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The Glass Web: Kinship Networks, Female Executives, and Firm Outcomes in the Middle East

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The Glass Web: Kinship Networks, Female Executives, and Firm Outcomes in the Middle East*

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Abstract

Leveraging data on firms operating in the Gulf Cooperation Council (GCC) countries and a novel measure of family ties among firm executives, we show the quantitative importance of kinship ties for female executives in settings and industries characterized by low female representation. Our findings suggest that kinship ties bring women into executive networks, what we call ‘the glass web’, that make up the proverbial glass ceiling which has traditionally kept women out of business leadership. We combine our executive-level data with administrative employer-employee matched data for Saudi Arabia to show that greater representation of women among firm executives, with or without a kinship tie, is associated with more gender-equal outcomes at the firm, including greater female employee share and smaller gender wage gaps.

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1 Introduction

‘More women entering leadership positions at family businesses normalises the idea of having women in C-suite roles.’

Kholoud Mousa, Head of Diversity, Inclusion and Equity, KPMG Saudi Arabia¹

Can family networks serve as a catalyst for women to be recruited from and break through the glass ceiling in male-dominated industries? We present quantitative evidence of kinship network prevalence in industries characterized by low levels of female representation. Using data on executives working in countries of the Middle East Gulf Cooperation Council (GCC), we document that kinship networks appear predominantly in industries with low levels of female executive shares. Thus, we find that kinship networks are an important source of female leadership in GCC firms, bringing women into the executive networks, what we call the ‘glass web’, that make up the proverbial glass ceiling which has traditionally kept women out of business leadership.

Next, we ask whether family ties among executives have detrimental effects on firm performance as previously found in the literature (Bloom & Van Reenen 2010, Akbari et al. 2019), or alternatively, are they associated positively with gender-equal outcomes? We answer this question by combining our executive-level data with private sector administrative employer-employee matched data for Saudi Arabia. Inspired by a literature that suggests that hiring women into leadership roles is a strong predictor of hiring more women in the future (Rosener 1997, Tate & Yang 2015), we measure to what extent greater shares of female executives alone are associated with differences in firm-level outcomes. We find that greater shares of female executives are positively correlated with the total number and share of female employees at the firm and a reduced gender wage gap, but that kinship ties are uncorrelated with firm outcomes.

Our study contributes to several strands of literature. First, we add to the literature on the prevalence and relevance of kinship networks in male-dominated firms, as has been shown of women in politics (Dal Bó et al. 2009, Labonne et al. 2019, Folke et al. 2020). Second, we nuance the impact that kinship ties have on firms. Previous studies find that kinship networks, often defined as a form of nepotism, have primarily negative economic impacts on various firm-level measures, including firm growth (Barnett 1960), total factor productivity (Caselli & Gennaioli 2013), stock market performance (Fahlenbrach 2009), firm valuation (Adams et al. 2009), profitability (Pérez-González 2006), smaller firm size, higher self-employment rate, lower number of listed firms and lower reliance on outside financing

¹ArabianBusiness, 29 May 2022: ‘Saudi women transforming family businesses can inspire others’: <https://www.arabianbusiness.com/gcc/saudi-arabia/saudi-women-transforming-family-businesses-can-inspire-others>

(Bertrand & Schoar 2006), lower levels of reinvestment (Dower et al. 2022), and management quality (Bloom et al. 2012). Our findings suggest that given the historical lack of female leaders and the high prevalence of kinship networks, kinship ties are a mechanism by which women enter a glass web of executives from which firm outcomes may benefit.²

In this way, we contribute to another strand of literature showing whether female leaders have any impact on the outcomes of subordinates. While some scholars have found that women leaders have little effect on subordinates (Bertrand et al. 2019), others have shown that women leaders, especially in political contexts, can direct resources differently from male leaders (Chattopadhyay & Duflo 2004).³ A study by Chiplunkar & Goldberg (2021) suggests that female entrepreneurs in India, while facing several disadvantages when it comes to the registration and expansion of businesses, tend to hire female workers more easily than their male counterparts. Consistent with these positive findings, we find that firms with greater female representation in management have greater shares of female employees and smaller gender wage gaps. Furthermore, we show that these positive effects on female workers arise regardless of whether the female executive is part of a kinship network or not.

We contribute to a growing literature on firm-level hiring practices in countries of the Middle East. Peck (2017) studies the effects of a localization policy intervention in Saudi Arabia that aimed to increase Saudi hiring at private firms and finds that Saudization quotas caused firms to incur substantial costs. Peck’s study is relevant in the context of ‘Saudi Vision 2030’ which aims to increase the share of both Saudis and women in the workforce.

Lastly, we contribute methodologically to a literature that uses names to identify family relationships (Gomez-Mejia et al. 2001, Güell et al. 2007, Angelucci et al. 2010, Durante et al. 2014, Clark & Cummins 2015, Diéguez-Soto et al. 2015). Exploiting a patronymic naming convention in the Middle East, we are able to observe matched pairs of executives by first, middle, and last name, gender, and nationality. We explain differences between our family tie measurement procedure and those of other authors in Appendix Section C.

The rest of the paper is organized as follows. In Section 2, we familiarize the reader with the institutional context and the role of kinship networks. Section 3 presents our data and explains our kinship measurement procedure. Section 4 illustrates the prevalence of kinship networks at the executive level in countries of the GCC. Section 5 discusses our empirical

²Family ties have shown importance in other settings: Dube & Harish (2020) find that married queens in Europe were more inclined to enlist their spouses in helping them rule. Familial ties have been found to matter for geographical mobility (Alesina & Giuliano 2010). Durante et al. (2014) find greater incidents of familism of Italian academic dynasties in areas with low civic capital. Family ties of politicians have been shown to affect labor market outcomes of relatives in Western democracies (Gagliarducci & Manacorda 2020, Folke et al. 2017) and the Philippines (Fafchamps & Labonne 2017).

³Aside from differences in directing resources, female leaders may govern differently and improve the reputation of the firm as female-friendly. Kramer et al. (2006) find that women executives may bring a more collaborative approach to leadership in Fortune 1000 companies. McGuinness et al. (2017) show that promotion of female leaders improves corporate social responsibility ratings in Chinese firms.

strategy and presents our results. We discuss potential mechanisms and conclude in Section 6.

2 Institutional Context

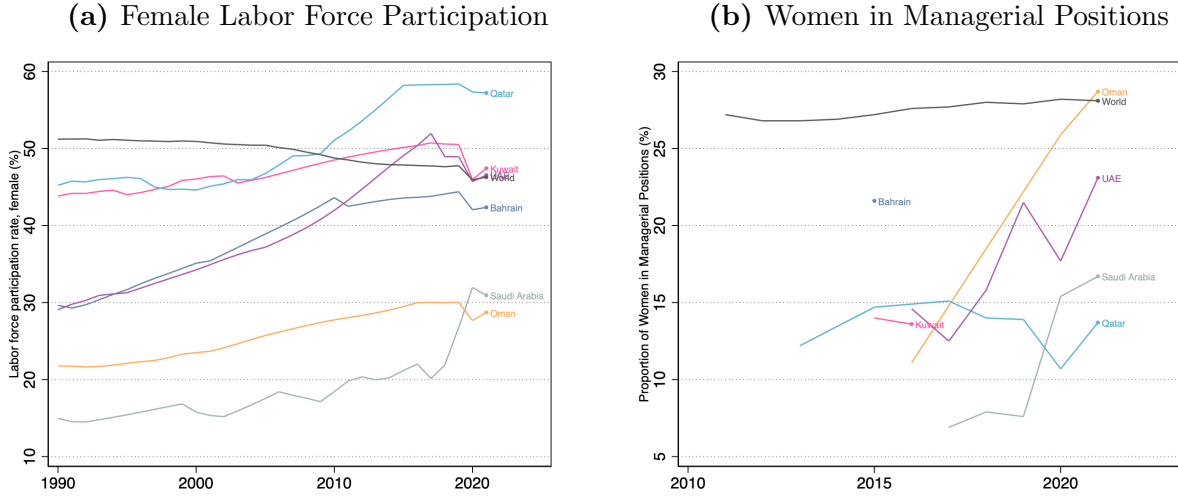
The GCC countries of Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and United Arab Emirates are characterized by relatively high average GDP per capita (World Bank 2023) and an environment in which foreign direct investment is an important part of GDP (UNCTAD 2023). The historically low level of representation of women in work outside the home throughout the Middle East remains one of its starkest disadvantages in the development of its economic institutions (Ross 2008, Charrad 2009, Norris 2009). While tertiary education and female labor force participation (Majbouri 2020, Ghazalian 2022) in the Middle East has risen in recent years, this increase has been especially pronounced in the countries of the Gulf Cooperation Council (GCC). In our sample, in 2019, the share of female executives in the GCC was about 19 percent on average. Although cross-country differences are substantial (Bahrain: 34.8 percent, Kuwait: 21.0 percent, Oman: 16.7 percent, Qatar: 11.8 percent, Saudi Arabia: 6.7 percent, United Arab Emirates: 15.8 percent), shares are relatively low compared to many other countries around the world (Australia: 37.8 percent, Canada: 35.5 percent, France: 34.6 percent, Germany: 29.4 percent, USA: 40.0 percent) and substantially lower than the world average (28 percent).⁴ Moreover, as we will demonstrate, on average, 15 percent of all executives working in countries of the GCC share at least one observable kinship tie with another executive in the same firm. This combination allows for an examination of gender differences in the prevalence of kinship networks when female representation is low.

2.1 The Glass Web

If kinship networks are an important source of female leadership in GCC firms, bringing women into the executive networks that comprise the proverbial ‘glass ceiling’ which has traditionally kept women out of executive networks, we can argue that kinship networks can serve as a mechanism for women to break through the glass ceiling via membership in what we term ‘the glass web.’ We define ‘the glass web’ as the executive networks that make up the ‘glass ceiling’, a term coined in the late 1970s to mean the invisible barriers that women face when attempting to reach top executive ranks in organizations. The concept of women’s unique barriers to accessing leadership positions has generated a vast literature on the topic (Chaffins et al. 1995, Frankforter 1996, David et al. 1998, Veale & Gold 1998,

⁴The world average comes from the International Labour Organization (SDG indicator 5.5.2).

Figure 1: Women in the Labor Force



Note: The figure illustrates the overall labor force participation rate of women (a) and the proportion of women in managerial positions (b) in countries of the GCC and the world average. Data are from the World Bank and International Labour Organization (SDG indicator 5.5.2).

Corsun & Costen 2001, Weyer 2007, Carnes & Radojevich-Kelley 2011). In subsequent decades, additional work has built on this metaphor, including examining whether barriers to women's equality in leadership are due to entry-level 'sticky floors' (Booth et al. 2003) or a slowing down of promotion out of 'the frozen middle' (Byrnes 2005). Decades later, the persistent low share of women in organizational leadership remains a puzzle.

Particularly in the context of the GCC, the recent rise of women in management positions, while remarkable (see Figure 1b), continues to rank in low fractions relative to men, with the persistent expectations of women to subsume important roles in the home as one of the main barriers for women's careers in the GCC (Ayari 2018). While traditional gender norm expectations persist, the supreme importance of familial ties to GCC women means that often their first points of contact with the world of work outside the home are through male relatives. The fact that women face a glass ceiling in a setting in which networks through familial ties are of the essence would mean that gaining access to and visibility for leadership positions would need to come *through* the glass ceiling if there is any chance of superseding it.

3 Data

This section describes the data sources employed in our analysis.

BvD Orbis: Our first dataset, obtained from Bureau van Dijk's (BvD) Orbis database, provides us with cross-sectional firm-level data for all GCC countries. BvD Orbis data

provide information with respect to essential firm-level characteristics such as industry, firm age, size, ownership (foreign or domestic owned), and revenue. A major advantage of this dataset is that it contains information on the name and gender of all executives working in the firm and their respective role (management, supervisory, CEO, and others). Name records of executives are critical as executive names can be exploited to identify family relationships, as outlined in the next section. These GCC executive-level data include around 590,000 firms and 640,000 unique executives in 2019. We use ORBIS data from 2019 because Orbis went through a significant renovation of their database in December of 2018, particularly adding many more executives to their companies in the Middle East.⁵ To our knowledge, since executive data is manually entered, there does not exist panel data for executives and the executives listed at each firm in 2019 are likely to be similar to the actual executives at the firm since 2016. Important to note is that executives often work in different firms simultaneously, and hence the total number of unique firm-executive pairs is about 931,000.⁶ To the best of our knowledge, BvD Orbis is the most comprehensive list of firms in the GCC that provides executive demographic data.

GOSI: Our second data source is an administrative employer-employee matched dataset provided by the Saudi General Organization for Social Insurance (GOSI). It covers the period from 2009 to 2016 and includes comprehensive data on Saudi private sector employer-employee demographics and worker employment history. In 2016, the sample contains around 9 million unique workers and 369,000 unique firms.

Linked sample: For our analysis of firm-level outcomes, we link these two datasets using the common commercial registration numbers of firms, which are available in both datasets. This approach allows us to observe both the kinship network structure among female executives (BvD Orbis data) as well as broader firm-level measures such as female employment at different occupation levels and gender-specific wage bills (GOSI data). When combining our two datasets, we apply the following sample restrictions: We only keep firms that (i) report a valid commercial registration number in both BvD Orbis and GOSI data, (ii) have non-missing name records for directors and managers in the BvD Orbis data, and (iii) are included in both the BvD Orbis and GOSI data. Applying these restrictions results in 10,649 firms, which represent our full matched sample. This sample is further reduced in specifications that, for example, limit the sample to large firms or other subsamples. Note that combining both datasets based on the commercial registration number biases our firm sample toward larger firms as those are the ones who would usually report a commercial registration number, and hence our sample is not representative for the universe of Saudi

⁵Bvd Orbis: ‘What’s New on Orbis’ - December 2018: https://help.bvdinfo.com/mergedProjects/68_EN/mergedProjects/WN68_EN/Home.htm

⁶About 19 percent of all executives work in more than one firm.

private sector firms.⁷ However, for the purposes of our research question, we focus on the trickle-down effect that kinship ties among female executives may have on female employees. In this way, we consider it appropriate to use a biased sample focused on larger firms.

4 Kinship Networks in the GCC

This section describes how we measure family relationships between executives in the BvD Orbis data and presents summary statistics regarding the prevalence of and gender differences in kinship networks in countries of the GCC.

4.1 Measurement

To measure family relationships in the BvD Orbis data between individuals working as executives in the same firm, we exploit the patronymic naming convention that is present across the Middle East. That is, children receive the first name of their father as their middle name, and they share the same last name (Notzon & Nesom 2005). This phenomenon applies to both sons and daughters, and women usually do not change their last name upon marriage.⁸ Thus, comparing the last names and middle names of executives allows us to identify common family relationships.⁹ More details regarding the exact algorithm used to identify kinship relationships are provided in Appendix D. We then aggregate kinship ties from the individual level to the firm level as follows.

Let $F_j^1 = \{f_{j1}^1, f_{j2}^1, \dots, f_{jN}^1\}$ represent the set of families that have only one member working as an executive in firm j and $F_j^2 = \{f_{j1}^2, f_{j2}^2, \dots, f_{jM}^2\}$ represent the set of families that have at least two members working as executives in firm j . Let E_{jf}^g denote the number of executives of gender $g \in \{Female, Male\}$ that are members of family $f \in \{F_j^1, F_j^2\}$ that work in firm j . Our gender- and firm-specific kinship network measure, which we call the network share measure (NSM), is then given by

$$NSM_j^g = \frac{\sum_{f \in F_j^2} E_{jf}^g}{\sum_{f \in F_j^1} E_{jf}^g + \sum_{f \in F_j^2} E_{jf}^g}. \quad (1)$$

⁷Appendix Table A reports mean differences in four different firm-level measures between the matched dataset and the unmatched GOSI data. The average firm in our matched sample has about 29 employees, whereas the average firm in the unmatched GOSI data only has about 13 employees. Evaluating the significance of mean differences in female employment share, female wage share and Saudi employment share between our matched sample and the unmatched GOSI data, we find that the share of women among all employees is about 1.9 percentage points lower in our matched sample, the female wage share is approximately 8 percentage points higher, and the Saudi employment share is 2.7 percentage points higher. We thus emphasize that our regression results derive from a sample of relatively large Saudi private sector firms.

⁸Note that a limitation of our method is that we are unable to identify married executives.

⁹Scholars who exploit similar naming conventions in other countries are Gomez-Mejia et al. (2001), Angelucci et al. (2010), and Diéguez-Soto et al. (2015).

The numerator represents the total number of executives of gender g across all families that have at least two members working in the firm. The denominator represents the total number of executives of gender g in the firm.¹⁰

To develop a better understanding of our measure, consider the following example. A father and his daughter, as well as four siblings (two brothers and two sisters) unrelated to the father and the daughter, work in firm j . In this case the father and the daughter would be considered as family $f_{j,1}^2$ and the four siblings as family $f_{j,2}^2$. Thus, the number of female executives that are members of $f_{j,1}^2$ equals 1 (the daughter), and the number of women in $f_{j,2}^2$ equals 2 (the two sisters). Hence, the total number of women that share at least one kinship relationship would be 3. Let us furthermore assume that there are five additional female executives in the firm that do not share any family relationship with any other executive and hence are members of families $f_{j,1}^1, \dots, f_{j,5}^1$. Then, our measure for female executives would equal $3/(3 + 5) = 0.375$. The measure in equation (1) thus ranges from 0 (no one shares a family tie) to 1 (everyone shares at least one family tie). We now present summary statistics on the prevalence of kinship networks in the GCC.

4.2 Prevalence and Gender Differences

Kinship networks are prevalent in all countries of the GCC. Figure 2 shows that the share of executives with at least one family tie, measured by the network share measure (NSM), ranges from about 5 percent in Qatar to approximately 30 percent in Kuwait. In Saudi Arabia, one of the largest economies in the Middle East and North Africa (MENA) region, about 15 percent of all executives share at least one family tie with another executive in the same firm. On average, female executives are more likely than male executives to share at least one family tie. The average gender difference across all GCC countries, weighted by the share of a country’s number of executives in all executives in the GCC, is two percentage points. Thus, family ties among coworkers are not uncommon in all six GCC countries, and female executives are more likely than male executives to share at least one family tie in a firm. In Appendix B, we list more comprehensive summary statistics for gender differences in kinship ties across different countries, firm sizes, and industries. We find that

¹⁰Whenever we need country-level averages of our network measures, we calculate the country-level weighted mean of the measure, where weights represent the share of a firm’s number of male (female) executives in the total number of male (female) executives of country c . The country-level version of our network share measure is as follows:

$$NSM_c^g = \sum_{j \in J_c} NSM_{jc}^g \frac{E_{jc}^g}{\sum_j E_{jc}^g}$$

Here, J_c represents the set of firms in country c . It appears important to apply weights in this calculation given that network measures of large firms account for greater shares of all executives.

large firms exhibit much greater gender differences in the extent of kinship ties relative to small firms (female kinship networks are more common than male kinship networks) and also find substantial heterogeneity across industries.

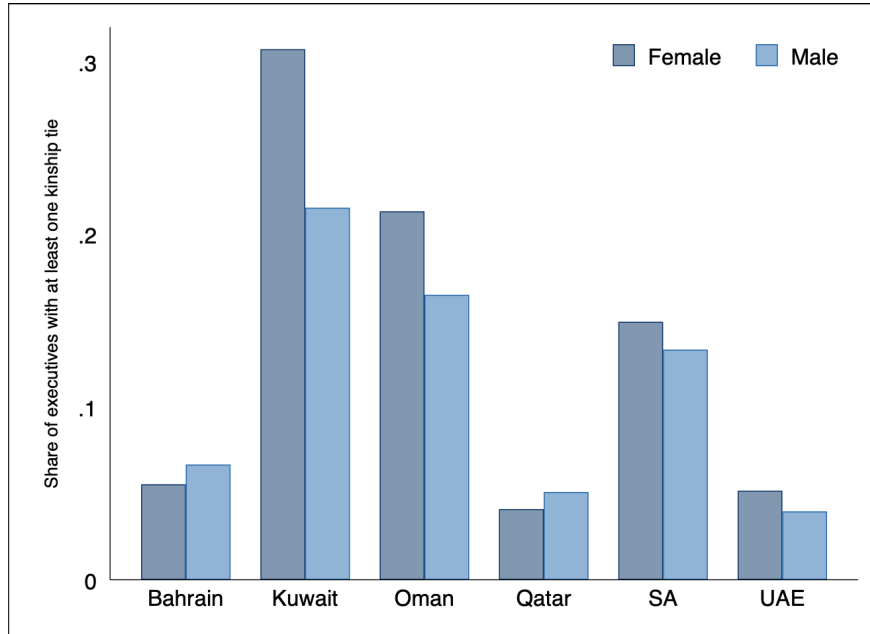


Figure 2: Gender Differences in Kinship Networks

Note: The figure illustrates the country-level weighted average of the network share measure from Section 4. Data are from the BvD Orbis database.

Appendix C provides further analyses focusing on our Saudi Orbis-GOSI matched sample in more detail since we employ this sample in most of our subsequent analysis. We find that, focusing on this subsample of firms, most industries show a similar kinship network share with approximately 3-4 percent of all female executives having at least one family relationship with another executive.¹¹ Furthermore, the smaller the firm, the greater the female labor share, and the female labor share is the greatest among occupations that rank high in the corporate hierarchy, such as managers, professionals, and services and sales workers.

We now examine the relationship between kinship networks and female representation as well as the extent to which female representation and kinship networks among firm executives can predict differences in firm-level outcomes.

¹¹The share of non-Saudi female executives among all female executives in Saudi Arabia was 2.6 percent in 2019 according to our data.

5 Empirical Strategy and Results

Equipped with a firm-level measure of kinship networks, in this section we describe our empirical strategy and systematically analyze, first, the relationship between kinship networks and female representation in countries of the GCC, second, whether female representation in leadership is associated with firm-level outcomes of gender equality and performance, and third, whether this relationship is different for firms that have female executives with kinship ties compared to firms that employ female executives without kinship ties.

5.1 Kinship Networks and Female Executives

We begin by estimating the relationship between our kinship network measure and the share of female executives in an industry in which a firm operates. Since the variation that results from comparing firm-level measures is extremely limited (the majority of firms do not employ any female executive at all), we begin by comparing firm-level kinship network shares with industry-level female executive shares.

Kinship networks may function as door openers for women, especially in industries that are characterized by low levels of female representation. The question is thus whether firms in *industries* with lower female executive shares show greater levels of kinship networks. We test this via the following regression equation:

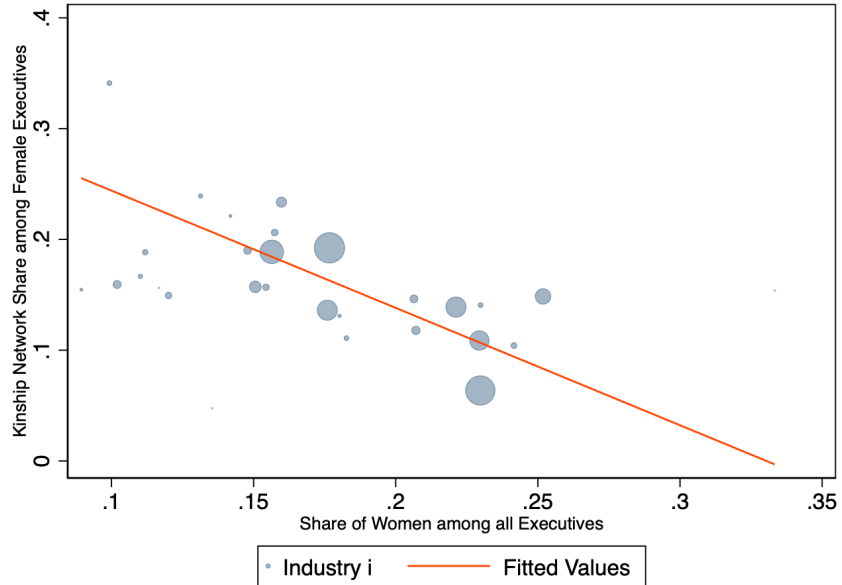
$$NSM_{jikc} = \alpha_0 + \alpha_1 F_{ik} + S_{jikc} + Z_k + Z_c + \epsilon_{jikc}, \quad (2)$$

where NSM_{jikc} is our network share measure described above for firm j operating in industry i located in country k and city c , F_{ik} represents the female executive share of industry i (number of women as a fraction of all executives), and S_{jikc} , Z_k , and Z_c stand for firm size, country and city fixed effects. The BvD Orbis data measure firm size via a categorical variable that differentiates between small, medium, large, and very large firms based on the size of company sales, operating revenue, and employment. At this stage of the analysis, we control for 29 different industries that are available in the BvD Orbis data.

We begin by examining our relationship of interest visually and, in doing so, at the industry level exclusively. Figure 3 shows, for each industry, the share of women among all executives as well as the average female network share measure. The relationship is negative and significant at the 1 percent level, suggesting that female kinship networks are more prevalent in industries that have lower levels of female representation among their executives.

To evaluate how robust this relationship is at the firm-industry level and after controlling for firm size, country, and city fixed effects, we estimate equation (2). The results are shown

Figure 3: Kinship Networks and Female Executive Shares 2019



Note: The figure illustrates the industry-specific share of female executives and industry-level averages of our kinship networks measure. Bubble sizes are proportional to the number of female workers in each industry. Data are from the BvD Orbis database.

in Table 1. The share of female executives that have a kinship tie at the firm level falls with the share of female executives working in an industry in which the firm operates. The relationship remains negative and significant at the 1 percent level after introducing controls. Our most demanding specification in column 4 suggests that a rise in the industry-level female executive share by 1 standard deviation is associated with a decline in the firm-level network share measure of 0.004 standard deviations.

Table 1: Kinship Networks and Female Representation

| | (1) | (2) | (3) | (4) |
|------------------------------------|------------------|---------------------|----------------------|---------------------|
| DV: Network Share Measure | | | | |
| Female Executive Share in Industry | -0.027 (0.01) | -0.018*** (0.00) | -0.0046*** (0.00) | -0.0038** (0.00) |
| Firm Size FE | | ✓ | ✓ | ✓ |
| Country FE | | | ✓ | ✓ |
| City FE | | | | ✓ |
| N | 592885 | 593201 | 593201 | 592805 |
| R2 | 0.00071 | 0.0042 | 0.036 | 0.040 |

The table shows results of OLS fixed effects models that estimate the relationship between industry-level female executive shares and firm-level female kinship networks. Both dependent and independent variables are standardized such that coefficients can be interpreted as changes in standard deviations. Firm size is a categorical variable that distinguishes between small, medium sized, large, and very large firms based on size of company sales, operating revenue, and employment. Robust standard errors are in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Note that our observation that female kinship networks emerge predominantly in industries that have low levels of female representation among executives can be regarded as evidence for a female-specific door-opening function of kinships only if the same is not true for men. That is, if male executives happen to share kinships predominantly in industries with low levels of male representation, then our argument, that kinship ties serve only as door-openers, would not be valid. As a robustness check, we thus analyze the relationship between industry-level male executive shares and male kinship networks at the firm level (this constitutes the same analysis as we performed in equation (1), but this time with male kinship networks and male executive shares). Our results are depicted in Appendix Table 10. Confirming our hypothesis, male kinship networks do not emerge in industries that exhibit relatively smaller shares of male executives. In fact, we obtain positive and highly significant correlations, suggesting that male kinship networks are substantially more prevalent in industries that have a higher share of male executives.

Overall, we interpret these findings as suggestive evidence that kinship networks may function as door openers in industries with low levels of female executive shares.

5.2 Female Executives and Firm-Level Outcomes

Since kinship networks are prevalent predominantly in settings in which female representation is low, as demonstrated in the previous subsection, we ask whether greater numbers of female executives matter for firm outcomes beyond the executive level. That is, does greater female

representation on executive boards correlate with differences in firm-level outcomes? We are able to answer this question using our Orbis-GOSI matched sample for Saudi Arabia (for details, see Section 3), measuring the association between the share of female executives and firm-level outcomes as follows:

$$Y_{jic} = \beta_0 + \beta_1 F_{jic} + S_{jic} + \mathbf{X}_{jic} \boldsymbol{\beta}_2 + Z_c + Z_i + u_{jic} \quad (3)$$

where Y_i represents one of four outcome variables in firm j , operating in industry i located in city c . Note that we drop the k subscript here since we study firms in Saudi Arabia exclusively. The term F_{jic} represents the share of women among all executives in firm j , and X_{jic} represents a vector of control variables that include a dummy for whether the firm is foreign or domestic owned, the share of Saudis among the employees, and the logged total number of employees in the firm.¹² We control for Saudi share as it reflects firm compliance with an important Saudi localization quota policy, *Nitaqat*, instituted in 2011.¹³ The variable Z_i stands for industry fixed effects where we control for nine different industries available in the GOSI data.¹⁴ The rest of the variables remain as previously defined.

The outcome variables that we are interested in include the number of female employees, the share of female employees, the gender wage gap, as well as logged firm revenue. The number and share of female employees reveal whether the workforce composition changes with changes in the representation of women on the executive board, while the gender wage gap tells us the extent to which female representation correlates with equal pay policies. Firm revenue relates to the gender equality and firm performance literature that aims to estimate the effect of greater female representation on firm performance outcomes. The gender pay gap is calculated as the difference between the average salaries of men and women working in the same firm.

To estimate equation (3), we perform a negative binomial regression when using the number of female employees as the outcome variable because of a heavily right-skewed distribution (very few firms have any female executive at all) and OLS fixed effects regressions for all other outcomes. We report the results in Table 2. Note that our sample size is substantially smaller now that we focus on Saudi Arabia alone and restrict ourselves to a sample of firms that have valid identifiers in both the BvD Orbis data and the Saudi administrative GOSI data (for details, see Section 3).

¹²We compare the nationality of the firm’s global ultimate owner with the country in which the firm operates. If these two pieces of information differ, we categorize this firm as foreign owned. If information on the global ultimate owner is missing, we categorize the firm as domestic.

¹³See Peck (2017) for more details.

¹⁴We switch from BvD Orbis measured industry classifications to GOSI industry classifications since we believe GOSI administrative data to be more accurate. GOSI distinguishes between: Agriculture and Fishing; Petrol and Mining; Manufacturing; Electricity Gas and Water; Construction; Trade; Telecom and Mail; Business Services, Finance, and Insurance; and Social Services.

Table 2: Female Executive Shares and Firm-Level Outcomes

| DV: | Num. Fem. Empl. | Shr. Fem. Empl. | Wage Gap | Log Revenue |
|------------------------|-------------------|-------------------|------------------------|-------------------|
| Female Executive Share | 0.48*** (0.12) | 0.046** (0.02) | -1273.6*** (310.32) | -0.19 (0.10) |
| Log Number Employees | 0.98*** (0.02) | 0.00015 (0.00) | -557.2*** (46.59) | 0.14*** (0.02) |
| Foreign Firm | -0.17 (0.14) | -0.010 (0.01) | 1556.0*** (414.98) | -0.0093 (0.12) |
| Share Saudi Employees | 2.92*** (0.18) | 0.24*** (0.03) | 3195.8*** (545.68) | 0.95*** (0.14) |
| Industry FE | ✓ | ✓ | ✓ | ✓ |
| Firm Size FE | ✓ | ✓ | ✓ | ✓ |
| City FE | ✓ | ✓ | ✓ | ✓ |
| N | 3604 | 3604 | 3604 | 2802 |
| Pseudo R2 | 0.17 | | | |
| R2 | | 0.17 | 0.16 | 0.80 |

The table displays estimates of the relationship between firm-level female executive shares and firm-level outcomes. Column 1 uses negative binomial regression, all other columns employ OLS fixed effects regressions. Firm size is a categorical variable that distinguishes between small, medium sized, large and very large firms based on size of company sales, operating revenue and employment. Robust standard errors in parantheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 2 suggests that greater shares of female executives are positively correlated with the total number of female employees in the firm (column 1), the share of female employees in the firm (column 2), and a reduced wage gap between men and women (column 3). All these estimates are measured with statistical precision and can be interpreted as changes in standard deviations of the dependent variable due to a one standard deviation increase in the predictor variable. Moreover, greater female executive shares do not seem to be significantly correlated with overall firm revenue (column 4).

We have therefore determined that the presence of women in executive positions within firms is correlated with positive outcomes at the firm level regarding gender equity but not firm performance.

5.3 Do Kinship Networks Affect Firm-Level Outcomes?

Our findings up to this point suggest that kinship networks seem to emerge primarily in industries characterized by low levels of female executive shares and that firms exhibiting greater shares of female executives tend to show greater gender equity. This brings us to our

final research question: do firms that have female kinship networks among their executives operate differently compared to firms without female kinship networks? To shed light on this question, we run a regression of our four outcome variables described above on our kinship network measure, controlling for the same covariates as in equation (3):

$$Y_{jic} = \gamma_0 + \gamma_1 NSM_{jic} + \gamma_2 F_{jic} + S_{jic} + \mathbf{X}_{jic} \gamma_3 + Z_c + Z_i + \eta_{jic} \quad (4)$$

We standardize our network share measure to have a mean of zero and a standard deviation of 1 to facilitate interpretation. Findings on the extent to which firms that experience kinship networks among their executives are systematically different from those without network ties (equation 4) are reported in Table 3.

Table 3: Female Kinship Networks and Firm-Level Outcomes

| | Num. Fem. Empl. | Shr. Fem. Empl. | Wage Gap | Log Revenue |
|------------------------|-------------------|-------------------|------------------------|-------------------|
| Fem. NSM | -0.079 (0.15) | -0.023 (0.01) | 760.2 (478.85) | -0.018 (0.15) |
| Female Executive Share | 0.50*** (0.13) | 0.052** (0.02) | -1467.3*** (307.60) | -0.19 (0.10) |
| Log Number Employees | 0.98*** (0.02) | 0.00013 (0.00) | -556.8*** (46.60) | 0.14*** (0.02) |
| Foreign Firm | -0.17 (0.14) | -0.011 (0.01) | 1571.2*** (415.35) | -0.0097 (0.12) |
| Share Saudi Employees | 2.92*** (0.18) | 0.24*** (0.03) | 3182.8*** (545.75) | 0.95*** (0.14) |
| Industry FE | ✓ | ✓ | ✓ | ✓ |
| Firm Size FE | ✓ | ✓ | ✓ | ✓ |
| City FE | ✓ | ✓ | ✓ | ✓ |
| N | 3604 | 3604 | 3604 | 2802 |
| Pseudo R2 | 0.17 | | | |
| R2 | | 0.17 | 0.16 | 0.80 |

The table displays estimates of the relationship between firm-level female networks (NSM) and firm-level outcomes. Column 1 uses a negative binomial regression; all other columns employ OLS fixed effects regressions. Firm size is a categorical variable that distinguishes between small, medium-sized, large, and very large firms based on size of company sales, operating revenue, and employment. Robust standard errors are in parentheses. * p<0.05, ** p<0.01, *** p<0.001

As all four columns show, kinship networks among female executives do not correlate significantly with any firm outcome of interest, meaning that we cannot reject the null hypothesis that the correlation between these two variables is zero.

To examine the sensitivity of these results, we perform a range of robustness checks. First, we restrict our sample to firms that have at least one female executive working in the firm. We then evaluate whether, for that subsample, those firms that have kinship ties perform differently from those without kinship ties (to ensure the results are not driven by firms either having or not having female executives). Furthermore, we control for the number of female executives. Thus, our treatment group consists of firms with female executives and kinship ties among their executives, while our control group comprises firms that have a similar level of female executives but without kinship ties. We report the results in Appendix Table 6. The results are robust to this alternative assignment of treatment and control group.

Second, we reevaluate the relationship between female executive shares and firm-level outcomes as well as kinship network shares and firm-level outcomes (equations 3 and 4), this time substantially increasing the number of industries that we control for. Where our baseline specification controlled for nine industries, we now control for 48 different industries. Our GOSI data allow us to perform this test since Saudi administrative data differentiate between industries and *subindustries*. The results are depicted in Appendix Table 7 and 8, and are virtually unchanged.

Third, we perform our analysis for middle-sized, large, and very large firms only. One potential concern is that our results are primarily driven by small family firms where daughters or sisters are employed without much thought put into outside hires. In this case, kinship networks should not be regarded as door openers. The results are depicted in Appendix Table 9. Again, our qualitative finding that kinship networks are unrelated to firm-level outcomes remains valid.

Overall we have established that while kinship networks tend to emerge more often in industries that have low levels of female executive representation, those female executives that share kinship ties do not seem to be associated with firm outcomes differently than women who do not share kinship ties with other executives. Therefore, we find that female executives hired through kinship networks are not associated with firm performance or gender equal outcomes that are different than female executives without kinship ties.

6 Discussion and Conclusion

Using executive-level data for GCC countries, we find that kinship ties are a prevalent source of women entering leadership positions. With additional data from the Saudi private sector, we find that, regardless of kinship ties, an increased female executive share correlates positively with various firm-level economic outcomes including female employee share and smaller gender wage gaps.

When thinking through the channels by which kinship ties help women break through

the glass web of executive leadership positions, we can think of a few plausible mechanisms. It is conceivable that kinship ties could signal ability because of historically low female labor market representation. That is, firms might know systematically less about women's qualifications, and thus women might rely on a kinship tie to signal their skills. Kinship ties could also provide accountability and a source of referral networks from existing male employees. It is likely that kinship ties offer a rebuttal to male leaders who would not normally consider women for executive positions in their companies. Second, once women are hired into positions of leadership, correlations with increased female employee share, as found here and in similar settings, suggest that women leaders may direct resources toward female constituencies (Chattopadhyay & Duflo 2004), which in turn may raise employer demand for female workers and become attractive to a potential supply of unemployed female workers. The fact that a greater female management share corresponds with a greater share of Saudi employees and smaller wage gaps reinforces this idea. Additionally, an increased female employee share may influence male executives to lead differently, perhaps more in line with the kinds of business strategies and norms that can increase a firm's appeal to female workers, such as with increased cooperation or consensus building. The fact that the presence of female managers has been found to correlate with female retention would support this mechanism (González 2023).

Lastly, a mechanism that could be specifically relevant in the Middle East, with its social norms of gender segregation, is that employing the relative of an incumbent executive prevents an interaction with a greater number of unrelated women, which an ordinary screening and hiring process would inevitably imply. Exploiting an already existing kinship network could therefore serve as a shortcut whenever a firm decides that having a greater number of women in the firm is desirable. This form of avoiding a lengthy and potentially costly employment process might be of special importance for Saudi Arabia, where the government-mandated 'Saudi Vision 2030' encourages firms to increase the share of women among their employees while respecting local customs that historically have avoided gender mixing. Despite existing policies discouraging nepotism, filling the corporate ranks with female family members of the current all-male workforce might be tempting. Furthermore, a resulting gender difference in the prevalence of kinship ties should then also be more pronounced in industries with low levels of female labor shares as hiring women via the usual process may prove to be difficult given that few women are available in the employment pipeline.

We provide evidence that kinship ties are an avenue for women to enter executive positions in firms, particularly in settings with historically low levels of female labor force participation. Our findings suggest that as women gain access to the glass web of executive leadership through their family ties, in the short term, representation alone is sufficient to correlate female leadership with positive firm outcomes.

References

- Acemoglu, D., Bautista, M. A., Querubin, P. & Robinson, J. A. (2007), Economic and Political Inequality in Development: The Case of Cundinamarca, Colombia, Technical report, National Bureau of Economic Research.
- Adams, R., Almeida, H. & Ferreira, D. (2009), ‘Understanding the Relationship between Founder–CEOs and Firm Performance’, *Journal of Empirical Finance* **16**(1), 136–150.
- Akbari, M., Bahrami-Rad, D. & Kimbrough, E. O. (2019), ‘Kinship, fractionalization and corruption’, *Journal of Economic Behavior & Organization* **166**, 493–528.
- Alesina, A. & Giuliano, P. (2010), ‘The power of the family’, *Journal of Economic growth* **15**(2), 93–125.
- Angelucci, M., De Giorgi, G., Rangel, M. A. & Rasul, I. (2010), ‘Family Networks and School Enrolment: Evidence from a Randomized Social Experiment’, *Journal of Public Economics* **94**(3-4), 197–221.
- Ayari, A. (2018), Women and careers: The issues of the “glass ceiling”, in ‘Arab Women and Their Evolving Roles in the Global Business Landscape’, IGI Global, pp. 74–86.
- Barnett, M. L. (1960), ‘Kinship as a Factor affecting Cantonese Economic Adaptation in the United States’, *Human Organization* **19**(1), 40–46.
- Bertrand, M., Black, S. E., Jensen, S. & Lleras-Muney, A. (2019), ‘Breaking the Glass Ceiling? The Effect of Board Quotas on Female Labour Market Outcomes in Norway’, *The Review of Economic Studies* **86**(1), 191–239.
- Bertrand, M. & Schoar, A. (2006), ‘The role of family in family firms’, *Journal of economic perspectives* **20**(2), 73–96.
- Bloom, N., Genakos, C., Sadun, R. & Van Reenen, J. (2012), ‘Management practices across firms and countries’, *Academy of management perspectives* **26**(1), 12–33.
- Bloom, N. & Van Reenen, J. (2010), ‘Why do management practices differ across firms and countries?’, *Journal of economic perspectives* **24**(1), 203–24.
- Booth, A. L., Francesconi, M. & Frank, J. (2003), ‘A sticky floors model of promotion, pay, and gender’, *European Economic Review* **47**(2), 295–322.
- Byrnes, J. (2005), ‘Middle management excellence’, *Harvard Business School Working Knowledge Series* **5**, 4–6.

- Carnes, W. J. & Radojevich-Kelley, N. (2011), ‘The effects of the glass ceiling on women in the workforce: Where are they and where are they going?’, *Review of Management Innovation & Creativity* **4**(10).
- Caselli, F. & Gennaioli, N. (2013), ‘Dynastic Management’, *Economic Inquiry* **51**(1), 971–996.
- Chaffins, S., Forbes, M., Fuqua Jr, H. E. & Cangemi, J. P. (1995), ‘The glass ceiling: Are women where they should be?’, *Education* **115**(3), 380–387.
- Charrad, M. M. (2009), ‘Kinship, islam, or oil: Culprits of gender inequality?’, *Politics & Gender* **5**(4), 546–553.
- Chattopadhyay, R. & Duflo, E. (2004), ‘Women as Policy Makers: Evidence from a Randomized Policy Experiment in India’, *Econometrica* **72**(5), 1409–1443.
- Chiplunkar, G. & Goldberg, P. K. (2021), Aggregate implications of barriers to female entrepreneurship, Technical report, National Bureau of Economic Research.
- Clark, G. & Cummins, N. (2015), ‘Intergenerational Wealth Mobility in England, 1858–2012: Surnames and Social Mobility’, *The Economic Journal* **125**(582), 61–85.
- Corsun, D. L. & Costen, W. M. (2001), ‘Is the glass ceiling unbreakable? habitus, fields, and the stalling of women and minorities in management’, *Journal of Management Inquiry* **10**(1), 16–25.
- Dal Bó, E., Dal Bó, P. & Snyder, J. (2009), ‘Political Dynasties’, *The Review of Economic Studies* **76**(1), 115–142.
- David, M., David, M. E. & Woodward, D. (1998), *Negotiating the glass ceiling: Careers of senior women in the academic world*, Taylor & Francis US.
- Diéguez-Soto, J., López-Delgado, P. & Rojo-Ramírez, A. (2015), ‘Identifying and Classifying Family Businesses’, *Review of Managerial Science* **9**(3), 603–634.
- Dower, P. C., Gerber, T. P. & Weber, S. (2022), ‘Firms, kinship networks, and economic growth in the kyrgyz republic’, *Journal of Comparative Economics* **50**(4), 997–1018.
- Dube, O. & Harish, S. (2020), ‘Queens’, *Journal of Political Economy* **128**(7), 2579–2652.
- Durante, R., Labartino, G. & Perotti, R. (2014), Academic Dynasties: Familism, Civic Capital, and Nepotism in Italian Universities, Technical report, National Bureau of Economic Research Working Paper.

- Fafchamps, M. & Labonne, J. (2017), ‘Do politicians’ relatives get better jobs? evidence from municipal elections’, *The Journal of Law, Economics, and Organization* **33**(2), 268–300.
- Fahlenbrach, R. (2009), ‘Founder-CEOs, Investment Decisions, and Stock Market Performance’, *Journal of Financial and Quantitative Analysis* **44**(2), 439–466.
- Folke, O., Persson, T. & Rickne, J. (2017), ‘Dynastic political rents? economic benefits to relatives of top politicians’.
- Folke, O., Rickne, J. K. & Smith, D. M. (2020), ‘Gender and Dynastic Political Selection’, *Comparative Political Studies* p. Forthcoming.
- Frankforter, S. A. (1996), ‘The progression of women beyond the glass ceiling’, *Journal of Social Behavior and Personality* **11**(5), 121.
- Gagliarducci, S. & Manacorda, M. (2020), ‘Politics in the Family: Nepotism and the Hiring Decisions of Italian Firms’, *American Economic Journal: Applied Economics* **12**(2), 67–95.
- Ghazalian, P. L. (2022), ‘The effects of the arab spring on female labour force participation in the mena region’, *Economics of Transition and Institutional Change* **30**(4), 869–900.
- Gomez-Mejia, L. R., Nunez-Nickel, M. & Gutierrez, I. (2001), ‘The role of Family Ties in Agency Contracts’, *Academy of Management Journal* **44**(1), 81–95.
- González, A. L. (2023), ‘Signals and Role Models: First Female Managers, Firms, and Female Employment in Saudi Arabia.’, *Unpublished Manuscript* .
- Güell, M., Rodríguez Mora, J. V. & Telmer, C. (2007), ‘Intergenerational Mobility and the Informative Content of Surnames’, *CEPR Discussion Paper No. DP6316* .
- Kramer, V. W., Konrad, A. M., Erkut, S. & Hooper, M. J. (2006), *Critical mass on corporate boards: Why three or more women enhance governance*, Wellesley Centers for Women Wellesley, MA.
- Labonne, J., Parsa, S. & Querubin, P. (2019), Political Dynasties, Term Limits and Female Political Empowerment: Evidence from the Philippines, Technical report, National Bureau of Economic Research.
- Majbouri, M. (2020), ‘Fertility and the puzzle of female employment in the middle east and north africa’, *Economics of Transition and Institutional Change* **28**(2), 225–244.
- McGuinness, P. B., Vieito, J. P. & Wang, M. (2017), ‘The role of board gender and foreign ownership in the csr performance of chinese listed firms’, *Journal of Corporate Finance* **42**, 75–99.

- Norris, P. (2009), 'Petroleum patriarchy? a response to ross', *Politics & Gender* **5**(4), 553–560.
- Notzon, B. & Nesom, G. (2005), 'The arabic naming system', *Science* **28**(1).
- Peck, J. R. (2017), 'Can Hiring Quotas work? The Effect of the Nitaqat Program on the Saudi Private Sector', *American Economic Journal: Economic Policy* **9**(2), 316–47.
- Pérez-González, F. (2006), 'Inherited Control and Firm Performance', *American Economic Review* **96**(5), 1559–1588.
- Rosener, J. B. (1997), *America's competitive secret: Women managers*, Oxford University Press on Demand.
- Ross, M. L. (2008), 'Oil, islam, and women', *American political science review* **102**(1), 107–123.
- Tate, G. & Yang, L. (2015), 'Female leadership and gender equity: Evidence from plant closure', *Journal of Financial Economics* **117**(1), 77–97.
- UNCTAD (2023), 'Unctad world investment report 2022', *Link: <https://unctad.org/topic/investment/world-investment-report>* .
- Veale, C. & Gold, J. (1998), 'Smashing into the glass ceiling for women managers', *Journal of Management Development* **17**(1), 17–26.
- Weyer, B. (2007), 'Twenty years later: explaining the persistence of the glass ceiling for women leaders', *Women in management Review* **22**(6), 482–496.
- World Bank (2023), 'World bank databank: Gdp per capita (current us\$)', *Link: <https://data.worldbank.org/indicator/NY.GDP.PCAP.CD>* .

APPENDIX

A Sample differences between matched and unmatched GOSI data

Table 4: Differences between Matched and Unmatched GOSI data

| | Mean Matched | Mean Raw | Diff. | Std. Err. |
|-------------------------|--------------|----------|----------|-----------|
| Female Employment Share | .0820699 | .0984349 | -.016365 | .0026185 |
| Female Wage Share | .3325651 | .2772917 | .0552734 | .0044531 |
| Saudi Employment Share | .2143532 | .1898154 | .0245378 | .0032708 |
| Total Employment | 29.20422 | 13.1563 | 16.04792 | .215326 |
| <i>N</i> | 275852 | | | |

Note: This table reports mean differences between the GOSI-BvD Orbis matched firm sample and the unmatched GOSI data that cover the universe of private sector firms in Saudi Arabia. The reported mean excludes mega-firms, defined as firms whose firm size, measured as the total number of employees, exceeds the 95th percentile of the firm-size distribution.

B Gender Differences in Kinship Networks

Table 5: Differences in Kinship Networks between Female and Male Executives 2019

| | Female | Male | Diff | P-value | N0 | N1 |
|---|--------|------|----------|---------|--------|--------|
| Overall | 0.14 | 0.12 | 0.03*** | 0.00 | 174784 | 756819 |
| <i>Countries</i> | | | | | | |
| UAE | 0.05 | 0.04 | 0.01*** | 0.00 | 45349 | 242511 |
| Bahrain | 0.06 | 0.07 | -0.01*** | 0.00 | 43421 | 81269 |
| Kuwait | 0.31 | 0.22 | 0.09*** | 0.00 | 32635 | 122680 |
| Oman | 0.21 | 0.16 | 0.05*** | 0.00 | 45256 | 225764 |
| Qatar | 0.04 | 0.05 | -0.01** | 0.00 | 4326 | 32324 |
| Saudi Arabia | 0.15 | 0.16 | -0.01 | 0.21 | 3797 | 52271 |
| <i>Firm Size</i> | | | | | | |
| Small | 0.11 | 0.10 | 0.01*** | 0.00 | 120071 | 447453 |
| Medium | 0.18 | 0.13 | 0.05*** | 0.00 | 42887 | 219078 |
| Large | 0.36 | 0.20 | 0.16*** | 0.00 | 8820 | 52232 |
| Very Large | 0.25 | 0.10 | 0.15*** | 0.00 | 2994 | 37956 |
| <i>Industries</i> | | | | | | |
| Agriculture, Horticulture and Livestock | 0.13 | 0.11 | 0.02 | 0.38 | 168 | 764 |
| Banking, Insurance and Financial Services | 0.16 | 0.06 | 0.10*** | 0.00 | 2002 | 17628 |
| Biotechnology and Life Sciences | 0.05 | 0.04 | 0.01 | 0.82 | 21 | 134 |
| Business Services | 0.14 | 0.10 | 0.04*** | 0.00 | 15808 | 74041 |
| Chemicals, Petroleum, Rubber and Plastic | 0.19 | 0.14 | 0.05*** | 0.00 | 743 | 5898 |
| Communications | 0.12 | 0.10 | 0.02** | 0.01 | 2206 | 8445 |
| Computer Hardware | 0.67 | 0.26 | 0.41 | 0.15 | 3 | 31 |
| Computer Software | 0.11 | 0.08 | 0.03* | 0.04 | 523 | 2340 |
| Construction | 0.19 | 0.15 | 0.04*** | 0.00 | 22182 | 119656 |
| Food and Tobacco Manufacturing | 0.21 | 0.14 | 0.07*** | 0.00 | 1290 | 6903 |
| Industrial, Electric and Electronic Machinery | 0.19 | 0.14 | 0.05*** | 0.00 | 1810 | 10429 |
| Information Services | 0.15 | 0.15 | 0.00 | 1.00 | 13 | 26 |
| Leather, Stone, Clay and Glass products | 0.34 | 0.18 | 0.17*** | 0.00 | 557 | 5053 |
| Media and Broadcasting | 0.10 | 0.11 | -0.01 | 0.49 | 912 | 2863 |
| Metals and Metal Products | 0.15 | 0.13 | 0.02 | 0.05 | 1151 | 8432 |
| Mining and Extraction | 0.17 | 0.11 | 0.05** | 0.00 | 366 | 2956 |
| Miscellaneous Manufacturing | 0.22 | 0.16 | 0.06 | 0.11 | 104 | 629 |
| Printing and Publishing | 0.14 | 0.14 | 0.00 | 0.84 | 533 | 1786 |
| Property Services | 0.23 | 0.11 | 0.12*** | 0.00 | 3497 | 18386 |
| Public Administration, Education, Health | 0.15 | 0.13 | 0.01 | 0.14 | 1914 | 7359 |
| Retail | 0.11 | 0.10 | 0.00 | 0.13 | 14622 | 49108 |
| Textiles and Clothing Manufacturing | 0.15 | 0.12 | 0.03*** | 0.00 | 8962 | 26627 |
| Transport Manufacturing | 0.15 | 0.09 | 0.06* | 0.05 | 97 | 988 |
| Transport, Freight and Storage | 0.16 | 0.10 | 0.05*** | 0.00 | 4752 | 26800 |
| Travel, Personal and Leisure | 0.14 | 0.13 | 0.01*** | 0.00 | 15957 | 56183 |
| Utilities | 0.24 | 0.15 | 0.09*** | 0.00 | 393 | 2599 |
| Waste Management and Treatment | 0.16 | 0.07 | 0.09 | 0.09 | 32 | 242 |
| Wholesale | 0.19 | 0.13 | 0.06*** | 0.00 | 37743 | 175866 |
| Wood, Furniture and Paper Manufacturing | 0.16 | 0.13 | 0.03** | 0.00 | 1199 | 6568 |

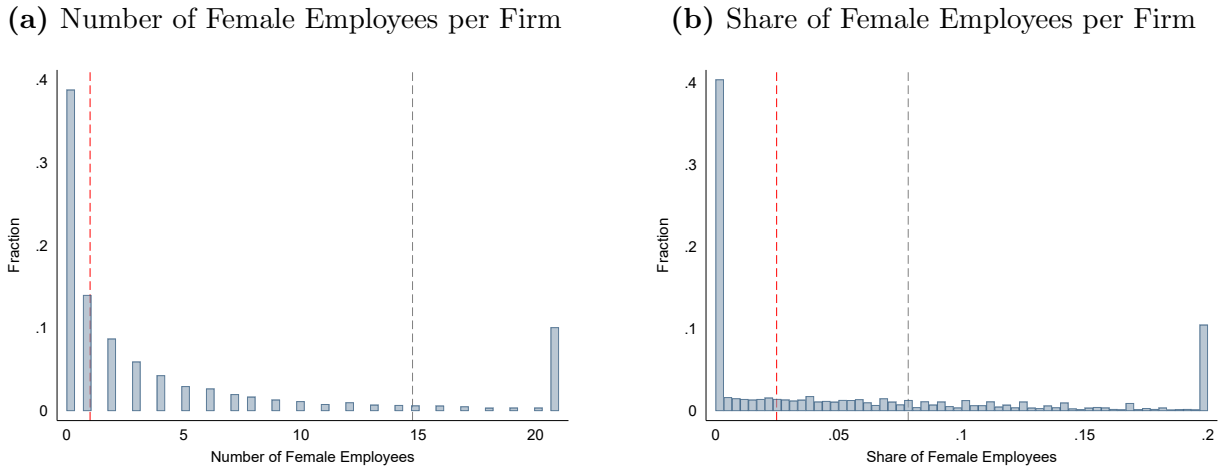
Notes: Data from GOSI/Orbis 2019.

C Matched sample: Data and Descriptive Statistics

Using data from our matched Orbis-GOSI firm sample, Figure 4 displays the distribution of both the number of women and the share of female labor across private sector firms and documents a highly right-skewed distribution with approximately 40 percent of firms not employing a single female employee and half of the firms having less than two female

employees. The median firm in our data has a female labor share of 2.5 percent.

Figure 4: Female Employment



Note: The figure illustrates the distribution of the number and share of female employees across private sector firms in Saudi Arabia. Data are from the GOSI database. The number of females is winsorized above at 21, and the share of females is winsorized above at 20 percent. The dashed red lines indicate the median and the dashed gray lines the mean value.

Examining female labor shares in different industries, Appendix Figure 5a suggests that the share of women in the workforce is the greatest in the social services sector (25.7 percent), followed by the trade industry (7.9 percent) and business and financial insurance services (7.2 percent). The lowest levels of female labor shares exist in the petrol and mining (1.4 percent), electricity, gas and water (1.9 percent) and telecommunication and mail industries (2.1 percent). Appendix Figure 5b documents the share of employees that are represented by these industries. The social services sector that had the greatest share of female employees accounts for a little less than 5 percent of the workforce in Saudi Arabia, while the trade industry that showed the second-highest female labor share accounts for approximately 24 percent of all employees. The construction industry represents the greatest share of the workforce, with 40 percent of all private sector employees working in this sector. Yet, with a 2.7 percent female labor share, it ranks way below the national average (7.8 percent) and only slightly above the national median value (2.47 percent). Finally, Appendix Figure 5c reports our network share measure derived in section 3, which reports the share of female executives who share at least one relationship with another executive in the same firm. We aggregate this measure to the industry level, taking weighted averages where weights are the number of female employees per firm. Most industries show a similar kinship network share with approximately 3-4 percent of all female executives having at least one family relationship with another executive. The trade industry as well as the agriculture and fishing industries

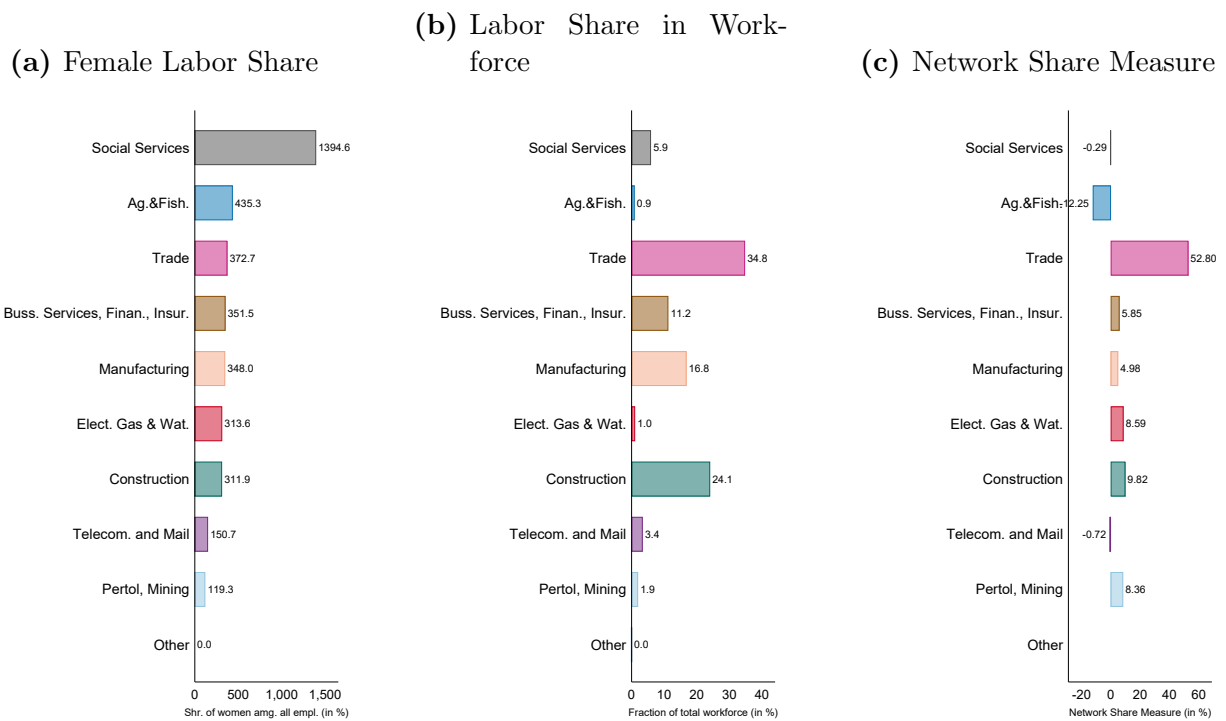
constitute two notable outliers, with trade showing an exceptionally high network share (10.28 percent) and the agriculture and fishing industries reporting a very low network share among female executives (0.53 percent).

A similar comparison is presented in Appendix Figure 6, this time differentiating between firm sizes as opposed to industries.¹⁵ Again, the types of firms that show the greatest representation of females are also the types of firms that account for the lowest share of private sector employment. It turns out that the smaller the firm, the greater the female labor share (Appendix Figure 6a). Firms characterized as very large employ about half of all workers in our data, and approximately 75 percent of all employees work in either large or very large firms (Appendix Figure 6b). Furthermore, with an almost 10 percent network share, very large firms tend to employ the greatest number of female executives who share a family relationship with another executive in the same firm.

Finally, Appendix Figure 7 compares the share of women in as well as the share of the workforce represented by different occupation levels. The GOSI data distinguish between nine hierarchy levels ranging from ‘elementary occupations’ to ‘managers’. Appendix Figure 7a documents that the female labor share is the greatest among occupations that rank high in the corporate hierarchy. The female labor share is particularly high among professional workers (24 percent), followed by clerical support workers (22 percent) and services and sales workers (13 percent). Comparing these figures to the share of the workforce that these occupations account for (Appendix Figure 7b) again reveals that these occupation hierarchies represent only a small fraction of the entire workforce (only about 18 percent combined). The greatest share of the workforce is employed in elementary occupations (38 percent), which has a female labor share of only a little more than 3 percent.

¹⁵The BvD Orbis data measure firm size via a categorical variable that differentiates between small, medium, large, and very large firms based on size of the company sales, operating revenue, and employment.

Figure 5: Industry Comparison



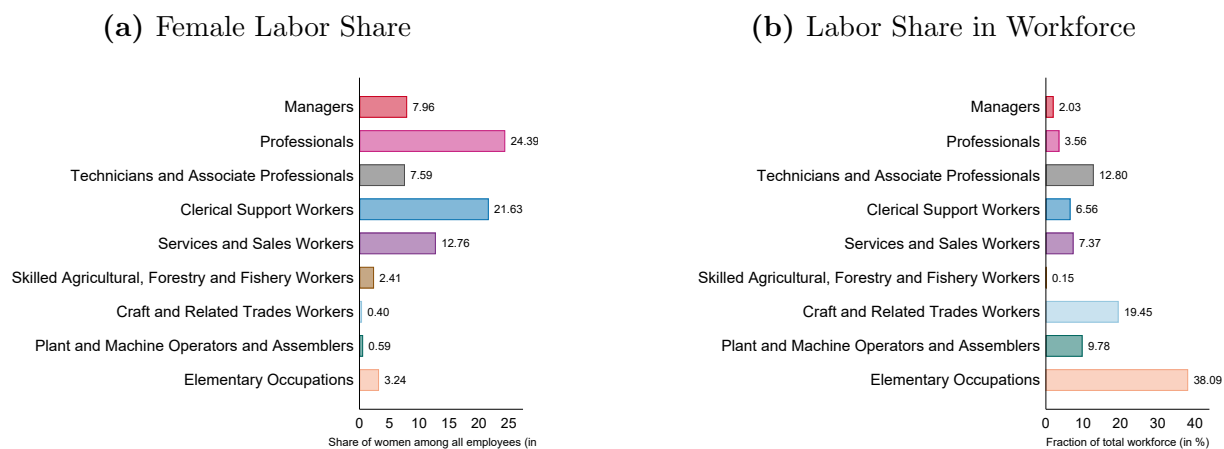
Note: The figure illustrates the share of female employees, the share of workers and the average network share measure in different industries across private sector firms in Saudi Arabia. Data are from the BvD Orbis and GOSI databases.

Figure 6: Firm Size Comparison



Note: The figure illustrates the share of female employees, the share of workers and the average network share measure in different firm sizes across private sector firms in Saudi Arabia. Data are from the BvD Orbis and GOSI databases.

Figure 7: Occupation Type Comparison



Note: The figure illustrates the share of female employees and the share of workers in different occupation types across private sector firms in Saudi Arabia. Data are from the BvD Orbis and GOSI databases.

D Kinship Measurement

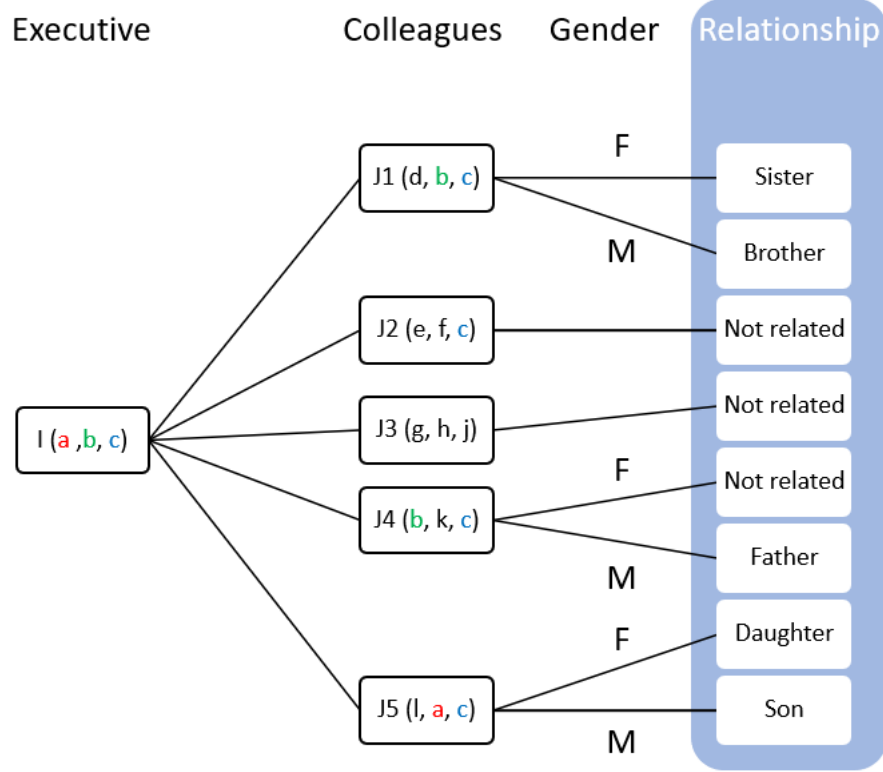
Figure 8 illustrates the kinship measurement process in detail. In this example, executive I has first name a , middle name b , and last name c . In a first step, we identify all colleagues of executive I who share the same last name c . We then compare first and middle names. Colleague J_1 shares the same last name and the same middle name. Therefore, executive I and J_1 are identified as siblings. Executive J_1 is a sister if she is female and a brother if he is male. Moving forward, executive J_2 does share the same last name but her first and middle names do not match executive I 's first or middle name. The two executives are therefore unrelated. Also, executive J_3 does not share a family relationship with executive I since none of the first, middle, or last names match. This is different for executive J_4 , who shares the same last name, and her first name matches the middle name of executive I , which implies that executive J_4 is the parent of executive I .¹⁶ Lastly, executive J_5 shares the same last name as executive I , and also her middle name matches executive I 's first name. Thus, executive J_5 must be a child and therefore either the daughter (if female) or the son (if male) of executive I . To account for human error during the data generation process (the names have typos), we execute a *fuzzy merge* when comparing the names of executives.¹⁷

This measurement process has three main advantages. First, most studies that exploit information on names to identify family ties need to have an additional piece of information such as rareness of last names (Güell et al. 2007, Durante et al. 2014, Clark & Cummins 2015), city of birth, or place of residence (Gagliarducci & Manacorda 2020) before comparing last names to increase the probability that kinship ties actually exist. Alternatively, some studies use the first and last name to match individuals across different datasets (Acemoglu et al. 2007). While we also use ‘same employer’ and ‘executive level position’ as two additional criteria before matching individuals with each other based on their names, these two criteria appear to be more credible restrictions that are less prone to pooling unrelated individuals. In short, we believe it is more convincing that two people who both work as executives in the same firm and that share a certain name combination belong to the same family than two individuals who share the same last name and live in the same city. Second, instead of exploiting the last name only, the patronymic naming convention allows us to utilize all three parts of a name, the first, middle, and last name, thus adding further credibility to

¹⁶One might be tempted to apply the same gender identification as before to determine whether executive J_4 is the father or the mother. However, since names across the Middle East are patronymic and not matronymic (that is, children do not inherit the name of their mother), mothers cannot be identified via our procedure. We therefore know that executive J_4 is the father of executive I if he is male but will be unrelated if she is a woman.

¹⁷Specifically, we employ a fuzzy match technique in Stata. We use the code ‘matchit’ and set the cutoff similarity score to 0.87.

Figure 8: Relationship Identification



Note: Relationships are identified by comparing the first name (a), middle name (b) and last name (c) of executive *I* to the first name, middle name and last name of all of her colleagues.

our family matches. Third, our identification procedure allows us to observe not only the existence of family ties but also the type of relationship, similar to [Angelucci et al. \(2010\)](#). The example in [Figure 8](#) shows that we can make precise statements about whether two individuals are father and son, father and daughter, or siblings.

One main limitation to our approach is that, while it is relatively unlikely that we falsely identify kinship ties that do not exist in reality as outlined above, family relationships that we cannot capture do exist. For example, we cannot identify kinship ties involving mothers, aunts, uncles, grandmothers, grandfathers, or cousins, since names do not reveal such relationships. Furthermore, in this predominantly Muslim region, women do not typically take their husband's last name upon marriage but retain their maiden name. Therefore, we are unable to identify spousal relationships using this procedure. When talking about family ties and kinship networks, we therefore exclusively refer to relationships between father and daughter, father and son, brother and brother, brother and sister, and sister and sister. Furthermore, we apply our algorithm exclusively to executives whose country of origin is a member of the GCC, since expats of other countries do not necessarily have a patronymic naming convention.

E Robustness Checks

Table 6: Female Kinship Networks and Firm-Level Outcomes: Firms with ≥ 1 Female Executive

| | Num. Fem. Empl. | Shr. Fem. Empl. | Wage Gap | Log Revenue |
|------------------------|-------------------|-------------------|------------------------|-----------------|
| Fem. NSM | -0.14 (0.17) | -0.040 (0.02) | 1202.5 (868.58) | -0.15 (0.19) |
| Female Executive Share | 0.91* (0.46) | 0.18 (0.10) | -4457.7** (1534.71) | -1.00 (0.68) |
| Log Number Employees | 0.95*** (0.07) | -0.0091 (0.01) | -940.5* (391.81) | 0.077 (0.07) |
| Foreign Firm | -0.29 (0.36) | -0.024 (0.03) | 943.2 (1502.28) | -0.42 (0.26) |
| Share Saudi Employees | 4.10*** (0.62) | 0.39* (0.17) | 57.0 (2981.29) | 1.36* (0.56) |
| Sub Industry FE | ✓ | ✓ | ✓ | ✓ |
| Firm Size FE | ✓ | ✓ | ✓ | ✓ |
| City FE | ✓ | ✓ | ✓ | ✓ |
| N | 241 | 241 | 241 | 191 |
| Pseudo R2 | 0.25 | | | |
| R2 | | 0.28 | 0.22 | 0.86 |

The table displays estimates of the relationship between firm-level female networks (NSM) and firm-level outcomes. Column 1 uses a negative binomial regression; all other columns employ OLS fixed effects regressions. Firm size is a categorical variable that distinguishes between small, medium-sized, large, and very large firms based on size of company sales, operating revenue, and employment. Robust standard errors are in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 7: Female Executive Shares and Firm-Level Outcomes: Subindustries

| DV: | Num. Fem. Empl. | Shr. Fem. Empl. | Wage Gap | Log Revenue |
|------------------------|-------------------|---------------------|------------------------|-------------------|
| Female Executive Share | 0.48*** (0.12) | 0.043** (0.02) | -1247.0*** (307.59) | -0.18 (0.10) |
| Log Number Employees | 0.82*** (0.02) | -0.000099 (0.00) | -552.4*** (47.28) | 0.15*** (0.02) |
| Foreign Firm | -0.43** (0.14) | -0.0085 (0.01) | 1594.2*** (416.83) | 0.018 (0.12) |
| Share Saudi Employees | 2.45*** (0.17) | 0.24*** (0.03) | 2991.4*** (560.44) | 0.94*** (0.15) |
| Sub Industry FE | ✓ | ✓ | ✓ | ✓ |
| Firm Size FE | ✓ | ✓ | ✓ | ✓ |
| City FE | ✓ | ✓ | ✓ | ✓ |
| N | 3427 | 3604 | 3604 | 2802 |
| Pseudo R2 | 0.12 | | | |
| R2 | | 0.21 | 0.18 | 0.81 |

The table displays estimates of the relationship between firm-level female executive shares and firm-level outcomes. Column 1 uses a negative binomial regression; all other columns employ OLS fixed effects regressions. Firm size is a categorical variable that distinguishes between small, medium-sized, large, and very large firms based on size of company sales, operating revenue, and employment. Robust standard errors are in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 8: Female Kinship Networks and Firm-Level Outcomes: Subindustries

| | Num. Fem. Empl. | Shr. Fem. Empl. | Wage Gap | Log Revenue |
|------------------------|-------------------|--------------------|------------------------|-------------------|
| Fem. NSM | -0.070 (0.14) | -0.022 (0.01) | 779.4 (483.22) | -0.0038 (0.15) |
| Female Executive Share | 0.46*** (0.13) | 0.049** (0.02) | -1444.4*** (304.11) | -0.18 (0.10) |
| Log Number Employees | 0.96*** (0.02) | -0.00010 (0.00) | -552.3*** (47.30) | 0.15*** (0.02) |
| Foreign Firm | -0.20 (0.14) | -0.0089 (0.01) | 1608.9*** (417.17) | 0.018 (0.12) |
| Share Saudi Employees | 2.88*** (0.18) | 0.24*** (0.03) | 2976.6*** (560.49) | 0.94*** (0.15) |
| Sub Industry FE | ✓ | ✓ | ✓ | ✓ |
| Firm Size FE | ✓ | ✓ | ✓ | ✓ |
| City FE | ✓ | ✓ | ✓ | ✓ |
| N | 3604 | 3604 | 3604 | 2802 |
| Pseudo R2 | 0.18 | | | |
| R2 | | 0.21 | 0.18 | 0.81 |

The table displays estimates of the relationship between firm-level female networks (NSM) and firm-level outcomes. Column 1 uses a negative binomial regression; all other columns employ OLS fixed effects regressions. Firm size is a categorical variable that distinguishes between small, medium-sized, large, and very large firms based on size of company sales, operating revenue, and employment. Robust standard errors are in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 9: Female Kinship Networks and Firm-Level Outcomes: Excluding Small Firms

| | Num. Fem. Empl. | Shr. Fem. Empl. | Wage Gap | Log Revenue |
|------------------------|-------------------|-------------------|------------------------|-------------------|
| Fem. NSM | -0.048 (0.16) | -0.030 (0.02) | 606.7 (504.27) | 0.041 (0.16) |
| Female Executive Share | 0.54** (0.19) | 0.081** (0.03) | -1667.9*** (491.51) | -0.36** (0.13) |
| Log Number Employees | 0.97*** (0.02) | 0.00023 (0.00) | -586.2*** (55.50) | 0.15*** (0.02) |
| Foreign Firm | -0.24 (0.14) | -0.0093 (0.01) | 1212.0** (402.26) | 0.0095 (0.12) |
| Share Saudi Employees | 2.95*** (0.21) | 0.22*** (0.03) | 3376.1*** (669.62) | 1.06*** (0.16) |
| Sub Industry FE | ✓ | ✓ | ✓ | ✓ |
| Firm Size FE | ✓ | ✓ | ✓ | ✓ |
| City FE | ✓ | ✓ | ✓ | ✓ |
| N | 2972 | 2972 | 2972 | 2518 |
| Pseudo R2 | 0.16 | | | |
| R2 | | 0.20 | 0.19 | 0.77 |

The table displays estimates of the relationship between firm-level female networks (NSM) and firm-level outcomes focussing on medium sized, large and very large firms only. Column 1 uses negative binomial regression, all other columns employ OLS fixed effects regressions. Firm size is a categorical variable that distinguishes between small, medium sized, large and very large firms based on size of company sales, operating revenue and employment. Robust standard errors in parantheses. * p<0.05, ** p<0.01, *** p<0.001

Table 10: Male Kinship Networks and Male Representation

| | (1) | (2) | (3) | (4) |
|---------------------------------------|--------|---------|---------|---------|
| DV: Male Network Share Measure | | | | |
| Male Executive Share in Industry | 0.37* | 0.31*** | 0.24*** | 0.22*** |
| | (0.17) | (0.01) | (0.01) | (0.01) |
| Firm Size FE | | ✓ | ✓ | ✓ |
| Country FE | | | ✓ | ✓ |
| City FE | | | | ✓ |
| N | 592885 | 593201 | 593201 | 592805 |
| R2 | 0.0040 | 0.0088 | 0.053 | 0.059 |

The table shows the results of OLS fixed effects models that estimate the relationship between industry-level female executive shares and firm-level male kinship networks. Both dependent and independent variables are standardized such that coefficients can be interpreted as changes in standard deviations. Firm size is a categorical variable that distinguishes between small, medium-sized, large, and very large firms based on size of company sales, operating revenue, and employment. Robust standard errors are in parentheses. * p<0.05, ** p<0.01, *** p<0.001