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The gender gap in the first deal: Equity split among founding teams

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ABSTRACT

We investigate the gender gap in equity splits among members of founding teams using proprietary survey data on Japanese startups. The results reveal that, on average, female founder chief executive officers (CEOs) own 12 percentage points less equity than male founder CEOs. The gender equity gap is more pronounced in founding teams in which the founder CEO is a woman and the other founding members are men. However, the results vary depending on the founding teams' characteristics. Notably, the gender equity gap is observed only in teams with individuals belonging to older generations and in teams from regions (prefectures) with great gender inequality. The findings indicate that gender norms influence the gender equity gap.

1. Introduction

Equity split is one of the most complicated and nerve-racking dilemmas faced by founders (Wasserman, 2012). On the one hand, if founders retain (almost) all ownership, they may fail to attract talented cofounders. On the other hand, if they relinquish a majority stake in favor of cofounders, they will lose control over the startup.[1] However, little is known about the factors that determine founders' ownership in an equity split. In this study, we focus on founder characteristics, specifically gender. A growing body of literature has documented the gender gap in entrepreneurial finance in terms of the amount of startup capital (Verheul and Thurik, 2001; Fairlie and Robb, 2009), investor behavior (Kanze et al., 2018; Ewens and Townsend, 2020; Hebert, 2020; Lyonnet and Stern, 2022), and valuations (Veer and Bringmann, 2021). While these studies have focused on the gender gap in deals *between* startups and outside investors, such as venture capitalists (VCs), there is little research on the gender gap *within* founding teams.

Equity split is a critical issue for founders because it concerns shareholders' cash flow and voting rights. Furthermore, many founders' primary financial motivation is the large potential equity upside, not the salary (Wasserman, 2012). Nevertheless, while the gender *pay* gap has been extensively explored (e.g., Bennedsen et al., 2022), the gender *equity* gap has often been overlooked. Moreover, equity splits among members of founding teams are always contentious issues and sometimes sources of conflict (Wasserman, 2012).[2] How equity should be split is one of the first major decisions that founding teams consider (Hellmann and Wasserman, 2017).

A major challenge in attempting to empirically study equity splits is collecting data on capitalization tables, as startups rarely disclose such information. Consequently, only a few studies have examined how founders split equity (Hellmann and Wasserman, 2017; Wasserman, 2017; Hellmann et al., 2019; Mueller and Hennicke, 2024). To address this issue, in this study, we conduct a survey. Using survey data on 400 Japanese startups founded by two or more individuals, including 46

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[1] In this study, we use the term "startup" to refer to "a company that is just beginning to operate" (Oxford Advanced Learner's Dictionary).

[2] Wasserman (2012) states that founders often use expressions such as "war," "exasperating," and "stressful" in reference to equity split negotiations.

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female-led and 354 male-led startups, we investigate the gender disparity in founder chief executive officer (CEO) ownership at the time of incorporation.[3] The results of univariate comparisons reveal that the mean (median) ownership is 62.9 % (61 %) for female founder CEOs and 71.2 % (75 %) for male founder CEOs. Furthermore, after controlling for founder and firm characteristics, we find that, on average, female founder CEOs have 12 percentage points less ownership than male founder CEOs.

We also assess the impact of gender pairing between the founder CEO and other founding members because wealth distribution varies with the gender combination of the proposer–responder pairing (Eckel and Grossman, 2001; Solnick, 2001). We find that female founder CEOs' ownership is significantly lower than that of male founder CEOs when the other founding members (i.e., other than the female founder CEO) are male. In contrast, a gender equity gap is not observed in all-female teams. These findings indicate that the gender combination in founding teams matters.

We consider several possible explanations for the gender equity gap. One possible explanation is rooted in gender norms. Thus, we examine whether the gender equity gap is driven by certain types of founding teams in which gender norms appear to be deeply entrenched. We rely on generational and regional factors to examine gender norms in the domestic context. First, we divide the sample into two subsamples based on the average age of the founding members: founding teams composed of an older generation (average age of 40 years or older) and founding teams composed of a younger generation (average age of less than 40 years). Importantly, we find that the gender equity gap is observed only in teams composed of the older generation. Second, based on the median value of the gender gap index, we divide the sample into two categories: startups located in highly gender-equal regions and those located in marginally gender-equal regions. In this regard, we find that the gender equity gap is observed in teams founded in less gender-equal regions. These results suggest that gender norms influence the gender equity gap.

We also explore the following possible explanations for the gender equity gap: (i) women are more risk averse (Jianakoplos and Bernasek, 1998; Sundén and Surette, 1998; Agnew et al., 2003; Faccio et al., 2016) and less confident than men (Barber and Odean, 2001; Niederle and Vesterlund, 2007; Huang and Kisgen, 2013); (ii) women are less knowledgeable about startup equity than men (Aran and Murciano-Goroff, 2023); and (iii) women tend to be less motivated by financial gain to start a business than men (Cromie, 1987; Guzman et al., 2020). We find that the gender equity gap remains sizable and significant even after we control for proxies for these founder CEO attitudes. Thus, the gender equity gap is not solely driven by the factors behind these founder CEO attitudes, although the alternative explanations cannot be ruled out because the proxies used may not accurately capture the true variables.

Other factors, such as gender differences in social preferences (e.g., fairness), may also impact the ownership stakes of female founder CEOs. As shown in experiments such as the ultimatum bargaining game, many—but not all—people care about the material resources allocated to others (Fehr and Schmidt, 2006; Levitt and List, 2007), and the behavior in a pie-splitting negotiation varies with gender (Croson and Gneezy, 2009). In this study, we use a dummy variable that equals 1 if the founding members divide ownership equally. We estimate the probability of equal splitting among members of a founding team and find that female founder CEOs are more likely to split ownership equally, suggesting that these CEOs prefer fairness. One potential concern about this finding, however, is that an equal equity split may be motivated by solidarity (Eckel and Grossman, 2001). From this perspective, we can expect the gender equity gap to be significantly large between same-gender teams. However, our findings provide no evidence of this.

The contribution of our study is threefold. First, to our knowledge, this is the first study to provide evidence of the gender equity gap in founding teams.[4] While previous studies have reported a gender gap in external financing (Ewens and Townsend, 2020),[5] we demonstrate that the gender gap also exists within the founding teams of startups. Furthermore, although previous studies have addressed the issue of equity splits (Hellmann and Wasserman, 2017; Hellmann et al., 2019; Mueller and Hennicke, 2024), they have failed to highlight gender differences. Hence, we contribute a gender-centric perspective to the literature.[6]

Second, we contribute to the behavioral economics literature—particularly the behavioral finance literature—by comprehensively examining the sources of the gender equity gap. Previous studies have provided evidence that social factors influence gender-based pricing bias (Adams et al., 2021) and intrahousehold decision-making (Ke, 2021; Guiso and Zaccaria, 2023). We provide evidence that social factors also influence the equity split.

Third, our study contributes to the literature on gender and various (corporate) financial decisions. Graham et al. (2013) and Huang and Kisgen (2013) analyze the impact of executive gender on acquisitions and capital structure. Faccio et al. (2016) find that firms led by female CEOs have less leverage, more stable earnings, and a higher probability of survival than similar firms led by male CEOs. Levi et al. (2014) examine the relationship between female representation on corporate boards and merger and acquisition decisions and find that female directors lead to fewer acquisitions and lower bid premiums. Verheul and Thurik (2001) and Coleman and Robb (2009) find that women begin their businesses with less startup capital than men. We add to the literature by showing that female founder CEOs are more likely than their male counterparts to make a fair choice in equity splitting (i.e., split equally) as a financial decision.

The rest of this paper proceeds as follows. Section 2 summarizes the differences between female and male founder CEOs and presents testable hypotheses based on these differences. Section 3 describes the survey method and provides an overview of the survey data. Section 4 outlines the methodology and provides evidence of a gender equity gap. Section 5 presents additional analyses exploring the causes of the gender equity gap. Section 6 provides a discussion of the external validity of the findings. Section 7 concludes the study.

2. Hypothesis development

2.1. Gender norms

Gender identity impacts economic outcomes (Akerlof and Kranton, 2000). Adams et al. (2021) provide evidence of the gender-based pricing bias, showing that auction prices for paintings by female artists are

[3] In Japan, a director who has the authority to represent a joint-stock company is called a "president." However, for the reader's convenience, we use the term "CEO" as equivalent. We categorize startups based on the founder CEO's gender. Specifically, female- and male-led startups denote startups with a female and male founder CEO, respectively.

[4] Although several studies have used the term "gender equity gap," they have used it in the sense of a gender *equity-based pay* gap or a gender *equity financing* gap and have not examined equity ownership.

[5] Many studies have been conducted from the perspective of external financing (e.g., Guzman and Kacperczyk, 2019; Howell and Nanda, 2019; Gornall and Strebulaev, 2020; Hebert, 2020; Bapna and Ganco, 2021; Feng et al., 2022; Lyonnet and Stern, 2022).

[6] Hellmann and Wasserman (2017) examine equity splits from the perspective of a trade-off between efficiency and fairness. In particular, they analyze the determinants and consequences of equal splits. Hellmann et al. (2019) extend the trade-off between efficiency and fairness to the dynamic setting of founder ownership. Mueller and Hennicke (2024) examine the impact of unequal splits on the outcomes of startups (particularly in the cases of the entry of a new member into the team and turnover growth).

significantly lower than those for paintings by male artists. They find that the pricing bias is larger in countries with considerable gender inequality. Ke (2021) finds that gender identity norms limit women's influence on households' stock market participation. Guiso and Zaccaria (2023) show that female headship is related to generational and regional factors.

Gender norms also affect the ease with which women negotiate. Compared to a world without gender discrimination, women are less likely to negotiate in a world with gender discrimination because the costs of bargaining to close the gap are perceived to be higher for women than for men, rendering the act of bargaining situational (Leibbrandt and List, 2015; Card et al., 2016; Exley et al., 2020; Biasi and Sarsons, 2022). Based on these studies, we expect that, in the context of our study, the prevalence of gender norms will vary according to the characteristics of the founding team, particularly those influenced by patriarchal family structures and generational and regional differences and that the ownership stakes of female founder CEOs will be lower than those of male founder CEOs in founding teams that are more strongly influenced by gender norms.

2.2. Gender differences

2.2.1. Risk preferences and confidence

The gender equity gap may be driven by the fact that women tend to be more risk averse and less (over)confident than men. Indeed, a large body of research has shown that women tend to be more risk averse than men (Jianakoplos and Bernasek, 1998; Sundén and Surette, 1998; Schubert et al., 1999; Agnew et al., 2003). This tendency can also be observed at the managerial level (Faccio et al., 2016).[7] If female founder CEOs are more risk averse than their male counterparts and all other factors (e.g., personal wealth and firm risk) are equal,[8] they are likely to hold a smaller proportion of risky assets in their personal portfolios. Thus, female founder CEOs are expected to have lower ownership than male founder CEOs.

The gender equity gap may also be caused by overconfidence. It entails a bias related to the assessment of one's knowledge and abilities. Previous studies have shown that men tend to be more overconfident than women (Barber and Odean, 2001; Niederle and Vesterlund, 2007), and this bias has also been observed among executives (Huang and Kisgen, 2013). If male founders are more overconfident than female founders, the former may overestimate their own abilities and future contributions,[9] leading them to demand greater equity stakes, thus leaving the latter with lower equity stakes.

2.2.2. Knowledge and seeking help

Aran and Murciano-Goroff (2023) find that only a small fraction of survey respondents answer equity compensation questions correctly and that men are more likely than women to answer equity financial literacy questions correctly. This may also be true in the context of equity splits. Female founder CEOs may have limited knowledge or awareness of equity splits, allowing relatively more knowledgeable cofounders to take larger shares. In essence, female founder CEOs may have lower ownership stakes than their male counterparts because they are less aware of the economic and control benefits of owning large stakes.

Furthermore, female founder CEOs may offer equity in exchange for resources that contribute to the value of a startup. It is more important for founders to focus on the size of the pie (i.e., the value of the startup) than on their shares of the pie. To this end, female founder CEOs may make a rational decision to settle for a smaller share to increase the value of their startups by attracting helpers with superior human capital, such as cofounders with prior founding experience. When women have limited knowledge, they may thus seek advice from experts. For instance, Levi et al. (2015) show that in corporate takeovers, women are more likely to seek advice from top financial advisors than men. If experts are more knowledgeable than female founder CEOs about the economic and control benefits of a large equity stake, the former may take larger stakes than the latter. Alternatively, female founder CEOs may grant experts larger stakes in exchange for professional advice.

2.2.3. Motivation

While founders start their businesses for various reasons, women are less motivated by economic gain than men (Cromie, 1987; Guzman et al., 2020). Guzman et al. (2020) find that women are more motivated by social impact than money, while men are more motivated by money than social impact. This suggests that female founder CEOs may be content with smaller equity stakes because their utilities are derived from nonfinancial rewards, such as social impact.

These mechanisms, however, are not mutually exclusive. For each mechanism, we predict lower ownership for female founder CEOs than for male founder CEOs. Therefore, we test the following hypothesis:

H1: The ownership stakes of female founder CEOs are lower than those of male founder CEOs.

Furthermore, if the gender equity gap is caused by prevalent gender norms and differences, we expect their impact to be more pronounced when the cofounders are male. Therefore, we test the following hypothesis:

H2: The ownership stakes of female founder CEOs are lower when the other founding members are male.

2.2.4. Fairness

The gender equity gap can be explained by gender differences in social preferences. An individual's utility function depends not only on their own material payoff but also on the material payoff for others, which is referred to as "social preferences" or "other-regarding preferences" (Fehr and Schmidt, 2006).[10] Several models of social preferences assume that some players care about the material payoff for others, while others are motivated by self-interest (Fehr and Schmidt, 1999). The heterogeneity of preferences can be grouped by gender (Eckel and Grossman, 2008; Croson and Gneezy, 2009). Hence, if women tend to be

[7] Whether findings on the general population can be generalized to top-level executives is debatable (Croson and Gneezy, 2009; Adams and Funk, 2012). Adams and Funk (2012) survey CEOs and board members of listed Swedish firms and find that female directors are more risk loving than their male counterparts.

[8] If these conditions are not met, ownership may differ even if risk tolerance is the same. Although we do not have data on the personal wealth of founder CEOs, we have no evidence of a wealth-constrained scenario. In an unreported analysis, we regress the log-transformed amount of startup capital on founder CEO and firm characteristics, as well as the female dummy. The results show that the coefficient of the female dummy is statistically insignificant.

[9] Here, we assume that managers overestimate free cash flows, but the same expectation holds true for the path of underestimating risk—so-called miscalibration (Ben-David et al., 2013).

[10] Experimental evidence, such as that obtained through the ultimatum bargaining game, shows that people tend to care about the well-being of others in addition to their own well-being. In the ultimatum bargaining game, two players split a sum of money (the pie), and the proposer offers the responder a way to split the pie. The responder then decides whether to accept or reject the offer. If the responder accepts, he/she receives the offered amount, and the proposer keeps the rest; if the responder rejects the offer, neither player gets anything. The perfect equilibrium predicted by game theory—which assumes self-interest—is that the proposer will get all or almost all of the pie. However, the subgame perfect equilibrium of the game is rarely observed. Instead, a robust outcome of many experiments is that proposers offer to allocate 40 %–50 % of the pie, which the responders accept. Furthermore, responders often reject the offer when the amount offered is small (e.g., less than 20 % of the pie) (Fehr and Schmidt, 2006).

more inequality averse than men, we can expect to see more equitable outcomes among female founder CEOs than among male founder CEOs.[11] Therefore, we test the following hypothesis:

H3: Female founder CEOs are more likely to split equity equally than male founder CEOs.

3. Data

3.1. Survey

Our data are sourced from a proprietary survey. In November 2021, a survey questionnaire entitled Survey on New Firms in Japan was mailed to 20,715 joint-stock companies in the manufacturing and information service industries incorporated in Japan between January 2020 and September 2021.[12,13] To identify these firms, we used a dataset collated by Tokyo Shoko Research (TSR), a credit reporting agency in Japan.[14] A total of 1441 firms responded, yielding a response rate of approximately 7 %. Although our response rate is not directly comparable to that of other surveys owing to differences in the growth stages of the firms and the questions asked, this rate is similar to or slightly lower than those in previous studies.[15] To identify potential nonresponse bias, we compare the characteristics of respondent and nonrespondent firms. Specifically, we test the null hypothesis that the means of the logarithm of paid-in capital are equal for respondent and nonrespondent firms. In this case, we can reject the hypothesis and find that respondent firms are larger than nonrespondent firms (7.6 and 7.4, respectively).[16] We also regress a response dummy on industry dummies (two-digit Japan Standard Industrial Classification [SIC] code) and perform an *F*-test to examine whether the response rates are equal across industries. We reject the null hypothesis that all coefficients of the industry dummies are equal, indicating significant differences in response rates across industries. However, this is unlikely to have a significant impact on the results, and we control for industry differences in our multivariate regression analyses.

In addition, we compare the representation of women in CEO positions between respondent and nonrespondent firms. We cannot reject the null hypothesis that respondent and nonrespondent firms have equal proportions of female founder CEOs ($p = 0.90$).[17] We also cannot reject the null hypothesis that respondent and nonrespondent firms have equal proportions of female founder CEOs in each industry.

To examine the equity split among founding teams, following Hellmann and Wasserman (2017), Hellmann et al. (2019), and Mueller and Hennicke (2024), we focus on founding teams and exclude firms founded by a single founder.[18] We also exclude firms incorporated as affiliates or subsidiaries of existing firms. To reduce the possibility of retrospective bias and survivorship bias, we exclude firms founded before 2010, thus limiting our sample to firms founded in 2011 or later. By doing so, we ensure that our sample contains firms no more than 10 years old at the time of the survey. In addition, to ensure the ownership type of interest, we exclude firms whose founder CEOs have been replaced (i.e., non-founder CEO-led startups).[19,20] We also exclude firms with incomplete information on key variables, such as ownership and the gender and number of founding members. Finally, to ensure the reliability of the data, we exclude firms for which the reported total ownership is not 100 %. Consequently, our final sample comprises 400 firms, of which 46 (12 %) are led by female founder CEOs, and the rest are led by male founder CEOs.

[11] Deviations from game-theoretic behavior can be explained by fairness and inequality aversion (Fehr and Schmidt, 1999; Bolton and Ockenfels, 2000). The proposer often offers a 50:50 split (Camerer and Thaler, 1995). In newspaper experiments, Güth et al. (2007) find that subjects tend to divide the pie equally among three players, and equal splits are more likely to be proposed by women and older people. Field evidence suggests that 30 %–60 % of founding teams choose an equal split. Similarly, Hellmann and Wasserman (2017) find that 32 % of their sample of 1,367 North American technology startups opt for an equal split. Hellmann et al. (2019) also find that 55 % of their sample of 84 high-growth-oriented technology startups in British Columbia, Canada, split the founder equity equally. Furthermore, Mueller and Hennicke (2024) find that 49.5 % of their sample of 24,194 German startups in knowledge-intensive industries have an equal split.

[12] The legal form of a joint-stock company implies that firms intend to raise external financing. In this respect, the firms in our sample may be looking to grow. In fact, when asked, "What is your opinion about the future size of your firm?" 76 % of our sample answered that they "want to expand" (the other options being "status quo" and "want to downsize"). Furthermore, from the time of founding to the time of the survey, 22 % of the startups in our sample had already acquired intellectual property (either patents or trademarks), which is highly predictive of the probability of growth (Guzman and Stern, 2017). In addition, 49 % had developed new products or processes.

[13] In the Internet Appendix, we provide an analysis of the potential impact of the COVID-19 pandemic on our results. We find no evidence that startups with female founders were less likely to raise funds than startups with male founders during the COVID-19 period. According to the Japan Finance Corporation, the number of pre-foundation loans to women relative to men increased in the post-COVID-19 period compared to the pre-COVID-19 period (Table IA.1). We also find no evidence that female founder CEOs are more likely to reduce their ownership during the COVID-19 period than male founder CEOs, suggesting no significant gender difference in the degree of ownership change (i.e., dilution of founder CEO ownership) from the time of incorporation to the time of the survey (Table IA.2).

[14] We commissioned TSR to mail and collect the questionnaires. TSR waited for responses to the questionnaires until the end of January 2022. Then, in February–March 2022, TSR re-mailed the questionnaires and conducted telephone surveys and email reminders to firms that had not yet responded.

[15] For instance, Okamuro et al. (2011) and Honjo et al. (2014) survey Japanese startups and have a response rate of 11 %. The survey response rates reported by Hellmann and Wasserman (2017) and Wasserman (2017) for small firms and startups are 10 %–20 %. The surveys of CEOs and chief financial officers of large companies conducted by Graham and Harvey (2001) and Graham et al. (2013) have response rates of 9 % and 11 %, respectively. Gornall and Strebulaev (2020) have a 6.5 % response rate for emails sent to VCs and angel investors.

[16] We take the logarithm to reduce the effect of extreme values, but without this transformation, the difference between the two would not be statistically significant ($p = 0.834$).

[17] TSR offers data on the gender classification of a firm's CEO, but these data are incomplete or missing for most of the firms surveyed. Therefore, we identify the gender of the CEOs in our sample based on their names and profile pictures on their firms' websites by having a research assistant visually check the data.

[18] Fifty-four percent of the respondent firms were founded by two or more individuals. This percentage is close to that reported by Ruef et al. (2003) and Brannon et al. (2013) for nascent entrepreneurs (52 % and 51 %, respectively) but higher than that reported by Coleman and Robb (2009) for new businesses (35 %). In an untabulated analysis, we examine whether the choice to operate solo or form a team differs by gender. Although the proportion of solo founder CEOs is higher among women (59 % and 52 % of female-led and male-led startups, respectively), we find no significant gender difference in the likelihood of this choice. We also examine whether the characteristics of female founder CEOs differ between solo and team founder CEOs. Specifically, we test for differences in the means of variables related to founder CEO and firm characteristics (i.e., CEO age, founding experience, managerial experience, specific industry experience, graduate education, paid-in capital, and firm age) and find no significant differences in the means of these variables between solo and team founder CEOs. Furthermore, as shown in Internet Appendix Table IA.3, there is no significant difference in ownership between female and male solo founders.

[19] We identified founder CEOs by asking, "Is the current representative the same as the founding representative?" The response options were "Yes" (i.e., the same at the time of founding) and "No" (i.e., replaced after founding).

[20] The results are essentially unchanged regardless of whether startups with non-founder CEOs are included in the sample.

3.2. Descriptive statistics

Table 1 presents the descriptive statistics of our sample, with the characteristics of the founders and startups shown in Panel A. Female founder CEOs account for 11.5 % of our sample,[21] and the average ownership at the time of incorporation is 70.2 %. Among the founder CEOs, 33.0 % have prior experience as founders, 12.8 % have prior experience as managers before starting the respective firms, 77.3 % have specific industry experience, and 14.5 % have graduate degrees. The average number of founding members is 2.74.[22] In our sample, 30.8 % of the founding teams consist entirely of family members, and 13.0 % consist of founding members with science, technology, engineering, and mathematics (STEM) backgrounds. The average age of the firms in the sample is 1.54 years, which is younger than the average ages of 6.62 and 11.26 years reported by Hellmann and Wasserman (2017) and Hellmann et al. (2019), respectively.

We then split the sample into two subsamples based on the gender of the founder CEO: female- and male-led startups. The former have two salient characteristics: they are more likely than the latter to have co-founders with prior founding experience and to be composed entirely of family members. With respect to other characteristics, we find no significant difference at the 5 % level between the two subsamples. The finding that women are more likely to be CEOs of family-owned firms is robust to controlling for other factors. In unreported results, we regress the female dummy on a series of founder and firm characteristics and find that women are more likely to be CEOs of family teams and less likely to be CEOs of STEM teams, with no other characteristics significantly impacting the likelihood of female founder CEOs, ceteris paribus. The finding of female underrepresentation in STEM teams is consistent with that reported by Adams and Kirchmaier (2016), who find that women are underrepresented on the boards of listed firms in the STEM and finance sectors.

Panel B of Table 1 reports the industry composition of the sample. Female- and male-led startups are homogeneous across industries because the likelihood-ratio chi-squared statistic does not reject the null hypothesis that female- and male-led startups are distributed equally across industries ($p = 0.576$). Specifically, the proportions of female-led startups in the chemical and allied products industry (e.g., cosmetics) and the miscellaneous manufacturing industry (e.g., jewelry) are 21 % and 24 %, respectively, which are higher than that of female-led startups in the entire sample, which is 12 % (Panel A of Table 1). Conversely, in the male-dominated electrical machinery, equipment, and supplies industry, only 6.3 % of startups are led by females.[23]

Table 2 presents the distribution of founder CEOs across ownership categories by gender. Many founder CEOs own 100 % of their firms (i.e., other founding members receive no equity), with proportions of 37 % and 41 % for female and male founder CEOs, respectively. Notably, some founder CEOs own no equity,[24] and in this subset, the proportion of female founder CEOs is greater than that of male founder CEOs (13 % vs. 3 %). The finding regarding the high proportion of female founder CEOs who own no shares is robust to controlling for founder and firm characteristics. Internet Appendix A Table IA.4 presents the results of a linear probability model in which we use an indicator variable as the dependent variable that takes a value of 1 if a founder CEO own no shares. We find that female founder CEOs are 12 percentage points more likely than their male counterparts to have no ownership.

4. Gender gap in founder CEO ownership

4.1. Specifications

To examine gender differences in founder CEO ownership using a multivariate regression framework, we use the following model:

$$Ownership_i = \alpha_0 + \alpha_1 Female_i + \mathbf{x}_i^{'}\boldsymbol{\gamma} + u_i, \tag{1}$$

where the dependent variable, $Ownership_i$, is a founder CEO's ownership of startup i at the time of incorporation (ranging from 0 % to 100 %),[25] and the independent variable of interest, $Female_i$, is a dummy variable that takes a value of 1 if the founder CEO of startup i is female, and 0 otherwise. The coefficient on *Female*, α_1, captures the equity shares of female founder CEOs relative to those of male founder CEOs (in percentage).[26] A value of α_1 is significantly different from 0 indicates that a gender equity gap exists.

In Eq. (1), $\mathbf{x}_i$ is a vector of the control variables. It includes the founder characteristics (*CEO Age* [30s, 40s, 50s, and 60s or older dummies; 20s or younger is the omitted group], *Founding Experience, Managerial Experience, Specific Industry Experience, Graduate Education, Relative Age, Relative Founding Exp. CEO, Relative Founding Exp. Cofounder, Relative Managerial Exp. CEO, Relative Managerial Exp. Cofounder, Relative Industry Exp. CEO, Relative Industry Exp. Cofounder, Relative Educated CEO*, and *Relative Educated Cofounder*) and firm char-

[21] This proportion suggests that women are underrepresented among founders in Japan, which is the same situation as in the United States. Ewens and Townsend (2020) report that female founder CEOs account for 15.8 % of their sample, which consists of "fundraising founders" registered on AngelList (an online platform that matches startups with potential investors) rather than "funded founders" included in archival databases, such as Crunchbase and VentureSource.

[22] This number is close to that reported in related studies. The average numbers of founding members reported by Hellmann and Wasserman (2017) and Hellmann et al. (2019) are 2.77 and 2.51, respectively.

[23] Huang and Kisgen (2013) report that female executives are highly represented in consumer industries, whereas male executives are highly represented in manufacturing industries. The underrepresentation of female founder CEOs is more pronounced in our sample, which comprises startups in the manufacturing and information service industries.

[24] While Coleman and Robb (2009) and Kotha and George (2012) consider the person with the largest (or joint-largest) stake the primary owner (focal actor), we consider the founder CEO as the focal point because the CEO plays a crucial role in a startup's decision-making. Thus, in our sample, founder CEOs are not necessarily the largest owners.

[25] To account for the possibility that ownership changes over time as more investors and owners join a firm, we inquired about ownership at two time points: (1) the time of incorporation and (2) the time of the survey. As our survey covers young firms shortly after their incorporation, ownership at the time of the survey is not significantly different from that at the time of incorporation (Internet Appendix Table IA.2, Table IA.5, and Table IA.6).

[26] In contrast to previous studies examining the impact of the appointment of female directors and the proportion of female directors in listed firms (e.g., Adams and Ferreira, 2009), our sample consists of founder-led startups. Thus, endogenous matching between firms and CEOs is unlikely.

Table 1
Summary statistics.

Panel A. Founder and firm characteristics

Variable	Overall			Female	Male	Diff. in means	*p*-value
	N	Mean	*SD*	Mean	Mean		
Founder characteristics							
Female	400	0.115					
Ownership (%)	400	70.22	30.68	62.94	71.17	−8.23	0.087
CEO Age, 20s or younger	400	0.103		0.152	0.096	0.056	0.239
30s	400	0.248		0.283	0.243	0.040	0.559
40s	400	0.268		0.304	0.263	0.042	0.550
50s	400	0.210		0.109	0.223	−0.114	0.073
60s or older	400	0.173		0.152	0.175	−0.023	0.699
Founding Experience	400	0.330		0.261	0.339	−0.078	0.290
Managerial Experience	400	0.128		0.152	0.124	0.028	0.595
Specific Industry Experience	400	0.773		0.696	0.782	−0.087	0.187
Graduate Education	400	0.145		0.174	0.141	0.033	0.555
Relative Age	400	0.749	6.93	−0.957	0.971	−1.928	0.076
Relative Founding Exp. CEO	400	0.163		0.130	0.167	−0.036	0.532
Relative Founding Exp. Cofounder	400	0.163		0.283	0.147	0.136	0.019
Relative Managerial Exp. CEO	400	0.060		0.065	0.059	0.006	0.875
Relative Managerial Exp. Cofounder	400	0.080		0.065	0.082	−0.017	0.695
Relative Industry Exp. CEO	400	0.200		0.152	0.206	−0.054	0.390
Relative Industry Exp. Cofounder	400	0.088		0.130	0.082	0.049	0.274
Relative Educated CEO	400	0.070		0.130	0.062	0.068	0.088
Relative Educated Cofounder	400	0.083		0.087	0.082	0.005	0.907
Firm characteristics							
Paid-In Capital (thousand yen)	400	3463	4623	3324	3481	−157	0.828
Firm Age (months)	400	18.45	18.51	18.15	18.49	−0.337	0.908
IPO Intention	400	0.323		0.370	0.316	0.053	0.469
Team Size	400	2.74	1.31	2.39	2.78	−0.388	0.058
Family Team	400	0.308		0.457	0.288	0.168	0.020
Friends Team	400	0.205		0.196	0.206	−0.011	0.868
STEM Team	400	0.130		0.043	0.141	−0.098	0.064
Investor	400	0.100		0.087	0.102	−0.015	0.755

Panel B. Startup distribution across industries

Industry	*N*	Female	
		N	%
Manufacture of			
Food	36	5	13.9
Textile products	21	3	14.3
Chemical and allied products	19	4	21.1
Electrical machinery, equipment, and supplies	16	1	6.3
Miscellaneous manufacturing industries	21	5	23.8
Information services	187	20	10.7
Others	100	8	8.0
	Chi-squared = 4.75 ($p = 0.576$)		

Note: This table reports summary statistics. Panel A presents the founder and firm characteristics. Definitions of the variables are provided in the Appendix. *t*-tests are used to assess for differences between the means for female- and male-led startups. Panel B presents the startup distributions across industries and the proportion of female-led startups in each industry. The industry classification is based on the Japan SIC. The "Others" category includes industries with fewer than 12 startups.

Table 2
Distribution of founder CEO ownership.

	Female ($N = 46$)		Male ($N = 354$)	
	N	%	*N*	%
0 %	6	13.04	8	3.08
<33 %	3	6.52	28	7.84
≥33 %	2	4.35	37	10.36
≥50 %	13	28.26	78	21.85
≥66 %	5	10.87	55	15.41
100 %	17	36.96	148	41.46
Chi-squared = 12.34 ($p = 0.03$)				

Note: This table presents the distribution of founder CEO ownership in each category by gender. The data are from a survey that asked the following question: "What percentage of the firm's capital was invested by the founder CEO and the other founding members (or current board members) when the firm was incorporated?"

acteristics (ln *Paid-In Capital*, ln *Firm Age, IPO Intention, Team Size, Family Team, Friends Team, STEM Team*, and *Investor*).[27] Definitions of the variables are provided in the Appendix. The correlation matrix for these explanatory variables is presented in Table IA.7 in the Internet Appendix. Upon checking the correlations between the variables, we find that multicollinearity is not a serious concern. We further control for industry based on Japan's two-digit SIC code. α_0 is the intercept, and u_i denotes the error term.

To examine how the gender equity gap varies with the gender pairing between the founder CEO and other founding members, we decompose the female dummy and use the following model:

$$Ownership_i = \beta_0 + \beta_1 FF_i + \beta_2 FM_i + \mathbf{x}_i^{'}\mathbf{\Gamma} + v_i, \quad (2)$$

where FF_i denotes startup i whose founder CEO is female and the other founding members (cofounders) are also female (FF team), while FM_i indicates startup i whose founder CEO is female and the other founding members are male (FM team). In this model, we exclude startups whose founder CEO is female and the other founding members are both male and female (i.e., mixed-gender cofounder teams with a female founder CEO). This is because of the small number of such startups (five) in the sample compared to those with FF and FM teams (12 and 29 startups, respectively). For robustness, we examine the impact of gender pairing more closely by also excluding mixed-gender cofounder teams with a male founder CEO (63 startups).

4.2. Does a gender equity gap exist?

Table 3 presents the regression results for founder CEO ownership. In Columns 1 and 2, we use ordinary least squares (OLS) regressions of Eq. (1). In Columns 3 and 4, we use a double-bounded Tobit model because the dependent variable is censored at 0 % and 100 %. All models control for firm characteristics. In Column 1, we further control for founder CEO age, founding experience, managerial experience, specific industry experience, and graduation status. We find that the coefficient of *Female* is negative and statistically significant at the 5 % level. Female founder CEOs own approximately 12 percentage points less equity than their male counterparts. Given that, as shown in Panel A of Table 1, male founder CEOs' average ownership is 71 %, female founder CEOs' average ownership is 59 % after controlling for founder and firm characteristics. These results support H1 (female founder CEOs' ownership is lower than male founder CEOs' ownership). In terms of control variables, we find that the coefficients of acquired founder CEO characteristics (founding experience, managerial experience, industry experience, and graduate education) are not only statistically insignificant but also small in magnitude, suggesting that founder CEOs' task (i.e., non-demographic) characteristics are not critical determinants of their ownership shares.[28]

In Column 2, we additionally control for the relative characteristics of founder CEOs' human capital within the founding teams. Although none of the relative human capital variables is statistically significant at the 5 % level, the signs of the coefficients of these variables are generally intuitive: a founder CEO with superior human capital within the founding team tends to have a greater equity share. Despite these controls, the gender equity gap is not eliminated. In Columns 3 and 4, the results concerning the gender equity gap are robust to the use of the Tobit model.

One might be concerned that women may simply work fewer hours or be less committed to a startup, leading to lower ownership rates. If so, such a difference in commitment could reflect a difference in salary. We examine this possibility and find no significant difference in salary levels between female and male founder CEOs in the founding teams (Internet Appendix B).

Overall, our estimates indicate that female founder CEOs own smaller equity stakes than male founder CEOs. This gap does not disappear even after controlling for observable founder and firm characteristics.

4.3. Gender pairing

Table 4, Panel A reports raw data on founder CEO ownership for the four types of startup founding teams (i.e., FF, FM, MF, and MM). Panel B presents the results from Eq. (2), which are estimated using OLS regression. We report only the coefficients of the key variables, although the control variables are included in the models. In Column 1, we find that the coefficient on *FM* is −17.4, which is statistically significant at the 5 % level ($p = 0.013$). This means that female founder CEOs own 17 percentage points less equity than male founder CEOs when the other founding members (excluding the CEO) are male. In Column 2, the results are generally unchanged when the reference group is set to founding teams in which the founder CEO is male and the other founding members are also male (i.e., MM teams). We note that the coefficients on FF are positive in both columns, although they are not statistically significant. These results suggest that the gender equity gap occurs primarily in FM teams and that male cofounders widen the gender equity gap, thus supporting H2. In unreported regressions, the results are robust to the use of the Tobit model and fractional logit and probit models.

5. What causes the gender equity gap?

5.1. Gender norms

As shown in Table 1, the founding teams of female-led startups are more likely to be composed entirely of family members than those of male-led startups. This suggests that family affiliation may contribute to

[27] The validity of some control variables is as follows: Wasserman (2012) argues that for equity splitting, entrepreneurial experience is much more important than other forms of general human capital, such as work experience and education. To control for the heterogeneous effect of human capital, we include the founders' prior founding experience, managerial experience, specific industry experience, and graduation status. Given that superior human capital is considered to have a high opportunity cost and the capacity to increase the value of a startup, founders with great human capital may have greater ownership. As the founder CEO's ownership stake increases, other founding members stakes decrease, and vice versa. The ownership of founder CEOs is influenced by their own characteristics and those of their cofounders. Thus, we control for the relative difference in human capital between a founder CEO and other founding members. Hellmann and Wasserman (2017) theorize that teams with a strong outcome inequality aversion are more likely to divide equity equally because an equal split is always optimal. Hellmann and Wasserman (2017) treat family founding teams as a proxy for a stronger outcome inequality aversion and find that family teams are more likely to divide equity equally. Thus, we control for family teams. Furthermore, founders with particularly high economic motivation may want to have more ownership. To account for this possibility, we control for IPO intention.

[28] Given that only a few studies have analyzed the determinants of founder CEO ownership, there is insufficient empirical evidence to determine whether these findings align with previous research. One exception is Kotha and George (2012), who find that entrepreneurs with prior startup experience have 4.3 % more equity than those without such experience. Compared to this value, the effect of founding experience on founder CEO ownership is small in this study. However, when the cofounder has no founding experience, the ownership stake of a founder CEO with founding experience is close to the value reported in Kotha and George's (2012) study (3.6 % higher). Thus, our results are inconsistent with Wasserman's (2012) proposition that prior founding experience is more important than general human capital for equity splits. In particular, after controlling for prior founding experience, status as an ideas person, and capital investment, we find that prior founding experience is associated with an increase in equity share, while a founder's prior work experience does not lead to an increase in equity share.

the gender equity gap (even though the family team dummy is included in the multivariate regression analyses). Therefore, we examine whether the gender equity gap differs between family and nonfamily teams. The first two columns of Table 5 report the results. While the coefficient on the female dummy is small and insignificant for the nonfamily team subsample (Column 2), it is −21.6 % and statistically significant at the 5 % level for the family team subsample (Column 1). We cannot reject the null hypothesis that the estimated coefficients on the female dummy are equal for the family and nonfamily team subsamples at the 5 % level ($p = 0.06$).

The composition of family members on founding teams may be more critical than the homogeneous treatment of family members. For instance, spousal relationships matter because some gender identity norms lead to the idea that "a man should earn more than his wife" (Bertrand et al., 2015), thus limiting women's influence over intra-household financial decision-making (Ke, 2021). As our survey did not ask about spousal relationships, we identify them indirectly by assuming that family teams comprising two mixed-gender founders with an age difference of 10 years or less are highly likely to have spousal relationships. In an unreported regression analysis, we limit the sample to these presumed spouses (78 startups) and rerun the model presented in Column 1 of Table 5. The coefficient of the female dummy remains statistically significant despite low statistical power.

Traditional gender norms may be ingrained in older generations (Guiso and Zaccaria, 2023). To examine this possibility, we split our sample into founding teams with an average age of 40 years or older (*Older Generation Teams*) and those with an average age of less than 40 years (*Younger Generation Teams*). The results show that while a slim gender equity gap exists in younger generation teams (Column 5), there is a significant gap of −28.2 percentage points in older generation teams (Column 4). Furthermore, we reject the null hypothesis that the estimated coefficients on the female dummy are equal in these columns ($p < 0.01$).

In addition, we create another measure of gender norms at the regional level using data from the gender gap index for each region (prefecture) in Japan provided by Professors Mari Miura and Asuka Takeuchi.[29] Fig. 1 shows gender inequality by region, with darker colors (higher values on the gender gap index) indicating a greater degree of gender inequality. In general, gender inequality is greater in rural areas. Based on the median of the gender gap index in our sample, we divide the sample into startups located in regions with low gender equality (*Less Gender-Equal Regions*) and startups located in regions with high gender equality (*More Gender-Equal Regions*).[30] In Columns 7 and 8, the gender equity gap is observed only among startups in less gender-equal regions.

The results are robust to the use of the interaction term instead of the subsamples in Columns 3, 6, and 9.[31] The results are also robust to the estimation methods (i.e., Tobit, fractional logit, and fractional probit models) and even to the exclusion of observations with zero ownership. It should also be noted that the different measures of gender norms do not divide startups into similar subsamples. The Venn diagram in Fig. 2 shows the number of female-led startups in each group (i.e., family teams, older generation teams, and startups in less gender-equal regions). Although the numbers of female-led startups are the same in the family and older generation team subsamples, the overlap is small: the product set of these subsamples contains 11 female-led startups. Furthermore, female-led startups located in less gender-equal regions are a subset of the sum set of the family and older generation team subsamples.

Overall, the gender equity gap is observed only in certain subsamples—namely, older generation teams and those in regions with low gender equality. These results indicate that gender norms impact the gender equity gap.

Table 3
Determinants of founder CEO ownership.

Independent variable	Dependent variable: Ownership			
	OLS (1)	OLS (2)	Tobit (3)	Tobit (4)
Female	–11.83**	–12.05**	–19.75**	–19.52**
	(5.48)	(5.25)	(9.11)	(8.63)
CEO Age, 30s	1.23	0.46	5.64	4.20
	(5.76)	(5.67)	(9.19)	(8.97)
CEO Age, 40s	2.52	1.45	10.24	8.43
	(5.57)	(5.62)	(9.05)	(9.19)
CEO Age, 50s	–3.59	–7.34	–0.94	–7.42
	(6.25)	(6.62)	(10.00)	(10.72)
CEO Age, 60s or older	–10.59*	–13.68*	–13.59	–18.33
	(6.40)	(7.11)	(10.02)	(11.67)
Founding Experience	0.07	–2.11	–2.86	–6.65
	(3.09)	(4.36)	(5.18)	(6.59)
Managerial Experience	1.98	0.85	3.06	0.88
	(4.42)	(6.26)	(7.63)	(10.23)
Specific Industry Experience	4.78	1.84	7.47	0.99
	(3.70)	(4.23)	(6.09)	(6.88)
Graduate Education	–0.24	–8.69	0.00	–13.16
	(4.72)	(6.73)	(7.88)	(10.37)
Relative Age		0.29		0.46
		(0.25)		(0.43)
Relative Founding Exp. CEO		5.68		11.05
		(5.46)		(8.97)
Relative Founding Exp. Cofounder		3.82		7.38
		(4.68)		(7.74)
Relative Managerial Exp. CEO		3.30		8.01
		(8.44)		(14.31)
Relative Managerial Exp. Cofounder		–5.65		–7.84
		(5.34)		(8.03)
Relative Industry Exp. CEO		5.18		11.82
		(4.02)		(7.79)
Relative Industry Exp. Cofounder		–3.77		–8.38
		(7.04)		(11.33)
Relative Educated CEO		13.49*		20.44
		(7.80)		(12.92)
Relative Educated Cofounder		–5.08		–9.50
		(5.44)		(8.40)
Firm controls	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes
Number of observations	400	400	400	400
Adjusted *R*-squared	0.128	0.132	n.a.	n.a.
F test: all coefficients = 0	5.25***	4.10***	4.25***	3.47***

Note: This table presents the regression results for the determinants of founder CEO ownership. Columns 1 and 2 present the OLS estimates. Columns 3 and 4 present the maximum likelihood estimates of a double-bounded Tobit model, with censoring at 0 % and 100 %. Firm controls include the following: ln Paid-In Capital, ln Firm Age, IPO Intention, Team Size, Family Team, Friends Team, STEM Team, and Investor. Definitions of the variables are provided in the Appendix. The regression also includes two-digit Japan SIC code dummies. Heteroskedasticity-robust standard errors are presented in parentheses. ***$p < 0.01$, **$p < 0.05$, and *$p < 0.1$.

[29] This index is calculated using the same methodology as that used in the World Economic Forum Gender Gap Index, but with different data items (e.g., the gender gap in time spent on housework, childcare, etc. in dual-earner families). Therefore, the regional gender gap indices are not directly comparable to the World Economic Forum Gender Gap Index. More information can be found at https://digital.kyodonews.jp/gender2023/ ("Prefectural Gender Gap Index 2023") by the Research Team to Achieve Gender Equality from Localities Up (2023). The data used in the Prefectural Gender Gap Index can be found at https://github.com/kyodo-official/gender-gap-index.

[30] Here, we report the results using the arithmetic mean of the indices in four areas (i.e., politics, government, education, and economy). The results obtained using the indices for each area are basically the same as those obtained using the arithmetic mean of the indices.

[31] We thank a reviewer for advising us to add these columns.

5.2. Other possible explanations for the gender equity gap

We begin by examining risk preferences and confidence mechanisms as other possible explanations for the gender equity gap. Although having data on psychological measures of founder attitudes would be ideal for examining these mechanisms,[32] we regress firm outcomes on a female dummy following previous studies (e.g., Huang and Kisgen, 2013). In terms of firm outcomes, we focus on financing and investment policies. First, we construct a dummy variable, *Debt Financing*, which takes a value of 1 if a startup has received loans from financial institutions and 0 otherwise. The rationale behind this variable is that if a startup takes on debt, its net income will be more volatile than if it does not, and the risk of profit variance is borne by the founders as shareholders. Previous studies have indicated that female executives are less likely to issue debt and have lower debt ratios because they are less (over)confident and more risk averse than male executives (Huang and Kisgen, 2013; Faccio et al., 2016).[33] Second, we use R&D investment scaled by sales (*R&D Intensity*), which is a proxy for riskier investments (Coles et al., 2006) and innovations (Hirshleifer et al., 2012). Hirshleifer et al. (2012) find that firms with overconfident CEOs allocate more investments to innovation.

In Column 1, Panel A of Table 6, we find that female-led startups are 19 percentage points less likely to have debt financing than male-led startups. This negative association between debt financing and the female dummy is consistent with the findings of Coleman and Robb (2009), who show that female-owned new firms are less likely to take on debt. Panel B of Table 6 presents the results of adding each of the dependent variables in Panel A to the model in Column 2 of Table 3 (baseline regression). In Column 1, we find that after controlling for debt financing, the estimated coefficient on the female dummy is reduced by about 1 percentage point, but it is still large and statistically significant at the 5 % level.

We also find that female-led startups have a lower R&D intensity than male-led startups conditional on undertaking R&D investments, although the difference is statistically insignificant (Column 2, Panel A).[34] In addition, the gender equity gap persists even after controlling for R&D investments (Column 2, Panel B).

Next, we examine whether women have less knowledge of startup equity than men using the responses to a survey question as a proxy for the acquisition of founding knowledge. Specifically, we ask the founder CEOs, "How did you prepare to start your business?" We construct a dummy variable, *Knowledge*, which takes a value of 1 if a founder CEO consulted acquaintances with entrepreneurial/managerial experience and 0 otherwise. If female founder CEOs are at a disadvantage in terms of information, the female dummy should be negatively related to the knowledge dummy. We find that although this is the case, it is significant at the 10 % level (Column 3, Panel A). However, the gender equity gap exists even after controlling for the tendency of female founder CEOs to seek knowledge and help (Column 3, Panel B).

In addition, although we have already controlled for various types of cofounder human capital in the multivariate regressions, we explore the possibility that female founder CEOs settle for a smaller equity share to increase the value of their startups by attracting helpers with superior human capital. In an unreported regression, we compare the gender equity gap between the subsamples of startups with and without cofounders with founding experience and find no significant difference between the estimated coefficients on the female dummy. We also include the interaction term between the female dummy and the dummy for the relative founding experience of the cofounders in Column 2 of Table 3 (baseline model). The results show that the coefficient on the interaction term is positive but statistically insignificant, while the coefficient on the female dummy is negative and remains statistically significant at the 5 % level. From a financing perspective, we examine whether female-led startups had raised funds from angel investors, VCs, or corporate investors by the time of the survey. We find that only one of the female-led startups in our sample received equity financing; hence, the low ownership stakes of female founder CEOs are not due to dilution from external financing. Overall, we find little evidence that obtaining superior cofounders and/or external funding is related to the gender equity gap. We also examine the possibility that the gender equity gap is driven by women's lack of negotiation skills. Although it is difficult to directly observe negotiations within founding teams, we compare the time taken by female- and male-led startups to negotiate an equity split and find no significant difference in the time taken to reach an equity split–related decision (Internet Appendix C).

Table 4
Founder CEO ownership and cofounder gender impact across startup types.

Panel A. Founder CEO ownership for startup types

	N	Mean	*p*-value	Median	*p*-value
FF	12	82.50	0.056	100	0.051
FM	29	55.79	0.102	50	0.200
MF	98	83.18	0.000	100	0.000
MM	193	65.81		62.50	

Panel B. Impact of cofounder gender on founder CEO ownership

Independent variable	Dependent variable: Ownership	
	(1)	(2)
FF	2.85	6.10
	(8.02)	(8.28)
FM	–17.45**	–15.81**
	(7.02)	(6.76)
MF		7.76*
		(4.56)
Reference group	Male founder CEO teams	MM teams
Founder controls	Yes	Yes
Firm controls	Yes	Yes
Industry dummies	Yes	Yes
Number of observations	395	332
Adjusted *R*-squared	0.136	0.171
F test: all coefficients = 0	3.93***	5.24***

Note: Panel A presents founder CEO ownership for the four startup founding team types (FF, FM, MF, and MM). *p*-values are for the test of the difference between the mean (median) of MM and that of each of the other startup founding team types (i.e., FF, FM, and MF). Panel B presents the OLS estimates. FF denotes a startup whose founder CEO is female and the other founding members are also female. FM denotes a startup whose founder CEO is female and the other founding members are also male. MF denotes a startup whose founder CEO is male and the other founding members are female. Founder controls include CEO Age dummies, Founding Experience, Managerial Experience, Specific Industry Experience, Graduate Education, Relative Age, Relative Founding Exp. CEO, Relative Founding Exp. Cofounder, Relative Managerial Exp. CEO, Relative Managerial Exp. Cofounder, Relative Industry Exp. CEO, Relative Industry Exp. Cofounder, Relative Educated CEO, and Relative Educated Cofounder. Firm controls include ln Paid-In Capital, ln Firm Age, IPO Intention, Team Size, Family Team, Friends Team, STEM Team, and Investor. Definitions of the Variables are provided in the Appendix. The regression includes two-digit Japan SIC code dummies. Heteroskedasticity-robust standard errors are presented in parentheses. ***$p < 0.01$, **$p < 0.05$, and *$p < 0.1$.

[32] One possible option is to conduct a survey that focuses on personality traits. For instance, Adams and Funk (2012) examine gender differences in values measured by Schwartz's 40-question Portrait Values Questionnaire and in risk attitudes at the individual director level. Graham et al. (2013) use psychometric tests to measure the attitudes of senior managers and relate them to firm behavior.

[33] Huang and Kisgen (2013) find that male executives issue more debt than female executives, suggesting that male executives are overconfident of their corporate finance decisions. They also find that female executives tend to make conservative investments (acquisitions). Faccio et al. (2016) find that firms led by female CEOs have less leverage, suggesting that female CEOs are more risk averse.

[34] We also adjust for R&D intensity by industry (i.e., a focal startup's R&D spending minus the median of the industry's R&D spending). The results remain qualitatively unchanged despite this adjustment.

Table 5
Evidence for gender norms.

Independent variable	Dependent variable: Ownership								
	Subsample			Subsample			Subsample		
	Family Team	Nonfamily Team		Older Generation Team	Younger Generation Team		Less Gender-Equal Regions	More Gender-Equal Regions	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Female	–21.57**	–2.74	–3.74	–28.18***	–3.22	–1.95	–29.50**	–5.16	–5.57
	(9.64)	(5.98)	(5.74)	(7.27)	(7.55)	(7.39)	(11.67)	(6.46)	(5.91)
Family Team			6.22			3.73			3.73
			(3.93)			(3.75)			(3.78)
Female × Family Team			–19.33*						
			(11.11)						
Older Generation Team						3.38			
						(5.97)			
Female × Older Generation Team						–22.57**			
						(10.56)			
Less Gender-Equal Regions									–0.44
									(3.27)
Female × Less Gender-Equal Regions									–26.93**
									(12.87)
Founder controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	123	277	400	179	221	400	136	264	400
Number of female-led startups	21	25	46	21	25	46	11	35	46
Adjusted R-squared	0.0240	0.133	0.139	0.196	0.0764	0.141	0.297	0.0861	0.143
F test: all coefficients = 0	1.84**	3.53***	4.15***	4.23***	2.44***	4.23***	6.33***	2.55***	4.03***
p-value for testing H_0: the estimated coefficients on Female are equal across subsamples	0.0625		0.0092		0.0396				

Note: This table presents the OLS estimates. Older Generation Team denotes a founding team with an average age of 40 years or older. Less Gender-Equal Regions are prefectures with low gender equality based on the gender gap index. Definitions of the variables are provided in the Appendix. The regression includes two-digit Japan SIC code dummies. Heteroskedasticity-robust standard errors are presented in parentheses. ***$p < 0.01$, **$p < 0.05$, and *$p < 0.1$.

To examine whether women are less motivated by economic gains than men, we asked founder CEOs about their exit intentions to elicit their revealed preferences rather than asking them directly about their financial motivations. Specifically, we asked, "Do you plan to go public in the future?" and "Do you plan to sell the firm?" The answer options were: (1) "Planning to do so," (2) "No plan but would like to aim for that in the future," and (3) "Not aiming for it." We construct a dummy variable, *Exit Intention*, which takes a value of 1 if a founder CEO has a plan to go public or sell the firm and 0 otherwise. The results show that there is no significant difference between male and female founder CEOs in terms of the likelihood of having an exit intention (Column 4, Panel A). Furthermore, the gender equity gap remains after controlling for exit intention (Column 4, Panel B).

Overall, these results suggest that the gender equity gap is not driven solely by the factors behind the alternative explanations. However, we cannot completely rule out the alternative explanations because the proxies used may not accurately capture the true variables.

5.3. Fairness

Following Hellmann and Wasserman (2017), we use a measure of equitable outcomes, which is a dummy variable that equals 1 if the founding members of startup i divide equity equally at the time of incorporation. Table 7 presents the estimation results, where the dependent variable is the equal split dummy. We report only the estimated coefficients of the female dummy and the dummies for the gender pairing of the founding members. We do not report the estimated coefficients of the other variables, although they are included in all specifications. In Column 1, we find that the female dummy is positively associated with the likelihood of equal splitting. In computing the marginal effect at the medians, the likelihood of an equal split is 10 percentage points higher for female-led startups than for male-led

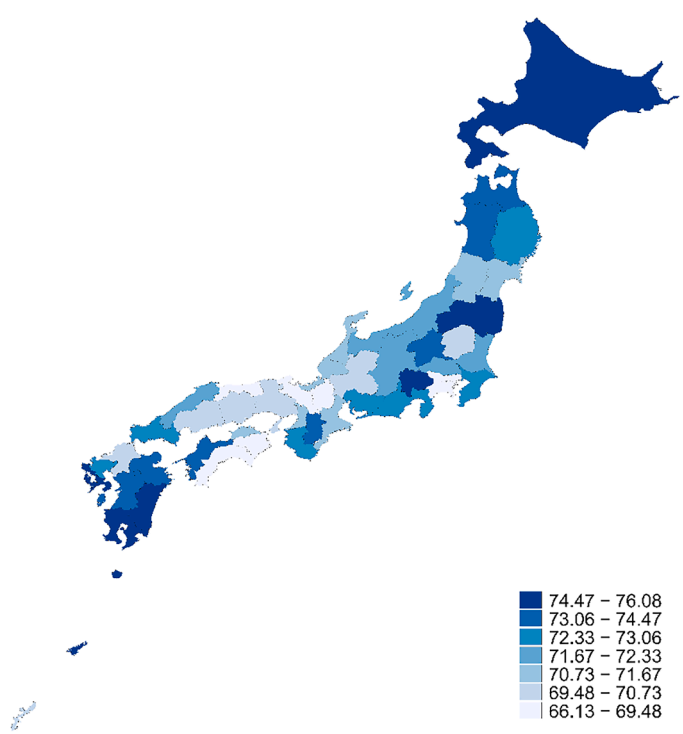

Fig. 1. Geographic distribution of gender inequality in Japan. The figure shows a heat map reflecting the gender gap index across prefectures. Darker colors (higher values on the gender gap index) indicate a higher degree of gender inequality.

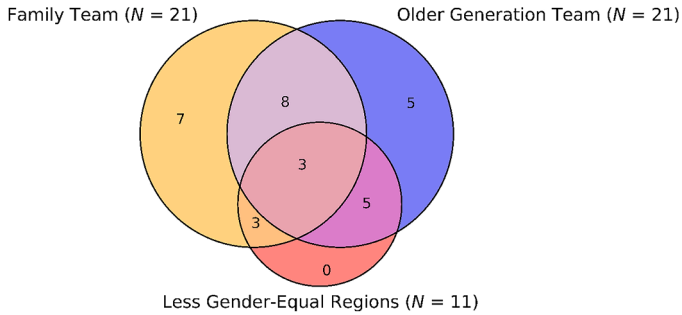

Fig. 2. Number and overlap of female-led startups across subsamples. The Venn diagram shows the number of female-led startups in each subset across subsamples.

startups. Column 2 shows the results with gender pairing considered. The coefficients of FF and FM are positive and statistically significant at the 10 % level ($p = 0.056$ and $p = 0.061$, respectively), indicating that FF and FM teams are more likely to share equity equally than MF teams.

Equal splits may be motivated by both men and women who feel a sense of solidarity with a partner with expected similar behavioral traits, as when working with a partner of the same gender (Eckel and Grossman, 2001). If so, we can expect to see more equitable outcomes in same-gender (FF and MM) teams than in opposite-gender (FM and MF) teams. In Column 3, however, we find no significant difference in the probability of an equal split between same-gender (FF/MM) and opposite-gender (the reference group) teams. Thus, there is no evidence of solidarity in our data.

Overall, the abovementioned results indicate that female founder CEOs are more likely to split ownership equally because they derive utility from fairness, thus supporting H3. This is one reason why female founder CEOs own less equity than their male counterparts.[35]

6. Discussion

6.1. External validity

Our findings are based on specific industries (i.e., manufacturing and information services) and a single country (i.e., Japan). As both industries are likely to be dominated by males (Adams and Kirchmaier, 2016), the extent to which our findings apply to other industries is debatable. If there are differences in the gender equity gap across industries, this may suggest that industry-related factors could be the source of the gap. Thus, we first discuss this possibility.

The difference in the degree of male dominance (shown in Panel B of Table 1) allows us to analyze the gender equity gap between more and less male-dominated industries in our sample. Panel A of Table 8 presents the results. In Column 1, we include the (standardized) proportion of male founder CEOs in the industry (*Male Dominance*) in the baseline model instead of industry dummies. In Column 2, we add the interaction term between the female dummy and male dominance to the model. We find that female founder CEO ownership is lower in more male-dominated industries. An increase of one standard deviation in the degree of industry male dominance is associated with an increase in the gender equity gap by 7 percentage points.

We also provide evidence that female founder CEOs can narrow the gender equity gap in male-dominated industries through industry specialization. In Column 1 of Panel B, as a proxy for male-dominated industry specialization, we include the STEM dummy, which takes a value of 1 if a founder CEO received a STEM education in college or graduate school. In Column 2, we also add the interaction term between the female and STEM dummies and find that the estimated coefficient on *Female* × *STEM* is positive and statistically significant. The ownership stake of female founder CEOs who have a STEM education is 7.3 percentage points greater than that of female founder CEOs who do not. We cannot reject the null hypothesis that the estimated coefficient on the female dummy plus that of *Female* × *STEM* equals zero ($p = 0.28$), which suggests that STEM education can help narrow the gender equity gap.

Next, we discuss whether our findings on Japanese startups reflect startup culture in more gender-equal countries. Gender equality in Japan is among the lowest in the world (World Economic Forum, 2022). Yukiko Kimura, founder of the content creation startup Genic Lab, said, "In Japan, female startup founders trying to raise funds are often told: 'You're a woman, so don't ask for too much' " (French et al., 2023). As this quote reflects striking gender inequality in Japan, one might assume that the gender equity gap is a Japan-specific phenomenon. However, gender inequality is also evident in the United States, as in the case of startup pitches (Kanze et al., 2018), the VC industry (Calder-Wang et al., 2021), and leadership on founding teams (Yang and Aldrich, 2014). Furthermore, anecdotal evidence suggests that even in the United States and Europe, there is a massive equity gap in the cap table, or so-called gap table. An analysis by Sifted and Beauhurst shows that among the four VC-backed private companies with female cofounders in the United Kingdom, male cofounders own, on average, almost five times as much equity as female cofounders (O'Brien, 2022). Among early-stage tech companies in Silicon Valley, the average female founder owns only $0.39 in equity for every $1 held by the average male founder (The Carta Team, 2018), demonstrating a persistent gender equity gap (MassChallenge, 2021). Moreover, despite Japan's low gender equality ranking in the World Economic Forum, female entrepreneurial activity—relative to male entrepreneurial activity—in the country does not differ significantly from that in other countries (Internet Appendix D).

Each country has its own gender culture, such as Southern culture in the United States (Ke, 2021); religious dimensions, such as active churchgoers (Guiso et al., 2003); and matrilineal and patriarchal societies (Gneezy et al., 2009). Among the various dimensions of gender norms, we focus on those related to age, region, and family structure, which are not specific to Japan. Previous studies have shown that gender norms rooted in these factors constrain women's influence (e.g., Yang and Aldrich, 2014; Ke, 2021; Guiso and Zaccaria, 2023). Thus, we believe that our findings are broadly generalizable.

6.2. Limitations and opportunities for future research

While our findings may be generalizable, further analyses are needed to determine whether a gender equity gap exists in more gender-equal countries. Studies focusing on differences in gender cultures across countries (e.g., Adams et al., 2021) may provide a better understanding of the factors that contribute to the gender equity gap. In addition, given that the gender equity gap is not observed in younger generation teams in this study, it would be interesting to examine whether the gap disappears on its own as the younger generation becomes a larger part of the corporate community.[36] Thus, the evolution of the gender equity gap across countries should be investigated in future studies.

Furthermore, the number of observations in this study is small, and the proportion of female-led startups in the sample is also small. Hence, the statistical power of our analysis may be low, and changes in the number of female-led startups might substantially alter the results.

In addition, we do not discuss the optimal equity split. While the

[35] In an untabulated analysis, we examine the effects of gender norms by simultaneously including the gender norm variables, specifically older generation teams, less gender-equal regions, and family teams (even though the family teams dummy is already included as a control) in the models in Table 7. The results show that the significant effects of the female dummy and the FF and FM team dummies are not eliminated, thus suggesting that the equal split is not due to the gender norm.

[36] We thank a reviewer for providing this perspective.

Table 6
Behavioral tendencies and channels.

Panel A. Behavioral tendencies of female CEOs				
Independent variable	Dependent variable:			
	Debt Financing (1)	R&D Intensity (2)	Knowledge (3)	Exit Intention (4)
Female	–0.192***	–0.032	–0.155*	–0.103
	(0.067)	(0.166)	(0.083)	(0.064)
Founder controls	Yes	Yes	Yes	Yes
Firm controls	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes
Number of observations	400	130	396	400
Adjusted *R*-squared	0.0895	0.132	0.0568	0.358
F test: all coefficients = 0	3.38***	2.28***	1.99***	13.42***

Panel B. Channels				
Independent variable	Dependent variable: Ownership			
	(1)	(2)	(3)	(4)
Female	–10.82**	–11.13*	–11.96**	–12.12**
	(5.19)	(6.17)	(5.31)	(5.25)
Debt Financing	6.35**			
	(3.18)			
R&D Intensity		2.76		
		(4.86)		
I (R&D > 0)		–5.01		
		(4.06)		
Knowledge			0.41	
			(3.01)	
Exit Intention				–0.71
				(3.45)
Founder controls	Yes	Yes	Yes	Yes
Firm controls	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes
Number of observations	400	318	396	400
Adjusted *R*-squared	0.138	0.129	0.132	0.129
F test: all coefficients = 0	4.30***	3.48***	4.16***	3.96***

Note: Panel A presents the linear probability model estimates. Only the coefficients on the female dummy from the firm outcome regressions on a female dummy and founder and firm characteristics are reported. The dependent variables are an indicator that equals 1 if a startup has received loans from financial institutions (Column 1); R&D Intensity, which is defined as the ratio of R&D expenditure to sales (Column 2); an indicator that equals 1 if a founder CEO acquired knowledge related to the incorporation of the firm (Column 3); and an indicator that equals 1 if a founder CEO intends to go public or sell the business (Column 4). R&D Intensity is winsorized at the 95th percentile to trim extreme values. Column 2 uses the subsample of startups with positive R&D expenditure. Panel B presents the OLS estimates. I (R&D > 0) is an indicator that equals 1 if a startup has positive R&D expenditure. Definitions of the variables are provided in the Appendix. The regression includes two-digit Japan SIC code dummies. Heteroskedasticity-robust standard errors are presented in parentheses. ***$p < 0.01$, **$p < 0.05$, and *$p < 0.1$.

optimal split ratio is of interest to founders and investors, there is no consensus regarding how founding teams should split equity. For instance, while Michael Seibel, managing director of Y Combinator, recommends an equal split (Seibel, 2015), some studies highlight the pitfalls of doing so (Hellmann and Wasserman, 2017; Mueller and Hennicke, 2024). Although there is no one-size-fits-all solution, observing the performance of startups and changes in ownership over time is useful for assessing the consequences of equity splits. However, because our sample firms are still too young for an analysis of their long-term performance, investigating the relationship between equity splits and long-term performance is a potential direction for future research.

Table 7
Probability of equal split by gender.

Independent variable	Dependent variable: Equal Split		
	(1)	(2)	(3)
Female	0.524**		
	(0.238)		
FF		1.058*	
		(0.553)	
FM		0.729*	
		(0.390)	
MM		0.027	
		(0.299)	
FF/MM			–0.029
			(0.263)
Reference group	Male founder CEO teams	MF teams	FM/MF teams
Founder controls	Yes	Yes	Yes
Firm controls	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes
Number of observations	400	241	241
Pseudo *R*-squared	0.118	0.156	0.125
Log-likelihood value	–144.5	–91.40	–94.81

Note: This table reports the maximum likelihood estimates of a probit model. The dependent variables are an indicator that equals 1 if a founding team divides the shares equally at the time of incorporation. FF denotes a startup, whose founder CEO is female and the other founding members are also female. FM denotes a startup, whose founder CEO is female and the other founding members are male. MM denotes a startup whose founder CEO is male and the other founding members are also male. For the founder and firm controls, see Table 4 note. Definitions of the variables are provided in the Appendix. The regression includes two-digit Japan SIC code dummies. Heteroskedasticity-robust standard errors are presented in parentheses. ***$p < 0.01$, **$p < 0.05$, and *$p < 0.1$.

Table 8
Impact of male dominance and STEM education.

	Dependent variable: Ownership	
Panel A. Impact of male dominance		
Independent variable	(1)	(2)
Female	–12.01**	–14.41**
	(5.21)	(5.63)
Male Dominance	–0.10	1.19
	(1.39)	(1.50)
Female × Male Dominance		–7.44*
		(3.93)
Founder controls	Yes	Yes
Firm controls	Yes	Yes
Industry dummies	No	No
Number of observations	400	400
Adjusted *R*-squared	0.132	0.138
F test: all coefficients = 0	4.02***	3.92***
Panel B. Impact of STEM education		
Independent variable	(1)	(2)
Female	–12.10**	–15.09**
	(5.25)	(5.91)
STEM	–1.13	–2.99
	(4.84)	(4.93)
Female × STEM		22.42**
		(8.99)
Founder controls	Yes	Yes
Firm controls	Yes	Yes
Industry dummies	Yes	Yes
Number of observations	400	400
Adjusted *R*-squared	0.130	0.134
F test: all coefficients = 0	3.97***	4.05***

Note: This table presents the regression results of the OLS estimates for the determinants of founder CEO ownership. Male Dominance is the (standardized) proportion of male founder CEOs in the industry. STEM is a dummy variable that takes a value of 1 if a founder CEO received STEM education in college or graduate school. For the founder and firm controls, see Table 4 note. Definitions of the variables are provided in the Appendix. In Panel B, the regression includes two-digit Japan SIC code dummies. Heteroskedasticity-robust standard errors are presented in parentheses. ***$p < 0.01$, **$p < 0.05$, and *$p < 0.1$.

7. Conclusion

This study sheds light on the gender gap in equity splits within founding teams. Using a propriety survey of Japanese startups to collect information on their equity splits at the time of their incorporation, we find that, even after controlling for founder and firm characteristics, such as age, education, experience, and team structures, female founder CEOs have less ownership within founding teams than their male counterparts. Furthermore, the gender equity gap is more pronounced when all cofounders, except the (female) founder CEO, are male.

The results further reveal that the gender equity gap varies with startup characteristics; it is observed only in older generation teams and in those founded in less gender-equal regions. These results suggest that gender norms contribute to the gender equity gap. We also find that female founder CEOs are more likely than male founder CEOs to split equity equally among founding members. These results are consistent with the notion that female founder CEOs have a greater preference for fairness than do male founder CEOs, resulting in lower ownership of the former.

Aside from the abovementioned findings, we explore several possible explanations for the gender equity gap, including differences in risk preference and confidence, knowledge, and motivation. We find no evidence that proxies for these measures eliminate the gender equity gap.

Our study is relevant to the broader literature on entrepreneurial finance, behavioral finance, and entrepreneurship. Hellmann and Wasserman (2017) examine how founders split the ownership of a startup in the first deal, but they do not focus on the effects of founder gender on the equity split. Our study is the first to provide empirical evidence for the gender gap in the first deal.

CRediT authorship contribution statement

Hidenori Takahashi: Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Yuji Honjo:** Investigation, Writing – review & editing, Validation, Methodology. **Masatoshi Kato:** Investigation, Writing – review & editing, Validation, Resources, Funding acquisition.

Data availability

Data will be made available on request.

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.jbankfin.2024.107272.

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