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The duality of class and love☆
Homogamy spaces and the New York social elite, 1970–2020

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ABSTRACT

Social classes are, in part, the intersection of economic and intimate relations. Just as groups and individuals form a duality, social classes and marriages form a duality to the extent marriages are homogamous along class-relevant dimensions; yet analyzing homogamy through the lens of duality is largely under-exploited. Using network, geometric, and text-analytic methods, I explore the intersection of individuals and groups through the social sinews of elite marriage as represented in nearly 14,000 *New York Times* wedding announcements over fifty years. In particular, I find that homogamy at the level of educational organizations and surnames has increased in the last few decades among this group of elites, while homogamy by occupational organizations and titles has decreased. The technique outlined here allows us to explore fine-grained similarities, moving beyond measuring identical matches or assuming affiliations are independent, to arrive at the latent social structures that emerge from the "homogamy space" created by the dualities of marriage.

Marriage may shape the overall class structure by, for instance, nurturing a sense of shared class identity or connecting economic relations beyond production. Indeed, the very notion that people form groups we could call "classes", depends in part on the extent to which people tend to marry people with similar class locations as themselves – i.e. the extent they are (or are not) homogamous (Blau & Schwartz, 1997; Burgess & Wallin, 1943).

Research on homogamy routinely finds that, generally speaking, it is quite common for people to marry others who are similar to themselves (Lichter & Qian, 2019). While homogamy along religion, ethnicity, and race has declined in Western countries, it has generally increased or stayed high for class-relevant characteristics since the mid-20th century, with important nuance (Choi & Qian, 2023; Frémeaux & Lefranc, 2020; Gonalons-Pons & Schwartz, 2017; Hirschl et al., 2024; Hout, 1982; Ravazzini et al., 2017; Schwartz et al., 2021; Shen, 2021; Smits, 2003; Toft & Jarness, 2021; Wagner et al., 2020; Wilken, 2025).

When studying class homogamy, research typically defines class *a priori*, through occupations, education, or income. For instance, a study of homogamy in England over the last century finds that the status of bride's surnames equaled the status of the grooms (Clark & Cummins, 2025). A surname's status, in turn, is cleverly defined by estimated value of homes owned by people with shared surnames. Often, analysts reduce the possible "classes", either by limiting occupations to a rank in a given class scheme or by using income percentiles, occupational prestige, or levels of education, and so on. Consider a longitudinal study of educational homogamy in the United States that finds spousal similarity in terms of education dropped to the lowest in the mid-century and has been rising since (Mare, 2016; see also Smith et al., 2014; Mäenpää, 2015; Eika et al., 2019). Educational attainment, in turn, is defined by number of years of school completed, divided into six categories. Furthermore, often for practical purposes, there is a tendency to focus on a single dimension of class homogamy (but see Chiappori et al., 2024; DiMaggio & Mohr, 1985; Güémez & Solís, 2022; Kalmijn, 1998). Although not without advantages, these procedures bake in both partitioning and homogeneity, glossing

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over important differences that may exist at more fine-grained levels – such as which educational institutions spouses attended (e.g., Ford, 2020), their respective degrees (e.g., Han & Qian, 2022). More importantly for our purposes, these approaches do not allow marriage to be a class formation process.

Here, I build on the affinity between duality (Breiger, 1974; Breiger & Pattison, 1986; Lee & Martin, 2018; Puetz, 2017) and embeddings (Arseniev-Koehler, 2022; Kozlowski et al., 2019; Nelson, 2021; Stoltz & Taylor, 2021) to measure homogamy as it relates to both fine-grained and heterogeneous affiliations (namely, families, organizations, and occupations). This relaxes assumptions of between-affiliation independence and can easily incorporate multiple dimensions of matching, all while avoiding classifications or rankings imposed by the analyst at the onset. Rather, the structure emerges from the pattern of associations among all marriages in a sample.

In what follows, I situate my approach to class analysis, and note that marriage is a cultural, legal, and interpersonal practice that plays a key role in producing and maintaining class structures (Griffiths & Lambert, 2013; Lambert & Griffiths, 2018; Prandy & Lambert, 2003). Each person in a marriage brings certain class-relevant affiliations, forming an intersection of socio-economic circles. In particular, their own families, their occupations, and the organizations with which they are affiliated through kinship, education, employment, or philanthropy. The pattern of affiliations created by marriage forms a multidimensional space (Bourdieu, 1987) through which we can measure homogamy. I then discuss how the duality of groups and persons provides an empirically and theoretically driven approach to defining both class and homogamy. This provides the foundation for the key methodological premise of this paper: we can use embeddings to generalize the concept of duality, and thus as a generic method of social scientific inquiry. I demonstrate this technique by exploring homogamy among a group of elites who have been "elected" by social gatekeepers in a major American city: those celebrated in the *New York Times* wedding announcements.

After first using text analysis tools (dictionaries, named entity recognition models, and pretrained large language models) and close reading to annotate roughly 14,000 wedding announcements from 1970 to 2020, I create a two-mode marriage by group affiliation (surname, occupation, organization) matrix. I then use embedding techniques to represent each affiliation spatially by a vector that summarizes the patterns among affiliations defined by co-occurring in similar wedding announcements. Homogamy, in turn, is operationalized as the average cosine similarity between the vectors of each spouses' respective affiliations. Thus, rather than measuring only identical matches or assuming affiliations are independent, I allow latent social structures to reveal themselves in the "homogamy space" created by the dualities of class-relevant affiliations within marriages. Using this technique, I find that overall homogamy has increased in recent decades among this group of "newsworthy" marriages, and this is driven by matching on surname and educational affiliation.

1. Why marriage matters for class

Class, at minimum, refers to a social position defined by economic relations. A key tension in social scientific research on class is if people "cluster" together into something we could call a "class", should we discover these affinities (or lack thereof) through empirical analysis or should we impose affinities using theoretically-driven typologies. Such approaches can be arranged along a continuum. On one side, we have gradational accounts in which every individual can be place somewhere along a continuous measure (or a few measures), such as income. On the other side, individuals can be clearly clustered into just a few large groups, such as capitalists and proletariat. Whether a moment in a given political-economic system falls more to one side or the other of this continuum is often implied, but others propose that the organization of the structures of inequality is an empirical question which may change over time, place, and population (Bourdieu, 1994; Mills, 1956; Pakulski, 2005; Weeden & Grusky, 2012). The latter is my point of departure.

This paper draws on the concept of duality (Breiger, 1974) as a bridge between three literatures: power structure, homogamy, and class analysis. Power structure research is an empiricist approach to class (and power more generally). A key concern in this literature is not simply that people can be clustered into (often latent) groups, but rather that these clusters emerge from objective relations, and they have phenomenological salience for the people involved.[1] That is, they have semblance of "class for itself" – even if such class does not fit clearly into a few theoretically driven groupings. This "class for itself" is the conceptual leverage provided by micro-class "occupations". Occupations are both recognized by those within an occupation and by various institutions, together driving the social closure leading to "class effects" (Alejandro, 2001; Grusky et al., 2000; Weininger, 2002).

A possible resolution is to consider this an empirical and historically-contingent question (Weeden & Grusky, 2012): being *class-like* versus *micro-class-like*, for instance, is an outcome of specifiable social processes. For instance, credentialing plays a central role in producing the class effects of occupations. Similarly, marriage is a cultural, legal, and interpersonal practice that plays a similar role in producing and maintaining class structures (Mare, 2016; Prandy & Lambert, 2003). That is, we may find larger class formations spanning isolated occupations (and organizations or families), but without imposing purely analytical schemes (Bourdieu, 1994, 11). Below, I briefly consider three ways that marriage may shape the overall class structure of a given time and place: class identity, class (de-)consolidation, and forging economic relations beyond production.

[1] Here, I use social class and economic class interchangeably. Domhoff (2006, 4-10) distinguishes between *social* class and an *economic* class, but argues that, the upper social class *is* an economic class in the United States.

1.1. Class identity

If "classes" are identified – either discovered or imposed – we must consider whether the people within the class see themselves as a group, with a shared position, identity, and interests. Following Marx's terminology this could be understood as the difference between a "class-in-itself" versus a "class-for-itself" (Eidlin, 2014). More cautiously, following Bourdieu (1994, 11), this tracks the difference between a "class on paper" as opposed to a "real class" defined by mobilization:

> The "real" class, if it has ever "really" existed, is nothing but the realized class, that is, the mobilized class, a result of the struggle of classifications, which is a properly symbolic (and political) struggle to impose a vision of the social world, or, better, a way to construct the world, in perception and in reality, and to construct classes in accordance with which this world can be divided.

Marriage is typically the result of homophilic tendencies that both shape identity and bring potential dating partners together, such as shared social foci, cultural consumption, or neighborhoods. Marriage also provides a fertile environment for germinating such solidarity and collective purpose – and, thus, potential collective action – that bridges both the subjective and objective (Hout, 2008), and the academic and practical realization of class. As Berger and Kellner state, "In each partner's psychological economy of significant others, the marriage partner becomes the other par excellence" (Berger & Kellner, 1964, 11). It may be possible for an "upwardly mobile" individual, however defined, to nevertheless feel like a stranger in a strange land. As (Domhoff (1974, 83-85); see also Sweezy, 1953), marriage was a mechanism by which the rising managerial occupations were assimilated to the (old money) upper-class.

As Grusky, et al. argue (Grusky & Galescu, 2005; Grusky & Sørensen, 1998; Weeden & Grusky, 2012), what makes occupations useful sites of analysis is the closure institutions generating homogeneity through socialization and selection. Similarly, marriage is also a possible mechanism by which prestige can be translated into economic inequality through explicit acts of selection and rejection (Haller, 1981, 768):

> These [social] boundaries have the twin functions of preventing "unequal" people from entering one's own sphere and restricting one's own interaction possibilities to "equals". Social boundaries, thus, exclude others, but they also create and preserve identity.

1.2. Class (de-)consolidation

Marriage may nullify or amplify the kinds of consolidation emblematic of the class concept, which involves "increasing internal homogeneity" and "increasingly sharp delineation of external boundaries" (Kocka, 1984, 423; see also Glenn et al., 1974; Haller, 1981; O'Brien, 2023). Toft and Jarness 2021, for instance, using data for the entire population of Norway, find upper-class people are more likely to marry upper-class people than are even upwardly mobile "newcomers". While moving up the ranks of a large bureaucracy may be a pathway to the American middle class, Mills (1956, 113) argued that very few have "risen to great wealth" this way. Rather, it is a combination of company mergers "often cemented by marriage":

> . . . as when the du Ponts bought out Laflin and Rand, their largest competitor, and Charles Copeland – assistant to the president of Laflin and Rand – became assistant treasurer of du Pont and married Luisa D'Anbelot du Pont.

This presents marriage as the "cement" between powerful families or a strategic shield against losing amassed wealth (Mills, 1956, 30, 68; Padgett & Ansell, 1993; Chung et al., 2021; Toft & Hansen, 2022; Tisch & Ischinsky, 2023). But, this instrumental view of marriage is complicated by "love" (Goode, 1959; Rusu, 2018). For instance, a common trope in popular culture – novels, film, television, and music (Carey, 1969; Sharot, 2013) – is the so-called "cross class" romance (Streib, 2015). The cultural archetype "gold digger" emerges as antithesis (Donovan, 2020), highlighting that the "lower-class" suitor may be driven by a desire for upward mobility. Importantly, however, a "precondition for the cross-class romance was the emergence of romantic love as a basis for marriage" (Sharot, 2016, xv). In other words, material interests, even if present, are illegitimate motivations in the modern conception of marriage (De Rougemont, 1983; Prandy & Lambert, 2003; Shorter, 1977). If the freedom of choice implied by this popular trope were widely embraced in practice, however, we could expect marriage to be a source of *class deconsolidation* (Blau & Schwartz, 1997).

In lieu of romantic love as a common driver of marriage, consider the exchange theory of partner selection, more specifically "status exchange", where partners may use their "higher" ranking on one dimension of stratification in "exchange" for the partners "higher" ranking on another dimension. Commonly, this body of research explores, race, education, age, caste, beauty, and wealth as dimensions of exchange (Davis, 1941; Merton, 1941). For instance, the stereotype of women exchanging "beauty" for men's wealth or education (Elder, 1969; McClintock, 2014; Xu & Pan, 2023). In some scenarios, for instance where one partner is exchanging for a higher non-class-relevant ranking for a higher class position, we again would see *class deconsolidation* (Illouz, 2012, 48-9). If partners commonly exchange along two or more class-relevant dimensions, however, we would expect more *class consolidation*.

1.3. Class beyond production

Finally, marriage forms the nexus of the full range of economic relations (e.g., Curran, 2017; Zelizer, 2010), many of which are missed (or demoted) by the typical focus on formal occupations, production, and markets. Typically, class analysis proceeds from one's position vis-à-vis the "enterprise" (which prioritizes profits) but the "budgetary unit" (which prioritizes consumption) is a pervasive form of economic organization exemplified by the family (McDonnell, 2013). For some, conceptualizing class as incorporating economic relations beyond relations of production is a non-starter, possibly even rendering "class" an incoherent concept (Lynd, 1956, 111-113). This has lead some traditional class analytic approaches (e.g., Goldthorpe, 1983) to define women's class position by the "head of household" – typically father or husband's position – which is obviously deficient for contemporary class analysis (Stanworth, 1984) and ill-suited for studying homogamy. Still, other approaches (Leiulfsrud & Woodward, 1987; Wright, 2005) presume that only after entering the formal workforce do women acquire a proper class position. This fails to appreciate, for instance, how household and philanthropic work (Domhoff, 2009; Silver, 2007) are both class-relevant in themselves; may facilitate the other spouse's participation in a formal labor market; and shape the family's capacity for the intergenerational transmission of class-relevant affiliations. Thus, marriage provides a concrete connection between typically disparate occupations and organizations, providing a set of objective social relations that plausibly generate class solidarity (and conflict) at an aggregate level.

2. Homogamy as duality

To the extent homogamy research is concerned with the space of economic inequality, this research typically begins with class related categories. Classes – i.e. clusters in the space of economic relations – are defined *a priori*. For example, "classes" are often defined by earnings standardized into (typically gender relative) percentiles. Homogamy is defined by the extent couples have incomes in similar percentiles. Such an approach is certainly appropriate if, for instance, one is interested in exploring how income homogamy may contribute to income inequality (e.g., Boertien & Permanyer, 2019; Gonalons-Pons & Schwartz, 2017; Schwartz, 2010). However, in this approach, marriage itself is not a mechanism that defines class. We can identify this same feature in research that begins with, for example, class schemes, levels of education, occupational prestige, or some other class-relevant relation. In addition to defining class *a priori*, such approaches often limit the number of possible classes to a few (e.g., reducing education to degrees or years) and furthermore, it is uncommon to attempt to measure similar across "kinds" of class-relevant relations (similarity between education and occupation). In the approach I will outline below, the patterns of affiliation created by marriages inductively provide the means to measure spousal similarity of those same affiliations, and can easily incorporate heterogeneous kinds of class-relevant affiliations within the same space.

The concept of the duality of groups and persons provides an empirically and theoretically driven approach to defining both class and homogamy. Each person in a marriage brings certain class-relevant affiliations, forming an intersection of socio-economic circles. In particular, their own families, their occupations, and the organizations with which they are affiliated through kinship, education, employment, or philanthropy. The underlying conception of homogamy as duality shares much with recent applications of network ideas to occupational mobility data (Block, 2023; Cheng & Park, 2020; Lin & Hung, 2022; Toubøl & Larsen, 2017; Villarreal, 2020). In this literature, two occupations are similar to the extent people move from one job to the other. Where we depart slightly is in dealing with the two-mode nature of marriages and affiliations. Furthermore, the method discussed here builds upon previous work applying scaling and dimensional analysis to two-mode, class-related data (e.g., Bourdieu, 1984; Goodman, 1981; Laumann & Guttman, 1966; Mitchell & Critchley, 1985; Robson & Sanders, 2009), such as friendship networks (in particular the "Cambridge Scale", see Bakker, 1993; Griffiths & Lambert, 2012, 2013; Prandy & Lambert, 2003; Stewart et al., 1980).[2]

We can begin with a two-mode matrix of marriages, I, by affiliations (here, family, occupation, and organization), J. Then, we apply the procedure outline by Breiger 1974 to discover first-order homogamy (see Fig. 1): the count of every j that share i (column-wise projection) and we can also get the count of every i that share j (row-wise projection). Thus, affiliations are similar to the extent they share the same marriages and marriages are similar to the extent they share the same affiliations. Importantly for our purposes, we can *also* compare their respective vectors in the projected matrices. Specifically, the vector for every j is more similar to every other j to the extent the relative count goes up in the same places and down in the same places.

Consider the hypothetical example in Fig. 1, the vector for "Harvard" is most similar to "Lawyer" and "Simmel" because, in this case, they have the exact same pattern in the column-wise projection ($A^T A$): $[3, 2, 3, 2, 2, 1, 3]$. Whereas "Harvard" is most dissimilar to "Du Bois" and "Writer", Two affiliations are similar not only if they co-occur in the same marriages, but also if they co-occur with the same set of other affiliations and *do not* co-occur with the same set of other affiliations. Both projections, though, proceed with each i being independent of every other i and every j being independent of every j to derive their within mode dependence. This is a limitation with first-order homogamy that we can call the *independence constraint*.

[2] To be sure, some have claimed that this approach does not actually tap into "class", but should rather be called something else like "status" instead (e.g., Bukodi & Goldthorpe, 2013, Bihagen and Lambert (2018)), and is part of a larger conversation primarily in British class analysis (e.g., Chan, 2019; Chan & Goldthorpe, 2007; Flemmen et al., 2019; Lizardo, 2019; Savage et al., 2013).

$$A = \begin{array}{c} \\ a_1 \\ a_2 \\ a_3 \end{array} \begin{array}{c} \begin{array}{ccccccc} Harvard & Yale & Lawyer & Writer & Weber & DuBois & Simmel \end{array} \\ \begin{pmatrix} 1 & 0 & 1 & 1 & 0 & 1 & 1 \\ 1 & 1 & 1 & 0 & 1 & 0 & 1 \\ 1 & 1 & 1 & 1 & 1 & 0 & 1 \end{pmatrix} \end{array} \qquad AA^T = \begin{array}{c} \\ a_1 \\ a_2 \\ a_3 \end{array} \begin{array}{c} \begin{array}{ccc} a_1 & a_2 & a_3 \end{array} \\ \begin{pmatrix} 5 & 3 & 4 \\ 3 & 5 & 5 \\ 4 & 5 & 6 \end{pmatrix} \end{array}$$

$$A^TA = \begin{array}{c} \\ Harvard \\ Yale \\ Lawyer \\ Writer \\ Weber \\ DuBois \\ Simmel \end{array} \begin{array}{c} \begin{array}{ccccccc} Harvard & Yale & Lawyer & Writer & Weber & DuBois & Simmel \end{array} \\ \begin{pmatrix} 3 & 2 & 3 & 2 & 2 & 1 & 3 \\ 2 & 2 & 2 & 0 & 2 & 0 & 2 \\ 3 & 2 & 3 & 2 & 2 & 1 & 3 \\ 2 & 1 & 2 & 2 & 1 & 1 & 2 \\ 2 & 2 & 2 & 1 & 2 & 0 & 2 \\ 1 & 0 & 1 & 1 & 0 & 1 & 1 \\ 3 & 2 & 3 & 2 & 2 & 1 & 3 \end{pmatrix} \end{array}$$

Fig. 1. Hypothetical data.

2.1. The independence constraint

First-order homogamy – following the Breiger method, or "Breiger classic" (Lee & Martin, 2018, 20), described above – presumes that, initially, affiliations are precisely equal, and otherwise precisely unequal. This is a binary measure of sameness: Harvard is as much not Yale as it is not Lawyer. While certainly sharing the exact same occupation or organization would qualify as homogamous, it renders the difference between, say, an accountant marrying a management consultant equivalent to an accountant marrying a biologist: a management consultant and a biologist are equally not an accountant. This independence constraint is not limited to this first-order duality approach, but is shared by all categorical approaches to class analysis.

There are two common ways this constraint is relaxed in class analysis. First, we could use more encompassing categories in our system of classification to nullify some of these differences. Perhaps most well-known is the "EGP" class scheme (Erikson et al., 1979; Mitnik & Cumberworth, 2021) which categorizes occupations on the basis of "difficulty monitoring" and "skill specificity" associated with a set of job titles to group them into seven categories. Here, though, we inherit problems with *a priori* typologies (Prandy, 2002), such as assuming what makes two occupations similar, rather than discovering. We also move further away from inequality producing situations (Tomaskovic-Devey & Avent-Holt, 2019) and potentially embed our theories about what produces a class system into our data partitioning, while also overlooking important heterogeneity within, and affinities across, groups (e.g., Andrade & Thomsen, 2019; Atkinson, 2024; Avent-Holt et al., 2020; Martin-Caughey, 2021).

Second, we could arrange our categories into a continuous dimension (commonly, one dimension, but perhaps two or three), as exemplified by the long tradition of studying occupational prestige from Dudley onward (Duncan, 1961; Featherman & Hauser, 1976). Typically, rather than the analyst hand-ranking occupations, analysts will recruit survey respondents to do the ranking. Although people seem remarkably capable of placing such occupational titles onto a single dimension (c.f., Valentino, 2021), this procedure typically requires an initial reduction of respondents' titles to an acceptable list. And, furthermore, presuming a single spectrum of stratification is itself a theoretical assumption that is not without critics (Atkinson, 2024; Bourdieu, 2018). More importantly for present purposes, this provides no means to arrange heterogeneous categories – like occupations and organizations – in the same space of inequality.

2.2. Enter hyper-space duality

Another way to relax the independence constraint is to go beyond first-order similarities, to incorporate second-order similarities: any two affiliations, ij, are similar to the extent they also are share an affiliation, q. As a simple example, consider a large professional services firm like Deloitte, q, which employs both accountants, i, and management consultants, j. Despite being different occupations, incorporating information about both i and j's affinity to the shared organization, q, will form the basis of a more graded similarity between the two. We continue this logic by also incorporating the similarities between the various other q that a given i and j may

share, and so on. The result demonstrates the affinity between graph models (popular in social network analysis) and vector space models, specifically embeddings (popular in computational text analysis).

This vector space of D dimensions will give a vector associated with an affiliation that is close to another affiliation's vector to the extent they tend to co-occur with the same affiliations, and those affiliations tend to co-occur with the same affiliations, and so on. Therefore, if we continue to push Breiger's insights about duality, we arrive at embeddings – a family of methods typically used to measure the meanings of words in a textual corpus (Arseniev-Koehler, 2022; Boutyline & Arseniev-Koehler, 2025; Kozlowski et al., 2019; Lenci, 2018; Nelson, 2021; Rodriguez & Spirling, 2021; Stoltz & Taylor, 2021). At a general level, this involves using dimension reduction techniques on a co-occurrence matrix – e.g., singular-value decomposition (Levy & Goldberg, 2014); weighted log-linear models like GloVe (Pennington et al., 2014); or neural networks like word2vec (Mikolov et al., 2013). Similar techniques are used in "image compression" and therefore it is tempting to think of this process as "losing" information, providing an ersatz representation of the original data. However, what we gain is a clearer picture of the *latent* similarities that undergird these otherwise discrete entities.

Furthermore, while the demonstration here uses co-occurrences affiliations within marriages derived from a corpus of wedding announcements, this could easily be adapted to any data of co-occurrences derived from, for example, official records or surveys.

3. The case of wedding announcements

The wedding announcements in the *New York Times* (*NYTs*) started in 1851 and chronicle the marriages of people deemed important enough to be "newsworthy". There have been a few sociological analyses of these wedding announcements, and I follow the first such study to suggest the group that passes the editorial gatekeepers "is assumed to occupy a superior position in the New York social system" (Hatch & Hatch, 1947, 396; see also Blumberg & Paul, 1975; Schuster, 1997). Or, consider the words of a former *NYTs* writer responsible for, among other things, the announcements (Doty, 2021, 5):

> What is in a wedding announcement? After all, weddings will (and do) happen without one. In fact, most American nuptials, successful or not, go unnoticed by news organizations and unannounced, except on social media and the occasional church bulletin. But the weddings we wrote about for the Times – they were different. They were, generally speaking, wildly expensive – far beyond the average American expenditure of $44,000. But they were more than the sum of their gilded parts. They were mergers of families and bank accounts, of aspirations and hubris. And these announcements were battle plans, and business plans, of class and warfare. They were incredibly difficult to obtain, which meant that they were worth far more than the soy ink they were made of. They were expected by a certain set. And they were, above all, exclusive. If your wedding announcement was in the paper of record, then your marriage counted – and, by proxy, so did you.

Drawing on a similar mechanism by which occupations may generate prestige, wedding announcements provide a public venue by which social elites demonstrate worthiness and commitment to a set of values that are "seen as transcending self-interests and group boundaries, and… accepted by a large audience" which confers "legitimacy and appropriateness" (Zhou, 2005, 95). Nevertheless, we must bear in mind that there are two acts of selection in these announcements: the soon-to-be married couple decides to submit materials to the *NYT* editors, and the editors decide a couple is newsworthy (c.f. Doty, 2021, 69). In some cases, the order of these acts are reverse, and in other cases there are other parties involved (such as parents or publicists). Without knowing the potential candidates that either were not selected or declined the offer, we cannot make strong inferences to a larger population. Therefore, rather than treating these marriages as a sample of a larger population, what follows is a description of an actually existing group of "newsworthy" people that orbit one of the most important cities in the United States.

More relevant for the following demonstration, the *NYT* has explicitly discussed the intent to "diversify" the wedding announcements (Doty, 2021, 67). If homogamy is more common among the social elites (e.g., O'Brien, 2023; Toft & Jarness, 2021), and the *NYT* was successful in looking outside this group for "newsworthy" couples, this could result in an overall decline of homogamy in recent years. However, this "diversity" may also come from weddings between people who *both* have non-central affiliations – in other words, are changes in homogamy evenly distributed or is the *NYT* engaging in tokenism. On the contrary, consider the possibility of "status exchange", it may be case that an association to central affiliations "purchases" freedom to marry someone with non-central affiliations.

4. Analysis

4.1. Data and preparation

I collected roughly 200–300 wedding announcements per year from *The New York Times* (*NYTs*), except 1979 (n = 198), 1980 (n = 61), and 2020 (n = 19) (see Table 1).[3] The *NYTs* places some limits on eligibility for inclusion. The *NYTs* prints announcements before the wedding date (none after), requires enough time to fact-check each detail, and announcements are typically in print one to two weeks prior to the actually legal ceremony.

[3] While the low count for 2020 appears to be related to the Covid pandemic, the low count for 1980 appears to be an archival problem. I removed announcements that fall under the "Vows" column as they tend to deviate from the standard announcement format and are substantially longer. Many of these documents use "Optical Character Recognition" (OCR) to convert images of print media into digital form, especially the early years. Therefore, text has been cleaned for potential OCR errors. Then, I removed excess whitespace; converted all characters to the broadest range of Latin characters; and then transliterated to "Basic Latin'' ASCII characters. I then developed a custom dictionary to fix spelling errors that were identified through close reading alongside spell-checking dictionaries.

Table 1
Corpus descriptives.

Total Announcements	13,804
Mean Announcements per Year	271
Total Word Tokens	2,681,572
Mean Word Tokens	194
St. Dev. of Tokens	100

After collection, I then developed three dictionaries for surnames, occupations, organizations. I began by using a Named-Entity Recognition (NER) model on my corpus, which identities potential "named entities", specifically, people and organizations.[4] While the model was quite comprehensive, it also required some hand cleaning of unique entities. To develop the organizations dictionary, I hand annotated named-entities by type, and noted any false negatives. Next, using a combination of NER tagging on the headlines and manual editing, I identified the names of the individuals getting married. I then isolated each surname using the named-entities and a list of the most common surnames from the U.S. Census to create a surname dictionary. Again, I went through a round of manual editing to complete missing surnames. Then, I used a pre-compiled list of roughly 475,000 occupational titles collated from a professional networking sites to identify occupational titles (Liu et al., 2022). Lastly, using this information, I developed targeted prompts as inputs to a large language model (LLM) that was prompted to associate a given organization or occupational title with a given spouse in each announcement.[5] Again, this was used in combination with manual editing.

Next, the announcements are tokenized into *n*-grams (Gupta et al., 2019) with an *n* from one to sixteen to encompass organizational names and occupational titles, which includes lowercasing and removing punctuation – for instance, New York University represented as a 3-gram would be new_york_university. This same tokenizing procedure is then applied to the dictionaries. Finally, I took the intersection of the *n*-grams in the combined dictionary and the *n*-grams in the articles to arrive at a vocabulary of 283,078 *n*-grams for all years.

4.2. Modeling hyper-space duality

To model higher-order co-occurrences, I use the GloVe embedding algorithm (Pennington et al., 2014) to create my embedding space. This is a dimension reduction technique typically used to create word embeddings. I use this to model the hyperspace dualities between all possible affiliations (as discussed above). In contrast to other embedding algorithms (e.g., word2vec), GloVe emphasizes less frequent tokens, which is precisely what we encounter with a vocabulary restricted to *n*-gram representations of affiliations. More specifically, it is a weighted log-linear model fitted to co-occurrences of *n*-grams. Importantly, the basic procedure outlined here is not married to this dimension reduction algorithm, however, it is commonly used in text analysis, is computationally efficient., and is actually a commonly used modeling technique in sociology (e.g., Featherman & Hauser, 1976; Smits et al., 1998; Xu & Pan, 2023).

First, I create a co-occurrence matrix of all *n*-grams. This matrix counts the times two *n*-grams occur together in a given window. Here, the meaningful "window" is an entire wedding announcement. For example, does "cornell" occur in the same announcement as "assistant professor". Second, the GloVe algorithm attempts to find a reduced "embedding" matrix that predicts the co-occurrence matrix. It does so by finding vectors where the dot products of the vector pairs minimizes the error in predicting the log of that term pair's co-occurrence frequency. This way the "meaning" of a given *n*-gram is how well it is vector predicts the other *n*-grams it is commonly found alongside.

I create co-occurrence matrices for each year using a rolling five year window of window announcements. Co-occurrence matrices tend to be sparse, especially given the relatively small corpus and restricted vocabulary I use here. Therefore, using co-occurrences in the five previous years provides more information to locate an affiliation in the homogamy space. Finally, I specify an embedding matrix of 50 dimensions, again, because of the relatively smaller corpora used to train each embedding space.[6] This estimates the relationship between affiliations *within each year*, allowing them to vary over time.

4.3. Measuring homogamy via duality

After training the embedding models to account for *n*-order similarity between affiliations in each announcement, we still need the similarities between each spouses' affiliations. In research on word embeddings, the "meaning space" created by the dimension-reduction process can be navigated using a range of basic geometric operations (e.g., Mikolov et al., 2013; Kozlowski et al., 2019; for

[4] I use a transformer-based NER model hosted on Hugging Face: https://huggingface.co/docs/transformers/index. Specifically, this is a BERT large cased model (Devlin et al., 2018) that was fine-tuned on the CoNLL-2003 named-entity recognition dataset (Tjong Kim Sang & Meulder, 2003).

[5] Specifically, I used the open-source large language model (LLM) Llama3.1:70b obtained from Hugging Face: url https://huggingface.co/meta-llama/Meta-Llama-3.1-70B.

[6] It is typical to see embeddings between 50–300 dimensions. While previous work finds that there are diminishing returns to embeddings above 300, Rodriguez and Spirling (Rodriguez & Spirling, 2021) also find that 50-dimensional embeddings tend to perform comparably to higher dimensional embeddings, especially when the context windows are quite large (as is the case here).

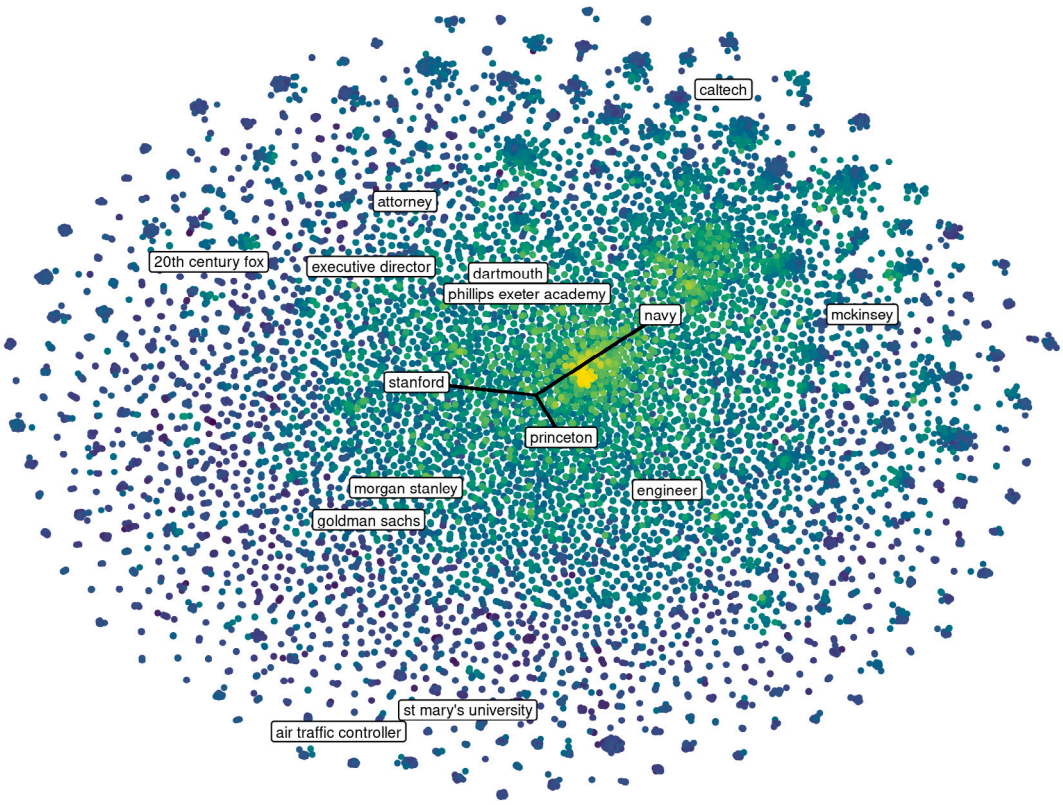

Fig. 2. 2-Dimensional representation of 2010 embeddings.

an overview Stoltz et al., 2024). As "distance" between two vectors operationalizes the similarity in their respective contexts, I use the most common measure of distance in high dimensional spaces: cosine similarity. Here, the limiting case is 1 if $affiliation_1$ is exactly the same as $affiliation_2$.

Take Fig. 2 for instance. We, of course, cannot visualize a 50-dimensional space, so for illustration purposes, I have reduced the 50-dimensional space of the 2010 embeddings to just two dimensions.[7] Each possible affiliation is a point (lighter colors are more centralized affiliations, as defined below). I have also labeled a handful of affiliations in that space, again for illustrative purposes. Note the dark line from "navy" to the origin and another dark line from "princeton" to the origin, forming an angle between the two points. Using, the cosine of this angle, we would get a measure of relative similarity between the two points. We could then compare it to the angle that "navy" forms with "stanford". We would find that "navy" is closer in this space to "princeton" than it is to "stanford". We, in turn, would interpret this as "navy" co-occurs with "princeton" (and co-occurs with affiliations that "princeton" also co-occurs with) in more wedding announcement than it does with "stanford".

We can continue to measure the cosine between these affiliations within each year-specific embedding space. Fig. 3 shows the cosine similarity between the vectors for a selection of occupational titles (engineer, consultant, lawyer) and a selection of educational organizations (stanford, yale, and harvard). These similarities are calculated for each year, allowing for a comparison of the associations over time: e.g., "consultant" is more similar to "harvard" over the entire period. This means "consultant" not only co-occurs with "harvard" in wedding announcements, but also co-occurs with a similar set of other affiliations, and do so more than with either "yale" or "stanford" in each year.

Using this approach, I create five measures of homogamy based on the mean cosine similarities for (1) all affiliations, (2) educational institutions, (3) occupational organizations, (4) occupational titles, and (5) surnames. Each variable is mean-centered and normed such that one unit is a standard deviation. I then present a series of plots showing the Loess-smoothed fit line (with confidence intervals at the 95% level) between an announcement's homogamy score along the five measures and the year in which it was published.

[7] To do so, I use the t-distributed stochastic neighbor embedding (t-SNE) algorithm (Maaten & Hinton, 2008), a technique commonly used to visualize word embeddings (e.g., Yung, 2021).

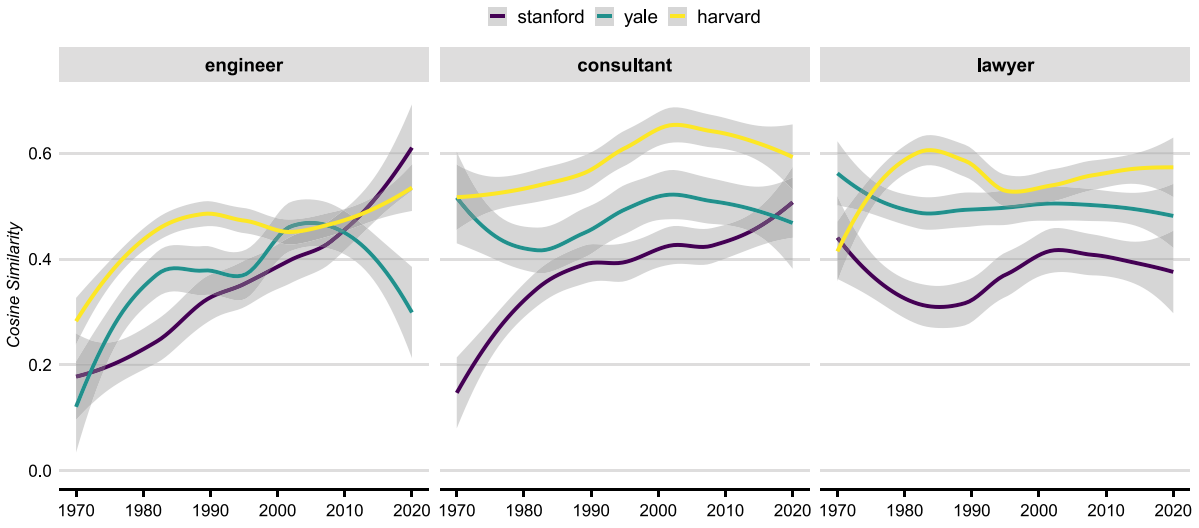

Fig. 3. Similarity between a selection of occupations and schools,1970–2020.

Aside from change in homogamy over time, I explore two related questions. First, the announcements may be "diversifying", but this diversity maybe be coming from "peripheral" affiliations, versus more evenly distributed across marriages. To measure the average "centrality" of each announcements' affiliations, I find the average pairwise cosine similarity between those affiliations within the announcement and all other affiliations within their respective five-year window.[8] For the sake of visualization, I group announcements into "Central" or "Non-Central" by dividing them at the mean. Second, continuing with an exploration of "status exchange". By far the most common affiliation is Harvard University, therefore I measure the extent homogamy is associated with whether one or more spouse attended Harvard. It is possible that such marriages are more homogamous, however it may also be the case that such a central affiliation "purchases" freedom in terms of other affiliations.

5. Results

As demonstrated in Fig. 4, overall homogamy – measured by the average similarity between the vectors of each spouses' affiliations – has increased since 2000. When disaggregating this over time trend, spouses attending similarly positioned educational institutions started low in the early decades and increase steadily until plateauing in the 2000s onward. This fits with prior findings regarding educational assortativity (Mare, 2016). Some have interpreted this as achieved statuses becoming more important than ascribed statuses for marriage suitability (Schwartz, 2013, 454). However, the relatively high (and increasing) surname homogamy in Fig. 4 would suggest that at least one ascribed status – family name – remains important for the New York Elite (see also Clark & Cummins, 2025). In other words, the couples in *NYTs* wedding announcements have family names which are often mentioned together. We also see a plateauing relationship with occupational organization affiliations: in the early decades the similarity between spouse's place of work was high, decline for a few decades, and very recently increased some. Finally, homogamy in occupational titles shows a steady decline from a peak in the 1970s. As others have noted (e.g., Schwartz, 2013), the recent research on occupational homogamy is sparse (Hout, 1982; Kalmijn, 1994). One exception (Schwartz et al., 2021) finds that generally occupational homogamy is increasing, but was primarily driven by men in professional or managerial careers (see also, Urbina et al., 2024). Thus, a fuller exploration of these data should consider the possible differential effects of gender.

Focusing on overall homogamy may obfuscate underlying variation by the rate of centrality. Specifically, the structure of affiliations may produce a core–periphery-like structure. In such a scenario, increases (or decreases) in homogamy may be driven by a few highly homogamous (or heterogeneous) weddings contributing disproportionately – either at the core or periphery. So, I measure whether there is an association between the centrality of a given wedding announcement (measured as the average distance to all affiliations in a year-specific embedding space) and the respective homogamy score of that announcement.

There is a fairly robust association between centrality and overall homogamy. Non-central marriages are far more homogamous and this remains throughout the period studied. From Fig. 5, we can also see this relationship reflected in similarity between each spouse's educational affiliations. For instance, in three of the most homogamous marriages overall – occurring in 1971, 1978, and 2008, respectively – both partners graduated from the University of North Carolina at Chapel Hill (a less central institution). We can also see a similar relationship among occupational titles in that less central marriages tend to have more similar occupations. This overall association inverts for surnames beginning in the 1990s: more central marriages have slightly greater surname homogamy.

[8] This is equivalent to the average degree centrality in a full-connected, weighted graph.

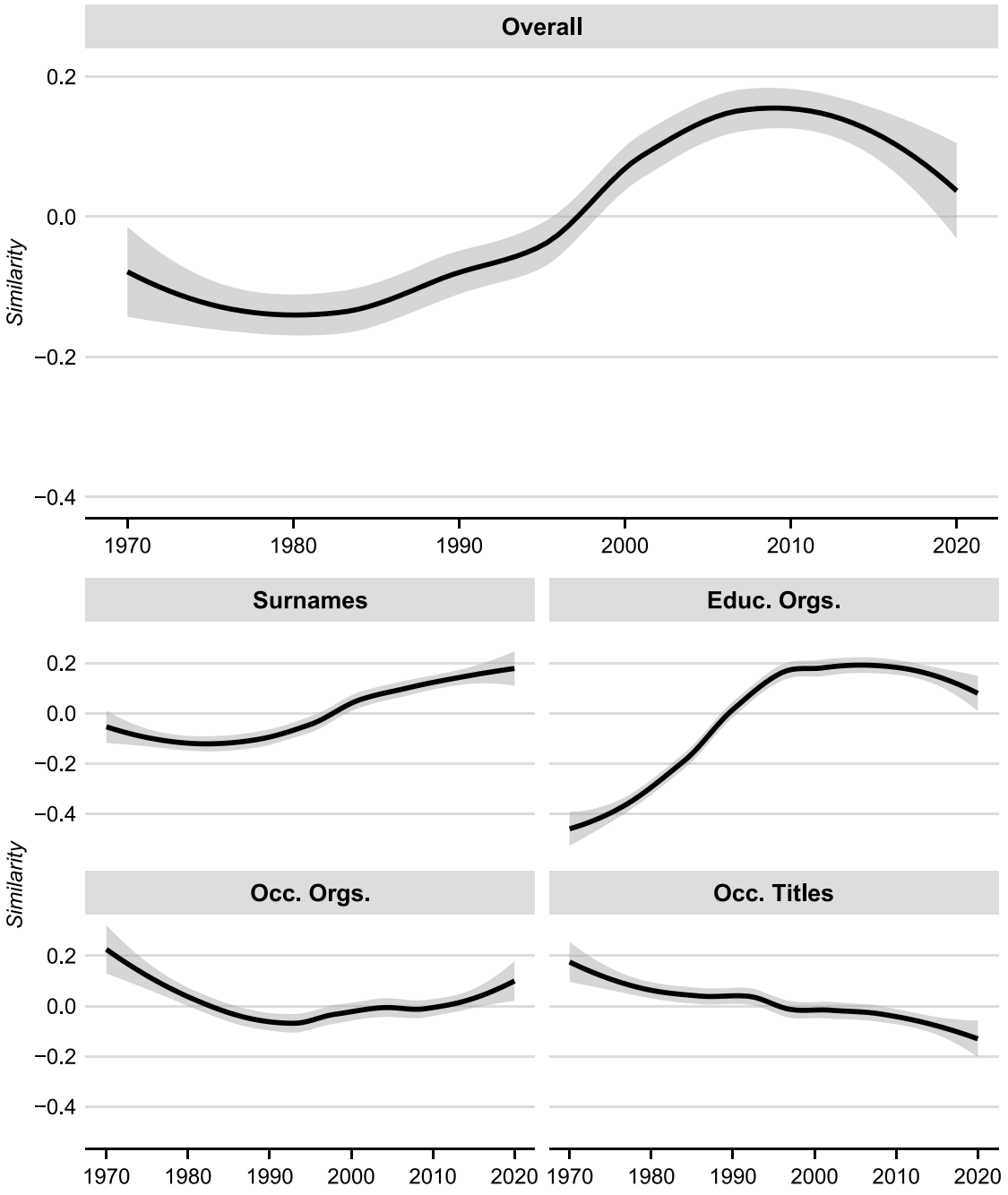

Fig. 4. Homogamy over time.

Finally, Fig. 6 shows homogamy by whether one or both partners attended "Harvard" – being by far the most common organization in the corpus, and thus an institutional pillar among the New York Social Elite. While overall centrality seems to "purchase" heterogamy, as discussed above, in the specific case of a central institution like Harvard, this does not seem to be the case. Overall, when either spouse attended Harvard, their union tends to be more homogamous throughout the period studied. This is driven by education for obvious reasons, but also to some extent occupational titles.

6. Discussion

Focusing on homogamy through the lens of duality draws our attention to the potential role of marriage in fostering class identity, (de-)consolidation, and forging economic relations beyond production. In particular, marriage provides a means by which

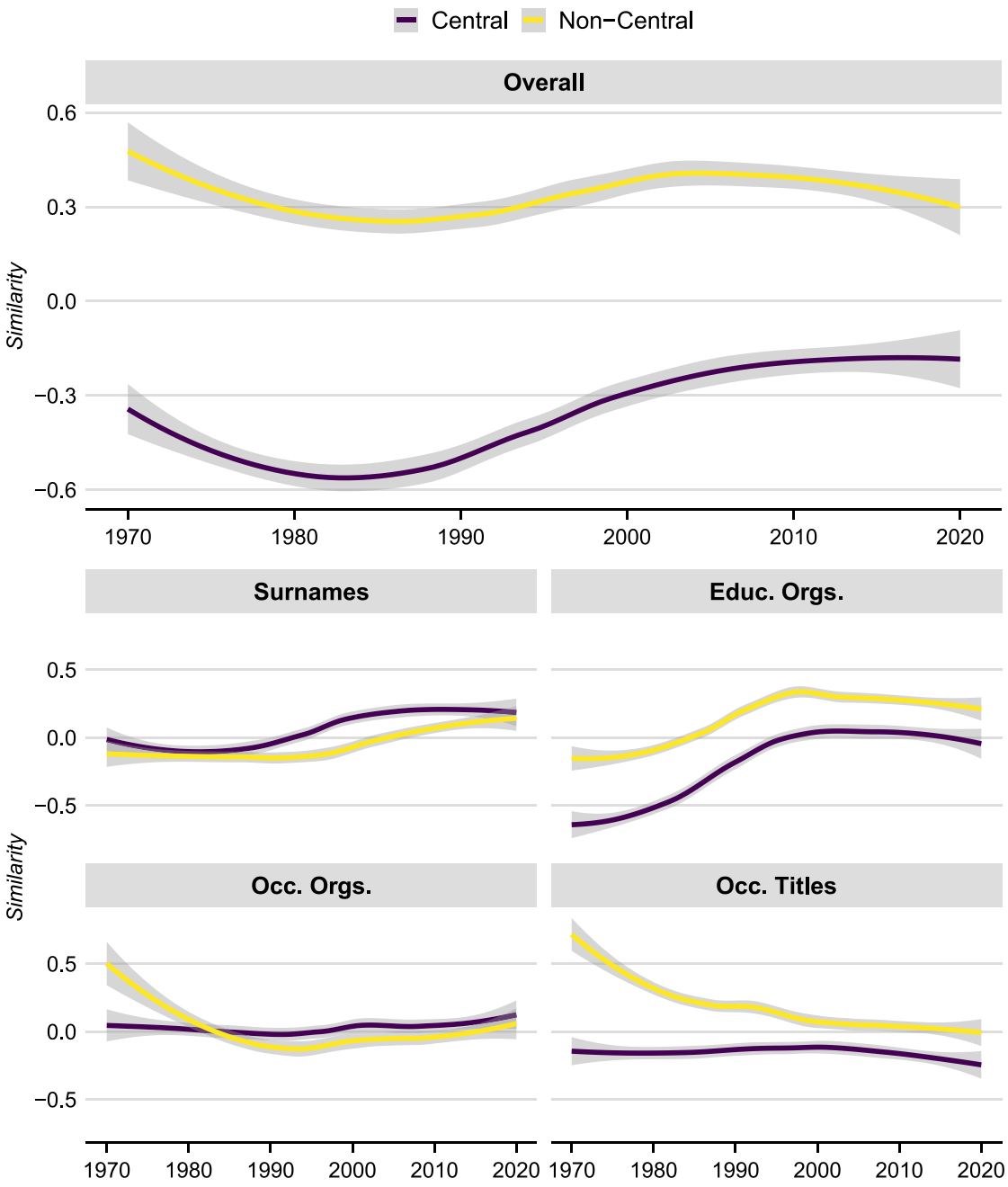

Fig. 5. Homogamy and centrality.

individuals may be objectively connected across occupational, organizational, and familial communities, while also providing the subjective sense of collective purpose and identity that spans otherwise disconnected class-relevant affiliations. Thus, the concept of the duality of groups and persons (Breiger, 1974) provides an empirically and theoretically driven approach to defining both class and homogamy.

Each person in a marriage brings certain class-relevant affiliations, forming an intersection of socio-economic circles. In particular, their own families, their occupations, and the organizations with which they are affiliated through kinship, education, employment, or philanthropy. Social classes are formed, in part, by the associations between economic and intimate relations, and yet analyzing *homogamy as duality* remains under-exploited (c.f., Blau & Schwartz, 1997). As a result, in homogamy research, the extent two affiliations are deemed similar is typically determined by reference to an external standard, rather than discovered by examining the patterns of associations among all associations (c.f., Prandy & Lambert, 2003).

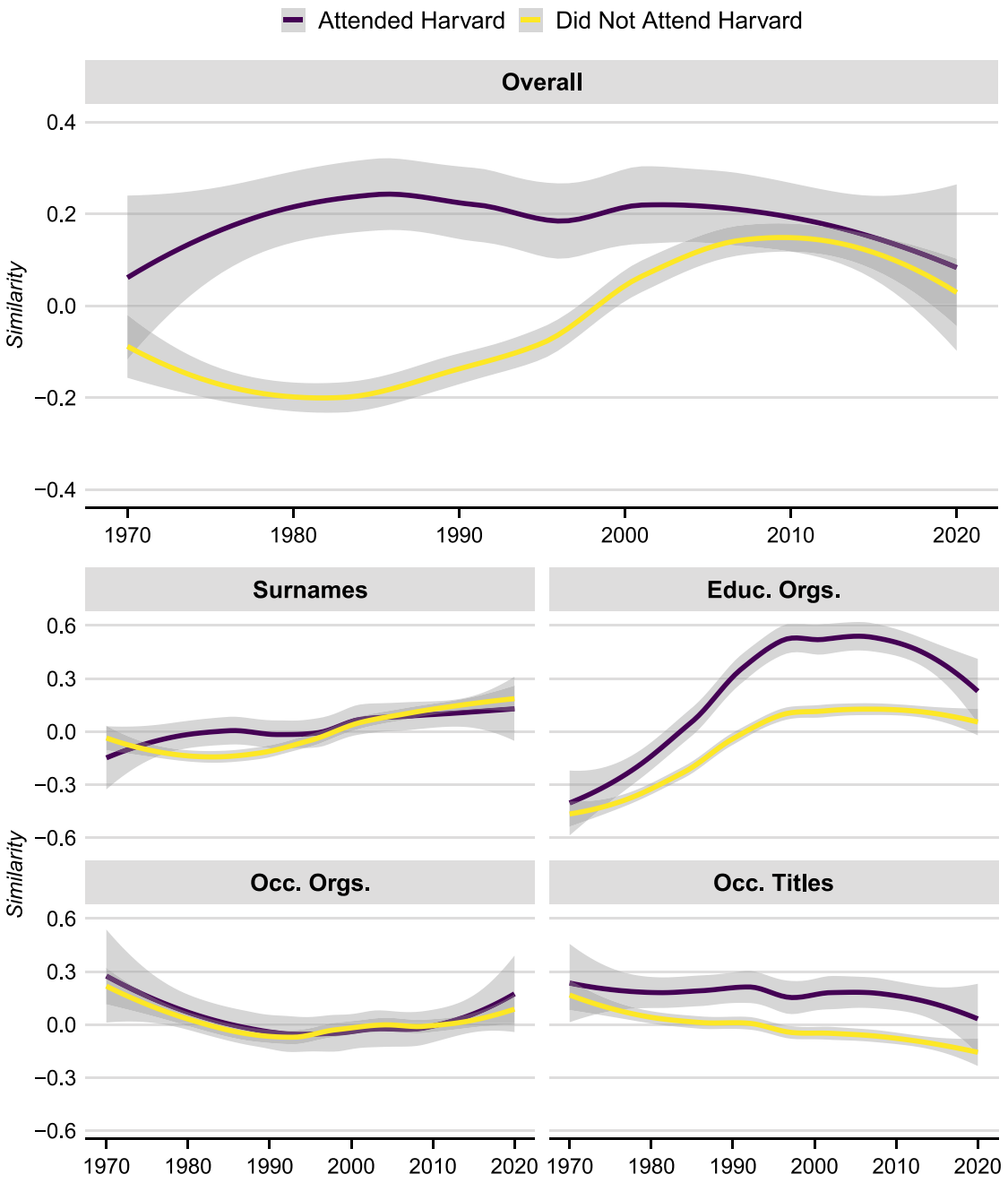

Fig. 6. Homogamy and attending harvard.

By taking these patterns of associations as our point of departure, we can apply the procedure outlined by Breiger 1974 to discover the ties between affiliations created by first-order homogamy: counting every pairwise affiliation that shares a wedding announcement (and vice versa, every announcement that shares an affiliation). Thus, affiliations are similar to the extent they share the same wedding announcements and announcements are similar to the extent they share the same affiliations. Both first-order projections, though, presume that each announcement and affiliation is independent to derive their respective within mode dependence. We can call this the *independence constraint*. Thus, relying on first-order homogamy alone presumes that affiliations are precisely equal, and otherwise precisely unequal.

Two common ways to relax this constraint involves either applying a categorical classification scheme, e.g., so-called "big classes", or ranking categories along a continuous dimension, like income or prestige. In this paper, I presented a third strategy to relax this independence constraint by going beyond first-order similarities to incorporate N-order similarities: any two affiliations

are similar to the extent they also share an affiliation. We continue this logic by also incorporating the similarities at higher orders. The result demonstrates the affinity between graph models (popular in social network analysis) and geometric models (popular in computational text analysis). Beginning with co-occurrence information derived from the projection of a two-mode matrix, affiliations are assigned a vector such that it will be close to another affiliation's vector to the extent they tend to co-occur with the same affiliations (and those affiliations tend to co-occur with the same affiliations, and so on). Therefore, if we continue to push Breiger's insights about duality, we arrive at *embeddings* – a family of methods typically used to measure the meanings of words in a textual corpus.

I demonstrate this method using fifty years of *New York Times* wedding announcements – widely regarded as a window in to the U.S. East Coast elites. Using computational text analysis (a combination of dictionary methods and large language models) along with manual coding, I create a structured dataset of spouses and their respect surnames, educational organizations, occupational organizations, and occupational titles. I then use embedding models to model the pattern of associations between affiliations formed by each marriage. Homogamy, then, is operationalized as the average cosine similarity between the affiliation-specific vectors for each spouse. I find that overall homogamy has increased in recent decades, and when disaggregating by type of affiliation, we can see homogamy by surname and educational affiliation has increased in recent decades, while homogamy by occupational organization and occupational title has declined. This suggests the potential for the continued significance of both family (and ascribed status) and education (an achieved status) among the New York social elite.

Three factors were omitted in the present analysis. First, there was no consideration of homogamy by parents' affiliations. Although this information is often present in the wedding announcements, it was unclear if it was consistent enough across the time period and seemed to only report parents' occupational affiliations if they occupied a prominent position. Second, there was no consideration of asymmetrical relations – by wealth, prestige, power, and so on – between spouses. While the present data are likely ill-suited for such an analysis without imposing externally rankings (for example, university or occupational prestige rankings), embeddings can be adapted to asymmetrical relations. Finally, the gender of individuals was not considered, and thus not the gendered aspect of occupations.

Related, while the method I outline here relies on co-occurrences of affiliations in marriages derived from a corpus of wedding announcements, this could easily be adapted to any data of co-occurrences drawn from, for example, official records or surveys, and can be expanded beyond the class-relevant affiliations discussed here. The key takeaway, I hope, is that drawing on the affinities between the concept of duality and embedding spaces, opens up several exciting avenues for connecting these methods to questions of class structure, homogamy, inequality, and the (re)production of privilege more broadly.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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