

Empirical Essays on Gender in Organizations

by

Tatiana Michelle Lluent

Business Administration
Duke University

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Ashleigh Rosette

Dissertation submitted in partial fulfillment of
the requirements for the degree of
Doctor of Philosophy in Business Administration
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ABSTRACT

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Abstract

This dissertation consists of three empirical essays on gender and organizations. It contributes to our understanding of the mechanisms that produce and reproduce gender inequality within organizations. The essays of this dissertation address causes of organizational gender inequality at the interpersonal and institutional levels. They do so drawing on rich datasets; one matching restricted-access administrative data on firms and their employees to data on acquisition deals, and a second one built during a year-long field study conducted at the headquarters of a multinational firm. In the first essay, I investigate the role of national culture on organizational inequality in the context of foreign acquisitions in France. I find that gender egalitarianism measured at the country level influences firm-level gender equality outcomes. In particular, I find that firms acquired by acquirers from more gender-egalitarian countries see a larger increase in female representation in management and a larger decrease in gender pay gap post-acquisition, compared to firms that get acquired by acquirers from less gender-egalitarian countries. This main effect is stronger when the post-acquisition integration process is more thorough and when a new CEO is appointed at the acquired firm. The second essay examines if the consistency between employees' observed workflow networks and formally prescribed workflows is associated with individual employee performance and examines how gender-role expectations affect this relationship. I find, together with my

co-authors, a relationship between the consistency between an employee's formally prescribed workflow network and their observed workflow network, and their work performance. I find that this relationship between consistency and employee performance is contingent on the employee's position in the formal structure; employees who are lower in the hierarchy (where roles imply lower levels of autonomy and higher task specificity) receive greater rewards when their actual workflow network is more consistent with their prescribed workflow network. This relationship however weakens for employees who are higher in the hierarchy (where roles imply higher levels of autonomy and lower task specificity). In turn, I find that employees' gender does not matter for the relationship between workflow network consistency, position in the hierarchy and individual performance.

The third essay considers how gendered workplace contexts affect female employees' network building and in turn their career outcomes. I investigate how gender plays into the relationship between propinquity and network building. I exploit data from a quasi-field experiment leading to the reconfiguration of the seating plan in an office to investigate, following this exogenous shock on spatial proximity, gender differences in how employees form ties with desk neighbors. I further study how this reconfiguration impacts their network positions when said neighbors are experimentally manipulated to be dissimilar in terms of functional membership. I find that reconfiguring the seating plan of an office can help countervail structural and agentic barriers to network brokerage for

female employees. Following the reconfiguration, I show that female employees are more likely than male employees to form friendship ties with their new desk neighbors and that women's friendship networks are more likely to become more brokerage-rich.

Dedication

To my grand-parents.

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1. Introduction

Despite decades of steady progress throughout the world, gender inequality remains a major issue today. While the most conspicuous barriers to equality are progressively challenged and removed, more pernicious inequality-producing processes linger on and contribute to persisting disparities between men and women, in particular in the economy and the workplace. Indeed, important gender differences in wages and career advancement remain in most if not all countries in the world. Women are under-represented in decision-making and leadership positions (Ely et al., 2011), as well as in high-status occupations and they typically earn lower wages (Elvira & Graham, 2002; Cha & Weeden, 2014).

This dissertation focuses on two potential sources of workplace inequality between men and women: cultural norms and social networks.

Cultural norms, understood as the values, beliefs, attitudes, and norms characteristic of a particular society, play an important role in shaping organizations. Gender egalitarianism, which concerns the level of differentiation between roles attributed to each gender in society, is a dimension of culture. Societies and countries differ in how they seek to minimize or maximize gender role differences (Emrich et al., 2004). Prior research suggests that cultural norms and beliefs about gender roles strongly influence gender gaps in labor participation, wages, and math achievement (Antecol,

2001; Fernandez, 2007; Nollenberger et al., 2016). The mechanisms highlighted in these studies operate at the individual level. Considering the role that organizational-level processes play in reproducing gender inequality, it is then interesting to interrogate the influence of cultural norms and beliefs about gender on organizations. Investigating the role of culture on any outcome is challenging methodologically because of issues related to cross-country comparability and the difficulty of disentangling the effect of culture from that of market conditions or the formal institutional environment. I address these theoretical and methodological gaps by adapting economics' epidemiological approach to the context of cross-border acquisitions. I show that cultural norms and beliefs play an important role in organizational level gender disparities thus suggesting a lever for change towards more equality.

Social networks, defined as patterns of relationships between actors, are an important determinant of individual outcomes. Intra-organizational social networks determine access to information, advice, and social support, which in turn strongly affect desirable outcomes such as creativity, promotions, pay increases, etc. Social networks have been shown to affect gender inequality within organizations. Indeed, past work has highlighted how men and women's networks differ in their features and shapes, how men and women utilize their network differently, and how men and women do not derive the same benefits from similar network positions. Prior research has highlighted how, within organizations, gender and social network processes collide in two major ways; women's

overrepresentation in lower ranks and non-core functions of organizations prevents them from building diverse and far-reaching networks (Ibarra, 1993), while gender role expectations confine women to communal behaviors that limit their ability to form strategic relationships and to derive benefits from usually advantageous network positions (Brands & Kilduff, 2014). In a study focused on the influence of the consistency between workflows prescribed by the formal structure and employees' observed workflows ('workflow overlap') on individual performance, I investigate how expectations to comply with formally delineated workflows interact with further expectations related to gender roles. This study finds that while workflow overlap matters for individual performance it does not matter differentially for male and female employees. In the last study, I investigate the efficacy of spatial design in increasing female employees' rate of network brokerage. Drawing from prior research's findings that brokerage positions are harder for women to reach and to benefit from, I argue that altering seating assignments can allow women, to a larger extent than for men, to diversify their ties and to access more advantageous network positions in a gender-role congruent way.

1.1 Dissertation outline

The next three chapters of this dissertation are independent quantitative research papers related to the topics outlined in this introductory chapter.

In Chapter 2, I study the influence of national cultural norms on gender inequality in organizations by drawing on administrative data on French firms targeted by cross-border acquisitions.

In Chapter 3, together with my co-authors Ramon Lecuona and Jonathon Cummings, I test predictions arguing that consistency with formally prescribed workflows affects the relationship between patterns of interactions within the office and pay. I further study how gender-role expectations affect these predictions. I draw on exhaustive data collected in the field at a Mexican firm.

In Chapter 4, I study gender differences in the relationship between propinquity in an office, network tie formation, and network brokerage. I use data from a quasi-field experiment that manipulated the seating plan of a Mexican company's headquarters.

In Chapter 5, I summarize the core contributions of this dissertation and propose avenues for future research.

2. The Impact of National Culture on Firm Gender Diversity

2.1 Introduction

Despite much progress in workplace gender equality over the last decades, women continue to be underrepresented in leadership positions (Ridgeway, 2011), and to face a persistent pay gap (Goldin, 2014). Why do these disparities persist? An important body of work has investigated the role of organizations in gender inequality (Stainback et al., 2010; Amis et al., 2020). Scholars have shown that within organizations women tend to be disadvantaged in the recruitment process (Gorman, 2005), the allocation of promotions (Lyness & Heilman, 2006), the level of compensation (Goldin et al., 2017) and they tend to be segregated in certain occupations (Pan, 2015; Blau et al., 2013a). Inequality scholars have also identified generic mechanisms that contribute to the creation and reproduction of workplace inequality including organizational inertia, power dynamics between internal constituencies, and environmental pressures, which include, for example, regulatory or political forces (see Stainback et al. 2010 for a thorough review).

Among environmental pressures affecting organizational inequality, less attention has been paid to the role of national gender culture and norms. National gender culture refers to the set of beliefs, values and norms about gender roles, which are characteristic of a particular society and are relatively stable over time. Although laws are gradually changing in countries around the world in order to reduce structural disadvantages for women, inequalities remain, in part because of these slowly changing values and norms

that dictate the “appropriate” roles for members of each gender (Emrich et al., 2004). While the role of national culture on gender differences in individual outcomes such as labor force participation (Blau et al., 2013), fertility choices (Fernandez & Fogli, 2009) and wages (Antecol, 2001) has been examined by economics scholars, less is known about how national gender norms affect organizations and their arrangements towards gender equality.

The role of national culture in organizational gender equality is difficult to study for several reasons. One issue is data availability; there is a lack of easily accessible and comparable organization-level data on gender equality practices and outcomes across countries. There are also methodological concerns; even when it is possible to access relevant data, for example on the gender diversity of firms’ boards of directors (Grosvold, 2011), cross-country comparability issues related to the ability to reliably measure and control for differences in market structures and institutional characteristics represent major hurdles to analysis. Most central to my question, even when comparisons are possible, it is hard to disentangle the impact of culture and norms on organizational gender equality outcomes from that of economic conditions or of other formal institutions. For instance, the national legal framework or institutional features could affect the “quality” of women on the labor market which could also affect outcomes.

This chapter addresses the role of national gender culture in shaping firms’ gender equality outcomes by employing a novel research design using cross-border firm

acquisitions and exploiting the variation in the home-countries of acquirers within a same host-country. My study examines if acquiring firms' national gender culture influences post-acquisition gender equality outcomes at acquired firms. By focusing on acquired firms from a same host country that share the same environment, I am able to observe the differential impacts of acquiring firms from various countries with different gender cultures. This design is inspired by the "epidemiological approach" (Reimers, 1985; Giuliano, 2007; Fernandez & Fogli, 2009) which studies migrants to assess the role of national culture on economic outcomes. After a cross-border acquisition, the newly foreign-owned firm operates outside of their acquirer's home-country' formal institutional and economic setting but goes through changes in leadership, practices and processes which reflect the acquirer's home-country environment and culture. A set of acquired firms under diverse cultural influences coming from their respective acquirers, within a same host country context, thus offers a compelling testing ground for the effect of culture on organizations. Indeed, the economic and legal setting is the same for all acquired firms while cultural influences differ according to acquirers' home-countries.

I argue why national gender culture may affect how firms organize, intentionally and unintentionally, to promote workplace gender equality. I draw from literatures in M&As and international business which have uncovered the existence of cross-border transfers from acquiring to acquired firms and from multinational corporations (MNCs) to affiliates (Kostova, 1999; Mtar, 2010), to theorize how the influence of national gender

culture on organizations would show up in the context of cross-border acquisitions. I hypothesize that targets acquired by firms from more gender egalitarian countries will see a larger increase in female representation in management and larger decrease in gender pay gap post-acquisition, compared to firms that get acquired by firms from less gender egalitarian countries. I distinguish three mechanisms through which this influence could operate; the integration of the acquired firm into the acquiring firm's systems and processes, the appointment of new leadership at the acquired firm and voluntary steps taken by acquired firms to copy acquirers' practices, in order to curry favor with their new owners.

I construct a dataset to reliably examine the effect of cross-border acquisitions on gender diversity outcomes at acquired firms. I use data from France, a large labor market comparable to the United States in terms of workplace gender equality. I match information on acquisition deals from Bureau Van Dijk to restricted-access administrative data on workforce composition and wages from the yearly social security records that all French businesses with employees must fill ("DADS forms"). Doing so provides longitudinal information on firm's employment diversity and gender wage gaps before and after their acquisition. I complement this data with acquirer home-country gender equality scores from the World Economic Forum.

I use a generalized difference-in-differences estimation strategy with a continuous treatment variable. An acquisition is not a random event; I thus expect the presence of

endogeneity due to selection bias. My interpretation of results could be challenged if the target selection process by acquirers involved criteria correlated to gender equality at the target. The data's panel structure enables me to examine the gender equality track record of target firms in the years prior to acquisition and to use fixed effects to estimate within-firm changes.

I find evidence consistent with my main hypothesis. After an acquisition, the within-firm improvement in gender equality outcomes is larger in targets acquired by firms from more gender egalitarian countries. Specifically, I find that targets acquired by firms from more gender egalitarian countries see a larger increase in the likelihood of being led by a female CEO, a larger increase in the share of female executives and a larger decrease in the gender wage gap post-acquisition, compared to firms acquired by firms from less gender egalitarian countries. I find that a one standard deviation increase in the acquirer's gender equality score from the mean country score in my data is associated with a 6.2% increase in the likelihood of the acquired firm being led by a female CEO post-acquisition, with a 3.0% increase in the share of female executives and a 13.1% decrease in the residual gender wage gap.

I further investigate the mechanisms driving the effects I observe at acquired firms. I find evidence that the main effect is driven by the degree of post-acquisition integration between the acquiring and acquired firms as well as by the appointment of new leadership at the acquired firm post-acquisition. The degree of resource dependence of the acquired

firm on the acquirer does not moderate the main effect, suggesting that the driving force behind the changes in gender equality outcomes is acquirers acting to ensure internal consistency, rather than acquired firms complying in order to obtain resources from their new owners.

I then discuss alternative explanations for my main effect, including the possibility that the changes in gender equality outcomes I observe post-acquisition are due to the prevalence of better management practices in acquirers' home-countries rather than more gender egalitarian national cultures. I also review the possibility that these changes are driven directly by acquirers' national laws that would apply beyond their countries' borders. Finally, I entertain the possibility that my main effect is solely driven by acquirers from more egalitarian countries sending female employees from their home-country headquarters to the acquired firms. I do not find evidence to support any of these alternative explanations.

This study contributes to the organizational literature on gender inequality. I add to the work of scholars that have uncovered the role of environmental contexts in workplace inequality by showing that national gender culture also matters in explaining organizational inequality. I am able to do so by using a novel research design and relying on fine-grained organizational data from the French Census. I also show that the influence of national gender culture on organizational inequality is carried across borders as these organizations acquire entities in different countries, this is particularly relevant as cross-

border acquisitions are the prevailing mode of entry into foreign economies for multinational firms (UNCTAD, 2019).

2.1.1 Related Literatures

Some papers in the international business literature have addressed questions related to the topic of this chapter in different contexts, with different data and methodologies. Wu, Lawler and Yi (2008) look at job advertisements posted by MNC subsidiaries in Taiwan and Thailand where there was no anti-discrimination legislation in effect, and establish that MNCs from countries that do have anti-age and gender discrimination laws, and with more individualist and less masculine cultures, tend to participate less in obvious age and gender discrimination in their foreign subsidiaries. Ferner et al. (2005) use case studies methodology to show evidence of a transfer of corporate diversity policies between US MNCs and their UK subsidiaries. Two more recent papers investigate the impact of the internationalization of business relationships on workplace gender diversity. Siegel et al. (2019) study how foreign firms in Korea instrumentally hire skilled but discriminated against local women in their subsidiaries to gain competitive advantage over domestic firms. Mun and Jung (2018) show how institutional investors pressure Japanese firms to become more socially responsible, focusing on the gender diversity aspect of corporate social responsibility (CSR).

International trade scholars have studied the impact of international trade and foreign direct investment to test Becker's (1967) model's implication that increased product market competition will eventually remove costly discrimination. They have found conflicting results (Juhn et al., 2013; Black & Brainerd, 2004; Berik et al., 2004) regarding the impact of increased trade on the gender wage gap. Finally, Greaney and Choi (2020) show that, in Korea, firms that switch from Korean to foreign MNC ownership employ a higher share of women as permanent workers than similar locally-owned firms.

Methodologically speaking, this chapter adds to a recent literature using firm events as levers to investigate the organizational determinants of workforce diversity. Koning and Ferguson (2019) investigate the impact of increased transparency on the representation of women or nonwhite workers among managers and use IPOs as a context. Zhang (2020), on the other hand, focuses on the role of "disruptive events" on workforce diversity and shows that M&As lead to increasing racial and gender equality.

2.2 Theoretical Developments

2.2.1 National gender norms shape firms' arrangements towards gender equality

Organizations differ across countries partly because of characteristics of their national environments that affect them at creation and throughout their organizational lives. One feature of the national environment is how it promotes gender equality, thus organizations are likely to differ across countries in the way they uphold and address

gender equality. Firm country of origin is thus likely to be an important determinant of firm gender diversity practices and outcomes.

2.2.1.1 The impact of the national environment on firms

Firms' structure, behaviors and strategies are affected by their environment. One feature of these environments, at the national level, is culture. Because cultural forces vary from country to country, firms from the same country tend to resemble each other on features that emerge from cultural influence more than they do firms from different countries.

Several scholarly traditions in the study of organizations emphasize the role of organizational environments and founding conditions in organizational life. Organizational ecologists focus on how firms need to adapt to their environment in order to survive, and how this necessity leads firms that share the same environment to develop common features (Hannan & Freeman, 1977). Imprinting scholars home in on how the environment of firms at the time of founding strongly influences their structure, practices and evolution (Marquis & Tilcsik, 2013). Neoinstitutionalist scholars identify the institutional environment as a key driver of firms' ways of organizing (DiMaggio & Powell, 1983, Scott, 1995).

Cultural forces are a major feature of organizations' environments. The influence of culture has been studied by socio-psychologists, economists (Guiso, Sapienza &

Zingales, 2005; Fernandez, 2011) as well as management scholars, particularly in the international business field. I retain Triandis' (1994) definition of culture as the "values, perceptions, attitudes, and norms characteristic of a particular society that evolve through social interaction. It is relatively stable over time, is transmitted across generations, and is learned rather than being inherent" which has the benefit of being all-encompassing. Cultural forces are not separate from institutional forces, instead culture is considered as the cognitive component of the institutional environment (Scott, 1995). I conceive of cultural forces as informal constraints on behavior while the regulative and normative pillars of the institutional environment, which include laws, regulations and governments, represent formal constraints on behavior (North, 1990; Lawler et al., 2008). These pillars influence each other but indicate different constructs.

Cultural norms operate at many levels but are particularly influential for firms at country level (Hofstede, 1980), as national borders determine coexistence under a cohesive set of beliefs, norms and values. In the context of firms, national culture provides a basis for interaction, shared understandings and a set of acceptable and desirable behaviors for organizational actors embedded in the same national environment. Individuals and the organizations they participate in are socialized in their national cultural environments, and this socialization influences behaviors and practices (Burbano and Hawn, 2019). Organizations that co-exist in the same cultural environment will tend to develop similar features and processes.

Cross-country differences in cultural assumptions about the environment and the nature of relationships within the organization have been shown to affect organizational outcomes and strategic behaviors such as the propensity to form of technology alliances (Steensma et al, 2000), compensation practices (Schuler and Rogovsky, 1998), creative performance (Chua et al., 2015) and non-market strategies (Burbano & Hawn, 2019). Cross-national cultural differences have also been shown to explain heterogeneity in management practices. For example, using data from the World Management Survey, Bloom and Van Reenen (2010) show that certain management practices, for example the use of incentives, are geographically situated, meaning that they are much more frequently used by firms in certain countries while much less in others. Culture also influences firms' structuring, as Bloom et al. (2012) show that firms headquartered in regions with high-trust cultures are significantly more likely to decentralize.

2.2.1.2 National gender culture

The GLOBE model of culture (House, 2004) identifies gender egalitarianism as an independent dimension of national culture. Gender egalitarianism, or national gender culture¹, refers to the commonly held norms, attitudes and beliefs defining appropriate behaviors and roles for members of each gender in a given country. The societies in which

¹ Throughout I will use the terms "gender egalitarianism" and "national gender culture" interchangeably.

individuals evolve and firms operate promote different levels of gender equality. Along a continuum of gender egalitarianism, some societies seek to minimize gender role differences while other societies seek to maximize them (Emrich et al., 2004). Societal cultural norms are transmitted from generation to generation and are relatively stable over time (Fortin, 2005). Large bodies of work have described the emergence of these differences as the result of multiple factors such as history, geography, or economic development, among others (Giuliano, 2017; Alesina et al., 2013; Emrich et al., 2004), here I take them as given. A number of studies in economics and entrepreneurship report that cultural gender norms matter for individual outcomes.

Cultural norms are a strong determinant of economic gender gaps. Sexist cultural norms affect women's outcomes in at least two ways; women internalize these norms and this weighs on their tastes, expectations, and beliefs, thereby limiting their choices and outcomes. Second, men who adhere to these norms and tend to hold decision-making power in the labor market, engage in discrimination against women (Charles et al, 2018). Multiple studies have established the role of national gender culture in the gender math gap, showing that girls tend to close it in societies that minimize differences in gender roles and thus providing supporting evidence for the strong influence of social conditioning and gender-biased environments (Guiso et al., 2008; Nollenberger et al., 2016). Several scholars have investigated the role of cultural norms in explaining the important cross-country variation in individual outcomes such as female participation

and advancement in economic life (Fortin, 2005). To bypass the methodological issues inherent to cross-country analysis, this literature has often used an “epidemiological approach” to analyze the effect of culture on economic outcomes. The approach relies on examining immigrants, or even descendants of immigrants, to a country to isolate the effect of culture from other factors. The idea is that the descendants of immigrants share, by construction, the markets and institutions of the country they live in, but since their parents came from countries with different cultures, and because culture is “portable” (while markets and institutions are not), they likely do not share the same culture (Fernandez, 2007; Zinabou, 2017). A set of studies using data on immigrants thus shows the impact of culture on outcomes such as female labor force participation (Fernandez & Fogli, 2009; Blau et al., 2013b, Gay et al., 2018), fertility decisions (Fernandez & Fogli, 2006) and gender wage gaps (Antecol, 2001).

In the entrepreneurship literature, Thebaud (2015), Ahn and Luo (2019) and Tonoyan et al. (2020) present evidence that societal gender norms influence women’s perceptions of start-up ease and decisions to become entrepreneurs across countries. Dimitriadis et al. (2017), show that cultural beliefs about what is appropriate behavior for women and men in the geographic community in which a social venture is embedded impact female social venture founders’ strategic decisions, here whether to engage in commercial activity.

Firms' ways of organizing are strongly influenced by their country of origin's cultural norms. Beliefs and attitudes held by employees participate in shaping firm processes, practices, routines and ways of organizing. I focus of the component of beliefs and attitudes that concern gender equality and argue that firms are likely to embody their country's cultural environment regarding gender equality in their practices and design.

2.2.1.3 National gender culture and firm-level features

Workplaces are one of the primary structural forms that recreate societal gender stratification (Ridgeway, 1997). Phillips (2005) refers to firm-specific gender hierarchies which establish ordinal status rankings between genders. These either tend to place women in leadership or subordinate positions. The determinants of firms' gender hierarchies are manifold, I specifically propose that national cultural norms are a determinant of workplace gender hierarchies. Commonly held beliefs and attitudes about gender roles in society are likely to translate to firm-level manifestations. National gender culture is likely to impact workplace gender equality outcomes through its influence on two major levers of organizational gender equality; employees, as they hold decision-making authority or just contribute to the workplace environment, and organizational structures and processes, whether formal or informal.

In more gender egalitarian countries, individuals are more likely to hold gender equal values and beliefs and this affects both the supply and demand side processes

generating gender disparities. At the individual level, beliefs that minimize differences in gender roles decrease the prevalence of limiting self-stereotypes for employees of all genders, such as “women cannot be leaders” or “men cannot be nurses”, which have been shown to produce gendered career aspirations (Thébaud & Charles, 2018). This in turn leads to decreased occupational (Del Carpio & Guadalupe, 2018) and vertical (i.e., across the hierarchical ladder) organizational segregation (Eagly & Karau, 2002; Heilman, 2012). At the interpersonal level, as employees and managers in firms, more gender egalitarian peers are more likely to foster workplace relationships in which women are perceived and treated as equally fit to occupy leadership positions. This matters because interactional processes are one of the main mechanisms explaining persisting gender discrimination (Ridgeway, 1997); when people interact they automatically resort to sex categorization which leads them to rely on and act according to ingrained gender stereotypes. Still at the interpersonal level, managers’ personal beliefs directly affect women employees’ advancement (Briscoe & Joshi, 2017) and female-friendly supervisors positively impact women’s careers (Bednar & Gicheva, 2018). Finally, at the organizational level, more gender egalitarian employees are also likely to sustain a supportive organizational culture that fosters women’s career advancement (Badjo & Dickson, 2001).

Further than just the individuals comprising the organization, the firm’s structure and practices are also likely to bear the marks of cultural norms. I argue that organizations in more gender egalitarian societies are more likely to organize and to develop practices

in ways that favor more gender equality in the workplace. Cultural gender norms around the definition of the “ideal worker” matter for how organizations are designed and how they operate. In societies where the “ideal worker” is conceived of as having very few responsibilities outside of work (Acker, 1990; Pedulla & Thébaud, 2015), firms tend to demand and reward long or irregular hours from their employees (Cha and Weeden, 2014) without simultaneously providing resources needed to manage family duties; work-family conflict is thus baked into the organization of work. This inherent work-family conflict affects all employees but most markedly women, who still are perceived as having greater responsibility for childrearing (Correll, Benard, & Paik, 2007). Breschi et al. (2020) show that these requirements to work longer hours penalize women’s career progressions. It is likely that differences in gender norms across countries, in how, for example, men are perceived as equally responsible for family-related responsibilities, thus lead to cross-country differences in how firms organize work.

I also argue that in countries where norms and beliefs promote more gender equality, firms are more likely to develop formal processes and policies to guarantee equal opportunities for all employees in the workplace. More egalitarian managers and a pro-diversity culture have been shown to foster the implementation of diversity enhancing programs (Dobbin et al., 2011). In practice, this translates into a variety of possible features, including putting in place mentorship and networking programs for members of underrepresented groups, appointing a diversity lead or taskforce, targeted recruiting

among underrepresented groups, or sponsoring affinity groups, these have all been shown to lead to increases in managerial diversity (Kalev et al., 2006). More egalitarian gender norms at the societal level are likely to lead to a higher prevalence of such practices among firms in this society, I can thus expect differences across countries in how widespread the adoption of such practices is.

The direct impact of national gender culture on organizational inequality is difficult to investigate for many previously described data availability and methodological reasons. Investigating how acquirers' national gender culture affect inequality at acquired firms in the context of cross-border acquisitions rather than using direct cross-country comparisons allows to disentangle the impact of culture from that of the formal institutional and economic setting of countries. Indeed, during the post-acquisition period, the acquired firms go through changes mandated by the acquirers and these changes are likely to be influenced by the acquirers' cultural norms.

2.2.2 The influence of acquirers' national gender culture on acquired firms' outcomes

Acquisitions are a good context to study the role of culture because, in the post-acquisition period, the acquiring firm exercises influence over the acquired firm. This influence may be embodied in key employees and leaders, or happen through the diffusion of processes and practices. If acquirers' national gender culture is reflected in

employees, structures and practices, it is thus likely to impact acquired firms' gender diversity outcomes post-acquisition.

Alternatives available to acquirers post-acquisition range from fully integrating the acquired firms' operations with theirs to leaving them to operate independently. How acquiring and acquired firms relate to each other post-acquisition and the degree of post-acquisition integration depend on a host of factors, including the strategic motivation behind the acquisition, as well as characteristics of the acquirer and of the target firm. While the depth and comprehensiveness of the integration varies from one acquisition to another, similarities exist across all. These include the implementation of new routines, practices, and organizational culture at the acquired workplace, and increased involvement of the acquiring firm's management at the acquired firm. An acquisition involves mutual adjustments between the two involved parties, but changes tend to be one-sided, occurring predominantly within the acquired firm (Pablo, 1994). The literature on MNCs has, in its more recent developments (Kostova et al., 2008), challenged the view stating that MNCs need to fully adapt to the host-country context in order to counter the "liability of foreignness", and rather emphasized a need for internal consistency that leads to a diffusion of practices within affiliated companies. Several papers in the M&A and international business literatures have then highlighted cross-border transfers from acquiring to acquired firms and from MNCs to affiliates with a focus on the home-country characteristics acquirers bring to target firms (Mtar, 2010). These papers show the impact

of cultural or institutional distance, along multiple dimensions, on acquired firms' outcomes such as asset restructuration and resource redeployment (Capron & Guillén, 2009), human resource management practices (Björkman et al., 2007) or knowledge stocks (Sarala & Vaara, 2010).

As compared to other organizational outcomes that have been studied thoroughly in the past, workplace gender diversity is not usually considered a strategic outcome of firms and how it is impacted during cross-border acquisitions remains unclear. Because acquirers strive to achieve a certain degree of internal consistency after the acquisition, I expect that culturally inspired features relevant for workplace gender diversity are likely to be transferred from the acquirer to the target.

The new ownership relationship that an acquisition establishes implies that the acquiring firm's leadership will become involved in decisions made at the acquired firm. The leadership team at an acquiring firm from more gender egalitarian countries is likely to be more gender egalitarian itself, it is also more likely to be aware of issues regarding gender equality and motivated to improve gender equality at the acquired firm. Because their culture minimizes gender role differences, acquirers from certain countries are also more likely to employ more women in leadership positions already. This could matter as women managers have been shown to act as empowering role models for lower-rank female employees (McGinn & Milkman, 2013) and to foster higher female promotion rate (Kunze & Miller, 2017; Cohen & Broschak, 2013) and smaller gender pay gaps (Bhide,

2019; Flabbi et al., 2019; Tate & Yang, 2015). Witnessing women in management positions also creates long-lasting mental frames that associate women with leadership traits for all employees (Phillips, 2005).

After an acquisition, change in gender equality outcomes could happen relatively fast, it is common, in the first few years after an acquisition, for the acquirer to make changes in the acquired firms' leadership team either through promotions or appointment of new executives from the outside (Quah & Young, 2005). The literature has also shown that on average about one fourth of managers leave immediately after an acquisition (Krug and Aguilera, 2004), they thus most likely have to be replaced. These scenarios could lead to changes in female representation in upper management at the acquired firm. Changes in the gender pay gap could happen through the setting of the wages for the newly recruited employees, and through the first rounds of yearly evaluation and salary evolution decisions happening after the acquisition, with more or less equality-fostering processes being progressively implemented.

I thus theorize that because firms from more gender egalitarian countries are likely to employ more gender egalitarian managers as well as more female managers, and to display more gender equality fostering features and processes than firms from relatively less gender egalitarian countries, they are also likely to positively influence gender diversity at the firms they acquire more than firms from relatively less gender egalitarian countries.

H1: Firms acquired by acquirers from more gender egalitarian countries will see a greater change in gender equality post-acquisition, compared to firms that get acquired by acquirers from less gender egalitarian countries.

I examine three channels through which the effect of acquirer's national culture on acquired firms' gender equality outcomes could unfold.

2.2.2.1 Post-acquisition cultural influence through integration in new structure, processes and systems

Acquirers that choose a high degree of post-acquisition integration are likely to exert influence on acquired firms, leading them to adopt more of the structural features, routines and practices acquirers have in place in their home-country offices, which could in turn impact workplace gender equality at acquired firms.

Throughout the literature on M&As, integration has received several definitions (see Graebner et al., 2017) such as "the extent to which the acquirer consolidates the functional activities of the target into its reporting hierarchy" (Zaheer et al., 2013), or operational integration which is "the extent to which the acquirer standardizes work procedures and systems, and removes overlapping operations" (Vaara et al., 2012). Here, I retain the following conceptual definition; post-acquisition integration is the process through which the acquiring firm integrates and acculturates the acquired firm into its organizational structure, its processes, and progressively diffuses its practices. In the post-

acquisition integration process, the acquired firm most often conforms to the acquirer's cultural norms (Chatterjee et al., 1992) and adopts its policies and processes (Schweiger & Walsh, 1990). The acquired firm also typically undergoes important structural changes in the post-acquisition period (Lin, 2014).

As previously described, gender cultural norms participate in shaping organizational features. Thus, one channel through which the acquirer could influence the acquired firm's gender equality outcomes is the transfer of routines and practices and the integration of the acquired firm's employees in the acquiring firm's formal management systems, such as recruitment and talent assessment systems. These processes and practices may be openly focused on increasing and fostering workplace gender diversity; for example, targeted recruitment, diversity task forces and managers, or affinity groups (Kalev et al., 2006). They may also pass on work design features that favor work-life balance (Breschi et al., 2020; Cha & Weeden, 2014). Finally, the subtler acculturation process at play after an acquisition could impact gender diversity as well through changes in organizational culture (Badjo & Dickson, 2001). These transfers are likely to be more exhaustive if the post-acquisition integration is more comprehensive.

H2a: The effect of acquirer's gender egalitarianism on gender equality at the acquired firm will be larger with a higher degree of post-acquisition integration.

2.2.2.2 Post-acquisition cultural influence through new leadership

Acquirer's national culture may be transferred to the acquired firm by key employees. In order to ensure an even deeper level of integration and to make sure their structure and processes are properly adopted, acquiring firms tend to intervene directly at acquired firms by either sending employees from headquarters to the new subsidiary (Hébert et al., 2005), or appointing new outside people to leadership positions at the acquired firm (Ranft & Lord, 2002). CEOs appointed from outside the acquired company, in particular, will likely bring about more change than insider CEOs who remain appointed or are promoted from within the acquired firm (Quah & Young, 2005). The new CEO and or leadership team appointed by the acquiring firm at the acquired firm is likely to align more closely with the acquiring firm's leadership's values and style than if there is no change. The arrival of new individuals, with different beliefs regarding gender roles, in leadership positions could have an impact on gender diversity at the target firm. Indeed, managers' norms and beliefs have a direct impact on employees' advancement (Carnahan & Greenwood, 2018).

H2b: The effect of acquirer's gender egalitarianism on gender equality at the acquired firm will be larger when the acquired firm's leadership changes after the acquisition.

2.2.2.3 Post-acquisition cultural influence through target-led isomorphism

Another possible mechanism through which acquirers influence their targets, was laid out by Kostova (1999) and draws from resource dependence theory (Pfeffer &

Salancik, 1978) and institutional theory (Meyer & Rowan, 1977). Kostova suggests that, because the acquired firm is less powerful than the acquirer and hierarchically inferior, it can develop a perception of dependence towards the acquirer. Indeed, the acquirer hold resources that it may choose to distribute or not to the acquired firm, and the acquired firm may act to increase its chances of getting access to these resources. Institutional theory suggests that the acquired firm would then actively mimic the acquiring firm's ways of doing, for example by implementing practices that have gained legitimacy at headquarters, to seek favor from the acquiring firm. Perceptions of being dependent on the acquiring firm may also provide an added incentive to comply with the acquiring firm's requests for practice standardization and to commit actively to this process (Kostova, 1999). According to this view, the impetus for change in gender equality outcomes at the acquired firms would come from the acquired firms themselves, as they try to gain legitimacy in the eyes of their acquirer and to qualify as the receptor of resources the acquirer could provide.

H3: The effect of acquirer's gender egalitarianism on gender equality at the acquired firm will be larger when the acquired firm is dependent on the acquirer for resources.

2.3 Data

I look at French firms that undergo an acquisition over the 1993-2016 period using a dataset that results from the matching of several sources; including data on M&A transactions from Bureau van Dijk's Zephyr, confidential access employer-employee data

from the French administration and data that captures country-level gender equality. France is a good laboratory for my analysis as it is one of the largest European economies and it is among the largest destinations for cross-border acquisitions. It was the seventh largest destination in the world in 2019 with firm sales amounting to about 17 billion dollars (UNCTAD, 2019).

2.3.1 M&A transactions data

The data on acquisition transactions come from Bureau van Dijk's Zephyr database. I extract all transactions where the target firm is French and registered in France. In Zephyr, the history of deals goes back to 1997, this is thus when my sample of transactions starts. This is convenient since the employer-employee data made available to me by the French statistics office starts in 1993, thus leaving a pre-period window of observation of four years for target firms involved in the first recorded deals in Zephyr. These data provide key information on deal characteristics, deal timing and acquirer characteristics. Importantly, it labels target firms with a BvD identifier that includes the same national firm identifier (SIREN) used in the administrative data, allowing for a clean match between the two databases. I clean the transactions data to only keep deals that are relevant for my study's purposes. I limit my sample to completed acquisitions (not mergers, joint ventures, IPOs, etc.) in which the acquirers are firms (not funds, governments, individuals or families) and targets are also firms (not standalone assets or

divisions). By acquisitions I mean deals where the acquirer ends up with 50% or more of the equity of the target firm, I exclude deals that are reinforcing a pre-existing majority in the target firm. The average final stake held by the acquiring firm in the acquired firm is 95.4%.

Since I want to ensure homogeneity in target firms' cultural baseline, I drop deals in which the target appears to be the French subsidiary of a foreign firm. I manually check all target names that include the word "France", and I drop the deals for which the target appears to be the French subsidiary of a foreign firm, one such example is "Thomas Cook France". For the same reason, I pay particular attention to firms that appear in the data as targets of multiple deals. In such cases, I keep the earliest deal and censor the years after the second deal (i.e. the firms drop out of the sample the year of the second deal). I also drop deals where the vendor firm, when there is one, is listed as having a nationality other than French.

I make sure that there are no remaining deals in which a private equity or venture capital firm is the acquirer by dropping deals where the acquirer is classified as pertaining to SIC Major Group 67 "Holding and Other Investment Offices" or 62 "Security and Commodity Brokers, Dealers, Exchanges, and Services".

The key variables in this data are the completion date of the acquisition, which helps build the *Post* dummy variable (1 if the observation is in a year after the acquisition, 0 if it is before the acquisition), as well as the acquirer's country of origin.

2.3.2 Administrative data

I use restricted access employer-employee data provided by the French National Statistical Institute (INSEE) for the period 1993 to 2016 to observe characteristics of the acquired French firms' workforces. The data are derived from confidential yearly social security records that all French businesses with employees must fill, the "Déclaration Annuelle des Données Sociales" or Annual Declaration of Social Data (DADS). Employers report information about their employees to both fiscal and social security authorities yearly and for each of their establishments. The information that must be declared for each employee includes their sex, age, city of residence, occupation code, terms of employment (full time, part time), number of paid hours and wages. Information at the establishment and firm level is also reported, such as industry, geographic location, total number of employees.

The INSEE produces several files using the DADS records, here I exploit one of them; the one at the "poste" or job spell level, where each observation corresponds to one employee in a particular establishment of a firm (i.e. a summation of all employment spells of an employee within an establishment) in a given year. The INSEE characterizes job spells as either primary or secondary. A job spell is considered as primary if the volume of work and the corresponding level of pay are deemed sufficient. If the pay is greater than three months of minimum wage, or if the amount of time worked is greater

than thirty days, 120 hours and 1.5 hours per day, the job spell is considered primary². Otherwise, it is deemed secondary. I drop observations corresponding to secondary job spells, since my focus is on characteristics of firms' permanent workforce.

I then calculate my dependent variables of interest at the firm-year level.

Share of female employees. I calculate the share of women among firm full-time employees.

Share of female executives. The French occupational categorization system, the PCS-ESE, is useful to distinguish workers according to their hierarchical level in the organization (per Caliendo, Monte and Rossi-Hansberg, 2015). I calculate the share of female full-time employees in occupational category 3, which refers to senior staff or top management positions, including chief financial officers, heads of human resources, and logistics and purchasing managers, etc. I make sure not to include CEOs in this calculation.

Women CEO/Head of Business. Occupational category 2 technically indicates chief executive officers, but in the data, I observe that not all firms have an employee in occupational category 2, I thus choose to proxy the CEO by the highest paid full-time employee. I create a binary variable that is 1 if the highest paid employee in the firm is a woman and 0 otherwise.

² <https://www.insee.fr/en/metadonnees/definition/c2003>

Gender wage gap. The gross wage as it appears in the DADS data is the sum of all amounts paid to the employee as specified in her contract, it includes, on top of regular wages, incentive schemes and profit sharing, company savings plan, in-kind benefits net of mandatory employee and employer payroll tax contributions. For standardization purposes, I first convert all wages from French francs to Euros for data up until 1999, I then normalize the amounts to 2018 Euros using the annual deflators from the Federal Reserve Economic Data. Then, to correct potential bias created by measurement error, I winsorize the wages in my data at the first and last percentile. I use the variable reporting the full-time equivalent ratio to standardize the wages according to the employee workload. I calculate the wage gap as a female earnings ratio (as in Bhidé, 2019) in the following way $\text{Mean}(\log(\text{Earnings}_{\text{Females}})) - \text{Mean}(\log(\text{Earnings}_{\text{Males}}))$ which essentially provides female full time equivalent earnings as a percentage of male full time equivalent earnings. I look at wage gaps for full-time employees in order to mitigate concerns related to changes in earnings coming from important changes in hours worked.

Residualized gender wage gap. In order to be able to observe the change in the wage gap independently from the change in female executive share or CEO, I calculate the residualized wages after controlling for occupation codes (2-digit), age, age squared, and industry and region fixed effects, these represent the portion of the wages that remains unexplained. I then calculate the female to male earnings ratio using the residualized wages.

2.3.3 Country Gender Gap Score

I use the Global Gender Gap Index (GGGI) produced by the World Economic Forum (WEF) to assess the state of gender equality in the countries from which the acquiring firms in my data originate (WEF Global Gap Report, 2018). Past research investigating the gender equality component of national culture has used the GGGI, such as Guiso et al. (2008), Fryer and Levitt (2010), and Nollenberger et al. (2016) which all study the role of national culture in the math gender gap.

The WEF started producing the index in 2006 with 115 countries, representing over 90% of the world's population, it progressively increased coverage to reach 149 countries in the 2018 edition. The GGGI measures gaps, rather than levels, in outcomes variables, rather than gaps in means or input variables. Measuring gender-based gaps in access to resources and opportunities in individual countries rather than the actual levels of the available resources and opportunities in those countries makes the index independent from the countries' levels of development (WEF Global Gap Report, 2018). Using outcome variables rather than "inputs" and "means" such as laws (Women, Business and the Law Database, The World Bank), norms and attitudes (World Values Survey) has advantages because country-level inputs to gender equality are multifold, some are hard to quantify in a way that allows comparisons across countries, their potency might depend on historical aspects that are also hard to measure. Ultimately, "inputs" and "outputs" are likely to be highly correlated, as laid out in the GLOBE study: "the concept of gender

equality, like gender discrimination, constitutes a behavioral manifestation of societies' beliefs about the appropriate allocation of roles between the sexes" (Emrich et al., 2004). I choose to use outcomes to put the focus on what countries have achieved in terms of gender equality, and because it provides a more straightforward way to compare countries.

In each covered country, the GGGI assesses the gap between men and women across four categories: economic participation and opportunity, educational attainment, health and survival and political empowerment (WEF Global Gap Report, 2018). In my analysis, I use the *Economic Participation and Opportunity* subindex of the GGI as it is the most fitting to capture country level gender equality in the workplace. The *Economic Participation and Opportunity* subindex is a composite measure, it incorporates three gaps based on data from the International Labour Organization and the United Nations Development Programme. A participation gap, that captures the difference between women and men in labor force participation rates. A remuneration gap is calculated using both a ratio of estimated female-to-male earned income and a qualitative indicator gathered through the WEF's annual Executive Opinion Survey. Finally, the advancement gap is captured through two statistics; the ratio of women to men among legislators, senior officials and managers, and the ratio of women to men among technical and professional workers. The score ranges from 0 to 1 and larger values point to a better position of women in society (WEF Global Gap Report, 2018).

I build the *Acquirer Gender Gap Score* variable by averaging WEF Economic Participation and Opportunity country scores over the 2006-2018 period, since it is meant to capture a construct that is relatively stable over time. My results are satisfactorily robust to using the raw yearly WEF scores instead.

2.3.4 Final sample

I match the country-level gender scores to the acquisition data using Acquirer country codes provided by Zephyr. I then match the acquisition data to the administrative data using the national firm identifier “SIREN” that is available in the BvD database. The SIREN number is the firm identifier issued by the French Statistics Office when a firm registers its business in France. It is a 9-digit number. It is assigned only once and kept on the register until the legal entity ceases to exist (death or cessation of all activity). For the analyses, I only keep acquired firms with 5 employees or more (on average over the years of observation) that are in the administrative data for at least one year before completion of the acquisition and one year after. The final sample is composed of 21,975 observations for 1,249 firms.

2.3.5 Descriptive statistics

Descriptive statistics are reported in Table 1. The final sample contains 1,249 French firms that were acquired at some point between 1997 and 2015. I observe these

firms in the French administrative data during the 1994-2016 window, on average a firm is in my data for 17.7 years. For acquired firms, in the year prior to acquisition, the average size is 182.2 employees, only 3.3% are listed companies, 33.3% operate in the manufacturing sector and 66.6% in the service sector (see Figure 1 for a more precise breakdown of acquired firms by industry). Figure 2 presents a breakdown of acquisitions per year. In the year prior to acquisition, 16.0% of firms are headed by women, the average female share of executives is 25.3%, the average wage gap is 20.8% and the average residual wage gap is 11.3%.

Acquirers are much larger firms with 15,424 employees on average and a median size of 540. 58.5% are classified as operating in the manufacturing sector and 40.3% in the service sector, 46.8% are listed companies. Figure 3 provides a breakdown of acquirers by country of origin. American firms represent a significant share of foreign acquisitions, in my analysis, I conducted robustness checks to ensure that US acquirers do not disproportionately affect my results. The average acquirer country gender score is 0.69 and varies from a minimum of 0.33 (Saudi Arabia) to a maximum of 0.82 (Norway). Figure 4 displays the country scores.

Table 1: Acquired and acquiring firms' characteristics

	Year prior to acquisition					
	N	Mean	Median	Std. Dev	Min	Max
<i>Acquired firms</i>						
# Employees	1,249	182.17	43	1,015.6	5	32,466
Manufacturing	1,249	0.3331	0	0.4715	0	1
Service	1,249	0.6661	1	0.4718	0	1
Listed	1,249	0.0328	0	0.1782	0	1
Year of acquisition	1,249	2006.6	2007	5.0811	1997	2015
Fem. share employees	1,249	0.3484	0.3193	0.2110	0	1
Fem. share executives	1,162	0.2539	0.2000	0.2282	0	1
Woman CEO dummy	1,249	0.1601	0	0.3669	0	1
Fem. Earnings Ratio	1,199	-0.2327	-0.2016	0.2782	-1.9080	1.0277
Fem. Res. Earnings Ratio	1,136	-0.1200	-0.1097	0.2054	-1.6567	0.9021
<i>Acquiring firms</i>						
# Employees	810	15,424	540	61,320	1	740,316
Manufacturing	1,249	0.5853	1	0.4929	0	1
Service	1,249	0.4027	0	0.4906	0	1
Listed	1,249	0.4676	0	0.4991	0	1

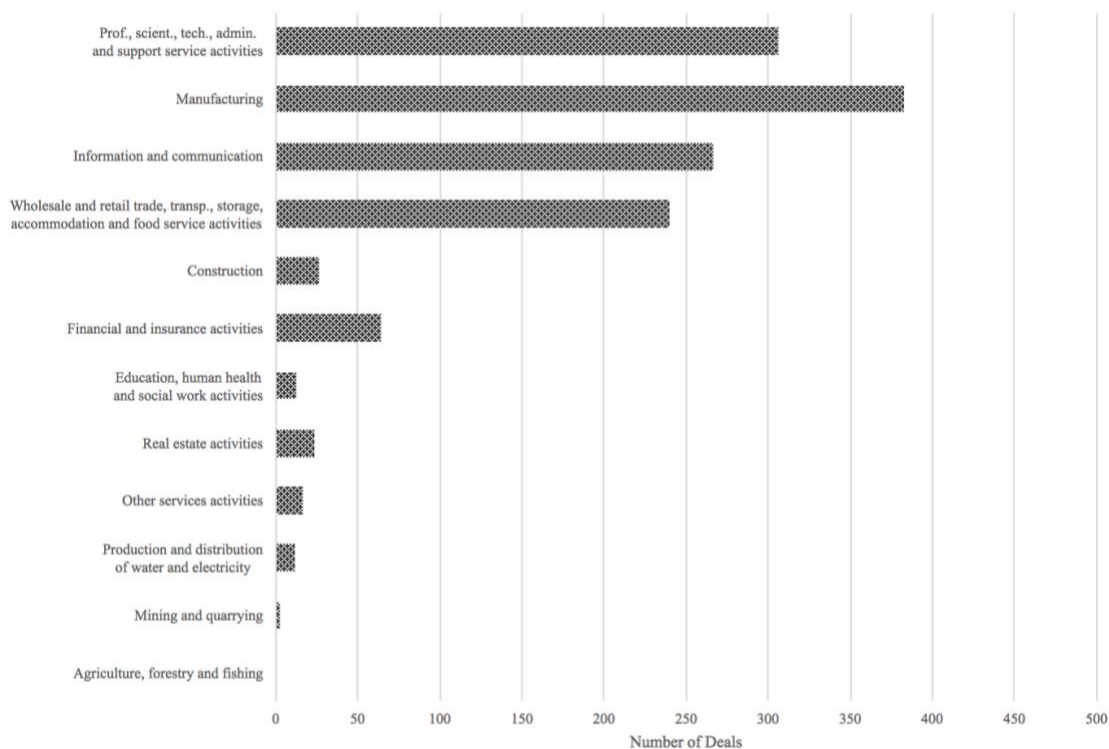


Figure 1: Deals by industry

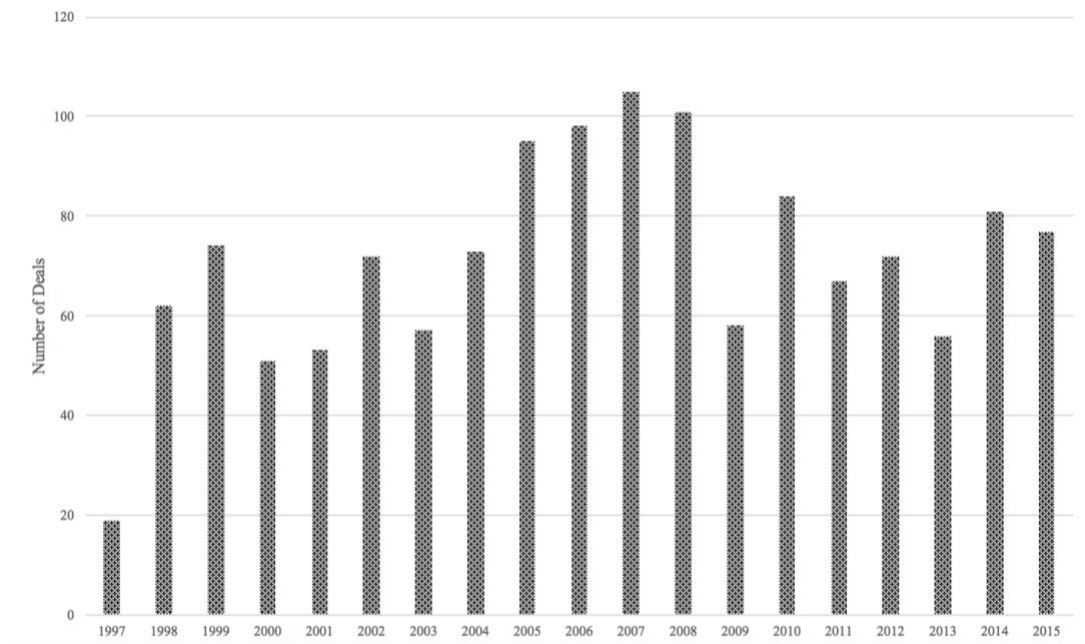


Figure 2: Deals by year

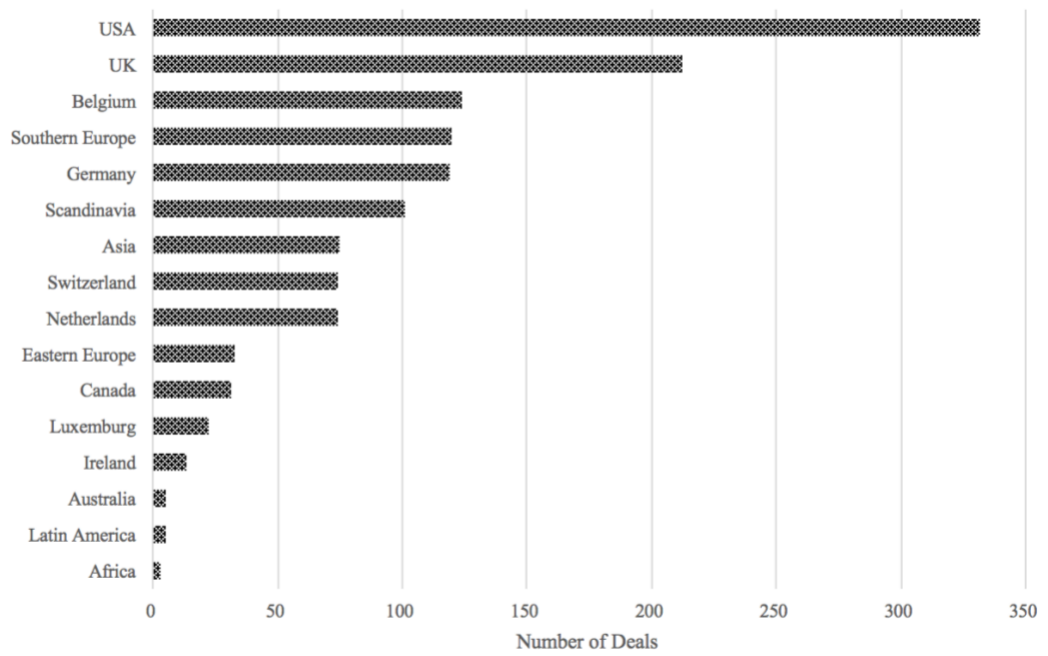


Figure 3: Deals by country of acquirer

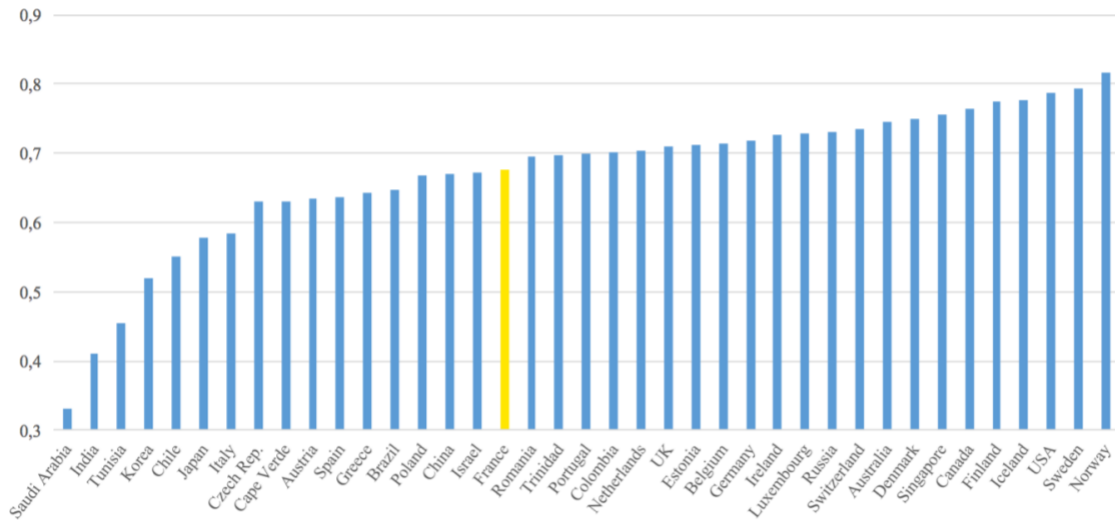


Figure 4: Country Gender Gap Scores

2.4 Empirical Strategy

I study acquisition events to assess the effect of acquirers’ home country gender culture on gender equality at acquired firms post-acquisition. I use these acquisition events and analyze acquired firms before and after their acquisitions by another firm to capture changes in gender diversity in management positions and in the gender pay gap post-acquisition. I test if these changes are driven by characteristics of the acquiring firms’ home country culture.

2.4.1 Model Specification

I apply a difference-in-differences approach, using a continuous treatment variable (as in Acemoglu et al., 2004) to estimate the effect of being acquired by a foreign

firm on gender diversity outcomes at the target firm, depending on the gender equality score of the acquiring firm's country of origin. I estimate the following difference-in-differences specification at the firm-year level:

$$Y_{ft} = \beta_1 Post_t + \beta_2 Post_t Acquirer\ Gender\ Gap\ Score_c + \beta_3 S_{ft} + \lambda_{it} + \alpha_f \delta_p + \epsilon_{ft}$$

where f denotes a firm in industry i , at time t and Y_{ft} indicates the dependent variable of interest. $Post_t$ is an indicator set equal to one for years following acquisitions and zero otherwise, $Acquirer\ Gender\ Gap\ Score_c$ is my continuous treatment variable, c denotes the acquirer's country of origin and ϵ_{ft} represents the remaining error. S_{ft} is a control variable for the number of employees in each acquired firm each year. α_f is a firm fixed effect which controls for firm characteristics that do not vary over my sample period interacted with a dummy variable δ_p equal to one if the observation is between four years prior to and four years post-completion, it ensures the difference-in-differences estimators are not identified off non-relevant comparisons between "extreme" time periods (for example, between $t-9$ and $t+6$). I also control for interacted industry and year fixed effects λ_{it} to control for secular trends that vary by industry. I cluster standard errors at firm level to account for serial correlation.

2.4.2 Endogeneity concerns

Challenges to the causal interpretation of my results come from the fact that acquisitions are not random events. Acquiring firms select their targets according to a

range of criteria and although a target firm's gender diversity is unlikely to be a main factor in an acquisition decision, it is possible that other unobserved dimensions that correlate highly with gender diversity may factor into the acquisition decision. In other words, target firms acquired by firms from more gender egalitarian countries and target firms acquired by firms from less gender egalitarian countries may differ in unobserved dimensions and these factors may account for the differential increase in gender diversity after acquisition. Although I cannot entirely dismiss this explanation, I provide evidence to suggest that it is not the main contributor to my findings.

First, I provide evidence that there is no strong correlation between acquirers' home-country gender equality score and observed characteristics of the acquired firms in the year prior to the acquisition such as size, industry, being listed and the gendered outcomes (see Table 2 and Figure 5). I also show that there is no strong correlation between acquirers' home-country gender equality score and other observed characteristics of the acquirer (size, industry, being listed). This could have been an issue, for example, if certain industries generally foster more gender equality and acquirers from more gender egalitarian countries operated more in these industries.

Table 2: Correlation matrix

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
<i>Acquired firms</i>										
1. # Employees	1									
2. Manufacturing	-0.0004	1								
3. Listed	0.1809*	-0.0746*	1							
4. Fem. share employees	0.0103	-0.2393*	0.0531	1						
5. Fem. share executives	-0.0056	-0.1923*	0.0612	0.6028*	1					
6. Woman CEO dummy	0.1296*	-0.0826*	0.0957*	0.2046*	0.2074*	1				
7. Fem. Earnings Ratio	0.0175	0.2507*	-0.0420	-0.2511*	0.0157	0.1838*	1			
<i>Acquiring firms</i>										
8. # Employees	0.0740*	-0.0614	0.0083	-0.0264	0.0010	0.0008	0.0435	1		
9. Acq. Gender Gap Score	0.0037	-0.0497	-0.0922*	0.0701	0.0154	-0.0615	-0.0591	0.1016*	1	
10. Manufacturing	-0.0318	0.4086*	-0.0236	-0.1215*	-0.0993*	-0.0389	0.0343	-0.0562	-0.0325*	1
11. Listed	0.0337	-0.1021*	0.0527	-0.0154	-0.0591	-0.0079	-0.0932*	0.1665*	0.2300*	-0.0802*

* p<0.05

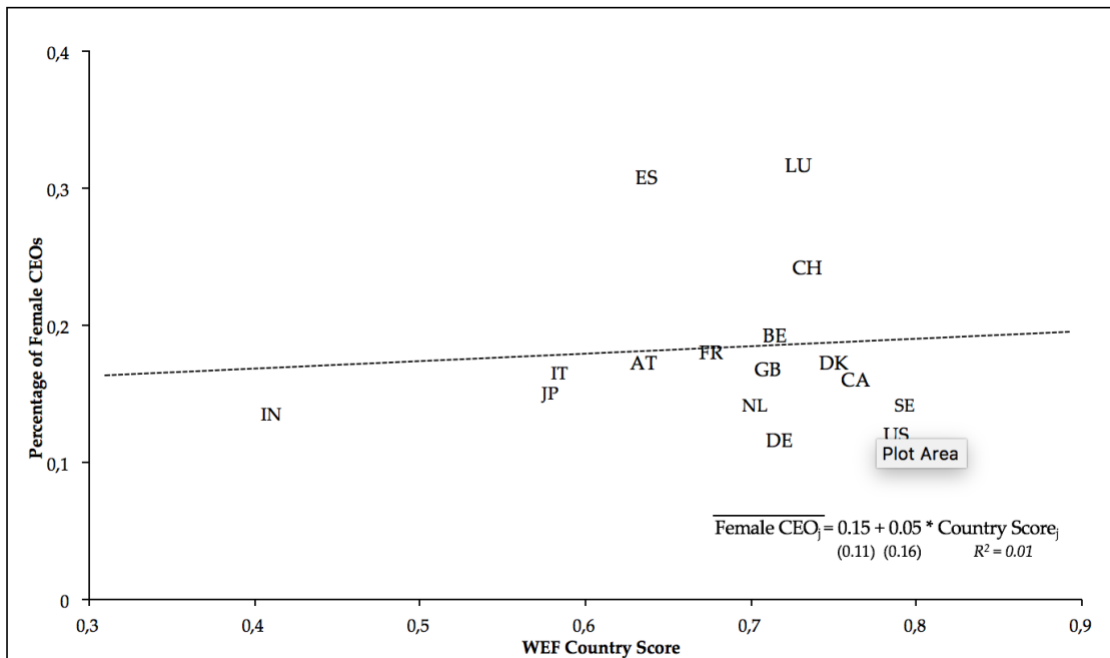


Figure 5: Percentage of female CEOs and acquirer country gender scores, pre-acquisition

Including acquired firm fixed effects in my specifications lets me examine within-firm changes rather than cross-sectional difference, which removes the effect of time-invariant unobserved factors.

A remaining potential threat to identification would be time-varying unobserved factors that make firms both more likely to get acquired by firms from more (less) gender egalitarian countries and more likely to increase (decrease) gender diversity. Based on the literature and common sense, it seems unlikely that there would be unobserved shocks that simultaneously affect the diversity outcomes and the acquisition decision.

I show below that there are also no differential target firm gender diversity trends correlated with future acquirer home-country gender gap score in the pre-acquisition period. I test for parallel trends in gender equality outcomes prior to acquisition by estimating the following equation:

$$Y_{ft} = \alpha_f + \lambda_t + \sum_{t=-4}^5 \beta_t \text{Acquirer Gender Gap Score}_c \cdot I(\text{Year}_t) + \epsilon_{ft}$$

Where Y_{ft} represent the variables measuring firm gender equality outcomes (share of female executives, woman CEO and wage gap) for firm f in year t^1 , $\text{Acquirer Gender Gap Score}_c$ is the acquirer home-country gender gap score and α_f and λ_t are the firm and year fixed effects respectively.

The results for all three main dependent variables are represented in Figure 6, Figure 7 and Figure 8. I find no evidence to reject the null hypothesis that the coefficients on the $\text{Acquirer Gender Gap Score}_c \cdot I(\text{Year}_t)$ interactions for periods prior to the acquisitions are 0, individually and jointly. And, looking at the 5 years following an acquisition, I see that there is a decrease in gender disparities in firms acquired by firms from more gender egalitarian countries (the F-test of joint significance for the post period coefficients supports rejecting the null).

¹ Year t is in reference to the year of when the acquisition deal is completed.

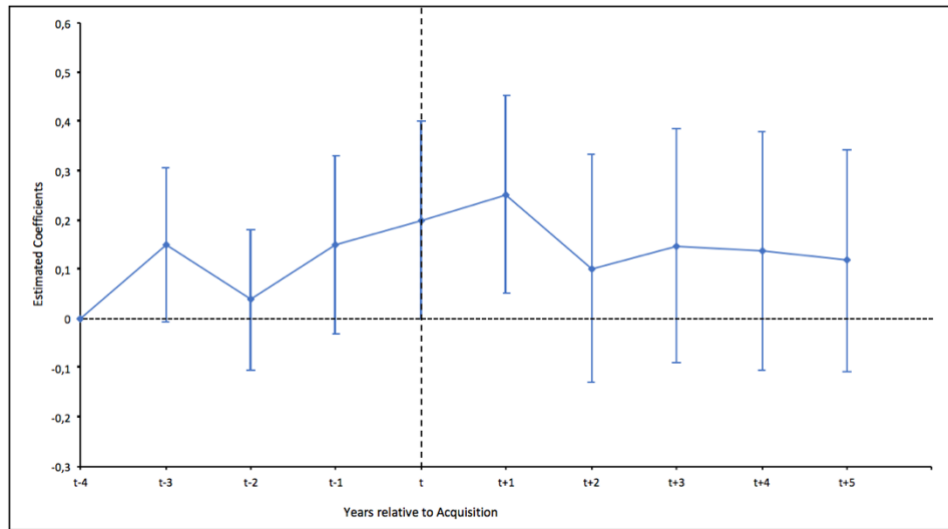


Figure 6: Female share of executives

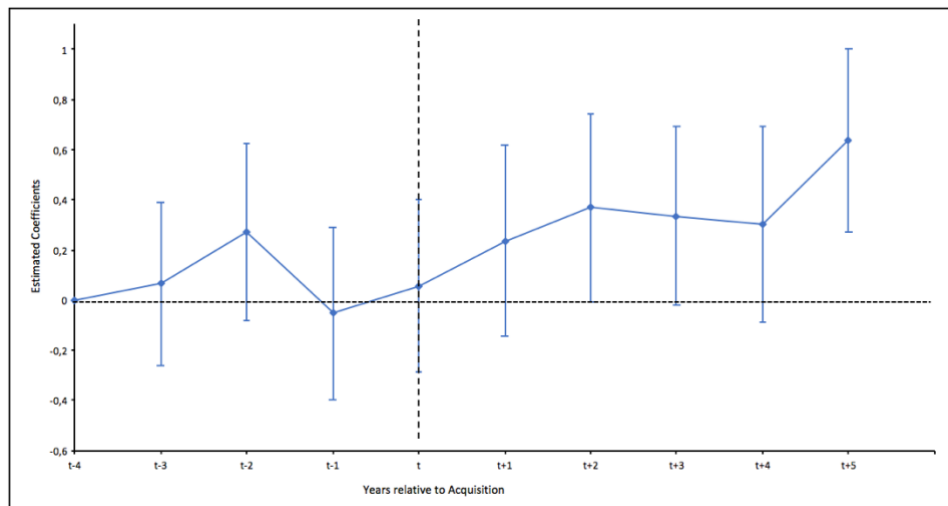


Figure 7: Female CEO

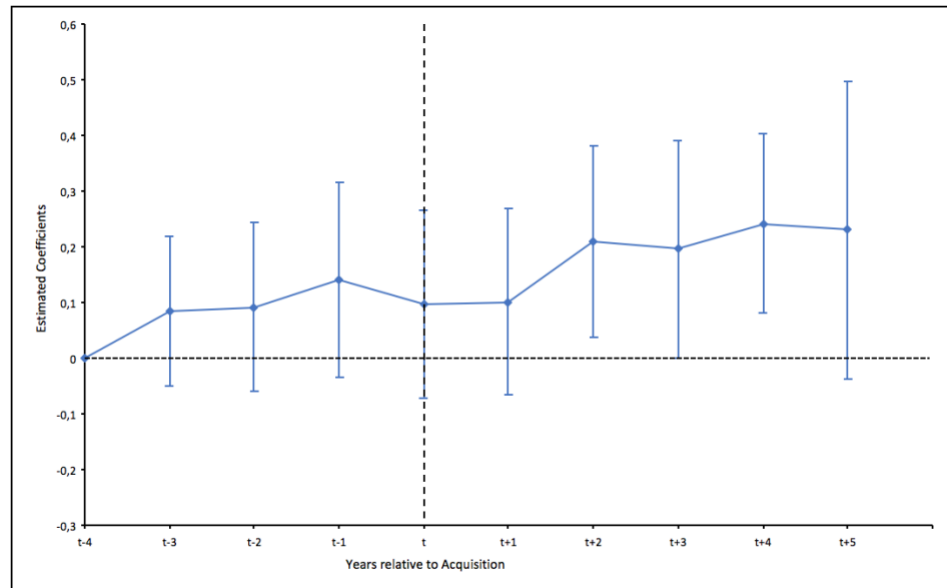


Figure 8: Female residualized earnings ratio

2.5 Results

2.5.1 Impact of national gender culture on main outcomes

I first look at the impact of acquirer’s national gender culture on female employment shares at the acquired firm. The results for this test are in the first column of Table 3. I do not observe an impact of acquirer’s gender culture on the total female employment share.

I then turn to the impact of acquirer’s national gender culture on female executives share. I find a significant effect of acquirer’s country gender culture on female executives share at the acquired firm; the more gender egalitarian the culture of the acquirer’s home-country the higher the post-acquisition increase in the share of executives that are women

at the acquired firm. I find that a one standard deviation increase in the acquirer's gender equality score from the mean country score in my data is associated with a 3.0% increase (0.9 percentage point) in the share of female executives at the acquired firm.

I then investigate the impact of acquirer's national gender culture on the likelihood that a woman is leading the acquired firm post-acquisition. I find that a one standard deviation increase in the acquirer's gender equality score from the mean country score in my data is associated with a 6.2% increase (1.7 percentage point) in the likelihood of the acquired firm being led by a female CEO post-acquisition.

I first look at the impact on the overall firm wage gap and find that a one standard deviation increase in the acquirer's gender equality score from the mean country score in my data is associated with a 7.3% decrease in the gender wage gap calculated as the log ratio of average female earnings to average male earnings.

A decrease in the overall wage gap is mechanically correlated with a higher likelihood of a female CEO running the acquired firm and an increase in female executives share, since the increase of women in these higher paying leadership positions mechanically increases the average earnings of women at the firm. I thus look at the impact of acquirers' gender culture on the gender wage gap calculated using residualized wages (i.e. the component of wages not explained by observable characteristics of workers). Here too I find a significant and positive impact of acquirers' gender culture. A one standard deviation increase in the acquirer's gender equality score from the mean

country score in my data is associated with a 13.1% decrease in the residual gender wage gap. These results support my main hypothesis (H1) that acquirer's national gender culture matters for gender equality outcomes at the acquired firm.

Table 3: Gender equality outcomes at acquired firms

	(1)	(2)	(3)	(4)	(5)
	Fem. share emp.	Fem. share exec.	Woman CEO dummy	Fem. Earnings Ratio	Fem. Resid. Earnings Ratio
Post _t	0.0093 (0.0321)	-0.0796* (0.0475)	-0.1413*** (0.0680)	-0.1030 (0.0633)	-0.0872*** (0.0406)
Post _t · Acq. Gender Gap Score _c	-0.0070 (0.0441)	0.1192** (0.0656)	0.2212*** (0.0940)	0.1594** (0.0872)	0.1233*** (0.0560)
Industry · Year FE	YES	YES	YES	YES	YES
Firm · Period FE	YES	YES	YES	YES	YES
Controls: Firm Size	YES	YES	YES	YES	YES
Adj R ²	0.838	0.632	0.352	0.520	0.375
N	21,681	19,524	21,681	20,430	19,560

Robust standard errors are clustered at the firm level
* p < 0.1, ** p < 0.05, *** p < 0.01

2.5.2 Mechanisms of influence

First, I investigate how the degree of post-acquisition integration influences the main effect. The literature has described many features of either acquirer or acquired firm that correlates with the likelihood of post-acquisition integration. One of them, which applies in cross-border contexts as well, is when the acquiring firm has a centralized

organization, i.e. when the power for decision-making is concentrated at a single point in the organization. In contrast, in a decentralized organization, the power is dispersed among many individuals (Mintzberg, 1979). When they perform acquisitions, centralized firms tend to fully integrate their targets (Puranam et al., 2006) to maintain the same structure of control, while decentralized firms often keep acquisitions as separate entities, because their existing organizational structure enables this functioning. Firms that are centralized thus tend to integrate the target of their acquisition to a much larger extent than firms that are decentralized.

The level of centralization of a firm's structure is not easily available information (Bloom et al., 2012), most of the literature has used survey measures, derived the information from official corporate documents or used indirect proxies. I take the latter approach. Because of their stronger need for internal consistency and the difficulty associated with post-acquisition integration, centralized organizations tend to acquire firms less frequently and to acquire smaller targets (Arora et al., 2014). Indeed, the level of disruption involved by the integration of a separate structure into one's own is likely more sustainable when the structure to be integrated is small (Ahuja & Katila, 2001). Additionally, when the acquired firm is large in size, it likely has more power and sway to retain its structures and processes.

I compare acquisitions according to the size of the target firm (measured by the number of employees) in the year prior to acquisition. I divide acquisitions in two groups,

one where the size of the acquired firm is under the median size of acquired firms in my sample and the other where the size of the acquired firm is over the median. I also use the Zephyr database to extract all acquisitions performed by acquirers in my original sample, I then calculate the median size of all acquisitions carried out by each acquirer over the 1997-2016 period. In my analyses, reported in Table 4 and Table 5, I find some support for Hypothesis 2a.

I find that the coefficient associated with the interaction term between the Post variable and the Acquirer gender gap score is larger when acquired firms are smaller in size than when they are larger (in Table 4, Model 3 vs. 4: $\beta_{Smaller}=0.371$ vs: $\beta_{Larger}=0.137$; Model 5 vs. 6: $\beta_{Smaller}=0.219$ vs: $\beta_{Larger}=0.069$). I also find that the effect of acquirer's national gender culture is larger when the median size of the acquirer's targets is smaller (in Table 5, Model 1 vs. 2: $\beta_{Smaller\ targets}=0.198$ vs: $\beta_{Larger\ targets}=0.081$; Model 3 vs. 4: $\beta_{Smaller\ targets}=0.409$ vs: $\beta_{Larger\ targets}=0.147$). The coefficients on the interaction term are significant for the sample of smaller acquired firms but not for the sample of larger acquired firms, however t-tests show that the coefficients are not statistically different from each other across samples.

Table 4: Gender equality outcomes at acquired firms, degree of integration proxied by size of target

	(1)	(2)	(3)	(4)	(5)	(6)
	Fem. share executives	Fem. share executives	Woman CEO dummy	Woman CEO dummy	Fem. Resid. Earnings Ratio	Fem. Resid. Earnings Ratio
<i>Split samples</i>	<i>Target under median size</i>	<i>Target over median size</i>	<i>Target under median size</i>	<i>Target over median size</i>	<i>Target under median size</i>	<i>Target over median size</i>
Post:	-0.0929 (0.0887)	-0.0828 (0.0570)	-0.2422** (0.1103)	-0.0868 (0.0883)	-0.1590 (0.0906)	-0.0439 (0.0376)
Post · Acq. Gender Gap Score:	0.1369 (0.1215)	0.1197 (0.0790)	0.3710** (0.1775)	0.1369 (0.1227)	0.2189* (0.1237)	0.0688 (0.0524)
Industry · Year FE	YES	YES	YES	YES	YES	YES
Firm · Period FE	YES	YES	YES	YES	YES	YES
Controls: Firm Size	YES	YES	YES	YES	YES	YES
Adj R ²	0.580	0.688	0.366	0.351	0.351	0.386
N	7,409	11,655	9,036	12,208	7,336	11,742

Robust standard errors are clustered at the firm level
* p < 0.1, ** p < 0.05, *** p < 0.01

Table 5: Gender equality outcomes at acquired firms, degree of integration proxied by average size of targets acquired by the acquirer

	(1)	(2)	(3)	(4)	(5)	(6)
	Fem. share executives	Fem. share executives	Woman CEO dummy	Woman CEO dummy	Fem. Resid. Earnings Ratio	Fem. Resid. Earnings Ratio
<i>Split samples</i>	<i>Acquirer buys smaller firms</i>	<i>Acquirer buys larger firms</i>	<i>Acquirer buys smaller firms</i>	<i>Acquirer buys larger firms</i>	<i>Acquirer buys smaller firms</i>	<i>Acquirer buys larger firms</i>
Post _t	-0.1220 (0.0860)	-0.0596 (0.0564)	-0.2804** (0.0883)	-0.0885 (0.0853)	-0.1238 (0.0874)	-0.0500 (0.0423)
Post _t · Acq. Gender Gap Score _c	0.1977* (0.1189)	0.0807 (0.0780)	0.4092*** (0.1766)	0.1470 (0.1189)	0.1709 (0.1207)	0.0783 (0.0586)
Industry · Year FE	YES	YES	YES	YES	YES	YES
Firm · Period FE	YES	YES	YES	YES	YES	YES
Controls: Firm Size	YES	YES	YES	YES	YES	YES
Adj R ²	0.627	0.652	0.336	0.363	0.345	0.401
N	7,840	11,114	9,009	12,187	7,842	11,176

Robust standard errors are clustered at the firm level
* p < 0.1, ** p < 0.05, *** p < 0.01

Second, I create a dummy variable to identify the acquired firms at which a new outside CEO is appointed sometime in the first three years after the acquisition. The appointment of an outside CEO following the acquisition proxies in part for a higher level of involvement of the acquiring firm at the acquired firm but also represents the appointment of a leader that is likely more aligned with the acquiring firm's leadership, particularly in their approach towards gender equality issues. Results on split samples reported in Table 6 lend support to hypothesis 2b. The effect of the acquirers' national gender culture is larger and significant when the acquisition is followed by the appointment of an outside CEO (in Table 6, Model 1 vs. 2: $\beta_{New\ CEO}=0.217$ vs: $\beta_{No\ new\ CEO}=0.099$; Model 3 vs. 4: $\beta_{New\ CEO}=0.484$ vs: $\beta_{No\ new\ CEO}=0.190$; Model 5 vs. 6: $\beta_{New\ CEO}=0.272$ vs: $\beta_{No\ new\ CEO}=0.043$). In particular, a woman is more likely to be appointed CEO at the acquired firm if the CEO is appointed from the outside. The t-tests show that the coefficients are only statistically different in the comparison between Models 3 and 4.

Table 6: Gender equality outcomes at acquired firms, change in leadership

	(1)	(2)	(3)	(4)	(5)	(6)
	Fem. share executives	Fem. share executives	Woman CEO dummy	Woman CEO dummy	Fem. Resid. Earnings Ratio	Fem. Resid. Earnings Ratio
<i>Split samples</i>	<i>New outside CEO appointed</i>	<i>No new outside CEO appointed</i>	<i>New outside CEO appointed</i>	<i>No new outside CEO appointed</i>	<i>New outside CEO appointed</i>	<i>No new outside CEO appointed</i>
Post _t	-0.1578* (0.0923)	-0.0671 (0.0518)	-0.3157** (0.1075)	-0.1187 (0.0847)	-0.2150** (0.0905)	-0.0209 (0.0418)
Post _t · Acq. Gender Gap Score _c	0.2167* (0.1262)	0.0995 (0.0722)	0.4843*** (0.1499)	0.1899 (0.1167)	0.2719** (0.1229)	0.0426 (0.0578)
Industry · Year FE	YES	YES	YES	YES	YES	YES
Firm · Period FE	YES	YES	YES	YES	YES	YES
Controls: Firm Size	YES	YES	YES	YES	YES	YES
adj. R-sq	0.632	0.647	0.309	0.380	0.335	0.387
N	6,618	12,508	7,386	13,937	6,368	12,817

Robust standard errors are clustered at the firm level

* p < 0.1, ** p < 0.05, *** p < 0.01

Finally, I look at how resource dependency between the acquired firm and the acquirer affects the main results. I proxy resource dependency between the acquired firm and the acquirer through capital intensity. Firms or industries that are capital intensive require large amounts of investment to produce a good or service. In HQ-subsidary relationships, HQ often acts as a provider of capital for subsidiaries, I thus expect that the dependence relationship between the acquirer and the acquired firm will be higher when the acquired firm's activity is capital intensive. I measure capital intensity as the assets needed to generate a unit of income, I divide gross total fixed assets by the number of full time equivalent employees at the acquired firm in the year before the acquisition. I then run the main specification on two split samples, acquired firms with lower capital intensity and acquired firms with higher capital intensity. Results are reported in Table 7. I do not find evidence to support Hypothesis 3, as the main effect rather seems to be stronger for acquired firms that are not capital intensive. The change in gender equality outcomes post-acquisition does not seem to be driven by how resource dependent the acquired firm is on the acquiring firm.

Table 7: Gender equality outcomes at acquired firms, degree of resource dependence proxied by capital intensity

	(1)	(2)	(3)	(4)	(5)	(6)
	Fem. share executives	Fem. share executives	Woman CEO dummy	Woman CEO dummy	Fem. Resid. Earnings Ratio	Fem. Resid. Earnings Ratio
<i>Split samples</i>	<i>Target capital intensive</i>	<i>Target not capital intensive</i>	<i>Target capital intensive</i>	<i>Target not capital intensive</i>	<i>Target capital intensive</i>	<i>Target not capital intensive</i>
Post _t	-0.0521 (0.0839)	-0.2066 (0.0978)	-0.2097* (0.1157)	-0.2507** (0.1213)	-0.0257 (0.3432)	-0.1105* (0.0659)
Post _t · Acq. Gender Gap Score _c	0.0814 (0.1170)	0.2883** (0.1331)	0.3181** (0.1594)	0.4143** (0.1665)	0.1443 (0.4962)	0.1610* (0.0888)
Industry · Year FE	YES	YES	YES	YES	YES	YES
Firm · Period FE	YES	YES	YES	YES	YES	YES
Controls: Firm Size	YES	YES	YES	YES	YES	YES
Adj R ²	0.622	0.635	0.370	0.325	0.341	0.320
N	8,121	5,980	8,937	6,903	509	6,203

Robust standard errors are clustered at the firm level
 * p < 0.1, ** p < 0.05, *** p < 0.01

2.5.3 Alternative Explanations

2.5.3.1 The role of better management practices

The effect I observe on gender equality outcomes at acquired firms could potentially be due to better management practices rather than to more gender egalitarian culture. For example, Bloom et al. (2011) find that firms that use family-friendly workplace practices tend to concurrently use better management practices. It could then be that acquirers impose management practices that are prevalent in their home-countries to the acquired firms, and it is these management practices that affect gender diversity outcomes at the acquired firm. To investigate this possibility, I use data from the World Management Survey (see Bloom et al. (2014) for a description of the data and survey methods). I focus on the Incentives/People management component of the World Management Survey which assesses how well organizations promote and reward employees based on performance, prioritize careful hiring, and try to keep their best employees. I average firms' People management scores by country to obtain country-level management scores. The World Management Survey has data for 21 of the countries in my sample. I find that country management and gender score are highly correlated, the correlation is 0.78.

In Table 8, I add an interaction term between Post and the acquirers' home-country management score to the models from Table 3. Adding the interaction term does not wipe out the effect of acquirers' home-country gender gap score though the coefficient in the

model with Women CEO as the DV (Column 2) does decrease in magnitude, but it does affect the precision of my estimation in models 2 and 3. This might be due to the high correlation between the gender culture and management measures and the resulting potential for collinearity. The coefficients on the interaction between Post and the acquirer's home-country management score are relatively small and are not significant. These results suggest that the post-acquisition effect on firm gender diversity outcomes is not purely driven by better management practices.

Table 8: Gender equality outcomes at acquired firms, role of country-level better management practices

	(1)	(2)	(3)
	Fem. share executives	Woman CEO dummy	Fem. Resid. Earnings Ratio
Post _t	0.0551 (0.0803)	-0.3523** (0.1754)	-0.0776 (0.0678)
Post _t · Acq. Gender Gap Score _c	0.2733** (0.1179)	0.1459 (0.1457)	0.1298 (0.0936)
Post _t · Acq. People Management Score _c	-0.0818* (0.0469)	0.0929 (0.0717)	-0.0042 (0.0351)
Industry · Year FE	YES	YES	YES
Firm · Period FE	YES	YES	YES
Controls: Firm Size	YES	YES	YES
Adj R ²	0.649	0.356	0.377
N	13,737	15,166	13,672

Robust standard errors are clustered at the firm level
* p < 0.1, ** p < 0.05, *** p < 0.01

2.5.3.2 The role of the legal environment

Another channel that could explain changes at the acquired firm mirroring the gender culture of the acquirer's home-country, is if the legal environment of said home-country dictated, through regulations, practices and attitudes towards gender equality in foreign countries where their national firms operate. For example, if there exist laws in the UK that favor workplace equality, which UK firms are mandated to apply in their foreign subsidiaries, the effect I observe at firms acquired by British firms could be explained, not directly by culture, but by the home-country legal environment that would directly impact acquired firms.

I review existing laws from acquirers' country of origin that could directly affect my three main variables of interest (World Bank, 2020; Baker McKenzie, 2018), the nomination of a female CEO, the representation of women in upper management and the gender pay gap. My research found no law expressly mandating representation of women in upper management and CEO positions. Some softer mandates, from the law or national corporate governance entities, on reporting do exist across countries but I do not expect these to be potent enough to directly affect outcomes at acquired firms. Quota laws on board composition have been passed in several countries but this is not an outcome I study (most of the acquired firms in my sample do not have board of directors). Several countries do have laws requiring equal pay for equal work, though enforcement of these laws have generally proven complicated. In recent years, countries such as the UK and

Iceland passed stricter laws to enforce equal pay, while these laws could potentially affect foreign subsidiaries of British or Icelandic firms, these laws were passed after 2016, thus after my period of study. It is thus unlikely that that the main effect is driven by foreign laws that would regulate workplace gender equality of subsidiaries in France.

2.5.3.3 The role of female employee mobility from HQ to new subsidiary

It could also be the case that acquiring firms systematically send executives from headquarters to work at acquired firms, and that acquirers from more gender egalitarian countries send a larger proportion of female executives (because they would be more likely to have more female executives working for them at HQ than acquirers from less gender egalitarian countries). If this were the case my results could be mechanically explained by the appointment of female executives from the foreign acquirers at the acquired firms rather than by active change at the acquired firms. I test this possibility by building a variable, NF_{ft} , capturing the log number of new foreign female employees each year at the French acquired firm (to proxy for the number of employees sent by the foreign HQ). I run the main regression equation with this new variable as the dependent variable and find that acquirers from more gender egalitarian countries are not more likely to send female employees to their target than acquirers from less gender egalitarian countries. I also run the following specification, to test if including the changes in the number of new female foreign employees at acquired firms makes the main effect weaker or disappear:

$$Y_{ft} = \beta_1 Post_t + \beta_2 Post_t Acquirer\ Gender\ Gap\ Score_c + \beta_3 Post_t NF_{ft} \\ + \beta_4 Post_t Acquirer\ Gender\ Gap\ Score_c NF_{ft} + \beta_5 S_{ft} + \lambda_{it} + \alpha_f \delta_p + \epsilon_{ft}$$

I find that it is unlikely that the main effect on acquired firm gender equality outcomes is driven by acquirers from more gender egalitarian countries sending more female employees from HQ to acquired firms. Results are reported in Table 9.

Table 9: Gender equality outcomes at acquired firms, role of transferred HQ female employees

	(1)	(2)	(3)	(4)
	New foreign fem. emp.	Fem. share exec.	Woman CEO dummy	Fem. Resid. Earnings Ratio
Post _t	0.0233 (0.1217)	-0.0931 (0.0499)	-0.1268* (0.0708)	-0.0808 (0.0422)
Post _t · Acquirer Gender Gap Score _c	0.0376 (0.1673)	0.1373** (0.0689)	0.1907* (0.0978)	0.1173** (0.0584)
Post _t · New foreign female emp. _{ft}		0.0422 (0.0359)	-0.0545 (0.1148)	-0.0185 (0.0329)
Post _t · Acq. GG Score _c · New for. fem. emp. _{ft}		-0.0572 (0.0499)	0.1020 (0.1575)	0.0186 (0.0454)
Industry · Year FE	YES	YES	YES	YES
Firm · Period FE	YES	YES	YES	YES
Controls: Firm Size	YES	YES	YES	YES
Adj R ²	0.593	0.632	0.352	0.375
N	21,681	19,524	21,681	19,560

Robust standard errors are clustered at the firm level

* p < 0.1, ** p < 0.05, *** p < 0.01

2.5.4 Robustness checks

I run several robustness tests. I first address the possible sensitivity of my main results to “extreme” or outlier observations, by replicating the tests for the main hypotheses (H1) over 1,000 bootstrapped samples with replacement (as in Marchetti, 2019). Results are reported in Figure 9. For each of the models, Figure 9 plots the distributions of the coefficients on the interacted term, and reports the percentage of positive coefficients, and the bootstrapped p values. The bootstrapped coefficients associated with the interaction of Post and Acquirer Gender Gap Score are positive in more than 96% of the bootstrapped samples, and the bootstrapped p values are below the .10 statistical significance threshold. This lends support to the fact that results in Table 3 are robust to the presence of “extreme” or outlier observations.



Note: Bootstrapped replication of main analyses reported in Table 3. Each regression was replicated over 1,000 bootstrapped samples with replacements. For each of the regressions in Table 3, Table 9 reports the reference to the specific model being replicated in the bootstrapped analysis, as well as the bootstrapped p value, the percentage of positive coefficients on the interaction term and a plot of the estimated Post · Acquirer Gender Gap Score coefficients.

Figure 9: Robustness check. Regression coefficients on bootstrapped samples, test for H1

In Table 10, I rerun the main models from Table 3 with three other different measures of national gender culture, this time I use one composite indices and two raw measures. First, I use the GLOBE gender egalitarianism country score from Emrich et al. (2004). Second, I use OECD data on the percentage of women among managers in each country, averaged between 2011 and 2018 (i.e. all the years available in the data)¹. Third, I use the World Values Survey and calculate the country averages of the answer to the survey question “When jobs are scarce, men should have more right to a job than women.” Following Nollenberger et al. (2016), I recode the answers "agree," "neither," and "disagree," with the respective scores of 1.5, 2.5, and 3.5. I use the 2005-2009 and 2010-2014 waves of the survey to calculate the country averages. Using only one question rather than several allows to pinpoint one precise sentiment about gender roles in the economy, I choose to do so rather than averaging answers to questions that do not get exactly at the same construct, for example "Being a housewife is just as fulfilling as working for pay", or "Both the husband and wife should contribute to household income". My results are substantially robust to using these measures of national gender culture instead of the WEF index.

¹ These measures are presented in Table 41 in Appendix A.1 along with the country Gender Gap Score used in the main analyses and Hofstede’s measure of masculinity dimension. See Emrich et al. (2004) for criticism of Hofstede’s masculinity/femininity dimension. For my purposes, I find that it doesn’t capture gender egalitarianism.

Table 10: Robustness check. Gender equality outcomes at acquired firms, using different measures of country gender culture

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Fem. share exec.	Woman CEO	Fem. Resid. Earnings Ratio	Fem. share exec.	Woman CEO	Fem. Resid. Earnings Ratio	Fem. share exec.	Woman CEO	Fem. Resid. Earnings Ratio
Post:	-0.1618*	-0.0903	-0.1184*	-0.0282	-0.0515	-0.0342	-0.1591**	-0.1456	-0.1020
	(0.0956)	(0.1159)	(0.0687)	(0.0241)	(0.0415)	(0.0236)	(0.0659)	(0.1040)	(0.0630)
Post: · GLOBE Score _c	0.0510**	0.0328	0.0361*						
	(0.0288)	(0.0346)	(0.0207)						
Post: · Country Share Women Managers _c				0.1002	0.2203*	0.1031			
				(0.0728)	(0.1263)	(0.0712)			
Post: · Country Women's right to a job _c							0.0549***	0.0538	0.0322
							(0.0218)	(0.0340)	(0.0205)
Controls: Firm Size	YES	YES	YES	YES	YES	YES	YES	YES	YES
Adj R ²	0.634	0.352	0.371	0.628	0.356	0.368	0.643	0.347	0.354
N	14,257	15,692	14,216	16,363	18,105	16,337	12,025	13,235	11,942

Robust standard errors are clustered at the firm level, firm period and industry year fixed effects are included

* p < 0.1, ** p < 0.05, *** p < 0.01

In another robustness test, striving to control for the potential effect of other firm characteristics on the dependent variables, I compare French firms acquired by foreign firms (treated group) to French firms acquired by French firms (non-treated or control group). Indeed, French firms acquired by French firms, go through an acquisition but the acquirer's home-country culture is the same as the acquired firms', any change in gender diversity I observe at these firms would not result from the effect of a change in national culture influence.

Many papers have shown that the targets of foreign and domestic acquisitions differ on average, foreign firms "cherry pick" their acquisition targets such that they are, for example, more likely to acquire high wage and high productivity firms (Orefice et al., 2019). To facilitate comparisons between foreign acquired firms and domestically acquired firms, I implement a matching procedure to address this selection bias.

In Table 11, one can see that firms acquired by foreign entities tend to be different from firms acquired by domestic entities in the year leading up to the acquisition. They differ in terms of size, firms acquired by foreign entities are larger on average, foreign firms tend to acquire more firms in manufacturing industries than domestic firms (31% of acquisitions vs 28%). Also, foreign firms tended to acquire firms that were doing worse in terms of gender diversity as compared to the firms that domestic firms tended to acquire; foreign-acquired firms have a smaller share of female executives, less likely to have a female CEO and a larger gender pay gap.

Table 11: Descriptive statistics domestic vs foreign acquisitions

	Year prior to acquisition						Difference in means
	Domestic			Foreign			
	N	Mean	Std. Dev.	N	Mean	Std. Dev.	
<i>Acquired firms</i>							
# Employees	2,726	108.65	347.15	1,249	182.17	1,015.6	-73.52***
Manufacturing	2,726	0.3041	0.4601	1,249	0.3331	0.4715	-0.0290**
Listed	2,726	0.0304	0.1718	1,249	0.0328	0.1782	-0.0024
% Less-skilled emp.	2,726	0.4713	0.3070	1,249	0.4036	2837	0.0680***
Year of acquisition	2,726	2007.9	4.6174	1,249	2006.6	5.0811	1.3167***
Fem. share employees	2,726	0.3706	0.2410	1,249	0.3484	0.2110	0.0222***
Fem. share executives	2,359	0.2884	0.2778	1,162	0.2539	0.2282	0.0345***
Woman CEO dummy	2,726	0.1662	0.3723	1,249	0.1601	0.3669	0.0060
Fem. Earnings Ratio	2,596	-0.2010	0.2844	1,199	-0.2327	0.2782	0.0317***
Fem. Res. Earnings Rat.	2,446	-0.0975	0.1993	1,136	-0.1200	0.2054	0.0225***
<i>Acquiring firms</i>							
# Employees	1,814	1,565.9	10,725.2	810	15,423.6	61,320.0	-13,857.8***
Manufacturing	2,726	0.4820	0.4998	1,249	0.5853	0.4929	-0.1032***
Listed	2,726	0.2568	0.4369	1,249	0.4676	0.4991	-0.2108***

* p < 0.1, ** p < 0.05, *** p < 0.01

Given the differences between firms acquired by domestic and foreign entities, I turn to propensity score matching to construct a comparable control group comprised of firms that were acquired by domestic firms. Control firms are sampled from the set of French firms I identify in the Zephyr database as having been acquired by another French firm between 1997 and 2015. I use the nearest neighbor method and select one control firm for each foreign-acquired firm (the “nearest neighbor” in terms of propensity score). Firms are matched based on an estimated propensity score which is the conditional probability

of a firm getting acquired by a foreign firm rather than by a domestic firm given a vector of covariates. I estimate the score using a probit regression with the following covariates: industry, firm size measured by the number of employees, year of acquisition and share of female employees to proxy for the female-friendliness of the firm, observed the year prior to the acquisition. I do not allow matched firms to repeat.

Table 12 shows a comparison between the foreign-acquired group and the domestically acquired group in the year before the acquisition. The matching performs well also in terms of smoothing differences in variables that were not matched on.

Table 12: Matched sample of foreign and domestic acquisitions

	Year prior to acquisition						Diff.
	Domestic			Foreign			
	N	Mean	Std. Dev.	N	Mean	Std. Dev.	
# Employees	1,245	134.53	471.94	1,245	182.75	1017.2	-48.217*
Manufacturing	1,245	0.3333	0.4716	1,245	0.3341	0.4719	0.0008
% Less skilled emp.	1,245	0.4006	0.3077	1,245	0.4041	0.2834	-0.0036
Listed	1,245	0.0385	0.1926	1,245	0.033	0.1785	0.0056
Year of acquisition	1,245	2006.7	4.6867	1,245	2006.6	5.0803	0.0602
Fem. share employees	1,245	0.3471	0.2137	1,245	0.3486	0.2108	-0.0015
Fem. share executives	1,123	0.2635	0.2546	1,161	0.2542	0.2282	0.0093
Woman CEO dummy	1,245	0.1494	0.3566	1,245	0.1574	0.3643	-0.0080
Fem. Earnings Ratio	1,192	-0.2389	0.2918	1,199	-0.2327	0.2782	-0.0061
Fem. Res. Earnings Ratio	1,122	-0.1255	0.2021	1,136	-0.1200	0.2054	-0.0054

* p < 0.1, ** p < 0.05, *** p < 0.01

The matched sample includes 43,076 observations of 2,710 firms. In specifications run on the matched sample, I include pair fixed effects to make sure that the difference-in-differences estimators are identified off comparisons between a treated firm and its matched control. As shown in Table 13, the main results are robust to this specification.

Table 13: Gender equality outcomes at acquired firms estimated over the matched sample

	(1)	(2)	(3)	(4)	(5)
	Fem. share employees	Fem. share executives	Woman CEO dummy	Fem. Earnings Ratio	Fem. Resid. Earnings Ratio
Post _t	0.0099 (0.0292)	-0.1132*** (0.0428)	-0.1418** (0.0651)	-0.1356** (0.0567)	-0.0782** (0.0380)
Post _t · Acq. Gender Gap Score _c	-0.0095 (0.0414)	0.1677*** (0.0610)	0.2364** (0.0928)	0.2059** (0.0811)	0.1141** (0.0539)
Controls: Firm Size	YES	YES	YES	YES	YES
Adj R ²	0.831	0.601	0.324	0.500	0.355
N	43,417	38,386	43,417	40,895	39,186

Robust standard errors are clustered at the firm level, firm period and industry year fixed effects are included
* p < 0.1, ** p < 0.05, *** p < 0.01

2.6 Conclusion & Discussion

Cross-border merger and acquisition is the prevailing mode of entry into foreign economies for multinational firms (UNCTAD, 2019) and they have noteworthy

ramifications for domestic labor markets. In France in 2016, multinational corporations employ 11% of workers and create 16% of the value added¹. These foreign interventions in the domestic economy also provide an interesting testing ground to study the influence of national gender culture on organizational equality. Foreign acquiring firms challenge local social norms and cultural beliefs regarding gender that shape employees' behaviors as well as organizational structures and practices. The current study contributes to extending our understanding of the role of firms' environment on how they produce and sustain inequalities by focusing on the influence of national cultural norms. Using micro data on French firms, I find that that firms that get acquired by firms from more gender egalitarian countries see a steeper increase in female representation in management and steeper decrease in gender pay gap post-acquisition, compared to firms that get acquired by firms from less gender egalitarian countries. My analyses suggest that these post-acquisition changes are most prevalent when the degree of post-acquisition integration is high and when a new CEO is appointed at the acquired firm in the follow-up to the acquisition. This suggests that following an acquisition, acquirers' cultural norms about gender roles affect the acquired firm, through both organizational features such as structure, processes and practices and key employees.

¹ INSEE Focus n°137, Aurélie Casarotti, division Infrastructures et répertoire statistiques

The intent of this study is to add to the literature on organizational inequality, by highlighting national cultural norms as drivers of organizations' arrangements towards gender equality. The study also contributes to the literature on cross-border M&As, more specifically to works focusing on how acquired firms are affected by foreign acquisitions. While this literature has shown that acquirers' features lead to changes at acquired firms in certain domains, the topic of how acquirers' national culture affected workplace gender equality in particular had not been thoroughly investigated. My findings attest to the fact that a change in firm ownership, and the transformation that it entails, can be significant in terms of gender equality in the workplace.

The present study is not without limitations. First, using France as the host country context limits generalizability to a certain extent. It is possible that in using a less gender egalitarian country as the "host country", I would not observe the same effects. While there is reason to believe that both in terms of economic features and openness to progress on gender equality topics, France is relatively close to other large markets like Germany or the UK in Europe and to the US or Canada in North America, it could be that in other contexts, possibly where the power relationship between the hosting country and the foreign acquirers is different or where the baseline gender norms are less egalitarian, the results of my analyses would be different. In particular, the implementation of explicitly gender egalitarian programs and practices in the workplace (for example, affinity groups) might be more or less well-received and thus difficult according to the acquired firms'

country context. Indeed, previous work has presented evidence consistent with the fact that the diffusion of an organizational practice at a recipient unit is likely conditional to the favorability of the unit's "country's regulatory, cognitive, and normative institutional profiles" (Kostova and Roth, 2002). On the other hand, having a nationally representative sample of acquisitions allows me to assuage concerns over generalizability regarding the type of firms included in my analyses.

Second, by focusing on the role of country-level gender culture, I do not take into account within-country variations in beliefs about gender roles. Beliefs and norms about gender roles are certainly not uniform within countries, however while country level is not the only level one can think about differences in beliefs about gender roles and how these differences might affect organizations, it remains an interesting and theoretically justified level of analysis. Indeed, the factors that influence culture such as history, religion or ethnicity are commonly thought of along national borders.

Third, from a theoretical standpoint, I argue that the acquirers' gender egalitarianism is likely to manifest at the acquired firms in part through the integration of said acquired firms in the acquirers' processes and systems, and through the diffusion of practices from the acquirers to the acquired firms. However, I am not able to directly observe these processes, systems and practices, whether at the acquirers or at the acquired firms, and no definitive conclusion can be drawn about the features of the post-acquisition integration process. This opens avenues for future research focused on precisely which

practices are transferred across borders and which are the most influential for workplace gender equality.

In conclusion, this study highlights the role of national gender culture in workplace gender equality. It uses the context of cross-border acquisitions within a same host country and puts forward how cross-border acquisitions, according to the national gender culture of the foreign acquirers, affect gender equality outcomes at acquired firms. It presents evidence that the effect of acquirers' national gender culture on acquired firms is stronger when the post-acquisition integration process is more thorough and when a new outside CEO is appointed at the acquired firms in the years following the acquisition.

3. Workflow networks, formal structure, and employee performance¹

3.1 Introduction

Scholars have associated the (lack of) overlap between employees' workflow networks ('who works with whom') and those formally prescribed by organizational structures ('who should work with whom') with performance outcomes such as promotions and increased compensation (see McEvily, et al., 2014 and Puranam & Clement, 2017 for reviews). Although extant works outline that such overlap has both costs and benefits (Soda & Zaheer, 2012; Puranam & Clement, 2017), the prevailing assumption is that such consequences are similar for all employees irrespective of their position in the formal hierarchy. This is far from a trivial omission since, by design, employees in different levels of the hierarchy vary in the type of work that they perform and in the level of autonomy that they have to undertake their responsibilities. In this chapter, we examine the extent to which, depending on the employee's position in the formal hierarchy, the overlap between actual workflows and those prescribed by the formal structure are associated with increased performance at the employee level.

There are two strands of literature that associate the workflows sustained by employees with employee-level outcomes such as promotions and compensation. On the

¹ This chapter is based on a research paper written in collaboration with Ramon Lecuona Torras and Jonathon Cummings.

one hand, the social network literature views organizations as networks of workflows that emerge spontaneously (Granovetter, 1973; Nohria & Eccles, 1992; Monge & Contractor, 2003). The logic behind these works is that employees are free to interact with colleagues who can provide them with information or resources that can be leveraged to attain their goals (e.g. Burt, 2004; Rodan & Galunic, 2004). On the other hand, the organizational design literature suggests that employees' workflows should be aligned with the formal division of labor (Lawrence & Lorsch, 1967). Namely, the logic behind these works is that employees are expected to prioritize workflows with those with whom they share formal work relationships, such as bosses, subordinates, and members of the same functional area (Thompson, 1967; Galbraith, 1977; Lincoln & Miller; 1997). That is, the purpose of formal structure is to encourage employees to prioritize certain workflows over others.

When considered together, these views expose an interesting puzzle: whereas the social network literature suggests that rewards await for those who are entrepreneurial and find work partners who can best help them achieve their goals, the organizational design literature suggests that employees should limit their workflows with those they are connected to by the organizational chart. We unite these views by arguing that the performance implications of the overlap between employees' workflows and those prescribed by the formal structure is contingent on the position of employees in the (formal) hierarchy. More specifically, we argue that whereas the arguments proposed by the social network literature are more germane to employees in higher levels of the

hierarchy (e.g. senior managers and directors), those proposed by the advocates of organizational design are more applicable to those in lower levels (e.g. middle managers and analysts). This is because employees who are at the bottom of the hierarchy are likely to hold more specialized roles with less autonomy and, hence, are expected to rely on formal channels to interact with colleagues with whom they are not functionally related. In contrast, those at the top of the hierarchy are expected to explore and bridge between otherwise disconnected areas of the organization.

We find evidence that is consistent with our predictions by examining the workflows of 125 employees who are part of the headquarters of a publicly traded company. Consistent with our logic, we find that, on average, employees whose workflows are aligned with the formal structure are likely to receive higher (wage) raises. Per our theory, we find that these effects are mostly driven by lower-rank employees (middle-managers and analysts) and find no evidence suggesting that alignment with the formal structure is associated with changes in the compensation of high-ranking employees (senior managers and directors). These results are robust when computed with different sub-samples and versions of the independent and dependent variables.

The arguments presented here improve our understanding of the interplay between the 'formal' structure of organizations and the more 'informal' patterns of employee workflows that emerge as work is being done (Gulati & Puranam, 2009; Soda & Zaheer, 2012; McEvily, et al. 2014). As suggested here, explaining the link between

employee workflows and compensation requires taking into account both the 'actual' (what employees do) patterns of workflow as well as those that are 'prescribed' by the employee's position in the formal hierarchy. Workflows that are considered valuable when embraced by high-level employees may be sanctioned when performed by those in lower ranks. Namely, whereas employees at the top of the hierarchy are expected to act as 'bridges' between functional areas, the same behavior may be interpreted as 'slacking off' when performed by an employee who has less autonomy and perform more specialized tasks (e.g. as is the case of employees who are in lower levels of the hierarchy). Moreover, our findings suggest that, in order to become a 'bridge' and occupy a (high-pay) position at the top of the formal structure, low-level employees first need to sustain workflows that are highly aligned with those prescribed by the formal structure.

In further investigations, I look into how gender-role expectations play into these relationships between workflow overlap, hierarchy and performance. I hypothesize that the expectation for employees to follow the prescribed workflows as they conduct their daily tasks and rely on a set of connections to do so, is likely to be stronger for female employees. I further hypothesize that compliant and non-compliant behaviors (in terms of closely following prescribed workflows) are likely to be rewarded differently depending on gender, compounding or relaxing the expectations linked to their position in the hierarchical structure. Interestingly, I do not find that gendered expectations matter for our results.

The rest of this chapter is organized as follows. The prior literature section provides a review of extant works. The theory section outlines a series of testable predictions. The methods section describes the empirical setting and strategy and the results section presents our findings. Finally, the discussion section addresses limitations, findings, and outlines contributions.

3.2 *Prior Literature*

A vast stream of works, commonly referred as the social networks literature, has been devoted to understanding how the position of individuals within a network ('who interacts with whom') affects behavior and outcomes (Granovetter, 1973; Nohria & Eccles, 1992). In general, papers in this stream assume that the location of actors in such networks is either the product of social constraints (e.g. gender, demographics) or attributed to the agency of individuals who are seeking to satisfy their own needs (McEvily, et al., 2014; Puranam, 2017). When explaining the link between workflow networks and performance, particular attention has been placed on situations in which individuals hold privileged network positions, as is the case when these are more 'central' (popular) or serve as a 'bridge' between otherwise unconnected actors (Burt 1992; Granovetter, 1973). This logic suggests that individuals who hold these positions have access to information and resources that are not available to others and, thus, these can be leveraged to obtain

superior benefits (Podolny & Baron, 1997; Reagans & McEvily, 2003; Rodan & Galunic, 2004).

An important portion of this literature has been devoted to understanding the performance of employees affiliated with organizations that have highly formalized structures (e.g., multinational corporations). Research has shown that in these settings the patterns of employees' interactions are prone to influence hiring decisions (Granovetter, 1973) as well as promotions (Podolny & Baron, 1997). In series of studies Burt (2002, 2004, 2007) shows that employees who serve as 'brokers' receive higher compensation than those who are constrained and can only reach colleagues via a 'broker.' Although highly informative, these studies fail to articulate whether 'brokers' are fulfilling a formal role (e.g. their position in the formal organization involves coordinating separate teams) or if they self-select such workflows. Hence, it is difficult to determine whether the rewards that have been shown to go to brokers are due to their privileged position within the organization's network or because they are behaving in accordance to the roles formally assigned to them.

The notion that brokerage may not be always associated with higher pay is developed in the work of Xiao and Tsui (2007). By examining the workflow networks of employees in high tech firms based in China, the authors argue that 'brokers' may be penalized under certain conditions. More specifically, they find evidence that suggests that employees who engage in this type of behavior receive lower compensation (salary +

bonus). This finding, however, is not attributed to deviations from what is expected from the formal roles assigned to employees but rather to the nature of social norms. Namely, brokerage-like behavior goes counter to the value of 'communal cooperation' that characterize China's collectivist culture. Another study that directly considers how differences between 'what employees do' and 'what the formal structure expects employees to do' affects career outcomes is that by Soda and Zaheer (2012). The authors find that employees with intermediate levels of overlap between actual and prescribed workflows are more likely to be promoted relative to those with either high or low levels of overlap.

Whereas Soda and Zaheer (2012) discuss at length the costs/benefits of high/low levels of overlap between observed and prescribed workflows, they do not make a clear distinction between factors that could drive the lack of overlap². This is not a trivial omission since this mismatch may be attributed to at least two different reasons. On one hand, this may come about because employees are not complying with the workflows prescribed by the formal structure (i.e. omission errors). On the other hand, this mismatch may arise from engaging with others with whom they are not formally related, even when employees do interact with those with whom they share a formal work relationship (i.e. commission errors). This distinction is noted by Puranam and Clement (2017), who model

² In addition, Soda and Zaheer (2012) are mostly focused on tracking a specific type of interaction, namely those pertaining to 'informal' advice about a number of elements that range from current work to those that are more long-term and relate to career progression.

the process by which agents learn about the technical interdependencies that are latent behind the horizontal division of labor. The authors argue that one of the prime roles of managers is to avoid 'omission errors' or situations in which employees fail to interact when it would be desirable for them to do so³.

3.3 Theory

3.3.1 Workflow Networks in Formal Organizations

What determines who works with whom in formal organizations? Scholars have noted that employee workflows should be driven by the extent to which individuals share 'technical' interdependencies (March & Simon, 1958; Thompson, 1967; Galbraith, 1977). In its purest form, a pair of employees are interdependent when the returns of the actions of an employee (i) are dependent on the work (actions) performed by a colleague (j) and vice-versa. Along these lines, one of the prime functions of formal work relationships is to outline and facilitate the workflows between employees who share strong technical interdependencies (Thompson, 1967; Galbraith, 1977). Scholars generally point to two types of formal work relationships that encompass different types of work interdependencies: (a) the *vertical work relationships* that arise from the hierarchal division of labor (boss-subordinate relationships); and (b) the *horizontal work relationships* that

³ This model examines the emergence of 'formal' structure as part of an 'informal' process by which agents discover useful interactions. Hence, 'desirable' interactions are not known to agents until they explore and find them.

emerge from the functional division of labor (grouping into units, departments). In the paragraphs that follow, we describe in detail how each of these formal work relationships influences the workflows among employees.

3.3.1.1 Vertical Work Relationships

The 'hierarchy' or the vertical division of labor is a characteristic feature of formal organizations that can be viewed as (an asymmetric) network of authority-based relationships (Williamson, 1975, 1985; Garicano, 2000). Work interdependencies and, consequently workflows, between bosses and subordinates are likely to arise for a number of reasons. One common case is when hierarchical superiors coordinate the integration of their subordinates' outputs (March and Simon, 1958). This increases the extent to which boss and subordinates need to interact, as the former acts as a 'central node' that concentrates the information produced by subordinates (Katz & Kahn, 1966). Even when bosses do not act as integrators, subordinates may still depend on them when these lack the skills or information to solve the problems that go beyond their expertise (Garicano, 2000).

Another form of work interdependency that is characteristic of hierarchical relationships has to do with the authority conferred to bosses (Williamson, 1975). When disputes between subordinates (and other co-workers) arise, bosses are expected to intervene to either reach a settlement or make a decision on how to proceed. Even in the absence of conflict, subordinates may need the approval of their hierarchical superiors

before taking certain actions (Barnard, 1938). Finally, even when subordinates have authority to make certain choices, these may still have to communicate with bosses to keep them informed about how tasks are being implemented. We therefore predict:

H1: Employees who share hierarchical relationships are more likely to interact relative to those who do not share such relationships.

3.3.1.2 Horizontal Work Relationships

Another feature of formal organizations has to do with the interfaces that come about from the 'horizontal' division of labor (Smith, 1776; March & Simon, 1958). The logic is that the tasks required to achieve the goals of the organization are partitioned (Newell & Simon, 1972) and then allocated to specialists (Hackman & Oldham, 1976). Along these lines, employees who perform similar roles are grouped into functional units and departments (Nadler & Tushman, 1997). The employees who are part of a functional group often depend on each other to perform their work. This is because, when tasks are not easily decomposable, these are assigned to employees who are part of the same functional group to facilitate the integration of actions that require constant and simultaneous adjustments (Ethiraj & Levinthal, 2004). We thus argue:

H2: Employees who are part of the same functional group are more likely to interact relative to those who are not part of the same group.

All in all, in the context of formal organizations, workflow networks are likely to be highly influenced by formal work relationships. In principle, these relationships point to the workflows that should be embraced by employees to carry out the tasks that the organization requires of them.

3.3.2 Prescribed vs Actual Workflow Networks and Employee Performance

As noted in the prior section, formal work relationships signal to employees that they are expected to prioritize some workflows over others. That is, these are the patterns of work that the organization has outlined for employees to follow⁴. In a sense, these elements of the formal structure enact the contract between the employee and the organization (Simon, 1951). Namely, the position of an employee in the organizational chart outlines the prescribed workflows: ‘you are part of the sales department and your role is to be a sales agent in ‘x’ market; you report to a regional sales manager; and you have to oversee a number of junior sales persons who specialize in servicing a number of clients in your market’. It is therefore reasonable to expect that employees who direct most of their communication efforts to colleagues with whom they are formally related are likely to receive more rewards relative to those who deviate from the formal structure.

⁴ Prior research has pointed out that given that those who design the formal structure may be limited in their capacities to predict every single contingency that may arise, it may be beneficial for the organizations to have employees deviate from the formal structure under certain conditions (March & Simon, 1958; Gulati & Puranam, 2009).

A number of arguments can be made to explain why high levels of overlap between prescribed and observed workflows can lead employees to obtain higher rewards. First, overlap in communication patterns may signal that employees' preferences are aligned with those of the organization (Alchian & Demsetz, 1972; Williamson, 1975).⁵ In contrast, the lack of overlap between what employees do and what they are expected to do is likely to be sanctioned (Jensen & Meckling, 1976). Second, alignment between prescribed and observed workflows may be a signal of the competency of employees and their understanding of the workings of the organization. In contrast, little overlap between what employees do and the formal structure may be interpreted as a symptom of poor judgment or lack of understanding of how to conduct work. We expect greater (lower) overlap between prescribed and actual workflows to translate in higher economic rewards for employees. We posit:

H3: The greater the overlap between an employee's prescribed workflow network and an employee's actual workflow network, the greater the increase in the employee's performance.

⁵ Even when employees' preferences may not fully coincide with those of the organization, some observed alignment may signal that they are willing to align some of their actions to what is expected by the organization.

3.3.3 Employee Workflow Networks, Performance, and Position in the Hierarchy

The arguments above imply that prescribed workflows are connected to the employee's position in the formal hierarchy. This logic relies on the premise fulfilling the roles of employees at the top of the hierarchy requires workflows that differ from those expected from those who are at the bottom. Workflow networks that may be considered valuable when embraced by high-level employees may be sanctioned when performed by those in lower ranks. For example, whereas employees at the top of the (formal) hierarchy are expected to act as 'brokers' between functional areas, the same behavior may be interpreted as problematic when performed by an employee whose role requires them to be specialized in a particular function (e.g. as is the case of employees who are in lower levels of the hierarchy). These are to a much lesser extent expected to go outside the organizational chart and are efficient when they stick to their close formal relationships as they perform their work. We therefore expect:

H4: The positive association between overlap in employee prescribed/actual workflow networks and performance is stronger for employees at lower levels in the hierarchy.

3.3.4 Workflow Networks, Performance, and Hierarchy within the Prism of Gender

Next, I rely on social role theory (Eagly, 1987; Eagly & Steffen, 1984) and examine, with this view, how gender-role expectations (Ridgeway & Smith-Lovin, 1999; Heilman, 2001) might play into our previous hypotheses. Social role theory contends that observed

gender differences in behavior are explained by gender roles, which are the sum of “shared expectations about appropriate conduct that apply to individuals solely on the basis of their socially identified sex” (Eagly & Wood, 1991). These expectations arise from the unbalanced representation of men and women in different social roles. Summarily, women are expected to behave in a communal way, whereas men are expected to be more agentic.

To the extent that following prescribed workflows is comparable to rule following and diverging from prescribed workflows resembles rule-breaking or “cheating”, it is interesting to note that scholars have found evidence of gender differences in ethical behavior (Kennedy & Kray, 2014; Gupta et al., 2019). Roxas and Stoneback (2004), relying on the gender socialization approach, mention that men “are more likely to break rules” and women “are more likely to adhere to rules”. Franke et al. (1997) note that “women were particularly critical of rule breaking”.

Thus, I propose that the set of agentic behaviors that are likely drive interactions outside of prescribed workflows are closer to masculine stereotypes, while behaviors compliance and rule-following that likely drive sticking to interactions within prescribed workflows are closer to feminine stereotypes. Women are thus more likely to adopt these compliant behaviors because otherwise, they might suffer penalties for it.

H5: Female employees are more likely than male employees to demonstrate compliance with prescribed workflows in their interactions.

Women and men whose behaviors go against gender-role expectations tend to suffer penalties and backlash in the workplace (Phelan & Rudman, 2008; Moss-Racusin et al., 2010). I thus propose that:

H6: Female employees are more likely than male employees to be rewarded (punished) for compliance (non-compliance) with prescribed workflows in their interactions.

Compounding gender role expectations with the previously hypothesized expectations regarding workflow overlap for employees at the top and bottom of the hierarchy. I propose that:

H7: The positive association between overlap in employee prescribed/actual workflow networks and performance is stronger for female employees than for male employees at lower levels in the hierarchy.

3.4 Data

3.4.1 Data Collection and Sample

To test our predictions, we conducted a year-long field-study in the headquarters of a multinational corporation dedicated to producing water solutions. This company is based in Mexico, is publicly traded, and has been in operation for nearly four decades. The headquarters consists of the top management team, as well as managers and analysts from the four divisions that make up the company. The headcount in the headquarters fluctuated during the time period in which we collected our data (June 2015 to May 2016), averaging 150 employees. Our analysis, however, is focused on 146 employees who were

employed by the company (and physically located in the headquarters) during at least half (six months) of the duration of our study period⁶. The average employee in the sample has been with the company for 5.5 years, is 36 years old, and the male/female ratio is relatively balanced (64/36).

A number of reasons make this an adequate setting for our predictions. First, we are able to observe with great level of detail the actual workflows between the employees who are part of the headquarters (and the entire company in general). Second, the 'prescribed' structure (vertical and horizontal) is not only well-delineated but is highly varied in terms of hierarchical levels and functions. Despite this variation, employees in the headquarters can be considered 'knowledge workers' that perform managerial tasks. All employees in the headquarters have a college degree (42% business, 36% engineering), which is not necessarily the case for other employees in the company who are either line-workers in manufacturing plants or salespersons. Third, the company follows a well-delineated (cyclical) process to assess the performance of employees and determine the corresponding economic rewards (see the Employee Compensation section for more details). Lastly, all of the employees in the sample are located in the same office space and are collocated with their direct hierarchical superiors, which strips variation in workflows ('actual' vs 'prescribed') that may come from being exposed to different degrees of

⁶ Our sample excludes the CEO (1) and the top management team (9) all of whom were part of the headquarters during our study period. Whereas we do not include these individuals as 'focal' employees in our analysis, we do account for them as hierarchical superiors of other employees.

monitoring (as is likely to be the case when some bosses and subordinates are in different sites).

3.4.2 Variables

3.4.2.1 Dependent Variables

Actual Workflows. We tracked employees' actual workflows using email communications. More specifically, we constructed a matrix with the bilateral exchange between each employee in the headquarters and every other member of the company (1,494 employees). This provided us with 1.37 million email messages. Consistent with prior studies that use similar data (Kleinbaum, et al., 2013; Srivastava, 2015) we disaggregate multiple-recipient messages and count these as a unique entry. We exclude 'mass' emails - defined as messages with more than 4 recipients⁷, and communications directed to generic addresses (e.g. help@company.com). With the 741,469 messages that remain, we measure the share of a focal employee's (i) *actual workflows* directed to a given partner (j) during the 12 months in our study period:

$$SC_{i \rightarrow j} = \left[\frac{C_{i \rightarrow j}}{TC_i} \right] \times 100$$

⁷ Results are robust to different thresholds and 2 recipients (485,226), 6 (967,989), 8 (1 million), and 10 (1.1 million) recipients. Qualitatively similar results are also obtained when analysis is restricted to individual emails with no cc (283,584). See 5.4 Robustness section for more details.

where $C_{i \rightarrow j}$ is the number of emails that the focal employee (i) sent to a given partner (j) and TC_i the total number of emails sent by the focal employee. Although we only consider employees who are part of the headquarters in our sample, TC_i accounts for the messages sent to all employees in the company. As $SC_{i \rightarrow j}$ tends to 100, more of the focal employee's communications (i) are directed to a given partner (j) and when this variable approaches 0 employees do not interact at all. One of the merits of relying on email exchange is that this constitutes 'revealed' (instead of 'stated') patterns of communication between employees. There are, of course, other important means of communication that are not captured by this variable, such as phone or face-to-face interactions. However, Quintane and Kleinbaum (2008) show that data on e-mail communications coincides with survey reports of organizational networks at least as well as do other sources of observational data.

Employee Performance. The company assesses employees' performance on a yearly basis following a well-structured 'talent review' process. The cycle starts (April/May) with employees setting specific goals/targets, which are subsequently modified/approved by the employee's direct hierarchical superiors. Within 10-12 months from the time that these milestones are set, the performance of the employee is assessed by a group of senior managers, including the employee's direct boss. This committee considers the extent to which the employee was 'effective' in achieving the goals/targets that were set for her.

The level of achievement is measured on a scale that captures the extent to which the employee met her pre-established targets/goals⁸.

In addition to the level of completion of targets/goals, the evaluating committee also takes into account whether employees abide by a series (five) well-defined principles as they carry out their work. One of these principles has to do with the extent to which ‘employees conform to pre-established workflows and processes’. Some of these processes/workflows are explicitly mapped (and are made available to employees in advanced) whereas others are more subjectively determined by the managers of particular areas as work is being realized. Regardless of the level of codification, these processes/workflows emphasize ‘who needs to interact with whom’ to perform a series of tasks that are core to the company’s operations (e.g. procuring inputs, manufacturing, and bringing new products to market).

The ‘talent review’ committees meet (throughout the months of January/May) to discuss each individual case and determine employees’ compensation for the coming cycle. Unfortunately, access to the full records of the discussions sustained by these committees was not available to us. However, interviews with the managers that oversee this process suggest that it is common for the members of the committee to discuss in length the extent to which employees followed processes and workflows. More

⁸ We use this measure as part of the analysis related to H3 and H4 to account for the extent to which employees were ‘effective’ in achieving pre-established goals. See 4.4 Control Variables and 5.1 Analytic Approach for more details.

punctually, these point to a number of instances in which failure to comply with these expectations resulted in penalties for employees, even when these were effective in reaching pre-established goals/targets. Similarly, our interviewees recall several instances in which compliance with established processes/workflows benefited employees when determining their compensation.

We track employees' performance by measuring *wage increase* as the year-on-year change in total compensation:

$$\Delta w_i = \left[\frac{w_{i,t=1} - w_{i,t=0}}{w_{i,t=0}} \right] \times 100$$

$w_{i,t=0}$ is the wage level for a focal employee (i) at the start of our study period, whereas $w_{i,t=1}$ is the updated wage for that employee as determined by the compensation committee towards the end of the study period⁹. It is worth noting that prior works utilize absolute wages as a proxy of employee performance (e.g. Burt, 2007). In the case of this study, we believe that the change in compensation is a more direct measure to capture the extent to which employees are rewarded for their actions during a given time period. We exclude 21 employees who received wage increases higher than 50%, as such high raises implied that employees changed from being temporary to becoming permanent workers¹⁰.

⁹ The majority of employees receive a fixed wage and only a small proportion receive a fixed-wage plus a variable bonus. For all cases we account for total compensation: fixed-wage plus bonus (if applicable).

¹⁰ Results are robust when including workers with raises higher than 50%.

3.4.2.2 Independent Variables

3.4.2.2.1 Formal Work Relationships

We used a combination of archival and survey data to measure the extent to which employees share formal work relationships:

Hierarchical Relationships. We relied on reporting lines in organizational charts to identify boss-subordinate relationships. Two employees are hierarchically related if these are part of the same 'line-of-command.' Every employee in the headquarters has one (direct) hierarchical superior. For a small number of cases (11) in which employees changed bosses we considered those in place at the end of our study period. We take this approach because it was the bosses at the end of the study period who were part of the committee that evaluated employee performance. We create the variable *hierarchical relationship* which takes the value of 1 (0 otherwise) when a pair of employees are directly connected by a reporting relationship, per the organizational chart. We further disaggregate this measure into two components that distinguish the extent to which the focal employee (i) is the *direct boss* or a *direct subordinate* of a potential communication partner (j).

Functional Groups. We rely on organizational charts and archival data to determine the extent to which a pair of employees is part of the same functional area. We distinguish between three different levels of organizational bonds: unit, department, and functional area. Employees in the headquarters are affiliated with four business units: finance, operations, new business development, and staff support. Each of these units has, in turn,

an average of 5.5 departments, which are areas specialized in particular functions, such as human resources, information technology, marketing, and sales. Most of these departments are divided into more granular areas that perform specific applications of the functions performed by the department to which they are affiliated. For example, the Marketing Department is divided into four functional areas: advertising, distribution channels, market intelligence, and product-centric campaigns. We create three different versions of a variable *departmental bond* which takes the value of 1 (0 otherwise) if two employees are part of the same formally defined group (unit, department, or functional area).

3.4.2.2.2 *Overlap between Prescribed and Actual Workflows*

We rely on two types of formal work relationships to delineate prescribed workflows: hierarchical relationships (boss-subordinates) and membership in a specialized functional area. For the reasons elaborated earlier, employees are expected to prioritize workflows with whom they share direct reporting relationships. This expectation is clearly denoted in a detailed mapping of interdependencies used by the company to keep track of the workflows that feed into its core work-processes. The archival records show that employees who are at the interface of interdependent processes are generally part of the same functional area¹¹. Along these lines, we create the measure

¹¹ We also revised the records that resulted from a company-wide effort to map the workflows that underpin a series of core processes. More than 4,000 concrete tasks were delineated (e.g. revising procurement orders) and associated with specific roles (e.g. procurement analyst). These tasks were then grouped into more aggregate workflows. Employees at the interface of interdependent tasks were typically part of the same

workflow overlap as the total share of employees' emails directed to bosses-subordinates and other members of the same functional area. This variable approaches 100 as most of the employee's communication efforts are directed to colleagues with whom she shares these types of formal work relationships.

$$Workflow\ overlap_i = \sum_{j \in Prescribed} \left[\frac{C_{i \rightarrow j}}{TC_i} \right] \times 100$$

3.4.2.3 Control Variables

We also account for a series of factors that have been shown to impact workflows and the performance of individuals. First, we consider employee's *gender*, as this factor has been shown to determine the choice of workflows (Kleinbaum et al., 2013) and compensation (Ragins, et al., 1998). Second, we also account for employees' *tenure* in the company¹². Employees who have been with the company for more years are not only likely to have a wider network of relationships, but also to have a more proven track-record and reliability, hence, these may not be affected by some of the explanations that we propose here. Third, for similar reasons, we account for the *rank* of employees within

functional area. Unfortunately, we could not use this information to construct our measure since this was only available (complete) for a portion (approximately 60%) of the employees in our sample. Similarly, self-reported measures show strong work interdependencies between employees who are part of the same functional area (i.e. the reported measure of the strength of work interdependencies from members of the same functional is almost twice as high as that for the average pair of employees).

¹² We transform tenure (years in the company) into a categorical variable (6 levels – lowest = lowest tenure). This facilitates comparing whether employees are within the same tenure bracket.

the company's hierarchy (number of reporting steps between a focal employee and the CEO). Employees with higher rank are more likely to have more discretion to decide how they perform their work (including selecting who to work with) and, in general, more influence over the behaviors of others.

We relied on self-reported measure to determine the strength of work interdependencies. Two surveys were administered to collect these measures, the first in May/June 2015 and a second one in November/December 2015. Nearly 90% (135) of employees in the sample responded this survey and were asked to rate in a five-point scale the following question: 'to what extent do you need [name] to do your work'¹³. Such rating was done in a dyadic basis, having a focal employee (i) rate the strength of her (bilateral) interdependencies with every other employee in the headquarters (j). This approach provided us with two opinions of the strength of the (bilateral) interdependencies between a pair of employees. To reduce potential biases in perceptions, we averaged the ratings provided by each employee. For example, if 'A' rated the strength of her interdependencies to be 5 (strongest) and 'B' rated the strength of such

¹³ Lower ratings (1-2) imply that employees share no/little work interdependencies, intermediate levels (3) refer to periodic interdependence, and higher levels (4/5) imply that employees frequently/always depend on each other.

interdependency ('A' interdependency on 'B') to be 4 (second strongest), the final score for the 'A' → 'B' is 4.5¹⁴.

We create the variable *work interdependencies* which takes the value of 1 (0 otherwise) if this average is greater than 4, which implies that at least both employees rated the relationship as being highly interdependent. The use of a dichotomous variable is consistent with prior works that utilize similar measures of interdependency (Van den Bulte and Moenaert, 1998) and allows a more direct comparison with those that proxy formal work relationships¹⁵.

We create the variable *goal progress* which captures the rate of completion of employees' goals. This is a categorical variable (4 levels) which captures the extent to which employees' progress is: (1) 'below expectations'; (2) 'almost on target'; (3) 'on target'; and (4) 'above expectations'. This variable is only available for 105 employees in the sample.

3.5 Empirical Strategy

We use both non-parametric and parametric analyses to investigate our hypotheses. We utilize models at the level of employee-dyad to test predictions related to

¹⁴ Since employees independently rated their dyadic interdependencies, we compared their cross-rating observing a robust correlation (0.67) –i.e. this suggests that employees have similar opinions about the nature of their interdependencies when asked separately.

¹⁵ The results presented here are robust when the full continuum of the categorical ratings provided by the survey or to different threshold for the average.

H1 and H2. Models at the employee-level are utilized to test predictions related to employees' compensation (H3 and H4).

Our dyadic models consider the workflows between every possible pair of employees who are located in the headquarters. Each dyad appears twice (Kenny et al, 2006) given that our predictions imply not only asymmetries in the levels of communication between employees but also in certain work relationships (e.g. boss / subordinate). This results in 18,741 (129 i, 150 j) employee dyads. We use Ordinary Least Squares and estimate robust standard errors that are simultaneously clustered on both members of each dyad, a common estimation problem that affects dyadic regressions (Kleinbaum et al., 2013)¹⁶. Both explanatory and control variables that enter these models are dyadic¹⁷. The models we estimate then take the following form:

$$SC_{i \rightarrow j} = \beta_0 + \beta_1 * Formal\ relationship_{ij} + \beta_k * Controls_{k,ij} + \varepsilon_{ij}$$

We also use OLS to estimate employee-level models and compute robust standard errors. The main independent variable in these models is *wage raise*, which we consider to

¹⁶ Two estimation problems are likely to arise from the lack of independence of the observations in a panel. The first has to do with the process that generates interactions between dyads of employees: the follow of emails from *i* to *j* is likely to depend on the volume of communication that flows from *j* to *i*. A second estimation problem arises because each employee in a dyad appears in numerous other dyads (Kenny et al. 2006). This introduces what is referred to as a 'common person effect', which means that the interactions between a given dyad (*i* to *j*) may be correlated with those another dyads (*k* to *i*) because some unobserved factor of a common member of these dyads (*i*) affects both values.

¹⁷ Results are also robust when fixed-effects for both members of the dyad (*i* and *j*) are added to the dyadic structure. These results are not reported here.

be a function of *workflow overlap*. In addition, these models include a series of control variables that account a series of individual (*gender* and *tenure*) and organizational (*rank*) characteristics. The models we estimate then take the following form:

$$Wage\ raise_i = \beta_0 + \beta_1 * Workflow\ overlap_i + \beta_k * Controls_{k,i} + \varepsilon_i$$

3.6 Results

3.6.1 Non-Parametric Analysis

Table 14 and Table 15 display descriptive statistics and correlations between the previously described variables. Table 14 shows descriptive statistics and correlations between variables that we use in the first part of our analysis, all the variables are thus at the level of the dyad. Our dependent variable, the share of *i*'s emails addressed to *j*, ranges from 0 to 49% with a mean of 0.33% and a standard deviation of 1.23%. This goes to show that, in our sample, while a few exceptional cases might concentrate the majority of their email communications on a restricted number of people (and up to 49% of their communications on a single one), most employees exchange emails with many different recipients. All of our dyadic explanatory variables are dummies, the means and standard deviations of the hierarchy-related variables are low, which is consistent with the fact that employees share this type of relationships with only a few other employees in the sample; one boss and on average 0.9 subordinates per employee. The functional groupings variables show decreasing means that are consistent with the scale of each grouping; from

the largest, the unit, to the smallest, the functional area. Finally, relationships involving work interdependencies represent 0.04% of all dyads, with on average employees each sharing such a relationship with 4.4 partners. The correlation part of Table 14 shows relatively strong and significant associations between our dependent variable and our explanatory variables. We can also note that the variable for work interdependencies is, as expected, significantly correlated with the hierarchical and functional ties variables.

Table 15 describes variables at the employee level. Our dependent variable, wage raise, ranges from 0 to 48% with a 13% mean and a 8.6% standard deviation. Inflation in Mexico is around 3%, we thus observe considerable variation (beyond inflation) in the wage raise variable. Our main explanatory variable, the share of workflows directed to formally prescribed partners varies from 1.2 to 84.2% and averages at 25.8%, and, when restricting formal partners to those with whom the employee also shares work interdependencies the workflow overlap then averages at 17.6% and ranges from 0 to 71.7%. The symmetric variable, measuring the share of employee emails addressed to formally prescribed but non-work interdependent partners, displays a mean of 6.0% and varies from 0 to 40.7%.

Table 14: Dyadic variables (i,j): descriptive statistics

Variable	Obs	Mean	S. D.	Min	Max	1	2	3	4	5	6	7	8
1 Actual workflows	26,600	0.32	1.47	0.00	48.95	1							
2 Formal	26,600	0.03	0	0	1	0.51*	1						
3 Hierarchical	26,600	0.01	0	0	1	0.50*	0.58*	1					
4 Same functional area	26,600	0.02	0	0	1	0.26*	0.81*	-0.02*	1				
5 Work interdep.	20,205	0.04	0	0	1.00	0.54*	0.38*	0.41*	0.18*	1			
6 Same gender	26,600	0.55	0	0	1	0.01	0.01*	0.02*	0.00	0.02*	1		
7 Same tenure	26,600	0.17	0.38	0.00	1	0.02*	0.02*	0.01	0.02*	0.02*	0.01*	1	
8 Same rank	26,600	0.29	0.45	0.00	1	0.03*	0.06*	-0.05*	0.12*	0.04*	0.01	0.02*	1
9 Physical distance ¹	24,674	3.69	0.63	0.75	4.89	-0.10*	-0.13*	-0.06*	-0.12*	-0.09*	0.03*	0.01	-0.12*

* p<0.05 in two-tailed test

¹ steps in logarithmic scale (ln)**Table 15: Individual-level variables (i): descriptive statistics**

Variable	Obs	Mean	S. D.	Min	Max	1	2	3	4	5	6	7
1 Wage raise	125	13.03	8.64	0.00	47.67	1						
2 Workflow overlap	125	25.77	17.17	1.20	84.24	0.30*	1					
3 Workflow overlap w/ work interdep	125	17.61	14.62	0.00	71.67	0.22*	0.89*	1				
4 Workflow overlap wo/ work interdep	125	6.01	6.97	0.00	40.69	0.18*	0.50*	0.09	1			
5 Gender	125	0.64	0.48	0	1	-0.06	0.10	0.06	0.05	1		
6 Tenure	125	3.63	1.74	1	6	0.07	-0.16	-0.08	-0.17	0.06	1	
7 Rank	125	3.50	0.83	1	5	-0.08	-0.17	-0.17	0.10	-0.07	-0.02	1
8 Goal Progress	105	3.51	0.71	1	4	0.27*	-0.16	-0.09	-0.23*	-0.09	0.14	0.09

* p<0.05 in two-tailed test

As shown in Table 16, the average share of emails *i* sends to *j* if they share work interdependencies is 4.7% and 0.2% if they do not, the difference in means is significant at the 0.001 level. We observe also that the mean share of *i*'s emails addressed to *j* when *i* and *j* share a hierarchical tie is 7.2%, whereas it is 0.2% when *i* and *j* do not share such a tie, which is consistent with H1. Additionally, if *i* and *j* are part of the same functional area, the average share of *i*'s emails addressed to *j* is 4.3%, while if they are part of different functional areas this average is only 0.2%, which is consistent with H2. In each case, the differences are significant. The table's last rows examine differences in means along the intersections between work interdependencies and the two types of formal work relationships. When *i* and *j* share both a hierarchical relationship and work interdependencies, the average share of *i*'s emails directed to *j* is 9.9%, which is higher than the 4.6% average for the case when they have a hierarchical relationship but do not have work interdependencies, and also higher than the 3.3% average for the case when they are interdependent for work but are not hierarchically related. If *i* and *j* are part of the same functional area and share work interdependencies, the average of our dependent variable reaches 8.7%, however, contrary to what we observe for the intersection with hierarchy, the average is higher for the group of dyads that are not in the same functional area but share interdependencies (2.5%) than for the group that are in the same functional area but whose tasks are not interdependent (1.9%).

Table 16: Differences in mean between groups of dyads

	Average share of realized communications		Diff.	T-stat	P- value
	YES	NO			
Work interdependencies	4.74	0.19	-4.55	-83.80	0.00
Hierarchical	7.17	0.25	-6.93	-88.05	0.00
Direct boss	8.51	0.28	-8.23	-70.80	0.00
Direct subordinate	5.84	0.30	-5.54	-45.04	0.00
Same unit	0.80	0.12	-0.67	-31.52	0.00
Same department	2.37	0.15	-2.22	-65.78	0.00
Same functional area	4.32	0.21	-4.11	-78.15	0.00
Hierarchical & Work interdep.	9.88	0.28	-9.60	-83.42	0.00
Hierarchical & No work interdep.	4.63	0.35	-4.28	-15.63	0.00
No hierarchical & Work interdep.	3.32	0.27	-3.05	-44.48	0.00
No hierarchical & no work interdep.	0.18	4.74	4.56	86.84	0.00
Same functional area & Work interdep.	8.75	0.24	-8.51	-100.00	0.00
Same functional area & No work interdep.	1.92	0.33	-1.59	-18.82	0.00
Different functional area & Work interdep.	2.48	0.31	-2.17	-27.83	0.00
Different functional area & No work interdep.	0.15	3.73	3.58	80.40	0.00

The first four rows of Table 17 show average (wage) raises for employees for each quartile of the distribution of *workflow overlap*. We observe that employees in the upper quartiles receive higher wage raises than those in the lower quartiles, indeed the mean wage raise for people in the first and second quartile are respectively 11.1 and 7.7%, while they are 15.4 and 18.0% for employees in the third and fourth quartiles. The following four rows show average wage raises for each quartiles of the distribution of the variable measuring overlap between actual workflows and formally prescribed workflows that also carry work interdependencies, here individuals in the fourth quartile receive higher raises than individuals in the other three. Finally, the remaining rows indicate that raises are higher on average for employees in the third (13.8%) and fourth (15.8%) quartiles of

the distribution of our third explanatory variable, overlap between actual workflows and formally prescribed ones that do not carry work interdependencies, than for the other two quartiles (1st: 11.8%, 2nd: 10.7%).

Table 17: Average wage raise by quartile of the distribution of the independent variables

		Mean Wage raise	Std. Dev.
Workflow overlap	1st quartile	11.10	9.36
	2nd quartile	7.66	4.27
	3rd quartile	15.44	7.76
	4th quartile	17.99	8.64
Workflow overlap w/ work interdep.	1st quartile	12.60	10.08
	2nd quartile	9.55	6.50
	3rd quartile	12.02	6.91
	4th quartile	17.98	8.65
Workflow overlap wo/ work interdep.	1st quartile	11.77	6.71
	2nd quartile	10.74	9.14
	3rd quartile	13.83	10.23
	4th quartile	15.83	7.62

3.6.2 Parametric Analysis

Table 18 displays results of regressing *actual workflows* as a function of ‘prescribed’ relationships. We include a baseline model (1) with only control variables for consistency with prior studies that examined employee workflows. As expected, greater physical distance in the office between two employees is associated with reduced communication and having started at the company at roughly the same time (same tenure) is positively related to interactions between employees. Work interdependencies are also strongly associated with increased communication. However, two characteristics, gender and

hierarchical rank, that are usually found, when shared, to be associated with increased communications, do not appear to be significantly so in our context. Hypothesis 1 is supported in Models 2 to 4, controlling for work interdependencies, a hierarchical tie between two employees is strongly associated with increased communication. Model 4 distinguishes between the cases where j is i 's boss and those where j is i 's subordinate, the coefficients for the two variables are both significant and statistically different from each other, they show that employees communicate with their boss more than they communicate with their subordinates. Hypothesis 2 receives strong support in Models 5 and 6; being part of the same functional grouping makes two employees more likely to interact than if they were part of different ones, even after controlling for work interdependencies. As shown in Model 6 where we include hierarchical and functional relationships in the same regression, being part of the same functional area (our most fine-grained grouping) is associated, all else equal, with a 2.3 ($p < 0.001$) percentage point increase in i 's share of communications addressed to j , while sharing a hierarchical relationship is associated with a 6.2 ($p < 0.001$) percentage point increase in that share, these two estimated coefficients are statistically different.

The associations between *wage increase* and *workflow overlap* are presented in Table 19. In Models 2 and 3, we look at this association without controlling for goal progress. In Model 2, the coefficient we estimate for *workflow overlap* is 0.14 and is significant at the 1% level, meaning that a 1% increase in an employee's share of communications directed to colleagues to which she is formally related (hierarchy or functional area) is associated, all else being held constant, with a 0.14 percentage point increase in wage raise. In other

words, an increase of one standard deviation (17.2) in *workflow overlap* is associated with an increase of wage raise by 2.4 percentage points.

In Model 4, we run the same regressions as in Model 2 but this time we introduce a control for *goal progress*, a measure of employee job performance. This leads us to drop 20 employees from our sample who had not received their final 'grade' by the time we collected the data. H3 receives further support from Model 4, once we control for performance on the job, *workflow overlap*'s association with higher raise is stronger (0.25) and more precisely estimated ($p < 0.001$).

In Table 20, we restrict our sample to employees situated at the top of the hierarchy. That is employees situated less than three reporting steps from the CEO. In this restricted sample, the coefficient on *workflow overlap* is no longer significant, providing support for Hypothesis 2. In Table 21, we then restrict the sample to employees four or more reporting steps from the CEO, here the coefficient on *workflow overlap* is significant at the 0.1% level; a 1% increase in an employee's share of communications directed to colleagues to which she is formally related (hierarchy or functional area) is associated, all else being held constant, with a 0.37 percentage points increase in wage raise. Thus, Hypothesis 4 receives further support.

Table 18: Actual workflows as a function of work interdependencies formally prescribed relationships

DV: Actual workflows $i \rightarrow j$	(1)	(2)	(3)	(4)	(5)	(6)
Same gender	-0.00 (0.03)	-0.01 (0.02)	-0.01 (0.02)	-0.01 (0.02)	-0.00 (0.03)	-0.01 (0.02)
Same tenure	0.06* (0.03)	0.04+ (0.03)	0.07* (0.03)	0.07* (0.03)	0.05+ (0.03)	0.05* (0.03)
Same rank	-0.01 (0.03)	-0.07** (0.02)	0.09** (0.03)	0.09** (0.03)	-0.08*** (0.02)	0.02 (0.02)
Physical distance ¹	-0.14*** (0.03)	-0.05** (0.02)	-0.09*** (0.02)	-0.09*** (0.02)	-0.11*** (0.02)	-0.04* (0.02)
Work interdependencies	4.71*** (0.43)	3.55*** (0.32)	3.33*** (0.34)	3.31*** (0.34)	4.47*** (0.40)	2.96*** (0.28)
Formal work		3.24*** (0.31)				
Hierarchical			5.88*** (0.73)			6.23*** (0.72)
Direct boss				8.19*** (1.02)		
Direct subordinate				3.74*** (0.69)		
Same functional area					1.97*** (0.28)	2.29*** (0.29)
Constant	0.70*** (0.10)	0.33*** (0.08)	0.46*** (0.09)	0.47*** (0.08)	0.55*** (0.09)	0.28*** (0.07)
N_{dyads}	18,741	18,741	18,741	18,741	18,741	18,741
N_i	129	129	129	129	129	129
N_j	150	150	150	150	150	150
adj. R-sq	0.299	0.418	0.410	0.430	0.334	0.458

+ $p < 0.1$ * $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$
 Clustered standard errors (i,j) in parentheses
¹ steps in logarithmic scale (ln)

Table 19: Wage raise as a function of workflow overlap

DV: Wage raise i	(1)	(2)	(3)	(4)
Gender	-1.06 (1.61)	-1.62 (1.58)	-0.89 (1.70)	-2.03 (1.57)
Tenure	0.47 (0.47)	0.69 (0.47)	0.11 (0.51)	0.31 (0.47)
Rank	-0.36 (1.29)	-0.27 (1.28)	-1.55 (1.29)	-1.26 (1.21)
Goal progress			3.56*** (1.01)	4.40*** (0.88)
Workflow overlap		0.14** (0.05)		0.25*** (0.06)
Unit dummy	YES	YES	YES	YES
Constant	11.28* (5.30)	7.95 (5.79)	5.24 (5.67)	-3.00 (5.29)
N	125	125	105	105
adj. R-sq	0.025	0.078	0.075	0.222

+ p<0.1 * p<0.05 ** p<0.01 *** p<0.001
Robust standard errors in parentheses

Table 20: Top of Hierarchy -Wage raise as a function of workflow overlap

DV: Wage raise i	(1)	(2)	(3)	(4)
Gender	-0.71 (2.00)	-0.80 (2.00)	-0.74 (2.21)	-1.61 (2.16)
Tenure	-0.33 (0.82)	-0.29 (0.83)	-0.97 (0.90)	-0.76 (0.92)
Rank	0.85 (2.61)	0.67 (2.64)	3.53 (3.13)	2.83 (3.09)
Goal progress			3.75* (1.64)	4.40** (1.58)
Workflow overlap		0.02 (0.06)		0.1 (0.07)
Unit dummy	YES	YES	YES	YES
Constant	12.94 (10.36)	12.85 (10.53)	-3.32 (14.31)	-5.95 (14.2)
N	59	59	48	48
adj. R-sq	-0.072	-0.091	0.023	0.034

+ p<0.1 * p<0.05 ** p<0.01 *** p<0.001
Robust standard errors in parentheses

Table 21: Bottom of Hierarchy -Wage raise as a function of workflow overlap

DV: Wage raise i	(1)	(2)	(3)	(4)
Gender	-0.31 (1.87)	-1.46 (1.91)	0.59 (1.97)	-0.98 (1.72)
Tenure	0.53 (0.47)	0.79 (0.51)	0.51 (0.48)	0.60 (0.43)
Rank	9.07* (3.46)	5.60+ (3.22)	9.25** (2.76)	6.29** (2.14)
Goal progress			3.58*** (0.92)	3.04*** (0.78)
Workflow overlap		0.25* (0.11)		0.37*** (0.08)
Unit dummy	YES	YES	YES	YES
Constant	-29.50* (13.78)	-20.04 (12.92)	-42.37*** (10.48)	-34.27*** (8.75)
N	66	66	57	57
adj. R-sq	0.269	0.357	0.317	0.524

+ p<0.1 * p<0.05 ** p<0.01 *** p<0.001
Robust standard errors in parentheses

Table 22 and Table 23 report results of tests of the role of gender role expectations in employee compliance with prescribed workflows, and the rewards of such compliance. As shown in Table 22, where the dependent variable is the share of i's email directed to j, female and male employees dedicate similar shares of their emails to counterparts to which they are formally related, whether it be hierarchically or functionally related. Further tests revealed that none of the coefficients of interest were significantly different across models of the interactions of women and men, respectively. I thus do not find support for Hypothesis 5.

In Table 23, where the dependent variable this time is wage increase, I find no differential effect of workflow overlap on wage increase for female and male employees,

whether I control for Goal progress (Model 3) or not (Model 2). Similarly, there is no differential effect of workflow overlap on wage increase for female and male employees at the bottom of the hierarchy (Models 6 and 7). I thus do not find support for Hypothesis 6 and 7.

Note that Model 4 in this table resonates with results found in Table 20 and Table 21, whereas these provide evidence to support Hypothesis 4 using split samples, Model 4 is the corresponding interacted model and thus reinforces support for Hypothesis 4.

Table 22: Actual workflows as a function of work interdependencies formally prescribed relationships, by gender of i

DV: Actual workflows i→j	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Women(i)	Men(i)	Women(i)	Men(i)	Women(i)	Men(i)	Women(i)	Men(i)
Same gender	-0.00 (0.05)	-0.00 (0.04)	0.01 (0.04)	-0.02 (0.03)	-0.00 (0.05)	-0.01 (0.04)	0.01 (0.04)	-0.02 (0.04)
Same tenure	0.03 (0.04)	0.08+ (0.04)	0.04 (0.03)	0.08+ (0.04)	0.03 (0.03)	0.06 (0.04)	0.04 (0.03)	0.06 (0.04)
Same rank	0.03 (0.04)	-0.04 (0.04)	0.13*** (0.03)	0.07* (0.03)	-0.04 (0.03)	-0.11*** (0.03)	0.05* (0.02)	-0.00 (0.02)
Physical distance ¹	-0.08** (0.02)	-0.18*** (0.04)	-0.03 (0.03)	-0.13*** (0.03)	-0.06** (0.02)	-0.13*** (0.03)	-0.01 (0.03)	-0.06** (0.02)
Work interdependencies	4.64*** (0.65)	4.75*** (0.51)	3.35*** (0.47)	3.31*** (0.43)	4.43*** (0.62)	4.49*** (0.49)	3.08*** (0.40)	2.90*** (0.35)
Hierarchical							6.61*** (1.38)	6.06*** (0.84)
Direct boss			7.38*** (1.53)	8.67*** (1.25)				
Direct subordinate			4.98** (1.70)	3.28*** (0.76)				
Same functional area					1.75*** (0.30)	2.08*** (0.35)	2.02*** (0.30)	2.45*** (0.37)
Constant	0.47*** (0.09)	0.84*** (0.14)	0.25* (0.10)	0.60*** (0.11)	0.38*** (0.08)	0.65*** (0.12)	0.13 (0.11)	0.36*** (0.09)
N	6847	11894	6847	11894	6847	11894	6847	11894
adj. R-sq	0.297	0.300	0.433	0.432	0.328	0.338	0.468	0.454

Robust standard errors in parentheses
+ p<0.1 * p<0.05 ** p<0.01 *** p<0.001

Table 23: Wage raise as a function of workflow overlap by gender and position in the hierachy

DV: Wage raise i	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Workflow overlap	0.14** (0.05)	0.14* (0.06)	0.26*** (0.07)	0.02 (0.06)	0.02 (0.06)	0.12+ (0.07)	0.12+ (0.07)
Workflow overlap#Female emp.		0.01 (0.11)	-0.04 (0.11)				
Workflow overlap#Low rank				0.32** (0.12)	0.29** (0.11)	0.31** (0.10)	0.31** (0.10)
Workflow overlap#Female emp.#Low rank					0.10 (0.16)		0.01 (0.12)
Goal progress			4.44*** (0.89)			3.90*** (0.83)	3.90*** (0.84)
Tenure	0.69 (0.47)	0.68 (0.48)	0.32 (0.47)	0.53 (0.46)	0.47 (0.44)	0.15 (0.44)	0.15 (0.45)
Rank	-0.27 (1.28)	-0.28 (1.27)	-1.22 (1.21)				
Low rank				-10.44** (3.20)	-10.51** (3.26)	-11.13*** (3.21)	-11.14** (3.28)
Female emp.	1.62 (1.58)	1.40 (2.98)	2.88 (3.19)	1.65 (1.54)	0.52 (1.95)	1.86 (1.44)	1.80 (1.95)
Unit dummy	YES	YES	YES	YES	YES	YES	YES
Constant	6.34 (6.00)	6.47 (5.86)	-5.66 (5.46)	10.21** (3.27)	11.06** (3.28)	-2.11 (3.80)	-2.05 (4.05)
N	125	125	105	125	125	105	105
adj. R-sq	0.078	0.070	0.215	0.171	0.170	0.319	0.312

Standard errors in parentheses
+ p<0.1, * p<0.05, ** p<0.01, *** p<0.001

3.6.3 Robustness Tests

We conduct additional tests to verify the robustness of the association between *actual workflows* and *prescribed relationships*. First, we compute different measures of the dependent variable using different thresholds for the number of recipients cc-ed in email communications, ranging from a variable that includes only private (no-cc) messages (Model 1) to one which also includes ‘mass’ emails, defined as emails with up to 10 recipients (Model 3). Model 2 uses our main measure (includes emails with up to 4 recipients) for the dependent variable for comparison. In Table 24, coefficients on explanatory variables in Models 1 to 3 are remarkably similar, both in magnitude and level of significance, indicating that our results for Hypotheses 1 and 2 are robust to stricter and laxer rules of inclusion of emails based on number of recipients. Similarly, we find similar patterns when the dependent variables capture different types of workflows, namely those that imply face-to-face work-related interactions (Model 4) and face-to-face social interactions (Model 5). These dependent variables are survey-reported measures, on a scale of 1 to 5, of the frequency of each type of interactions. Given the different scale these variables are measured on, a direct comparison of coefficient magnitudes with those of Models 1 to 3 is not possible, but interpreted on their own, the size of the coefficients on the independent variables in Models 4 and 5 are non-trivial; formal relationships are associated with increased face-to-face communication as well. Table 24 contains these additional tests.

Table 24: Robustness checks: Different measures of DV

	(1)	(2)	(3)	(4)	(5)
DV:	Actual workflows _{ij} (1)	Actual workflows _{ij} (4)	Actual workflows _{ij} (10)	Face-to-face work interactions _{ij}	Face-to-face social interactions _{ij}
Same gender	-0.04 (0.03)	-0.01 (0.02)	-0.01 (0.02)	0.01 (0.01)	0.01 (0.01)
Same tenure	0.06* (0.03)	0.05* (0.03)	0.05* (0.03)	0.02** (0.01)	0.04*** (0.01)
Same rank	0.02 (0.02)	0.02 (0.02)	0.01 (0.02)	0.01+ (0.01)	0.01 (0.01)
Physical distance ¹	-0.06** (0.02)	-0.04* (0.02)	-0.04* (0.02)	-0.04*** (0.01)	-0.06*** -0.01
Work interdependencies	3.21*** (0.31)	2.96*** (0.28)	2.79*** (0.27)	0.54*** (0.04)	0.41*** (0.04)
Hierarchical tie	6.31*** (0.78)	6.23*** (0.72)	5.66*** (0.66)	0.36*** (0.04)	0.30*** (0.06)
Same functional area	2.57*** (0.32)	2.29*** (0.29)	2.16*** (0.28)	0.38*** (0.04)	0.34*** (0.03)
Constant	0.37*** (0.08)	0.28*** (0.07)	0.28*** (0.07)	0.18*** (0.03)	0.29*** (0.04)
N _{dyads}	18,741	18,741	18,741	17,117	17,117
N _i	129	129	129	119	119
N _j	150	150	150	146	146
adj. R-sq	0.41	0.458	0.452	0.24	0.135

+ p<0.1* p<0.05 ** p<0.01 *** p<0.001
 Clustered standard errors (i,j) in parentheses"
¹ steps in logarithmic scale

Additional tests were also carried out to verify the robustness of the associations between *wage increase* and *workflow overlap*. As in the case of the dyadic models, we find that our results are robust when we computed variables with diametrically different types of workflow: only private communication (no-cc) and including 'mass' email. We also examine the extent to which results are driven by workflows with those with whom the employee is *hierarchically* related or by those with peers from the same *functional group*. We create two versions of *workflow overlap* that make such distinction and find qualitatively similar results than when using the aggregated measure. More specifically, we find that, controlling for goal progress, workflows with both hierarchically related and functionally related colleagues, are associated, separately, to higher raises. These results are reported in Table 25 and Table 26.

We use these two versions of workflow overlap to test for robustness for Hypothesis 4. We find that the difference between employees at the top and at the bottom of the hierarchy still holds, where workflows with both hierarchically related and functionally related colleagues are associated (independently), to higher raises for employees at the bottom of the hierarchy but not for those at the top of the hierarchy. These results are reported in Table 27 and Table 28.

Table 25: Wage raise as a function of overlap between prescribed workflow and different measures of actual workflow

DV: Wage raise i	(1)	(2)	(3)
Gender	-1.84 (1.59)	-2.03 (1.57)	-1.91 (1.59)
Tenure	0.42 (0.49)	0.31 (0.47)	0.30 (0.48)
Rank	-1.42 (1.20)	-1.26 (1.21)	-1.22 (1.20)
Goal progress	4.32*** (0.90)	4.40*** (0.88)	4.38*** (0.88)
Workflow overlap (indiv. emails)	0.23*** (0.06)		
Workflow overlap (original measure)		0.25*** (0.06)	
Workflow overlap (up to 10 recipients)			0.25*** (0.07)
Unit dummy	YES	YES	YES
Constant	-2.82 (5.26)	-3.00 (5.29)	-2.75 (5.31)
N	105	105	105
adj. R-sq	0.212	0.222	0.210

+ p<0.1 * p<0.05 ** p<0.01 *** p<0.001
Robust standard errors in parentheses

Table 26: Wage raise as a function of overlap between different measures of prescribed workflow and actual workflow

DV: Wage raise i	(1)	(2)	(3)	(4)
Gender	-0.89 (1.70)	-2.03 (1.57)	-1.58 (1.66)	-2.06 (1.57)
Tenure	0.11 (0.51)	0.31 (0.47)	0.10 (0.50)	0.34 (0.48)
Rank	-1.55 (1.29)	-1.26 (1.21)	-0.30 (1.39)	-1.90 (1.20)
Goal progress	3.56*** (1.01)	4.40*** (0.88)	3.25** (1.01)	4.68*** (0.88)
Workflow overlap		0.25*** (0.06)		
Workflow overlap (hierarch.)			0.22** (0.07)	
Workflow overlap (funct. area)				0.24*** (0.06)
Unit dummy	YES	YES	YES	YES
Constant	5.24 (5.67)	-3.00 (5.29)	0.03 (5.66)	-0.75 (5.26)
N	105	105	105	105
adj. R-sq	0.075	0.222	0.163	0.203

+ p<0.1 * p<0.05 ** p<0.01 *** p<0.001
Robust standard errors in parentheses

Table 27: Top of Hierarchy: Wage raise as a function of overlap between different measures of prescribed workflow and actual workflow

DV: Wage raise i	(1)	(2)	(3)	(4)
Gender	-0.74 (2.21)	-1.61 (2.16)	-0.69 (2.26)	-1.77 (2.18)
Tenure	-0.97 (0.90)	-0.76 (0.92)	-1.02 (0.94)	-0.73 (0.95)
Rank	3.53 (3.13)	2.83 (3.09)	4.08 (3.21)	2.52 (3.13)
Goal progress	3.75* (1.64)	4.40** (1.58)	3.62* (1.67)	4.49* (1.70)
Workflow overlap		0.10 (0.07)		
Workflow overlap (hierarch.)			0.08 (0.09)	
Workflow overlap (funct. area)				0.09 (0.08)
Unit dummy	YES	YES	YES	YES
Constant	-3.32 (14.31)	-5.95 (14.20)	-5.23 (14.42)	-4.79 (14.43)
N	48	48	48	48
adj. R-sq	0.023	0.034	0.017	0.019

+ p<0.1 * p<0.05 ** p<0.01 *** p<0.001
Robust standard errors in parentheses

Table 28: Bottom of Hierarchy: Wage raise as a function of overlap between different measures of prescribed workflow and actual workflow

DV: Wage raise i	(1)	(2)	(3)	(4)
Gender	0.59 (1.97)	-0.98 (1.72)	-0.86 (1.81)	-0.68 (1.75)
Tenure	0.51 (0.48)	0.60 (0.43)	0.59 (0.45)	0.51 (0.45)
Rank	9.25** (2.76)	6.29** (2.14)	7.94*** (2.22)	6.21** (2.16)
Goal progress	3.58*** (0.92)	3.04*** (0.78)	3.10*** (0.77)	3.07*** (0.79)
Workflow overlap		0.37*** (0.08)		
Workflow overlap (hierarch.)			0.36*** (0.06)	
Workflow overlap (funct. area)				0.37*** (0.09)
Unit dummy	YES	YES	YES	YES
Constant	-42.37*** (10.48)	-34.27*** (8.75)	-38.85*** (8.81)	-32.78*** (8.61)
N	57	57	57	57
adj. R-sq	0.317	0.524	0.491	0.515

+ p<0.1 * p<0.05 ** p<0.01 *** p<0.001
Robust standard errors in parentheses

3.7 Discussion

Though the main results were robust to a number of specifications, there remain several limitations. First, although we take into account features of the formal structure and work interdependencies relationships in a more detailed and conceptually motivated way than previous works investigating workflow networks within the organization, and

their influence on employee compensation, we are only able to show correlations. One reason why we are not able to identify the relationship between workflow networks and employee compensation is that our data do not allow us to observe how employees are selected into roles. It could be that over time, adopting certain patterns of interaction leads employees to fill positions in which these same patterns are now prescribed by the formal structure. Our knowledge of how work interdependencies emerge is also limited, it may well be that because employees interact they become work interdependent and not the other way around, that because employees are work interdependent they interact.

Second, while our results unearth an association between mirroring the formal structure in one's workflows and obtaining higher raises, we are not able to identify the mechanism that would explain this association. We provide two possible explanations, namely that mirroring the formal structure could signal compliance (aligned preferences) and/or it could indicate that the employee has the appropriate level of competency and understanding of the organization's functioning.

Third, our data only describes the headquarters of a single company over one year. We thus cannot claim generalizability beyond our setting. Importantly, we cannot know how much our findings depend on the particular organizational structure and culture of the firm we studied. It could be that the headquarters of the firm we studied was particularly 'traditional' and 'bureaucratic' features that could be driving our results. While we believe these findings are potentially generalizable to other countries and

industries, it would be necessary to replicate our study in settings that are different in terms of organizational structure (e.g., a smaller entrepreneurial firm with a flatter structure for example).

We view our findings to be important because they testify to the need to take into account structure when studying communication patterns within the firm, indeed we find that workflows largely mirror the formal organizational chart. More importantly, we find that deviations from the formal structure, understood as frequent work interactions with colleagues that are neither a boss, a subordinate nor a peer from the same functional area, are on average associated with lower increases in compensation. We find that this effect is driven by employees at the bottom of the hierarchy and disappears for employees at the top. We also introduce the idea that the benefits to brokerage shown in prior works could be mediated by employees' position in the hierarchy. Indeed, it could be that instead of a brokering position being the source of advantages, it is actually the individual's compliance with the brokering requirements associated with their formal position, when they are at the top of the hierarchy, that leads to these advantages.

The findings presented here are likely to be of interest to scholars who study social networks inside organizations in that they highlight the necessity of taking into account the formal structure of organizations to distinguish between cases when employees are being entrepreneurial in their interactions and cases when they are only doing what is required of them by their role in the organization. Our study is also likely of interest for

scholars that focus on organizational design and the role of formal organizational structure on performance. Indeed, our findings support the idea that, at least in our setting, that formal structure matters -- i.e. that not everything happens “behind the organizational chart,” and thus efficient principles of design are likely important to firms.

4. Befriend thy neighbor: office seating, social networks and gender

4.1 Introduction

It is now an established scholarly finding that social networks matter. Research over the past several decades has consistently shown that networks, defined as patterns of relationships between individual actors, are a key determinant of differences in individual career outcomes (Burt, 1992; Podolny & Baron, 1997; Granovetter, 1985; Tortoriello et al., 2012). On the other hand, gender scholars have thoroughly described the gender segregation that plagues organizations, and the strong influence of norms and role expectations derived from a gender status hierarchy on behavioral and interpersonal processes (Eagly, 1987; Ridgeway, 1991). It is then unsurprising that gendered processes play an important role in explaining network formation and network benefits (Burt, 1992; Ibarra, 1997).

One prolific stream of the network literature investigates gender differences in network building, utilization, and benefits. In particular, women have been shown to occupy advantageous network brokerage positions at a lower rate (Fang et al., 2020), and even when they do, they do not derive from such positions the same benefits men do (Burt, 1992). A deficit in organizational legitimacy, confinement to lower organizational ranks and non-core functions, and pressures to act in gender-role congruent ways have been put forward as explanations for the gender differences in brokering. In parallel, it has been shown that women tend to build denser and less sparse networks, from which they derive social support and strong friendships, but which at the same time hinder access to valuable diverse information.

Several remedies to this lack of access to diverse information that fosters career advancement have been proposed in the literature; borrowing legitimacy, and network contacts, from a high-status mentor or advocate (Burt, 1992), recasting brokerage as collaborative rather than competitive (Brands & Mannucci, 2020), diversifying gender-congruent friendship ties in order to access both rich and dissimilar information (Yang et al., 2019). In this study, I focus on this last solution and investigate the efficacy of a seat re-assignment that de-correlates seating from organizational memberships to induce new network diversifying friendship ties.

Prior research suggests that propinquity encourages the formation of new ties (Small & Adler, 2019). Through propinquity in time and space, which being desk neighbors at work favors, co-workers are exposed to each other repeatedly, are able to get to know each other on a deeper level, and thus have a clear opportunity to form strong ties (Reagans, 2011). Nevertheless, propinquity only offers an opportunity, and desk neighbors must also be interested in forming a tie. Past research has described a diverse set of factors that drive this needed will to form a tie; from similar interests and tastes, similar skills, to sharing similar demographic characteristics (McPherson & Levin, 2001). All sorts of preferences could thus hinder the formation of ties.

I hypothesize that women's more developed social skills will make them more likely to form ties with their new assigned neighbors and that the experimentally manipulated diversity of these new neighbors (in terms of organizational membership), will translate women's higher ability to make friends into a network with more structural holes.

In this study, I exploit a quasi-field experiment where, following an office move, the seating plan of an office was manipulated to induce propinquity between

functionally dissimilar organizational members. An exhaustive set of data was collected, including email data and survey data that enable the observation of network structures for 145 employees prior to and after the move, as well as data on dyad and individual characteristics.

I find several interesting patterns in the data, following the move, women form friendship ties with new desk neighbors at a higher rate than men do. As a result, following the move, the brokerage score of female employees' friendship networks is more likely to increase than that of male employees' friendship networks. I also find some suggestive evidence that women whose networks see an increase of brokerage following the move tend to reap higher organizational rewards in the form of wage increases.

This chapter is organized as follows, I first go through theoretical developments, I then describe the setting and the data, I lay out the empirical strategy before going through the results of the analyses, and finally conclude and discuss next steps.

4.2 Theoretical Developments

4.2.1 Women's networks often lack access to diverse information

4.2.1.1 Networks bring advantages

Over the past decades, scholars of organization theory, sociology, and management have highlighted the importance of networks, understood as the set of relationships or ties that connect groups of people, in shaping both organizational and individual outcomes (Borgatti & Halgin, 2011; Kilduff & Brass, 2010).

In particular, networks offer access to information and other key resources that shape individual outcomes and explains some of the variance in job performance and career success. Through their network of contacts, individuals, and more specifically employees, in the case of intra-organizational networks, gain access to formal but also informal information like gossip, advice, tips, as well resources in the form of social support or sponsorship. All of these are often key to receiving organizational rewards.

Social capital has thus been shown to matter for a range of individual outcomes from job performance (Mehra, Kilduff, & Brass, 2001), promotion (Burt, 1992; Shipilov et al., 2014), employee turnover (Vardaman et al., 2015) to creativity (Perry-Smith & Shalley, 2003; Burt 2004) and innovation (Obstfeld, 2005).

Differences across employees in network positions and other features, lead to differential access to valuable resources and thus explain some of the differences in employee outcomes. Different features of networks matter for different types of outcomes. For instance, egos (i.e. focal actors) whose networks have more structural holes are more likely to gain access to more novel information (Burt, 1992). Having a large, sparse network of informal ties enables individuals to acquire information and resources and is associated with increased intra-organizational mobility (Podolny & Baron, 1997). Centrality in advice networks leads to increased individual job performance (Sparrowe et al., 2001). Strong ties, network cohesion, and network range all positively impact the likelihood of receiving knowledge from other organizational units (Tortoriello et al., 2012).

4.2.1.2 Brokerage positions are particularly advantageous

A rich literature on intra-organizational networks has focused in particular on brokers (Burt, 1992, 2004, 2005, 2009; Quintane & Carnabucci, 2016; Soda et al., 2018; Kwon et al., 2020); individuals with open networks, that are able to bridge 'structural holes' to connect otherwise disconnected actors (Burt, 1992). Brokerage positions are particularly advantageous because they grant access to diverse and rich information that helps employees get ahead in their careers. Brokers are then able to bring forward ideas formulated through interactions with disconnected actors and to leverage private knowledge where it is valued the most within organizations (Burt et al., 2013).

In consequence, brokers hold an information advantage, as their scattered and distant connections enable them to collect more complete and valuable information earlier than others. Scholars have been building up empirical evidence consistent with the existence of this advantage and have detailed the benefits it brings brokers. Among other things, scholars have shown that brokers often lead more successful careers as they reach higher hierarchical ranks faster (Burt, 1992; Fang et al., 2015), to generate more ideas (Fleming et al., 2007), to have higher salaries and higher bonuses (Burt, 1997; Burt et al., 2000), and to receive more positive performance assessments (Burt, 2004).

In their review of the literature on brokerage, Kwon et al. (2020) highlight the helpful distinction between brokerage as structure and brokerage as behavior. Brokerage as structure describes the social network position of one actor when it is connected to two other actors that are not connected themselves, i.e. there is a structural hole between these two other actors. This structural view of brokerage is the most researched. However, brokerage opportunities deriving from structural features

are not necessarily accompanied by brokering behavior (Smith, 2005). Individuals must then want and have the skills to engage in information collection and exchange that is the purview of brokers (Burt et al., 2013). This distinction, in part, helps explain some of the gender differences the literature has uncovered regarding brokerage.

4.2.1.3 However, brokerage is more complicated for women

Meta-analytic evidence shows that women are less likely than men to occupy brokerage positions in networks and to act as brokers. Two main types of explanations have been put forward in the literature for this difference; structural and agentic explanations (see Fang et al., 2020 for a thorough review). There is also scholarly evidence that women are less likely to reap returns from brokerage.

4.2.1.3.1 Women are less likely to be brokers

Horizontal and vertical gender segregation in the workplace determine tie formation and access to high-status organizational actors. Structural explanations point to the fact that women, being segregated in less high-status positions and less strategic non-core departments in the firm (Ibarra, 1993; Kanter, 1977), have fewer job-based opportunities to form valuable and diverse relationships that are critical to occupying brokerage positions.

The fact that women tend to be clustered in lower-rank less critical positions affects both opportunities to form formal and informal relationships with colleagues from the same organization. It reduces opportunities for female employees to participate in various *formal* organizational activities that bring together employees occupying critical organizational positions and to then develop *informal* relationships

across different departments and functions (McEvily, Soda, & Tortoriello, 2014; Kleinbaum et al., 2013; Yakubovich & Burg, 2019).

Additionally, the well-researched human tendency towards homophily, i.e. the preference to interact with similar others along identity characteristics such as gender (McPherson, Smith-Lovin, & Cook, 2001) reinforces the effects of organizational gender segregation on tie formation. Since men are historically over-represented in higher-level positions, tendency towards homophily means that women are yet less likely to form informal connections with organizational actors in higher organizational ranks (Woehler et al., 2021).

The gender imbalance across occupations and hierarchical levels thus shapes the processes of network building and utilization by affording men and women actors different opportunities to form network ties with a diverse set of actors.

Agentic explanations, on the other hand, point to the fact that women have weaker preferences for forming the type of ties that favor the emergence of structural holes in networks, and yet others point to the fact that brokering is generally perceived as stereotypically masculine, which, drawing on role congruity (Eagly & Karau, 2002) theory, means that women that engage in brokering are often punished for it and that as a consequence, women might be reluctant to engage in brokering for fear of backlash (Rudman & Phelan, 2008; Brands & Kilduff, 2014).

According to research conducted from the agency perspective, gender differences in brokerage can be explained by preferences for engaging in different types of interpersonal processes and for adopting different relationship orientations

(Fang et al., 2020). Women have been found to be less likely to engage in agentic behavior and more likely to be communal and interdependent, while men tend to be more autonomous and independent (Heilman, 2012). Research also shows that women tend to draw a sense of belongingness and closeness from relationships while men rather derive a sense of accomplishment and their social standing from relationships (Kwang, Crockett, Sanchez, & Wann, 2013).

Driven by different relationship orientations and preferences for interpersonal processes, men thus often seek to augment their visibility and reputation by forming connections with organizational actors who occupy functionally and hierarchically diverse positions, whereas women seem less driven to network actively by connecting with colleagues across horizontal and vertical organizational boundaries.

These differences could explain why on average women are less likely to occupy brokerage positions.

Other scholars have explained the differences in brokering behaviors across genders, not by differences in preferences and motivations, but rather as compliance with gender role expectations; those of agency for men and communion for women. Male-typed brokering is not easily available or even useful for women (Burt, 1998; Brands & Kilduff, 2014; Brands & Mehra, 2019).

Stereotypes define the boundaries of socially acceptable roles and behaviors for women and men. Developing one's network of professional relationships requires control over one's own goals and actions, as well as being able to be forthright about one's value as a network contact (Gruenfeld et al., 2008), these behaviors fall in the purview of the stereotypically male, thus men may feel more compelled and

comfortable forming instrumental ties for professional advancement. Gender role expectations for men also dictate that they put the professional domain before the personal domain, whereas women are expected to do the reverse (Pedulla & Thébaud, 2015). The act of developing professional network relationships involves agency and being strategic in advancing one's career. Such behavior is thus likely to be cast as stereotypically masculine.

Thus, women may choose to avoid adopting agentic or instrumental behaviors and men may abstain from communal behaviors in order to preclude the backlash these gender role-incongruent behaviors elicit (Phelan & Rudman, 2008; Moss-Racusin et al., 2010). Gender role stereotypes may thus narrow the bandwidth women have to develop professional relationships in comparison to men and thus reach valued brokerage positions.

4.2.1.3.2 Women do not reap the same rewards from brokerage as men

Yet other explanations focus on different utilization of network ties (rather than tie forming behavior). Even with structurally similar network structures, men and women have been shown to utilize them differently and to derive dissimilar benefits from them.

Research has shown that even when women are in brokerage positions within their social networks they do not derive the same types of benefits from these positions as men do.

Individuals may be construed as and feel less legitimate when they utilize their network of relationships in ways that are gender-role incongruent. In a study focusing on MBA student teams, gendered stereotypes around brokerage in friendship

networks meant reputational penalties for women who were perceived to play these roles (Brands & Kilduff, 2014). Women may also feel more uncomfortable when holding network positions that facilitate agentic behavior, such as commandeering information, resources, and contacts (Brands & Mehra, 2019). Thus, women may be less likely to benefit from such positions.

It should be mentioned that these explanations also differ along the dimension of who they center to justify different network positions for men and women and different returns to brokerage network positions. Some are ego-centric in that they focus on the perspective of the focal actor, some are more alter-centric in that they focus on the perceptions and actions of the alters ego is trying to or connecting with.

4.2.1.4 How can women, then, access crucial diverse information to advance their careers?

As a result, women's networks tend to be dense and closed rather than sparse and open.

Women thus tend to have lesser access to the insight and skills crucial to individual performance and the attainment of career objectives. Scholars have found that an important challenge women face is constrained informal network access to necessary resources for making headway in their careers (Ely et al., 2011; Fang et al., 2020). In particular, women have been shown to "have limited awareness of who knows what in an organization and a lower ability to seek help from others best suited to guide the search for knowledge" (Singh et al., 2010), both of which hinder their execution of specific tasks.

The more homogeneous network-building behavior that women tend to display has been shown to lead to poor outcomes. In particular, “closed networks” in which every actor is connected lead to information homogeneity and redundancy (Coleman, 1994; Reagans & McEvily, 2003).

There are other ways for women to gain advantage through their social networks than the stereotypically masculine way that involves agentic behavior, and seemingly playing people against each other. Scholars have then highlighted ways women can get ahead and overcome some of the challenges described in both the structural and agentic explanations.

In his 1992 study, Ronald Burt finds that even when women have structural brokerage positions they do not derive the same benefits from these positions as men do, he postulates that women experience a legitimacy deficit in the workplace, which, reformulated, is close to the idea that women brokers are gender role incongruent, and that this ‘outsider status’ hinders their ability to profit from brokerage positions. Burt goes on to show that when women are able to “borrow” social capital from high-status mentors or advocates, they can reap substantial benefits.

The idea of providing women in the workplace with mentors and advocates has certainly taken hold among companies and HR practitioners. However, some systematic research into the impact of mentoring programs (Srivastava, 2015) point towards weak points in terms of both access and implementation; outside of dedicated programs that assign mentors, women tend to struggle in finding sponsors, and to receive less help from male sponsors, women also tend to lack the experience to

properly exploit social capital from powerful connections (Lin, 2001; McGuire, 2002; Lutter, 2015).

Brands and Mannucci (2021) propose another solution; it is possible to make brokering more appealing to women by shining a light on a different style of brokering that is more communal and thus closer to stereotypes of femininity, thus countervailing social identity threat. This recasting consists in depicting brokers as *tertius iungens*; connectors that “introduce disconnected individuals or facilitate new coordination between connected individuals” (Obstfeld, 2005), instead of the most often depicted *tertius gaudens*; an entrepreneur “who can play people off against one another for his or her own benefit” (Obstfeld, 2005).

The authors find confirmatory results that women who undertake *iungens* brokerage change their perception of creative brokerage and associate it to feminine traits, while it is not the case for women who undertake *gaudens* brokerage. They also find that women that were assigned to the *iungens* brokerage condition performed better on a creative task.

The third way I propose and test in this chapter is to take advantage of women’s superior ability to form friendship ties and to use office design, in particular quasi-random seating assignment next to dissimilar colleagues, to help women diversify their inner circles. This would thereby open up channels for women to gain access to more diverse information. Indeed, forcing physical proximity between dissimilar colleagues enables to circumvent the structural constraints to women’s brokering. Brokering through physical proximity, i.e. diversifying one’s network alters

by connecting with dissimilar neighbor colleagues, also shields from adverse perceptions of brokering as not feminine. Forming ties with office neighbors is likely to be perceived as less strategical, compared to forming ties with colleagues that are not one's immediate work counterparts and not neighbors.

4.2.2 Spatial design to reduce gender inequality in social capital

Both scholars and managers have wondered about the possibility to influence or redesign organizational social networks in order to reap the associated benefits identified in the literature (Hasan & Koning, 2020; Puranam, 2018; Catalini 2018). Tie formation within organizations can be fostered in several ways including altering the organizational chart or inducing collaboration by assigning individuals to cross-cutting projects, I, on the other hand, contribute to a literature focusing on altering workplace micro-geography (Ingram & Morris, 2007; Hasan & Koning, 2019; Lee, 2019; Lecuona Torras & Cummings, 2020).

Indeed, a feature of the workplace, that could affect gendered network processes, but has been less oft studied with this purpose in mind, is spatial design, and, in particular, in as much as it affects spatial propinquity (Small & Adler, 2019).

4.2.2.1 Spatial design as a feature of organizational design

The literature has investigated ways the spatial design of workspaces can affect a set of interesting outcomes.

Research on the psychological impacts of workplace design has investigated the impact of seating assignment and dividers on outcomes such as perceptions of

privacy, monitoring, and individuals' perceptions of social cohesion in organizations (Bernstein & Turban, 2018; Gonsalves, 2020; Cummins, 2020).

In particular, research on the impact of workplace design on gender diversity is rather scarce. Features of the environment and their implied gendering have been shown to affect women's sense of belonging and interest in a STEM classroom (Cheryan et al., 2009). In a computer science classroom, the researchers replaced items perceived as stereotypical of computer science (for instance Star Trek poster, video games) with items not perceived as stereotypical of computer science (such as nature poster, phone books) and found it was enough to get female undergraduate students as interested in computer science as their male peers.

Chang & Kajackaite (2019) suggest that other features of the work environment can affect the work performance of women and men differently, in their study women performed better on math and verbal tasks at higher room temperatures, while for men, the opposite was true.

4.2.2.2 Seating assignments and patterns of interactions

<i>4.2.2.2.1 Proximity and friendship ties</i>
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Feld (1981) proposed the concept of 'focus' as conditions in which relationships develop and persist. The sharing of "social foci" has been highlighted in the literature in sociology and geography as being highly conducive to the formation of ties between individuals (see Rivera et al., 2010 for a review), precisely, it allows members to become aware of one another, which increases the likelihood of joint affiliation. Research shows that, in a work context, sharing foci such as area, department, project

team leads to increased interactions and potentially the formation of friendship ties (Sias & Cahill, 1998; Dalhlander & MacFarland, 2013; Yakubovich & Burg, 2019).

Another social focus that induces relationships between people is space (see Small & Adler, 2019, for a thorough review). Sociologists and organizational theorists have investigated how spatial proximity influences tie formation and communication patterns. In particular, the organizational literature on micro-geography has shown that being in close physical proximity increases the likelihood of communication and even collaboration (Festinger et al., 1950; Allen & Fustfeld, 1975; Kabo, 2017; Catalini, 2018). The role of propinquity in generating strong ties has been demonstrated in many contexts that induce proximity including seating arrangements (Caldeira & Patterson, 1987; Reagans, 2011).

This literature has shown that spatial propinquity leads to the formation of strong, trusting, and dense ties between colleagues. Past research has found evidence that spatial proximity fosters interpersonal liking or friendship (Festinger et al., 1950). Propinquity is likely to affect tie strength through two mechanisms; recurrent exposure enables individuals to discover shared or compatible tastes or interests, or it could allow individuals to grow more sympathetic or understanding of their differences (Reagans, 2011). The closer individuals are seated in the workplace, the more the absolute amount of communication between them increases (Allen & Fustfeld, 1975). The quality of communication improves as well; face-to-face interactions are the most effective device for processing rich information; as they allow immediate feedback along with very useful cues such as body language and context (Lee, 2019).

While a large share of the interpersonal connections that emerge within organizations are prescribed by the organizational structure (Kleinbaum et al., 2013), employees may also choose to also form more informal ties akin to friendship. Propinquity is a vector of such bonds of friendship.

In the office, the most straightforward physically proximate peers are desk neighbors. Physical proximity offers opportunities for repeated, long-term, interactions that tend to lead to closer, friendship-like relationships. In the workplace, office neighbors tend to be the ones you take a break with, the ones you grab a coffee with during the workday, the ones you go to lunch with. These are the types of repeated interactions that tend to induce friendships.

In sum, physical proximity provides individuals with the opportunity to build a deep relationship.

<i>4.2.2.2 Propinquity, ties, and gender</i>
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To understand how women can derive benefits from their networks, despite the previously described constraints they face in building and utilizing them, one must understand some of the specific features that women's networks tend to display.

Relative to men, women tend to have more cohesive networks in which actors are densely connected to each other (McPherson et al., 2001). Women are perceived as more communal, warmer (Heilman, 2012), they are also consistently better at decoding non-verbal emotional cues (McClure, 2000); these match the qualities required to excel in the relational domain. Women have then been shown to be better at forming long-lasting deep friendship ties. For instance, women are more likely, when asked, to recall

a longer list of strong ties, i.e. contacts one feels emotionally close to, compared to men (Fischer, 1982; Marsden, 1987).

While this type of social behavior can 'close' networks, it can be exploited to 'open' them as well.

Spatial design that forces instances of physical proximity between employees offers a way to bypass the structural constraints that corral the formation of ties in the workplace. Spatial design can be, in certain contexts, de-correlated from the formal organizational structure. Indeed, it is becoming more common for firms to enable more novel and flexible forms of spatial design for their offices (for example, hot desking) that lead people from different functional groups and hierarchical ranks to seat at proximate desks in the office.

Spatial design can also affect the networking behaviors of employees. The literature on gender and networks has shown (Brands & Kilduff; 2014) that network brokerage, which brings considerable advantage, is less often adopted by women, because of the stereotyping of brokerage as masculine agentic behavior. Agentic networking behavior is perceived as being at odds with gender role expectations for women. Then the desire to conform with gender role expectations or the fear of the backlash they might face if they decided to adopt non-gender-role congruent behaviors, often drives women to forego brokering. However, forming ties with desk "neighbors" does not go against gender role expectations for women, rather it plays into the stereotypes of the communal woman. It follows that if women were to be seated with diverse alters rather than the neighbors their structurally segregated positions within the firm tend to afford them, they might be able to 'broker' with less penalty, and then derive the associated benefits.

While exogenous propinquity offers men and women similar opportunities for interaction, I argue that women, based on different preferences or social expectations, will be more likely to form friendship ties with their new neighbors.

H1: Physical proximity is a stronger determinant of friendship tie formation for women than it is for men.

Inner circles of friends have been shown to have a positive impact on individual outcomes. It is the case, in particular, when the friends are themselves connected to different types of people.

The inner circle in itself brings support, trust, and thorough information while the dissimilarity of its members allows for diverse information to reach the focal actor.

In a study of women grape-growers in Champagne, women's cohesive networks prove to provide reliable access to key professional expertise and know-how as well as social support. Women leverage these informal relationships to overcome social isolation in a male-dominated environment and gain a commercial advantage in the process (Ody-Brasier & Fernandez-Mateo, 2017).

The fact that women's close ties are more likely to persist over time is relevant too as it means that changing jobs or changing location in the office will not mean new ties replacing old ties, but new ties increasing the diversity of the focal actor's network. Zhang et al. (2020) show that women demonstrate higher network resilience after changing job positions and that this allows them to transition into their new job with more success. They hypothesize that women's stronger and more cohesive intra-organizational ties are more likely to persist after positional changes. The social support these persisting ties provide will positively affect the movers' performance.

Yang, Chawla, and Uzzi (2019) focus on graduate school networks and suggest that a network composed of a closed circle of diversely connected friends can have beneficial impacts for women. In their study of MBA student's networks and job-placement outcomes, they find that high-placing women tend to have an inner circle of strong ties that puts the focal women in reach of a large number of non-redundant contacts.

I further the research in that realm, by asking if office design is a way firms can try to increase networking and advancement opportunities for their female employees. This manipulation is interesting also because it should not affect men adversely, or be perceived as doing so, which can matter for ease of implementation.

Because women are likely to take better advantage of their new set of potential friendship relationships with neighbors and because these new sets of neighbors are, by design, dissimilar to the focal actors, I expect that women's higher propensity to forming friendship ties with new neighbors will lead to a more important increase in brokerage for them, compared to men. Women's friendship networks are thus more likely to be enriched in structural holes following the seat reassignment.

H2: The office seat reassignment post-move will increase women's network brokerage more than it will men's.

4.3 Data

4.3.1 Setting

To investigate these questions, I use data collected in the field at a multinational multi-business firm's headquarters between June 2015 and May 2016.

The firm is Mexican, is publicly traded, and operates in the water solutions industry. In August of 2015, the headquarters was relocated, and this naturally occurring move allowed for experimental manipulation.

The quasi-experiment was designed to randomize position in the office open plan and to not have employees that share work interdependencies sit next to each other. Prior to the move, employees sat in clusters with people from their team and closer to people from their larger area while post-move, the experimental manipulation (within the limits of the leeway given by management) led to the following office configuration: employees of hierarchical ranks 1 (CEO) to 3 were seated in offices with glass walls, and all the other headquarters employees were seated in an open plan configuration. These employees, of hierarchical ranks 4 to 6, were randomly assigned into three equally sized clusters based on work interdependencies and had their seats randomly assigned to them within these three clusters (see Figure 10).

The change from one office space to the other and the experimental manipulation meant that employees were quasi-randomly assigned to their seats and thus represents an exogenous change in physical proximity or propinquity between employees of this firm's headquarters.

Headquarter employees came and went during the 12-month data collection period; I focus on the 144 employees that were there at least a month before and at least a month after (I control for tenure in the analyses). Employees working at the HQ office are mostly high-level executives, middle managers, and analysts. Each of the four divisions that make up the company is represented at HQ.

In parallel, exhaustive and detailed data both on employees' demographic and work-related attributes and on working relationships between employees was collected.

At the individual level, I use internal HR documents complemented by LinkedIn searches to account for information such as age, gender, educational background, and past professional experience. The set of archival data also allows to capture characteristics of the work that each employee performs such as position title, tenure, rank, team, and department membership. Finally, to proxy for each individual's performance, I use historical wage data as well as internal assessment data from annual reviews.

I further use data on dyads of employees. The archival data enabled the coding of the strength of employees' technical interdependencies with each other (belonging to the same team, department, sharing functional processes, etc.). Data on all the emails sent by employees of the company (sender, recipient, subject, timestamp, and size) was also collected during the study period.

4.3.2 Variables

The firm context is the same as described in the previous chapter, in particular, for a description of the temporality of the evaluation process and the ensuing wage changes, please refer to the data section in Chapter 3. Some of the variables I use in the analysis for this chapter are also the same, I will give a brief description of their construction, one should refer to Chapter 3's data section for more details.

4.3.2.1 Dependent Variables

Network ties - Email. I use the email communications data made available to us by the company to build this variable. I adopt a conservative approach to model the intra-organizational communication network by focusing on one-to-one emails within the organization, thus excluding one-to-many emails and emails sent to external sources. Prior work has provided evidence that email data represents communication networks between employees effectively (Quintane and Kleinbaum, 2011; Kleinbaum et al., 2013).

I then code that a tie from i to j exists if i sent at least one one-to-one email to j during the study period. I differentiate between the Pre-move period and the Post-move period and accordingly build two variables $TieEmailPRE_{ij}$ and $TieEmailPOST_{ij}$. In all ties variables, the direction of the tie matters for me as I investigate the impact of i 's characteristics, in particular, gender on tie creation. Present in the data are thus both the tie from i to j , as well as the tie from j to i (potential issues related to this situation for the empirical analyses are discussed later).

Network ties – Friendship. A survey was conducted at the headquarters twice, once prior to the move, in April 2015, on 128 employees with a 100% response rate (this rate is not surprising as response was mandated by the firm, out of these only 120) and once after the move, in November 2016, on 141 employees with a 100% response rate. In this survey, employees had to answer, among others, the following question: "How frequently did you communicate with j informally to chat about non work-related issues?" and were asked to answer according to the following scale; 1=never, 2=monthly, 3=bi-weekly, 4=weekly, 5=daily. I then code that a friendship tie from i to j exists if i responds 4 or 5 to that question. I differentiate between the Pre-

move period and the Post-move period and accordingly build two variables TieFriendshipPRE_{ij} and TieFriendshipPOST_{ij}.

Network ties – Informal Work. In these same surveys, employees had to answer this other question: “How frequently did you communicate with j informally to chat about work-related issues?” and were asked to answer according to the following scale; 1=never, 2=monthly, 3=bi-weekly, 4=weekly, 5=daily. I then code that an informal work tie from i to j exists if i responds 4 or 5 to that question. I differentiate between the Pre-move period and the Post-move period and accordingly build two variables TieInfWorkPRE_{ij} and TieInfWorkPOST_{ij}.

Employee Brokerage. I calculate employee brokerage as the inverse of the square root of Burt’s (1992) structural constraint measure:

$$\text{Brokerage}_i = \left(\sum_{k=1}^n (P_{ik} + \sum_{q=1}^n P_{iq}P_{qk})^2 \right)^{-1/2}$$

where, as explained in Kleinbaum (2018) “P_{ik} represents the proportion of person i’s ties that comprise person k; the inner summation incorporates the indirect constraint imposed on each actor i by actor k through connections among actors q who interact with both i and k”. Using this transformation does not introduce bias to the analysis.

I calculate several measures of brokerage for each employee using the package igraph in R. I calculate brokerage in the email network, Brokerage Email_i, brokerage in the friendship network, Brokerage Friend_i, and brokerage in the informal work network, Brokerage Inf Work_i. I differentiate between the Pre-move period and the

Post-move period and accordingly build two variables for each type of network. To test the second hypothesis, I calculate the change in Employee Brokerage from before the move to after the move. To test the third hypothesis, I create a binary variable Increased Brokerage that is equal to 1 if the employee saw an increase in their brokerage score following the move.

Wage Change. The company evaluates employees' performance yearly following a structured 'talent review' process culminating in the Spring (see Figure 11). The performance of employees is assessed by a group of senior managers along with the employee's direct boss. The 'talent review' committees meet (in the months between January and May) to discuss each employee's case and determine their compensation for the next cycle.

I track employees' *wage change* by calculating the year-on-year change in total compensation (comparing employee wages of June 2015, to those of June 2016, both resulting from the performance assessment cycle that ended the month prior). In the analyses that involve this variable, I exclude the employees who received abnormally high wage increases as such high raises corresponded to employees moving from temporary to permanent worker status. Only a small minority of employees receive a variable bonus on top of their fixed wages. For this measure, I add both to get the total compensation. To account for the right-skewed distribution of Wage Change, I log-transform it. The implication for the interpretation of the estimated coefficients is discussed in the results section.

4.3.2.2 Independent Variables

Physical distance. The walking paths from all seats to all seats were walked in order to be mapped and steps were counted, leading to a measure of the distance between each seat in the office in number of steps. I create a set of binary variables at the dyadic level, equal to 1 if i and j are seated at desks that are less than X steps from each other ($X=10,12,15,18$).

Female employee. This variable at the individual i level, is equal to 1 if the employee i is a woman. Gender is proxied by inferences based on the employee's first name and, in cases of doubts, inferred from searches of pictures on the firm's intranet.

4.3.2.3 Control variables

I also account for a series of factors that have been shown to impact intra-organizational network ties.

4.3.2.3.1 Dyadic variables

Past work has shown that in work contexts, organizational features, such as functional and vertical groupings or temporary affiliations such as project team or task force membership, are important determinants of network tie formation (Kleinbaum et al. 2013). Common membership in these organizational 'groups' provides an opportunity for tie formation through temporal and physical colocation.

Hierarchical Relationships: I use the company's organizational charts to identify boss-subordinate relationships. The variable *hierarchical relationship* takes the value of 1 when a dyad of employees is directly connected by a reporting relationship, and 0 otherwise.

Functional Relationships. The organizational charts and other archival data provide information on functional areas. I create three different indicator variables which take the value of 1 if the two employees in the dyad are part of the same formal group (unit, department, or functional area).

Same tenure. Dyads of employees that have started their job at the firm around the same time are more likely to form relationships. I create a binary variable that is equal to 1 when *i* and *j* are in the same tenure bracket.

Same rank. Working in positions at the same rank within an organization fosters opportunities for contact and thus for forming relationships.

Same gender. Tie formation choices in social networks have been shown to display a strong pattern of “gender homophily” (Smith-Lovin & McPherson, 1993; McPherson et al., 2001). I account for this tendency with this dyadic variable that equals 1 when *i* and *j* share the same gender.

4.3.2.3.2 Individual variables

I account for each employee’s *network size* (or outdegree) prior to the move and for employees’ *tenure* in the company as employees who have been with the company for longer are likely to have a larger and more diverse network of relationships. At the individual outcome level, network size could influence other features of network structure organizational rewards such as wage increase. I also account for the *rank* of employees within the company, which I measure by the number of reporting steps between the focal employee and the CEO, as tie forming opportunities and behaviors of employees at different ranks might be different. I account for *employee’s unit* or VPs, as they are called in this firm. I include binary variables for each but one of the VPs of

the firm (all are represented at HQ). Finally, in models where the dependent variable is the wage change, I account for employee *age*, *age squared*, and their possession of a *graduate degree*.



Figure 10: Before and after seating plans

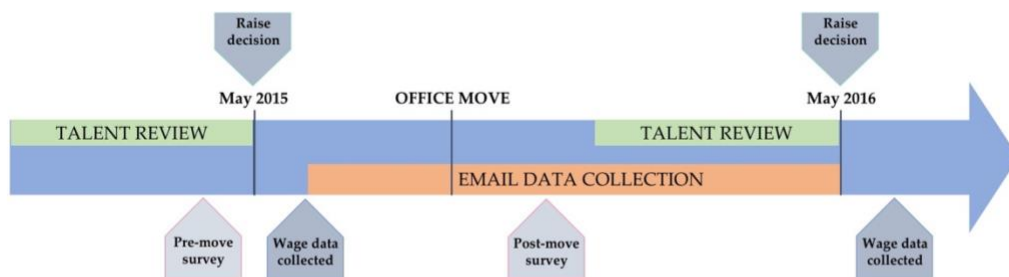


Figure 11: Data collection timeline

4.3.3 Descriptive Statistics

Table 29 and

Table 30 present descriptive statistics and a correlation matrix for variables at the individual level.

The average employee in the sample has a tenure of 6.1 years with the company, is 36 years of age. At headquarters, 34% of the employees are women while 66% are men. About 41% received graduate education. The average employee is 3.4 hierarchical steps away from the CEO. Wages are in Mexican pesos.

Table 31 provides insights into how these characteristics differ on average for women and men. Women are on average less paid and their positions are further remote from the CEO. They are younger, are less likely to hold a graduate degree and have a shorter tenure in the company.

Table 29: Descriptive statistics at individual level

	N	Mean	S.D.	Min	Max
Female emp. _i	144	0.3403	0.4755	0	1
Age _i	142	35.95	8.42	23.29	67.62
Tenure _i	144	6.147	6.291	0.942	32.85
Graduate Degree _i	137	0.4088	0.4934	0	1
Rank _i	144	3.3681	0.9589	1	5
Wage2015 _i	118	65,221	69,321	6,100	404,748
Wage2016 _i	132	70,096	70,328	6,285	423,119
Δ Wage _i	113	0.1736	0.4233	0	3.6884
Operations	144	0.3750	0.4858	0	1
New Businesses	144	0.3542	0.4800	0	1
Admin. & Fin.	144	0.2292	0.4218	0	1
Instit. Relations	144	0.0139	0.1174	0	1
Presidence	144	0.0278	0.1649	0	1

Table 30: Correlation matrix for individual variables

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1 Female emp. _i	1							
2 Age _i	-0.15	1						
3 Tenure _i	-0.20*	0.66*	1					
4 Grad. Degree _i	-0.08	-0.02	-0.02	1				
5 Rank _i	0.19*	-0.33*	-0.30*	-0.22*	1			
6 Wage2015 _i	-0.22*	0.46*	0.46*	0.34*	-0.67*	1		
7 Wage2016 _i	-0.22*	0.44*	0.44*	0.36*	-0.68*	0.99*	1	
8 ΔWage _i	-0.03	-0.22*	-0.09	0.03	-0.03	-0.16	-0.03	1.00

* p<0.05

Table 31: Gender differences in individual characteristics

	Male employee		Female employee		Diff	T-stat
	Mean	S.D.	Mean	S.D.		
Age _i	37.17	9.1458	33.58	6.2153	3.5873**	(2.756)
Tenure _i	7.135	7.056	4.231	3.837	2.904**	(3.198)
Grad. Degree _i	0.4333	0.4983	0.3617	0.4857	0.0716	(0.8122)
Rank _i	3.2632	0.9588	3.5714	0.9354	-0.3083	(-1.858)
Wage2015 _i	75,979	79,199	43,428	34,534	32,551**	(3.104)
Wage2016 _i	82,155	79,671	45,976	36,502	36,179***	(3.575)
ΔWage _i	0.1830	0.4829	0.1525	0.2480	0.0305	(0.4430)
N	95		49			

Table 32 and Table 33 present descriptive statistics and a correlation matrix for variables at the dyadic level. The average number of steps between dyads prior to the move and after the move remains very close (46.9 steps vs 45.8 steps). It is interesting to note that the average number of email ties between dyads decreases from the pre-move period to the post-move period, whereas friendship ties and informal work ties are reported at a higher rate in the post-period.

Differences in network features

It is interesting to note that the business of the firm the data comes from is not particularly cyclical, I thus do not expect that patterns of communication between and

after the move would differ because of fundamental differences in the business that is carried out at the firm.

Table 34 shows differences in network features in the pre-move period and in the post-move period between male and female employees. Network features such as network size, the number of ties gained in the move, the number of ties lost in the move are not statistically different for men and women in this office. The differences that draw attention in this table are the ones regarding brokerage in friendship networks, where women seem to gain in the move more than men. It is interesting to note, that, just looking at the means, the brokerage score in the pre-move period do not systematically differ for male and female employees.

Table 32: Descriptive statistics at the dyadic level

	N	Mean	S.D.	Min	Max
TieEmailPRE _{ij}	20,736	0.3704	0.4829	0	1
TieEmailPOST _{ij}	20,736	0.3125	0.4635	0	1
TieFriendPRE _{ij}	20,736	0.0870	0.2818	0	1
TieFriendPOST _{ij}	20,736	0.1022	0.3029	0	1
TieInfWorkPRE _{ij}	20,736	0.0677	0.2513	0	1
TieInfWorkPOST _{ij}	20,736	0.0800	0.2712	0	1
Steps PRE 10 _{ij}	17,681	46.9145	26.8546	1	142
Steps POST 10 _{ij}	20,736	45.8040	24.0859	1	132
Physical proximity PRE 10 _{ij}	17,681	0.0537	0.2255	0	1
Physical proximity POST 10 _{ij}	20,736	0.0438	0.2047	0	1
Same gender _{ij}	20,736	0.5487	0.4976	0	1
Same tenure category _{ij}	20,736	0.2023	0.4017	0	1
Same hierarchical rank _{ij}	20,736	0.2961	0.4565	0	1
Hierarchical relationship _{ij}	20,736	0.0128	0.1125	0	1
Functional relationship _{ij}	20,736	0.0215	0.1451	0	1

Table 33: Correlation matrix for dyadic variables

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
1 TieEmailPRE _{ij}	1													
2 TieEmailPOST _{ij}	0.52*	1												
3 TieFriendPRE _{ij}	0.30*	0.28*	1											
4 TieFriendPOST _{ij}	0.28*	0.31*	0.46*	1										
5 TieInfWorkPRE _{ij}	0.34*	0.31*	0.63*	0.41*	1									
6 TieInfWork _{ij}	0.33*	0.35*	0.44*	0.65*	0.51*	1								
7 Steps PRE 10 _{ij}	-0.15*	-0.14*	-0.23*	-0.17*	-0.20*	-0.17*	1							
8 Steps POST 10 _{ij}	-0.08*	-0.08*	-0.10*	-0.14*	-0.10*	-0.13*	0.22*	1						
9 Phys. prox. PRE 10 _{ij}	0.17*	0.16*	0.26*	0.19*	0.26*	0.22*	-0.36*	-0.06*	1					
10 Phys. prox. POST 10 _{ij}	0.02*	0.05*	0.03*	0.10*	0.03*	0.07*	-0.07*	-0.36*	0.04*	1				
11 Same gender _{ij}	-0.03*	-0.01	0.03*	-0.00	0.01	0.01	0.03*	0.04*	0.00	-0.00	1			
12 Same tenure cat. _{ij}	0.02*	0.03*	0.07*	0.06*	0.05*	0.04*	-0.04*	0.01	0.04*	0.01	-0.00	1		
13 Same hierar. rank _{ij}	0.03*	0.04*	0.07*	0.06*	0.08*	0.06*	-0.15*	-0.15*	0.08*	0.03*	-0.00	0.01	1	
14 Hierar. relationship _{ij}	0.16*	0.15*	0.17*	0.15*	0.23*	0.21*	-0.05*	-0.02*	0.14*	0.01	0.02*	0.02*	-0.06*	1
15 Funct. relationship _{ij}	0.17*	0.16*	0.25*	0.17*	0.31*	0.23*	-0.17*	-0.08*	0.32*	0.04*	-0.01	0.02*	0.12*	-0.02*

* p<0.05

Table 34: Differences in network characteristics

	Male employee		Female employee		Diff	T-stat
	Mean	S.D.	Mean	S.D.		
Network Size Email PRE _j	54.4000	30.2829	56.3061	25.4969	-1.9061	(-0.3981)
Network Size Email POST _j	48.8737	22.0639	54.9184	27.9708	-6.0447	(-1.3162)
Network Size Friend PRE _j	12.1579	10.6074	13.2245	11.4168	-1.0666	(-0.5440)
Network Size Friend POST _j	13.5053	13.2512	17.0612	15.4386	-3.5560	(-1.3725)
Network Size Inf Work PRE _j	9.4421	8.2986	10.3469	9.3531	-0.9048	(-0.5711)
Network Size Inf Work POST _j	11.2737	10.5965	11.9796	10.1622	-0.7059	(-0.3892)
Gained Email Ties POST _j	20.6421	10.9767	23.8980	15.0903	-3.2559	(-1.3386)
Gained Friend Ties POST _j	7.1474	9.1209	9.7959	9.9079	-2.6485	(-1.5609)
Gained Inf Work Ties POST _j	6.0526	7.5306	6.1837	7.6585	-0.1310	(-0.0978)
Lost Email Ties POST _j	26.1684	24.0357	25.2857	23.4023	0.8827	(0.2125)
Lost Friend Ties POST _j	5.8000	5.9010	5.9592	6.6894	-0.1592	(-0.1407)
Lost Inf Work Ties POST _j	4.2211	4.3618	4.5510	5.8312	-0.3300	(-0.3489)
Brokerage Email PRE _j	4.3108	0.6962	4.5323	0.7030	-0.2215	(-1.7913)
Brokerage Email POST _j	4.7608	0.7694	4.8969	0.8125	-0.1361	(-0.9597)
Brokerage Friend PRE _j	3.0653	0.6923	3.2448	0.5915	-0.1795	(-1.5423)
Brokerage Friend POST _j	3.2515	0.8635	3.7001	0.6855	-0.4486**	(-3.3622)
Brokerage Inf Work PRE _j	2.6826	0.5230	2.7665	0.5642	-0.0839	(-0.8239)
Brokerage Inf Work POST _j	2.9305	0.7389	3.0015	0.6862	-0.0710	(-0.5671)
Δ Brokerage Email _i	0.1061	0.1131	0.0791	0.1377	0.0270	(1.1702)
Δ Brokerage Friend _i	0.0813	0.1669	0.1686	0.2233	-0.0873*	(-2.2749)
Δ Brokerage Inf Work _i	0.1061	0.2202	0.1162	0.2711	-0.0102	(-0.2139)
N	95		49			

4.4 Empirical Strategy

My empirical approach builds on standard peer randomization techniques. The quasi-random assignment of employees to desks in the new office induced physical proximity of egos to colleagues with whom they have no to low work interdependencies.

In the correlation matrix (Table 33), for variables at the dyadic level, I first observe that the correlation between belonging to the same functional or hierarchical grouping and physical proximity in the office was much stronger pre-move than it is post-move, this provides some manipulation check that the new seating assignment fulfilled its objective to diversify employee's desk neighborhoods.

Because of my interest in gender differences in this study, I check that female and male employees are quasi-randomly seated post-move next to a comparable (or at least not systematically different) set of neighbors along relevant characteristics. In Table 35, are reported a set of T-tests comparing the average neighbors of female versus male employees at the headquarters. New desk neighbors for men and women are not systematically different except on one aspect, men are more likely to be seated next to neighbors of the same gender, this is likely due, at least in part, to the fact that men are overrepresented in the sample of employees at headquarters, indeed men represent 66% of HQ employees and women 34%. I do not find that, on average, women or men get "treated" with a more valuable set of neighbors.

I test my first hypothesis using linear probability models at the dyad-level with binary dependent variables. In a similar fashion as in Kleinbaum (2018), since my interest is in estimating differential tendencies in forming ties in responding to an exogenous shock on physical proximity, I condition on the lack of existence of a tie prior to the move and the quasi random seat assignment, and then estimate the effect of several factors on

tie formation. Thus, I focus, post-move, on what drives the formation of ties with the set of alters that egos did not share a tie with prior to the move.

As described in detail in Kleinbaum (2018), two notable problems come up in the estimation of regression models with data at the dyadic level: common person effects and reciprocal autocorrelation. Both need to be addressed to produce consistent estimates.

On the one hand, common person effects could arise if all potential ties involving a same person i are correlated because of unobservable characteristics of i . On the other hand, reciprocal autocorrelation could arise if the potential tie between i and j is correlated to the potential ties between j and i because of unobservable characteristics of the dyad. In both these cases, the described observations are not independent and thus violate a key assumption of OLS. Estimation methods that would fail to account for these issues would report downward biased standard errors and possibly render coefficients statistically significant when they are not (Kenny et al. 2006).

I use multiway clustering (`clus_nway.ado` by Kleinbaum) to address these issues. All the dyadic models I report in this study include three-way clustering (clustered on i , on j and on the ij dyad).

These models take the following form:

$$Tie_{i \rightarrow j} = \beta_0 + \beta_1 * Physical\ distance_{ij} + \beta_2 * Female\ employee_i + \beta_3 * Physical\ distance_{ij} \cdot Female\ employee_i + \beta_k * Controls_{k,ij} + \beta_q * Controls_{q,i} + \varepsilon_{ij}$$

For my second set of hypotheses, at the individual level, I estimate OLS models with robust standard errors. I use dependent variables that are within-person changes, i.e. the difference of a variable between the pre and the post periods, this allows me to account for time-invariable differences across individuals, such as individual ability.

Table 35: Gender differences in neighbors' characteristics

Neighbors char.	Male employee		Female employee		Diff	T-stat
	Mean	S.D.	Mean	S.D.		
Same gender _{ij}	0.6303	0.4832	0.3812	0.4864	0.2491***	(7.4929)
Same tenure category _{ij}	0.1937	0.3955	0.2229	0.4168	-0.0292	(-1.0427)
Same hierarchical rank _{ij}	0.3732	0.4841	0.3343	0.4724	0.0389	(1.1917)
Hierarchical relationship _{ij}	0.0317	0.1753	0.0235	0.1516	0.0082	(0.7466)
Same VP _{ij}	0.3961	0.4895	0.3724	0.4842	0.0237	(0.7114)
Functional relationship _{ij}	0.0651	0.247	0.044	0.2054	0.0212	(1.3915)
Brokerage Email PRE _j	4.3591	0.7273	4.3558	0.737	0.0033	(0.0661)
Network Size PRE _j	38.8768	18.6112	39.4018	19.1979	-0.525	(-0.4038)
Rank _j	3.5792	0.8039	3.5806	0.8314	-0.0014	(-0.0252)
Nb of neighbors wi/ 10 steps POST	7.662	1.9846	7.8739	1.9715	-0.2119	(-1.5652)
N	568		341			

4.5 Results

In Table 36 and Table 37, I see that women are not significantly more likely than men to form ties with their new desk neighbors when these ties are measured using email data or survey questions regarding the frequency of informal communication about work.

However, in Table 37, I find that exogenously imposed proximity leads female employees to be more likely to form friendship ties with neighbors than male employees.

The friendship ties that women form post move also tend to be gender homophilous, this is consistent with past literature. I thus find evidence to support Hypothesis 1.

In Table 38, I find that while being a woman was not significantly associated with the friendship brokerage score in the pre-move period ($\beta=-0.0084$, $p>0.1$), it becomes positively so in the post-move period ($\beta=0.3908$, $p<0.01$). I also find that women see a larger increase in their friendship network brokerage score following the move ($\beta=0.0946$, $p<0.05$) compared to men. These results provide support for Hypothesis 2.

Finally, I look into the impact of the move on wage change. In models 1 and 2 of Table 39, I find that women, in general, do not see a significantly different trend in their wage evolution after the move. However, in models 3 and 5, I find that women that increased their friendship brokerage score following the move see a higher increase in their wages, compared to men, independent of their brokerage score change, and to women who did not increase brokerage in their friendship networks. In these models, the dependent variable Wage Increase is log-transformed, the estimated coefficients of interest, on the interaction of the *Brokerage Increase* variable with the *Female Employee variable* should be exponentiated to get the average increase in wage due to being a woman with increased brokerage score in the post. Based on Model 5, women that increased their friendship brokerage score following the move get a 14.9% higher wage raise. At the mean, that is a supplemental raise of 2.6%.

Table 36: Determinants of Email tie formation, post-move

DV: TieEmailPOST _{ij}	(1)	(2)	(3)	(4)
Constant	0.1583*** (0.0161)	0.1443*** (0.0159)	0.0214 (0.0294)	0.0350 (0.0329)
Female emp. _i		0.0267 (0.0222)	0.0075 (0.0165)	-0.0173 (0.0280)
Phys. prox. post 10 _{ij}	0.1087*** (0.0203)	0.0871*** (0.0241)	0.0842*** (0.0235)	0.0833*** (0.0234)
Phys. prox. post 10 _{ij} #Female emp. _i		0.0564 (0.0375)	0.0568 (0.0347)	0.0563 (0.0349)
Same gender _{ij}	0.0010 (0.0112)	0.0103 (0.0098)	0.0081 (0.0100)	-0.0118 (0.0214)
Same tenure category _{ij}	0.0138 (0.0111)	0.0127 (0.0112)	0.0123 (0.0105)	0.0143 (0.0121)
Same hierarchical rank _{ij}	0.0181 (0.0113)	0.0184 (0.0112)	0.0148 (0.0111)	0.0131 (0.0130)
Hierarchical relationship _{ij}	0.3397*** (0.0997)	0.3410*** (0.0992)	0.3476*** (0.1039)	0.3535*** (0.1189)
Functional relationship _{ij}	0.4665*** (0.0626)	0.4680*** (0.0635)	0.4746*** (0.0621)	0.5291*** (0.0663)
Tenure _i			0.0010 (0.0012)	0.0010 (0.0012)
Network Size PRE _i			0.0033*** (0.0005)	0.0033*** (0.0005)
Same gender _{ij} #Female emp. _i				0.0604 (0.0437)
Same tenure cat. _{ij} #Female emp. _i				-0.0092 (0.0214)
Same rank _{ij} #Female emp. _i				0.0050 (0.0194)
Hierarchical rel. _{ij} #Female emp. _i				-0.0038 (0.2449)
Functional rel. _{ij} #Female emp. _i				-0.1652 (0.1299)
Rank _i Indicator Var.	NO	NO	YES	YES
VP _i Indicator Var.	NO	NO	YES	YES
N	13,055	13,055	13,055	13,055
adj. R-sq	0.014	0.015	0.042	0.043

Standard errors in parentheses
* p<0.1, ** p<0.05, *** p<0.01

Table 37: Determinants of tie formation, post-move

	(1)	(2)	(3)	(4)	(5)	(6)
	DV: TieEmailPOST _{ij}	DV: TieFriendPOST _{ij}	DV: TieFriendPOST _{ij}	DV: TieFriendPOST _{ij}	DV: TieInfWorkPOST _{ij}	DV: TieInfWorkPOST _{ij}
Constant	0.0214 (0.0294)	0.0350 (0.0329)	-0.0201 (0.0397)	-0.0130 (0.0400)	0.0019 (0.0162)	-0.0011 (0.0166)
Female emp _i	0.0075 (0.0165)	-0.0173 (0.0280)	0.0150 (0.0114)	0.0006 (0.0130)	-0.0007 (0.0083)	0.0056 (0.0099)
Phys. prox. post 10 _j	0.0842*** (0.0235)	0.0833*** (0.0234)	0.0949*** (0.0210)	0.0941** (0.0209)	0.0685*** (0.0155)	0.0684*** (0.0154)
Phys. prox. post 10 _j #Female emp _i	0.0568 (0.0347)	0.0563 (0.0349)	0.0914** (0.0395)	0.0918** (0.0391)	0.0173 (0.0230)	0.0174 (0.0233)
Same gender _{ij}	0.0081 (0.0100)	-0.0118 (0.0214)	0.0042 (0.0040)	-0.0066 (0.0067)	0.0086** (0.0038)	0.0095 (0.0059)
Same tenure category _{ij}	0.0123 (0.0105)	0.0143 (0.0121)	0.0160*** (0.0059)	0.0120* (0.0067)	0.0097** (0.0048)	0.0105* (0.0059)
Same hierarchical rank _{ij}	0.0148 (0.0111)	0.0131 (0.0130)	0.0208*** (0.0050)	0.0225*** (0.0059)	0.0148*** (0.0034)	0.0204*** (0.0048)
Hierarchical relationship _{ij}	0.3476*** (0.1039)	0.3535*** (0.1189)	0.2826*** (0.0641)	0.2887*** (0.0774)	0.3365*** (0.0813)	0.3174*** (0.0897)
Functional relationship _{ij}	0.4746*** (0.0621)	0.5291*** (0.0663)	0.2374*** (0.0413)	0.2502*** (0.0506)	0.2574*** (0.0445)	0.2596*** (0.0561)
Tenure _i	0.0010 (0.0012)	0.0010 (0.0012)	0.0011 (0.0017)	0.0011 (0.0017)	-0.0001 (0.0007)	-0.0001 (0.0007)
Network Size PRE _i	0.0033*** (0.0005)	0.0033*** (0.0005)	0.0020*** (0.0006)	0.0020*** (0.0006)	0.0011* (0.0006)	0.0011* (0.0006)
Same gender _{ij} #Female emp _i		0.0604 (0.0437)		0.0324** (0.0140)		-0.0026 (0.0107)
Same tenure cat. _{ij} #Female emp _i		-0.0092 (0.0214)		0.0104 (0.0115)		-0.0018 (0.0093)
Same rank _{ij} #Female emp _i		0.0050 (0.0194)		-0.0043 (0.0131)		-0.0168** (0.0077)
Hierarchical rel. _{ij} #Female emp _i		-0.0038 (0.2449)		-0.0154 (0.1213)		0.0651 (0.1562)
Functional rel. _{ij} #Female emp _i		-0.1652 (0.1299)		-0.0367 (0.0794)		-0.0063 (0.0779)
Rank _i Indicator Var.	YES	YES	YES	YES	YES	YES
VP _i Indicator Var.	YES	YES	YES	YES	YES	YES
N	13,055	13,055	18,933	18,933	19,332	19,332
adj. R-sq	0.042	0.043	0.050	0.051	0.045	0.045

Standard errors in parentheses
* p<0.1, ** p<0.05, *** p<0.01

Table 38: Network brokerage pre and post-move

	(1)	(2)	(3)	(4)	(5)
	Brokerage FriendPRE _i	Brokerage FriendPOST _i	ΔBrokerage Friend _i	ΔBrokerage InfWork _i	ΔBrokerage Email _i
Constant	3.4494*** (0.3444)	3.5460*** (0.3170)	-0.0373 (0.0598)	-0.0100 (0.1107)	0.1397*** (0.0456)
Female emp. _i	-0.0084 (0.0950)	0.3908*** (0.1321)	0.0946** (0.0380)	-0.0129 (0.0423)	-0.0271 (0.0269)
Tenure _i	0.0156 (0.0105)	0.0195 (0.0122)	0.0016 (0.0021)	-0.0010 (0.0028)	0.0017 (0.0016)
Network Size PRE _i	0.0169*** (0.0031)	-0.0001 (0.0027)	-0.0006 (0.0011)	-0.0003 (0.0015)	0.0000 (0.0004)
Rank _i Indicator Var.	YES	YES	YES	YES	YES
VP _i Indicator Var.	YES	YES	YES	YES	YES
N	128	141	126	126	140
adj. R-sq	0.282	0.188	0.008	-0.009	-0.012

Standard errors in parentheses
* p<0.1, ** p<0.05, *** p<0.01

Table 39: Wage change

DV: Δ Wage _i	(1)	(2)	(3)	(4)	(5)
Constant	1.1207*** (0.4168)	0.8186** (0.3974)	0.8086** (0.3915)	1.1136*** (0.4157)	1.0700** (0.4326)
Female emp. _i	-0.0013 (0.0328)	0.0126 (0.0313)	-0.0493 (0.0445)	0.0031 (0.0338)	-0.0958 (0.0728)
Age _i	-0.0399** (0.0184)	-0.0325* (0.0184)	-0.0318* (0.0178)	-0.0394** (0.0182)	-0.0367** (0.0184)
Age squared _i	0.0004* (0.0002)	0.0003 (0.0002)	0.0003 (0.0002)	0.0004* (0.0002)	0.0003* (0.0002)
Graduate Degree _i	-0.0316 (0.0283)	-0.0317 (0.0274)	-0.0415 (0.0277)	-0.0347 (0.0276)	-0.0401 (0.0272)
Network Size POST _i	-0.0294* (0.0150)	-0.0054 (0.0105)	-0.0041 (0.0105)	-0.0303* (0.0153)	-0.0314** (0.0157)
Δ Brokerage InfWork _i		-0.1246* (0.0646)	-0.1923 (0.1347)		
Δ Brokerage Friend _i		0.0591 (0.0885)	-0.1283 (0.1105)		
Δ Brokerage InfWork _i #Female emp. _i			-0.0484 (0.1600)		
Δ Brokerage Friend _i #Female emp. _i			0.4985** (0.2398)		
Increased Brokerage InfWork _i				0.0318 (0.0331)	0.0345 (0.0382)
Increased Brokerage Friend _i				-0.0257 (0.0539)	-0.0720 (0.0754)
Inc. Brok. InfWork _i #Female emp. _i					-0.0221 (0.0677)
Inc. Brok. Friend _i #Female emp. _i					0.1395* (0.0799)
Rank _i Indicator Var.	YES	YES	YES	YES	YES
VP _i Indicator Var.	YES	YES	YES	YES	YES
N	112	106	106	112	112
adj. R-sq	0.141	0.080	0.104	0.130	0.133

Standard errors in parentheses

* p<0.1, ** p<0.05, *** p<0.01

4.5.1 Robustness checks

As a robustness check for the tests of Hypothesis 1, I use different measures of physical proximity in the office. Results are reported in Table 40. The effect of proximity on the likelihood of forming friendship ties for women is stronger and more precisely estimated in the closest proximity.

Table 40: Determinants of friendship tie formation, different measures of proximity

DV: TieFriendPOST _{ij}	(1)	(2)	(3)	(4)
Constant	-0.0225 (0.0391)	-0.0208 (0.0395)	-0.0203 (0.0396)	-0.0201 (0.0397)
Female emp. _i	0.0142 (0.0111)	0.0154 (0.0113)	0.0146 (0.0113)	0.0150 (0.0114)
Phys. prox. post 18 _{ij}	0.0712*** (0.0154)			
Phys. prox. post 18 _{ij} #Female emp. _i	0.0493* (0.0274)			
Phys. prox. post 15 _{ij}		0.0882*** (0.0171)		
Phys. prox. post 15 _{ij} #Female emp. _i		0.0580* (0.0334)		
Phys. prox. post 12 _{ij}			0.0969*** (0.0208)	
Phys. prox. post 12 _{ij} #Female emp. _i			0.0917** (0.0391)	
Same gender _{ij}	0.0051 (0.0040)	0.0047 (0.0041)	0.0042 (0.0040)	0.0042 (0.0040)
Same tenure category _{ij}	0.0165*** (0.0059)	0.0158*** (0.0060)	0.0160*** (0.0060)	0.0160*** (0.0059)
Same hierarchical rank _{ij}	0.0197*** (0.0050)	0.0203*** (0.0051)	0.0207*** (0.0050)	0.0208*** (0.0050)
Hierarchical relationship _{ij}	0.2788*** (0.0633)	0.2778*** (0.0628)	0.2786*** (0.0631)	0.2826*** (0.0641)
Functional relationship _{ij}	0.2325*** (0.0403)	0.2351*** (0.0407)	0.2367*** (0.0415)	0.2374*** (0.0413)
Tenure _i	0.0011 (0.0017)	0.0011 (0.0017)	0.0011 (0.0017)	0.0011 (0.0017)
Network Size PRE _i	0.0020*** (0.0006)	0.0020*** (0.0006)	0.0020*** (0.0006)	0.0020*** (0.0006)
Rank _i Indicator Var.	YES	YES	YES	YES
VP _i Indicator Var.	YES	YES	YES	YES
N	18,933	18,933	18,933	18,933
adj. R-sq	0.049	0.049	0.051	0.050
Standard errors in parentheses				
* p<0.1, ** p<0.05, *** p<0.01				

4.6 Conclusion

In this chapter, I provide suggestive evidence that office design can affect network building differently for men and women, and could be thought through in deliberate ways to reduce gender inequalities stemming from differences in social capital.

With this study, I seek to contribute to the literature on gender differences in networks and network benefits. In particular, I seek to contribute to the conversation on network brokerage and women. This literature has highlighted how women face structural barriers as well as limitations linked to gender role expectations in reaching advantageous brokerage positions. I propose that office design could be used to facilitate women's brokerage. With the rise of co-working spaces, and trends such as open-plan offices, hot-desking, and working from home, managers are making conscious choices about the physical organization of work, doing so with an eye on gender inequality issues, and more generally on isolation of numerical minorities in the office could bring forth interesting innovations.

Interesting questions remains and I plan to address them in follow-on research. I show that the move leads to a larger increase of brokerage in friendship networks for women than for men. I assume that what is causing this is the exogenously introduced diversity in employee's neighborhoods that women are better able to take advantage of.

However, it could be that other features of the moves are causing the effect. I plan to investigate this possibility in future research.

A next step in my investigation is to look into the possibility that the improvement in brokerage score I observe for women following the move is about women connecting to other women (I do already find some evidence that, post-move, women's new ties are more likely to be to women), also the literature (Yang et al., 2019; Ody-Brasier & Fernandez-Mateo; 2017) has shown that inner circles of women provided higher value to focal actors.

5. Conclusion

The preceding chapters present a set of empirical studies that address how processes at the institutional level, cultural norms, and at the interpersonal level, social networks, affect gender inequality within organizations.

The first study (chapter 2) investigates the role of national culture on organizational gender inequality. Companies are investing large sums of money into improving the gender balance among their employees (Kelly, 2015), particularly in upper management positions. Making sure these investments are efficient requires a thorough understanding of the forces contributing to persisting gender inequality in organizations. My work contributes to the literature focusing on the role of environmental forces in organizational inequality (Stainback et al., 2010). Because cross-country comparisons present significant methodological challenges, I employ a novel research design exploiting cross-border acquisitions and the variation in the home-countries of acquirers within a same host-country context. I use employee-employer microdata from the French Census to analyze the impact of foreign acquirers' national culture on outcomes such as the share of women in upper management, the likelihood of the firm having a female CEO, and the gender wage gap at the acquired firms. I find that firms acquired by firms from more gender egalitarian countries see a stronger improvement in gender equality outcomes post-acquisition. I find evidence that the main effect is driven by the degree of post-acquisition integration between the acquiring and acquired firms as well as by the

appointment of a new CEO at the acquired firm after the acquisition. The degree of resource dependence of the acquired firm on the acquirer does not moderate the main effect, suggesting that the driving force behind the changes in gender equality outcomes is acquirers' acting to ensure internal consistency rather than acquired firms complying to obtain resources from their new owners. This study adds to the work of organizational inequality scholars by showing that national gender culture is part of the environmental forces that affect organizational inequality. It also contributes to the literature studying the impact of acquisitions on acquired firms' outcomes.

The French Census data covers all French firms that have employees and follows firms across the years from 1993 to the present day. Another version of the presently used dataset is organized in a panel format which makes it possible to follow workers across firms throughout their careers. Using this data, a new avenue for research would be to analyze how having worked at a firm while and after it was being acquired by a firm with more or less gender egalitarian norms impacts career outcomes for employees at the next firms they are employed.

The second study (chapter 3) seeks to bring back the formal structure of the firm in the study of the influence of social networks on individual outcomes. The coordination benefits of hierarchies and functional groupings are the basis for many theories of the firm (Thompson, 1967; Williamson, 1975; Chandler, 1977). Underlying these views is the idea that most of the communication between organizational members should happen within

these formally defined boundaries. At the same time, the social network literature (Burt, 2007; Reagans & McEvily, 2003) has uncovered the many benefits of communication across formal boundaries. For individual members of organizations, these two literatures provide somewhat conflicting predictions regarding desired behavior. I, along with my co-authors, thus examine the link between interactions of employees and compensation. We contrast the predictions of the social network literature with those of the organizational design literature. We unite these views by arguing that the link between patterns of interactions and compensation is contingent on the position of employees in the formal hierarchy. Using rich data collected in the field, we find that consistency between 'prescribed' and realized patterns of interaction is associated with higher wage increases for lower-level employees who hold more specialized roles. This is not the case for employees in the upper ranks of the organization. Our results suggest that whereas employees at the top of the hierarchy are expected to act as "bridges" between functional areas, the same behavior from an employee whose role requires them to be specialized in a particular function may be interpreted as an agency problem. Alternatively, patterns of interactions that are rewarded when adopted by an employee at the bottom of the hierarchy maybe not be sufficient to be a high performer when one holds a position at the top of the hierarchy. The arguments presented contribute to improve our understanding of the interplay between the 'formal' structure of organizations and the more 'informal' patterns of employee interactions that emerge as work is being realized.

In further investigations, I consider how gender-role expectations regarding compliant and rule-abiding behavior in the workplace color our findings from the first part of the study. Agentic behavior, which most often characterizes boundary-spanning, is gender-role incongruent for women, i.e. it defies usually held stereotypes about women. Compared to their male colleagues, it is thus more likely that women would be penalized for a misalignment between their 'prescribed' and realized patterns of interaction. Because women are overrepresented in lower ranks of the hierarchy, it could even be that the original finding is explained at least in part because of different expectations for employees based on their gender. I do not find gender differences in consistency between 'prescribed' and realized patterns of interaction nor in the effect of this consistency on individual performance.

The third study (chapter 4) addresses the gender differences in network brokerage previously highlighted in the literature. Accounting for the fact that women are less likely than men to occupy and benefit from otherwise advantageous network brokerage positions because of structural and choice-based reasons, I propose that spatial design in the workplace can be altered to foster the formation of more diverse ties by women, which in turn increases their likelihood of reaching brokerage positions. I take advantage of a field experiment where the seating plan of an office was experimentally manipulated, exploiting the naturally occurring move of a firm's HQ to a new office. The main difference between the seating plan before and after the seat re-assignment is that prior,

employees tended to be seated next to members of the same functional team, while after, employees were more likely to be seated next to colleagues with which they share low work interdependencies. I find evidence that, following the move, women are more likely to form friendship ties with their new neighbors. I also find evidence that following the move, women's friendship network brokerage score increases more than men's. In an era, where the physical organization of work is being thoroughly rethought, this study provides evidence that office spatial design matters for gender equality topics as well. This study contributes to the literature on gender and social networks as well as the literature on the spatial design of organizations.

A Appendix to Chapter 2

A.1 Measures of national gender cultures

Table 41: Various measures of gender culture for the countries in sample

Country Name	Gender Score (data)	Gap (WEF)	Gender Egalitarianism: society practices as is (GLOBE data)	Average Share of Female Managers (OECD data)	Masculinity Score (Hofstede data)
Saudi Arabia	0.331	-	-	-	-
India	0.410	2.9	12.4	56	
Turkey	0.433	2.89	14.0	45	
Tunisia	0.454	0	-	-	
Korea	0.519	2.5	10.9	39	
Chile	0.550	-	26.2	28	
Japan	0.579	3.19	12.1	95	
Italy	0.585	3.24	26.3	70	
Czech Rep.	0.630	-	26.6	57	
Cape Verde	0.631	-	-	-	
Austria	0.635	3.09	29.9	79	
Spain	0.637	3.01	30.6	42	
Greece	0.644	3.48	26.1	57	
Brazil	0.647	3.31	37.5	49	
Poland	0.667	4.02	39.3	64	
China	0.671	3.05	27.0	66	
Israel	0.672	3.19	32.2	-	
France	0.676	3.64	34.4	43	
Romania	0.696	-	-	42	
Trinidad	0.698	-	-	58	
Portugal	0.700	3.66	34.1	31	
Colombia	0.701	3.67	56.6	64	
Netherlands	0.703	3.5	26.0	14	

Country Name	Gender Score (data)	Gap (WEF)	Gender Egalitarianism: society practices as is (GLOBE data)	Average Share of Female Managers (OECD data)	Masculinity Score (Hofstede data)
UK	0.710		3.67	34.9	66
Estonia	0.713		-	34.0	30
Belgium	0.715		-	31.8	54
Germany	0.718		3.08	28.9	66
Ireland	0.727		3.21	34.4	68
Luxembourg	0.729		-	19.5	50
Russia	0.731		4.07	42.0	36
Switzerland	0.734		3.42	34.4	70
Australia	0.745		3.4	36.5	61
Denmark	0.750		3.93	27.1	16
Singapore	0.756		3.7	-	48
Canada	0.764		3.7	35.7	52
Finland	0.775		3.35	31.7	26
Iceland	0.776		-	37.7	47
USA	0.788		3.34	38.6	62
Sweden	0.793		3.84	37.3	5
Norway	0.817		-	35.4	8
Correlation w/GLOBE	0.640				
Correlation w/OECD	0.682		0.665		
Correlation w/Hofstede	-0.256		-0.305	-0.080	

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Biography

Tatiana Michelle Lluent received a Master in Business Administration from ESSEC Business School (2013) and a Master's Degree in Sustainable Development, Environment and Energy Economics from IFP School (2014). She worked in the field of Corporate Social Responsibility before returning to academia. Tatiana Lluent received grants from Duke University; a doctoral fellowship (2015-2021), a Preparing Future Faculty fellowship (2018-2019) and a Bass Digital Education fellowship (2020-2021). Tatiana Lluent is a member of the Academy of Management. She will be joining ESMT Berlin in the summer of 2021 as an Assistant Professor of Strategy and the Volkswagen-Audi Junior Chair for Diversity in Organizations. She also has interests in politics, public policy, urbanism, and ecology. She enjoys traveling, learning new languages, and crafts.