.0004 (0.0063)		-0.0038 (0.0038)		-0.0010 (0.0118)
R-squared	0.008	0.075	0.007	0.084	0.002	0.019
Observations	203	203	207	207	204	204

Notes: This table reports regression results of the estimated 2011 TTWA effects for couple formation, dissolution, and RQ on the log population aged 0-15 in the 1991 Census. Specifications sequentially control for total 1991 population and TTWA composition characteristics measured in the 1991 Census, including the sex ratio, age structure, and the shares of individuals active in the labour market, employed, and non-white. Standard errors clustered at the TTWA level are reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$