Everything is (Not) Negotiable: The Gender Startup Valuation Gap

May 20, 2021

Abstract

We explore gender differences in startup valuation in a comprehensive sample of 106 venture capital (VC) funded early stage high-tech startups from developed (Europe) and emerging (Latin America) markets. Startups led by female CEOs receive significantly lower valuations than firms featuring a male CEO, controlling for a wide range of startup and founder vocational characteristics. We build on role congruity theory and explore the potential moderation effects of self-initiation and negotiation experience on gender bias in VC deal terms. We find that, in case of female-led startups, self-initiation aggravates the gender gap in company valuation, whereas negotiation experience results in mitigating the gender gap. Further, our results suggest that supply side gender bias plays a stronger role in the gender valuation gap than demand-side bias.

Keywords: Startup Valuation; Venture Capital; Gender Gap; Role Congruity Theory; ICT industry

1 Introduction

The positive effects of VC funding for startup growth and success are well documented (Croce et al., 2013; Kortum and Lerner, 2000; Standaert and Manigart, 2018). Yet less than ten per cent of VC funding in the European Union went to startups with a female founder in 2018 (Skonieczna and Castellano, 2020). While in recent years business founding rates among women have increased, males still persistently outperform females not only in raising capital (Guzman and Kacperczyk, 2019), but also in deal pricing (Hinchliffe, 2019). In the U.S., the gender gap in startup valuation has even increased over the last years (Hinchliffe, 2019). This raises concerns because the discrepancies between men and women in startup valuation suggest lower rewards for female entrepreneurs in the success of high-tech companies at a liquidity event and, hence, lower incentives for women to participate in entrepreneurship. The gender valuation gap, consequently, constitutes a serious barrier to female entrepreneurship and thus is of considerable research and policy interest.

How this gender valuation gap is influenced by gender biases during financing negotiations is largely unknown. Consequently, we know little about factors that could bridge the gap. We examine this critical issue of gender bias in equity funding. Specifically, we study if self-imposed or investor-imposed gender biases produce inequalities in valuations between male and female-led startups.

While the VC funding process has been well researched (for example, gender discrepancies related to the investment pitch context (Brooks et al., 2014; Lee and Huang, 2018; Becker-Blease and Sohl, 2007; Greenberg and Mollick, 2017; Geiger, 2020; Eddleston et al., 2016) and gender differences in the demand of financing (Brush et al., 2018; Aernoudt and de San José, 2020)), the drivers of valuations of privately traded ventures still remain a mystery to some degree. As firm valuations constitute the backdrop of term sheets – outlining the basic terms and conditions of an investment – gender inequities in funding outcomes could extend beyond the pitch stage to the negotiation setting of VC investment deals and, ultimately, define founders' stake in the innovation process and their rewards. Yet, we have little data,

hampering knowledge building on the actual process as early stage entrepreneurs are often reluctant to disclose strategic financial information (Hsu, 2004; Shafi et al., 2020; Collewaert and Manigart, 2016; Heughebaert and Manigart, 2012).

Fact is that, in most cases, entrepreneurs and investors have differing estimates of a startup's value and engage in a process of deal negotiations (Shafi et al., 2020). In economic outcome negotiations, such as the negotiation on the valuation of a startup, women are generally disadvantaged to men. Most prominently, this is reflected in salary negotiations contributing to the gender wage gap (Stuhlmacher and Walters, 1999; Bowles and Babcock, 2013; Goldin et al., 2017). Building on the theory of gender role congruity (Eagly and Karau, 2002), we we theoretically frame startup valuation as a form of economic outcome negotiations in which women are disadvantaged vis-à-vis men due to persisting differences in gender roles (Hentschel et al., 2019). We explore two important mediators, experience in negotiations and self-initiation of the negotiation, that mitigate and aggravate gender bias in VC funding agreements, respectively.

Our analysis uses a sample of 966 observations of European and Latin American startups in the ICT high-tech industry that all are part of the portfolio of the same accelerator. Relying on this sample reduces the variance between the startups due to a common set of factors that drive the investment decision of the accelerator. Further, the data feature full and accurate valuations because the accelerator is the first institutional investor of all the startups in our sample and must be informed about any investment rounds and terms. Our results rely on regression analyses of a propensity-weighted sample (Austin and Stuart, 2015) that weights startup-observations according to their quality (e.g., regarding team, entrepreneurial opportunity, market potential, competition, etc.). The quality ratings stem from the accelerator and have real consequences for the accelerator's financial reporting and are therefore reviewed by external auditors. Hence, we not only control for startup quality but construct our sample in such a way that each male-led startup has a female-led startup twin regarding startup quality. Our empirical approach, thus, combats the so called "Glass

Cliff" phenomenon that essentially refers to the fact that women find themselves more likely in precarious leadership positions than men (Ryan and Haslam, 2005). Moreover, we control for industry fixed effects to ensure that structural differences between male- and female-led startups regarding their industry do not drive our findings.

We document that male-owned startups, defined here as having a male CEO[1], achieve consistently higher (75 per cent) pre-money valuations than similar female-owned tech firms, hence, gender biases are also apparent in investment deal structuring and beyond the investment pitch. According to our findings, there exists a very pronounced and persistent punishment effect for women that directly approach investors to take part in a funding round. A potential route to mitigating gender costs in valuation talks is negotiation experience. In contrast to actively approaching investors, negotiation experience appears to ameliorate gender differences in firm valuation for female CEOs. However, this positive effect is overcompensated by investments being self-initiated.

The shift to analyzing VC investment deal terms – in addition to identifying differences between men and women entrepreneurs in their access to funding resources – advances our theoretical understanding of the gender financing gap and the underrepresentation of women in innovative high-growth entrepreneurship in three ways.

First, we contribute to research on female entrepreneurship by showing that gender biases exist not only in the access to financing, but also in its pricing. We are able to simultaneously analyze and disentangle demand- and supply-side drivers of gender biases as firstly called for by Brush et al. (2004) and echoed by Fernandez-Mateo and Kaplan (2018); that is, we explore whether a lack of experience on side of the (female) entrepreneur or whether investors' reaction to agentic behavior (self-initiation) cause pre-money valuation heterogeneity between male and female-led startups.

Second, we stress the relevance of gender role congruity theory to entrepreneurship financ-

[1]We apply a conservative approach to leadership in this study and define as male, or respectively, female-led startups those firms that are featuring a male, or respectively, female CEO. Firms with a mixed gender, dual leadership structure are dropped from the sample.

ing by revealing how funding tactics and entrepreneur human capital are not associated with the same amount of firm valuation for men and women. Two frequently mentioned solutions in the public discourse on the side of the (female) entrepreneur to countervail differential outcomes in economic negotiations, namely experience accumulation and assertiveness, are scrutinized as to their effectiveness in the VC funding arena.

Third, our paper highlights a potential reason for the underrepresentation of women in the entrepreneurship process. Our findings highlight that participating in entrepreneurship comes with much less rewards for women than for men. Hence, the unlikely but big rewards for men offset more risk than the unlikely smaller rewards for women. Thus, women may find it less attractive to incur the high risks associated with founding a company when the offsite is less bright for them. This opens interesting avenues for research also in the area of behavioral entrepreneurship (Astebro et al., 2014). The common notion that women have different risk attitudes compared to men (Sexton and Bowman-Upton, 1990) falls short as an explanation for lower founding rates among women because current research does not take into account that the rewards for women and men largely differ.

2 Gender bias in Startup Valuations

The pre-money valuation of a startup – a key metric in the VC investment process – determines the price per share that an investor will pay for an equity stake in the company and thus presents an estimate of the enterprise value prior to an investment. For entrepreneurs, the valuation defines how much equity they have to give up to an investor in return for the invested capital, and thus, which control rights they maintain in the startup after the investment round. At a given investment amount, a lower valuation implies that the equity stake founders maintain is smaller, i.e., they experience higher dilution. Higher dilution will eventually result in smaller rewards in the case of the founder selling their stakes in an exit. Ceteris paribus, a lower valuation increases investors' control over the startup as they

are able to secure a larger equity stake (Manigart and Meuleman, 2004). For investors, the spread between the valuation they entered the company at and the final IPO or acquisition price also defines the proceeds they can expect as investment returns. Investors, hence, prefer a lower entry valuation (Miloud et al., 2012), while founders prefer a higher valuation.

At an aggregate level, factors that impact firm valuation can be divided into three broad categories: (1) investor characteristics (2) startup characteristics and (3) the external environment (see Köhn (2018) for a systematic review). Information asymmetries related to a limited historic track record and uncertainties surrounding the future cash flows and survival of new ventures, make valuations of early-stage businesses challenging and create ample adverse selection risks (Block et al., 2014). Given future performance estimates are often unobservable in very young businesses with primarily intangible assets, it is eventually through the subjective assessment of the investor as well as the relative bargaining power of the parties during the negotiation process that an agreement on the deal price is reached (Shafi et al., 2020; Miloud et al., 2012; Hsu, 2004).This results in "valuations at the early stage of ventures [being] negotiated rather than calculated" (Shafi et al., 2020, p. 300). Settings of such economic outcome negotiations are known for gendered results (see Mazei et al. (2015) for a meta-analysis).

Particularly, situations characterized by ambiguity about standards of agreement fuel the potential for biased outcomes (Bowles et al., 2019; Trombini et al., 2020). This condition makes startup valuations susceptible to stereotyped thinking. Analyzing VC investments in the US, Brush et al. (2018) find that startups with male CEOs are not only four times as likely to receive VC, they also consistently obtain higher (i.e., double) valuations than similar startups led by female CEOs. Also in the setting of televised pitches, female founders are observed to receive lower valuations for their startups than male founders (Poczter and Shapsis, 2018). A similar trend can be observed in a large-scale life-play simulation where business students are assigned the roles of "founder" and "investor" to experience fundraising dynamics in early-stage ventures. Assigning an identical startup to a female instead of a male

founder leads to an eleven per cent lower valuation from investors (Assenova and Mollick, 2019).

A parallel glass ceiling phenomenon for underrepresented market participants occurs in marketplace environments that are characterized by superstar effects – few actors absorb the majority of rewards, a so-called "winner-takes-all" context – like academia, sports, fine arts, and high-end gastronomy. For example, similar to startup valuations, art auction prices represent the market value of an artist. Gender disparities are regularly reported regarding art auction sales where there exists a large gap between the highest auction prices paid for work by male versus female artists (Bocart et al., 2017; Adams et al., 2017).

Proposed explanations for gender inequities focus on supply and demand side mechanisms. "Supply side" factors root gender inequities in institutional barriers limiting the participation or desire of *women themselves* to actively participate in the market. In televised pitches, female CEOs tend to immediately offer higher equity stakes to investors in return for comparatively lower investments when pitching, resulting in (self-imposed) lower firm valuations (Poczter and Shapsis, 2018). Relatedly, women are depicted to receive less funding because they ask for less (Babcock et al., 2003). In contrast, the "demand side" hypothesis of gender disparities argues that price differences simply reflect societal biases *towards women*, i.e., structural inequalities in the market and a bias by investors to price startups by female-CEOs equally to startups by male-CEOs (Assenova and Mollick, 2019). In what follows, we examine how gender roles simultaneously, on both the startup (supply) and investor (demand) side, matter for economic outcome negotiations (henceforth, negotiations).

3 Gender roles in economic outcome negotiation

Empirical research on negotiations shows that men, on average, are more successful than women in negotiations.[2] The underlying reasons for this difference have been rooted in

[2]We are referring to gender roles, i.e., the social connotations and not to the biological sex.

role congruity theory (Eagly and Karau, 2002), stipulating that gender roles are not merely describing behavior but also have an injunctive function, marking certain behaviors as inappropriate for men or women.

These gender roles and the connected expectations to behave accordingly persist (Hentschel et al., 2019), also in the VC industry that is characterized by prevailing masculine norms and a successful entrepreneur is generally pictured as male (Voitkane et al., 2019; Brooks et al., 2014). VC investors are mostly male and their investment patterns often show socio-demographic homophily (Sorenson and Stuart, 2008). Rules, norms and practices in the entrepreneurship domain tend to be aligned with personality attributes ascribed to men and incongruent with feminine-stereotyped behavior (Balachandra et al., 2019). Such gendered environments pose a distinctive set of challenges for women because the gender roles put forward influence how women and men a) behave in and b) are perceived in negotiations (Mazei et al., 2015).

Especially agentic behavior – showing traits of leadership including attributes like strength, dominance, assertiveness, and act independently and proactively – as a key element of successful negotiations is incongruent with female but fully congruent with the male gender role (Kray and Thompson, 2004; Kulik and Olekalns, 2012). Fear of social backlash – being punished for socially not or less accepted behavior – can actively disadvantage women in negotiations in that it causes women to adopt a congruent behavior with the female gender role, which is typically less effective in negotiations (Mazei et al., 2015). Accordingly, we hypothesize that men achieve better outcomes in negotiations with investors, i.e., their startups receive higher valuations than female-led startups.

Hypothesis 1 *Female-led startups receive, ceteris paribus, lower valuations than male-led startups.*

Literature on gender bias in negotiations discusses potential moderating factors that can mitigate gender bias or even flip the advantage to women (Mazei et al., 2015). Amongst these factors are negotiation experience and self-initiation of negotiations, which influence

the effect of gender on negotiation. Both factors also play a vital role in the negotiations of startups with their investors. Negotiation experience is a strong mediator on negotiation success (Mazei et al., 2015) and an aspect that CEOs of startups can directly influence. The self-initiation of negotiations, in turn, plays a very important role for startups because they are typically resource-constrained (McDougall et al., 1994; Kerr and Nanda, 2009), and actively searching for investment is common. Negotiation experience and self-initiation distinguish between self-imposed gender bias (negotiation experience) and investor-imposed gender bias (self-initiation), providing much-needed evidence on the difference between supply- and demand-driven gender bias (Fernandez-Mateo and Kaplan, 2018). In the following, we therefore discuss the moderating effect of negotiation experience and self-initiation on the gender bias in startup valuation.

3.1 Negotiation experience ameliorates the gender valuation gap

Structural ambiguity in negotiations typically aggravates gender bias (Mazei et al., 2015). In ambiguous situations, people tend to behave more according to broad social norms such as gender roles (Bowles and McGinn, 2008). One important way to reduce the ambiguity of a situation is to gain experience with the type of situation. Hence, gaining experience in negotiations reduces structural ambiguity and in turn reduces the likelihood that the negotiator (here, the startup's CEO) relies on general social norms, e.g., gender roles, as guidelines for behavior (Stuhlmacher and Linnabery, 2013; Mazei et al., 2015). This effect appears to be very strong so that even one single negotiation experience can already increase the performance in negotiations (Thompson, 1990; Zerres et al., 2013). Experience in negotiations is likely to reduce "women's reliance on the female gender role" (Mazei et al., 2015). This broadens the spectrum of acceptable behavior from the negotiator's perspective and women will be more likely to engage in agentic behavior. Eventually, this will improve their negotiation success. Hence, we predict:

Hypothesis 2 *The negative effect of being female-led on startups' valuation is mitigated by*

negotiation experience so that the effect of being female-led is less pronounced if the CEO has negotiation experience.

3.2 Self-initiation of negotiations aggravates the gender valuation gap

Research argues that – while women are often reluctant to negotiate – if they self-initiate negotiations they will be more successful because they will adhere less to gender role conform behavior (Mazei et al., 2015). Despite this argument, the empirical research has not reached consensus, yet, with a recent meta-study not reporting a statistical significant effect either positive or negative (Mazei et al., 2015). A potential reason for the lacking empirical evidence is the existence of a strong theoretical counterargument within the theoretical framework of role congruity (Eagly and Karau, 2002), namely that women not behaving according to the gender norm face social backlash. Indeed, experimental research supports this argument (Bowles et al., 2007).

Self-initiation, that is, the startup initiating the negotiations with the investors, thus, actively approaching investors for funding, in itself is an act of agency and as such (in)congruent with the (fe)male gender role (Kray and Thompson, 2004; Kulik and Olekalns, 2012). Role congruity theory stipulates, if a woman self-initiates a negotiation on resources (i.e., an economic outcome negotiation) then she challenges the unequal distribution of resources favoring men (Jackman, 1994; Jost and Kay, 2005). This can incur social backlash by the negotiation partner (here, the investor), resulting in the experimental finding that women get punished for initiating the negotiations while men do not get punished (Bowles et al., 2007). Bowles et al. (2007) demonstrate that the gender of the negotiation partner (here, the investor) does not matter. What matters is the gender of the negotiator initiating the negotiations (here, the startup's CEO). Hence, we predict:

Hypothesis 3 *The negative effect of being female-led on startups' valuation is aggravated*

by self-initiation, so that the effect of being female-led is more pronounced if the CEO has initiated the negotiations.

We summarize our theoretical framework in Figure 1.

Insert Figure 1 about here

4 Method and data

To test the above hypotheses, we use proprietary internal data of a large European corporation that runs an accelerator program. The corporation is a major global player in the market for information and communication technology (ICT) and is a member of the EUROSTOXX 50 index. The accelerator invests in very young startups, for which the accelerator is the first institutional investor. Using these data comes with certain advantages. Because all startups share the same accelerator as first institutional investor, we have very reliable and complete data on investment terms for all startups because the accelerator must be informed of the terms and conditions of any equity investments to exercise its contractual investor rights. Further, the startups are quite homogeneous with respect to the common set of factors that drive the investment decision of the accelerator. Reducing the variance in unobserved startup characteristic allows for a clearer identification of our results. The analyzed data are unbalanced panel data with 966 observations for 106 startups.[3] The observation period covers the years 2013–2017.[4]

The data stem from four sources. The first data source contains quality evaluations for all startups for each period, taken from the management information system (MIS) of the global

[3]For hypotheses 1 and 2, we rely on a larger sample than the sample we use for hypothesis 3. This is because the sample is reduced by almost two third when we include self-initiation as a variable due to missing values in the survey and due to non-participation. We ran all models on the small sample. All results are robust and are available upon request. Information on the small sample can be found in Tables 2 and 4.

[4]To accommodate for industry fixed-effects, we imputed missing data in such a way that each observation contains the latest valuation. Without imputation, including industry fixed-effects would not be possible due to missing degrees of freedom. Our results are fully robust relying on a non-imputed sample without including industry fixed-effects. They are available upon request.

team of the accelerator. This also includes name and gender information of the CEOs. The second data source contains information about the third-party financing the startups receive in addition to the standardized financing they receive from the accelerator.[5] The third source builds on LinkedIn and Crunchbase which we accessed to find information on the CEOs' educational background. The fourth and final source of our data is a questionnaire that the accelerator conducted each period with all operating ventures to continuously monitor the development of the ventures. This questionnaire contains information on whether the startups are actively looking for funding. Hence, for our empirical analyses we combine explanatory variables from different data sources with a dependent variable (valuation) from yet another data source.

In our international sample (roughly 30% of the observations are from Latin America), all startups are active in the ICT sector. 18.87% of the startups are female-led. This is well above the expected average in any industry but especially so in a high-tech sector such as ICT (OECD, 2019).

4.1 Measures

4.1.1 Dependent variable

As dependent variable we employ the *pre-money valuation* of the startup. We use the pre-money valuation instead of post-money valuation to ensure that the invested amount in the respective investment round does not bias our results (Hsu, 2004). We log-normalize and 90%-winsorize this variable because valuations are highly skewed: a lot of startups receive relatively low valuations, and few startups receive exorbitantly high valuations.

[5]The startups participate in a standardized acceleration program with fixed guidelines on when and how much cash is injected into the startups. These guidelines are part of the accelerators investment and valuation policy and part of the external auditing we discuss for the quality rating.

4.1.2 Explanatory variable

Our explanatory variable measures whether a startup is led by a *CEO* that identifies as a women or men.[6] This is a binary variable that we code based on the name of the CEO. Two different coders coded all CEO names and in case of discrepancy the coders engaged in extended search on the person (i.e., cross-check with Crunchbase, company homepage, LinkedIn profile) to settle any differences. If a startup is led by two CEOs of different genders, we dropped these observations. Roughly 15% of the observations in our final sample stem from female-led ventures.

4.1.3 Moderator variables

We operationalize the construct of negotiation experience by constructing a binary variable that indicates whether a valuation received by a startup is the first valuation or not. Empirical research on gender's impact on negotiation success shows that one single negotiation experience can already increase the performance in negotiations (Thompson, 1990; Zerres et al., 2013). Further, experience in negotiations is likely to reduce "women's reliance on the female gender role" (Mazei et al., 2015). Hence, we operationalize negotiation experience with the variable *valuation experience* that is zero if the startup has not received a previous valuation (i.e., the valuation received is the first one), and one if the startup has received previous valuations in the past.

The second moderator is *self-initiation* of negotiations. We operationalize this construct by using questionnaire data which indicate whether a startup is actively looking for financing. Startups that are not actively searching for investments can still be approached by interested VCs. Indeed, VCs often engage in active scouting for attractive investment opportunities. In these cases, startups can enter negotiations without initiating the negotiation. Moreover, continuing engagements of prior investors in follow-up rounds do not involve self-initiation

[6] We refer to the social gender, i.e., whether a person identifies with a gender. We do not refer to the sex a person is born with.

efforts on behalf of the startup. We translate the questionnaire information into a binary indicator *self-initiation* that is one if the startup is actively searching for investments, and zero otherwise. In roughly 65% of all cases, startups are actively looking for financing and, hence, self-initiating the negotiations.

4.1.4 Control and propensity score variables

We include several control variables to filter out confounding effects. First and foremost, we control for and match (c.f. section 4.2) our sample on *startup quality* as prior research has questioned whether gender disparities in VC financing occur due to differences in the type of startups founded across genders (Guzman and Kacperczyk, 2019). As an indicator for startup quality, we use the periodically updated rating information by the accelerator. The accelerator's offices in the different countries rate the startups according to a global rating scheme that is unified across all offices. The rating scheme builds the foundation for the valuation of the accelerators' total portfolio and are relevant for the financial reporting because they determine whether its investments need to be impaired based on IAS 36. Therefore, the rating is under scrutiny of a yearly external auditing. All offices must fulfill the same rating criteria. Consequently, the rating for a startup in Mexico is comparable to the rating a startup receives in the UK. The rating summarizes several aspects relevant to the current and expected future performance of the startup into a score ranging between 0 (very bad) and 10 (excellent). It refers, inter alia, to the quality of the founding team, the potential of the entrepreneurial opportunity, the liquidity level, the market potential targeted, the competition intensity, and the current level of revenues.

Furthermore, we control for the industry the startups cater to. While all startups are in the ICT industry, they offer their services and products to clients in different industries. To ensure that industry characteristics do not confound our findings, we include industry fixed effects.

Additionally, we control for the general experience of the CEO in dealing with business

partners. To operationalize this, we use a binary indicator encoding whether or not a CEO holds an MBA degree. [7]

Because of the international nature of our sample, we include fixed effects on the country level to buffer structural differences of the very divergent development stages of the VC system. We also include a fixed effect on the venture period to control for the maturity of the startup.

Insert tables 1, 2, 3, and 4 about here

4.2 Linear regressions and balancing the sample on the propensity score

For our estimations, we use linear omitted least square (OLS) estimations for which we log-normalized the dependent variable. Relying on OLS estimations comes with the advantage of facilitating the interpretation of the interaction effects we seek to explore in hypotheses 2 and 3, because in linear models the interpretation of interaction effects is straightforward (Ai and Norton, 2003).

The main effect we seek to analyze in this paper, i.e., the effect of gender on valuation can be interpreted as a classic treatment effect (Rubin, 1974). In our case, having a male CEO increases the valuation of the startup and could be interpreted as a treatment that increases the startup's valuation. Consequently, the sample may be imbalanced regarding startup characteristics that influence receiving the treatment (having a male CEO) in the first place. It is conceivable that high-quality startups attract more competition for the CEO position than low-quality startups and that the increase of competition results in a higher likelihood of men gaining the position. The low-quality startups could be more likely matched with female CEOs. This phenomenon has been coined as the "Glass Cliff" and essentially refers to the fact that women find themselves more likely in precarious leadership

[7] As a robustness check, we also controlled for investment amount. All results remain robust and are available upon request.

positions than men (Ryan and Haslam, 2005). As a consequence, an imbalance could exist where higher-quality startups are also more likely to receive the treatment of having a male CEO. As a result, startup quality would be the reason why the startup receives a higher valuation, and only to a lesser extent the gender of the CEO.

While including a control variable for startup quality addresses this concern to a certain extent, it cannot fully capture this confounding effect on receiving the treatment. A perfect approach would be an experiment in which we would randomly assign female and male CEOs to startups and then analyze the outcome of the valuation negotiations. This approach, however, is only possible in controlled experiments or simulations (see Assenova and Mollick 2019) and not with observational data of real-life startups. One way to solve this problem is to balance the sample between the treated (male CEO) and untreated (female CEO) group with respect to startup quality.

A commonly used method for this is propensity score matching (for an overview, refer to Ho et al. 2011). However, matching has the severe drawback that the sample size is artificially reduced (expanded) if the treatment group is smaller (bigger) than the non-treatment group. Because the group sizes in our sample are very different (only 15% of the observations stem from female-led startups) this would result in either a big reduction of the sample or a significant artificial expansion. Therefore, weighting by propensity score is a more accurate way to balance the sample. This involves two steps. First, the propensity to receive the treatment (male CEO) is estimated, i.e. the propensity score. For the propensity score, we rely on a binomial generalized additive model in which the treatment (male CEO) is the dependent and startup quality is the explanatory variable. In a second step, we estimate the inverse probability of treatment weighting (IPTW) based on the propensity score for each observation (Austin and Stuart, 2015). Finally, we use these weights when running the OLS regressions so that each observation is weighted according to its inverse probability of receiving the treatment. Effectively, the more likely the treatment, the lower the weight and vice versa. One concern with this method is that very few observations may receive

abnormally high weights. Fortunately, this is not the case in both samples we use.[8]

In summary, to balance our sample with respect to startup quality we run a propensity score weighting algorithm using the startup quality as the relevant dimension to be weighted on. We run a regression in which the treatment (male CEO) is the dependent and startup quality is the explanatory variable. Based on these results, we assign the IPTW to each observation which we take into account when running the reported OLS regressions that produce the results discussed in the next section.[9]

5 Results

Our results show a strong and significant effect of the CEO gender on startups' pre-money valuation: male-led startups reach higher pre-money valuations than female-led startups, while weighting for startup quality and controlling for industry, country and venture-period fixed effects (Model 2 table 5).This provides evidence for hypothesis 1. Model 4 explores the mitigating effect of negotiation experience on the gender effect on valuation (hypothesis 2) and shows that female-led startups without previous valuation experience receive lower valuations than male-led startups without experience. However, female-led startups with previous valuation experience show a smaller coefficient than female-led startups without experience. Furthermore, this coefficient is not significantly different from male-led startup with experience. Thus, experience does not fully close the gender gap, but the gap becomes smaller. These results provide first evidence for hypothesis 2.

Model 5 presents evidence for hypothesis 3 stating that self-initiation of negotiations leads to lower valuations for female-led startups. Female-led startups receive lower valuations if they self-initiate versus if they do not self-initiate the negotiations. In contrast, male-led startups are not as much punished for self-initiating negotiations. Further, female-led startups that do not initiate the negotiations still receive worse valuations than male-led

[8]The resulting weights range from 1.174 (1.216) to 6.762 (5.283) for the small (big) sample. There are no outliers.

[9]All results on the propensity score weighting are available upon request.

startups that do initiate negotiations. Hence, our results point to a strong punishment effect for self-initiating negotiations by female-led startups.

To further understand the relative strength of these effects and how they add up with each other or level each other out, we model a three-way interaction between gender, valuation experience, and self-initiation. Overall, we find that the discussed effects stay stable in the three-way interaction. Model 6 in table 5 shows that female-led, experienced, and non-self-initiating startups are statistically not significantly different from male-led, experienced, and non-self-initiating startups.

Insert Table 5 about here

For easier interpretation of the effect of gender and its interaction on the valuation received in Euro, we plotted the marginal effects of models 3, 4, 5, and 6 of gender and its respective interactions. Figure 2 shows the plots that include information on the actual Euro amount of pre-money valuation. Because we use simple OLS regressions, we can directly compare the differences of the marginal effects within each model to each other.[10] Gender on its own has a big economic impact on pre-money valuation. Male CEOs, ceteris paribus, receive a 72% higher valuation than female CEOs (compare figure 2a). Experienced female CEOs catch up with experienced male CEOs (here the male CEO receives a 1.1 times higher valuation and the estimates do not significantly differ in statistical terms) and consistently outperform their inexperienced counterparts by 39% (compare figure 2b and model 4, table 5). The punishment for self-initiation is very pronounced for female CEOs. On average and ceteris paribus, they receive a 69% higher valuation if they do not self-initiate the negotiations than if they do. Contrasting that, male CEOs are much less punished for self-initiation and receive valuations that are by 28% higher if they do not self-initiate the negotiations (compare model 6, table 5). These differences in being punished for self-initiation increases the valuation gap between self-initiating female and male-led startups resulting in 219% higher valuations for the latter (compare figure 2c). Combining the effects of gender,

[10] Please note that the Euro values of the marginal effects are rounded to thousands to increase readability.

experience and self-initiation, the plot in figure 2d shows that experience in negotiations helps bridging the gender gap but only for the group of CEOs that do not self-initiate the negotiations. Experienced male CEOs, ceteris paribus and on average, still receive a 47% higher valuation if they do not initiate the negotiations as compared to the female counterparts but this economically meaningful difference is statistically non-significant (compare model 6 in table 5). Experienced male CEOs, ceteris paribus and on average, receive a 79% higher valuation than experienced female CEOs if the CEO self-initiates the negotiations. The social backlash that experienced female CEOs face even stronger than the base gender difference of 72%.

Insert Figure 2 about here

All models show acceptable overall significance levels. Further, the explained variance (adjusted R^2) consistently increases from the base models for the large and the small sample (compare models 1 and 2 of table 5) to models including the explanatory variables and the interaction terms. The R^2 increases from 53.9% for the base model (cf. table 5 model 2) to 71.3% for the full model (cf. table 5 model 6), constituting a relative raise of 32.3% in the explained variance attributable to the explanatory variable and moderators. This reflects the strong overall explanatory value of gender, experience, and self-initiation.

Summarizing, our estimations show support for all hypotheses. The gender of the CEO is a strong predictor of pre-money valuation both in statistical and economic terms in that male CEOs receive a 72% higher valuation than female CEOs. Negotiation experience reduces this gap to 10% and renders it statistically insignificant. Self-initiation, however, increases the gender gap in pre-money valuation to 219%. In addition to these hypothesized effects, the three-way interaction effect points out that negotiation experience only bridges the gender gap for non-self-initiated negotiations and not both groups (self-initiating and not self-initiating) alike.

6 Discussion, implications and concluding remarks

Women entrepreneurs are disadvantaged in obtaining VC capital vis-à-vis their male counterparts. This phenomenon has been widely discussed and researched regarding the access to capital and the amount of capital female entrepreneurs obtain and has been coined as the gender financing gap. This financing gap is especially pronounced in highly innovative fields (OECD, 2019) that will shape our societal futures for decades to come, e.g., artificial intelligence, broadening any future gender gaps (Seitz et al., 2020).

While previous research has predominantly looked at the access to capital, our study examines one of the most important terms of the deal – the price of the startup – if entrepreneurs manage to acquire capital. We analyze what happens after women have jumped the first barrier of accessing capital and whether they encounter further gender bias down the road. Very few information is available on the valuation of startups, and even less on the difference between male- and female-led startups, the Diana report being a notable exception (Brush et al., 2014).

Our study relies on a sample of European and Latin American startups and looks at a highly innovative industry, namely the ICT high-tech industry. High-tech industries across OECD and BRICS countries consistently show a smaller share of female entrepreneurship than other industries and while female founders do obtain capital, they still receive much less than their male colleagues, even if there is only one female founder in the team (OECD, 2019). Analyzing the gender valuation gap in a high-tech sector, e.g., the ICT industry, is therefore of particular relevance.

Our study makes several contributions to the literature. First, our study sheds light on the enormous gender bias in financing beyond obtaining capital. While previous research has analyzed the amount raised by women and men, our study highlights that the gender bias runs deeper than providing less capital to women. Investors demand more equity from women than they demand from men for the same amount of money. In other words, women get less money for the same amount of cake they sell. At the same time, we constructed our

empirical analyses in such a way that the startups compared are of identical quality between the group of female and male CEOs, excluding reasons rooted in the quality of the startups that might be responsible for the difference in gender. Simply put, women get less money for the same amount of same quality cake they sell. Our work, hence, extends previous findings showing that US startups with female founders have higher first round valuations because on average they receive their first valuation much later than startups with only male founders (Brush et al., 2014). Expanding these findings, we employ a sample of European and Latin American startups and look at startups that are all in the early stages of maturity (average age is 2.6 years) and compare startups of similar age to each other instead of comparing first valuations across different age groups.

Second, the paper provides a field study on a new type of economic outcome negotiations in which gender bias plays a paramount role for the negotiation result: the valuation of startups. In so doing, we answer the call by researchers from psychology to provide scientific evidence in the context of management (Bowles and McGinn, 2008). More specifically, we contribute to the literature on gender bias in economic outcome negotiations. While there have been experimental (Bowles et al., 2007) and predominantly class-room studies (Mazei et al., 2015), we provide new and strong evidence based on data in a real life economic setting that women incur social backlash when initiating negotiations, while men experience a far weaker punishment effect when self-initiating valuation negotiations. This is in line with the results of experimental research on payroll negotiations (Bowles et al., 2007).

Third, we provide much-needed nuanced evidence on the difference between demand-side (here, the investors) and supply-side (here, the CEOs) drivers of gender inequality (Fernandez-Mateo and Kaplan, 2018). We can show that supply-side discrimination can be attenuated by gaining more negotiation experience, in line with earlier research on economic outcome negotiations (Mazei et al., 2015). But this experience helps women only so far. Consistent with gender role congruity theory (Eagly and Karau, 2002), the agency women display by self-initiating negotiations is punished with a lower valuation. Self-initiation

incurs such a social backlash for women that it overcompensates the effect of negotiation experience.

From these findings, it is indeed difficult to provide meaningful practical implications for startups, female entrepreneurs, or policy makers. The most straightforward implication for female entrepreneurs is to gather valuation experience early on and not to be discouraged by a first, rather low valuation. Future valuation negotiations will improve significantly after the first one, shrinking the gap to their inexperienced male counterparts but not closing it. Regarding the negative effect of initiating negotiations, female CEOs can benefit from a moderate approach in fundraising while male CEOs do not need to be cautious about this. Being approached for funding instead of actively looking for investors pays off only for women because the social backlash of initiating the negotiations is very strong. This is also true for experienced female CEOs. Naturally, startups often have no choice and need to actively search for investments to survive. According to our findings, this is likely to aggravate the gender bias we see in valuation outcomes. .

At the very extreme, startups interested in maximizing their own economic success might be better off with a male CEO when it comes to negotiating VC deals. Indeed, we know that female entrepreneurs are well aware of the gender bias they confront, and anecdotal evidence corroborates that female-only founding teams include an "imaginary" male member to combat this (Titlow, 2017). These aspects could be part of an underlying mechanism responsible for why we see so few female CEOs leading startups, especially in high-tech industries that are tied to strong gender roles. Looking into these aspects would open new and interesting avenues for further research.

Moreover, our findings suggest interesting possibilities for research in behavioral entrepreneurship (Astebro et al., 2014). Our findings highlight that participating in entrepreneurship is less rewarded for women than for men. While past research has looked into the risk attitudes of men and women to explain this difference (Sexton and Bowman-Upton, 1990) our findings put a new perspective forward. Women might find entering into

entrepreneurship less attractive than their male counterparts because their expected rewards are much lower. While men get 1 EUR valuation worth, women only receive 58 cents for the same startup quality. It is only natural that more men than women enter entrepreneurship if they can expect that much higher rewards than women. To understand why women are underrepresented, looking at women's characteristics and behavioral biases is not enough. Our study highlights the importance of difference in incentives offered to women and men when we seek to understand the differing levels of entrepreneurial activity.

To derive recommendations for policy to ameliorate the gender bias discussed in this paper, is likewise difficult. The gender gap in entrepreneurship financing has many sources. In this paper, we have explored one root cause, the inequity in valuation between women- and men-led startups. Prior research has revealed different, yet interrelated mechanisms producing gender differences in startup funding, showing how complex the problem of the female funding gap in entrepreneurship is. Thus, policy interventions have to be designed carefully in order to reach their intended goals. Our results highlight the importance of raising awareness of structural biases against women in startup deal negotiations. This awareness is the first important step to reduce barriers against women and to ensure that women enjoy equal access, terms and conditions in participating in innovation and high-tech entrepreneurship processes.

Prospectively, we also need further research that investigates how different levels of gender (in)equality influence gender bias in valuation. In our study, we concentrate on moderating factors of the negotiating parties. While we control for external circumstances by including a fixed effect on country level, we are not able to present findings that differentiate between tendencies of gender equality of different societies. Our findings show a variation between countries, but this variation captures many differences, e.g., the structure of the VC market, the availability of VC capital and public grants, and formal and informal institutional aspects, and the relevance of gender roles. Differentiating these effects in a sample with a broad cross-section of different countries and/or industries could yield important insights into how these

boundary conditions influence gender bias in valuation. This would be an important step towards drafting detailed policies that ameliorate gender bias in startup valuations.

References

Adams, R. B., Kräussl, R., Navone, M. A., and Verwijmeren, P. (2017). Is gender in the eye of the beholder? identifying cultural attitudes with art auction prices. *SSRN Working Paper*.

Aernoudt, R. and de San José, A. (2020). A gender financing gap: fake news or evidence? *Venture Capital*, 22(2):127–134.

Ai, C. and Norton, E. C. (2003). Interaction terms in logit and probit models. *Economics Letters*, 80(1):123–129.

Assenova, V. and Mollick, E. R. (2019). What drives the gender gap in startup equity funding?: Evidence from the startup game. *SSRN Working Paper*.

Astebro, T., Herz, H., Nanda, R., and Weber, R. A. (2014). Seeking the roots of entrepreneurship: Insights from behavioral economics. *Journal of Economic Perspectives*, 28(3):49–70.

Austin, P. C. and Stuart, E. A. (2015). Moving towards best practice when using inverse probability of treatment weighting (iptw) using the propensity score to estimate causal treatment effects in observational studies. *Statistics in medicine*, 34(28):3661–3679.

Babcock, L., Laschever, S., Gelfand, M., and Small, D. (2003). Nice girls don't ask. *Harvard Business Review*, 81(10):14–16.

Balachandra, L., Briggs, T., Eddleston, K., and Brush, C. (2019). Don't pitch like a girl!: How gender stereotypes influence investor decisions. *Entrepreneurship Theory and Practice*, 43(1):116–137.

Becker-Blease, J. R. and Sohl, J. E. (2007). Do women-owned businesses have equal access to angel capital? *Journal of Business Venturing*, 22(4):503–521.

Block, J. H., de Vries, G., Schumann, J. H., and Sandner, P. (2014). Trademarks and venture capital valuation. *Journal of Business Venturing*, 29(4):525–542.

Bocart, F., Gertsberg, M., and Pownall, R. A. (2017). Glass ceilings in the art market. *SSRN Working Paper*.

Bowles, H. R. and Babcock, L. (2013). How can women escape the compensation negotiation dilemma? relational accounts are one answer. *Psychology of Women Quarterly*, 37(1):80–96.

Bowles, H. R., Babcock, L., and Lai, L. (2007). Social incentives for gender differences in the propensity to initiate negotiations: Sometimes it does hurt to ask. *Organizational Behavior and Human Decision Processes*, 103(1):84–103.

Bowles, H. R. and McGinn, K. L. (2008). 2 untapped potential in the study of negotiation and gender inequality in organizations. *Academy of Management Annals*, 2(1):99–132.

Bowles, H. R., Thomason, B., and Bear, J. B. (2019). Reconceptualizing what and how women negotiate for career advancement. *Academy of Management Journal*, 62(6):1645–1671.

Brooks, A. W., Huang, L., Kearney, S. W., and Murray, F. E. (2014). Investors prefer

entrepreneurial ventures pitched by attractive men. *Proceedings of the National Academy of Sciences of the United States of America*, 111(12):4427–4431.

Brush, C., Carter, N., Gatewood, E., Greene, P., and Hart, M. (2004). *Clearing the hurdles: Women building high-growth businesses*. FT Press.

Brush, C., Greene, P., Balachandra, L., and Davis, A. (2018). The gender gap in venture capital- progress, problems, and perspectives. *Venture Capital*, 20(2):115–136.

Brush, C., Greene, P. G., Balachandra, L., and Davis, A. E. (2014). Diana report. women entrepreneurs 2014: Bridging the gender gap in venture capital. arthur m. *Blank Center for Entrepreneurship, Babson College*.

Collewaert, V. and Manigart, S. (2016). Valuation of angel-backed companies: The role of investor human capital. *Journal of Small Business Management*, 54(1):356–372.

Croce, A., Martí, J., and Murtinu, S. (2013). The impact of venture capital on the productivity growth of european entrepreneurial firms: 'screening' or 'value added' effect? *Journal of Business Venturing*, 28(4):489–510.

Eagly, A. H. and Karau, S. J. (2002). Role congruity theory of prejudice toward female leaders. *Psychological review*, 109(3):573–598.

Eddleston, K. A., Ladge, J. J., Mitteness, C., and Balachandra, L. (2016). Do you see what i see? signaling effects of gender and firm characteristics on financing entrepreneurial ventures. *Entrepreneurship Theory and Practice*, 40(3):489–514.

Fernandez-Mateo, I. and Kaplan, S. (2018). Gender and organization science: Introduction to a virtual special issue. *Organization Science*, 29(6):1229–1236.

Geiger, M. (2020). A meta-analysis of the gender gap(s) in venture funding: Funder- and entrepreneur-driven perspectives. *Journal of Business Venturing Insights*, 13:e00167.

Goldin, C., Kerr, S. P., Olivetti, C., and Barth, E. (2017). The expanding gender earnings gap: Evidence from the lehd-2000 census. *American Economic Review*, 107(5):110–114.

Greenberg, J. and Mollick, E. (2017). Activist choice homophily and the crowdfunding of female founders. *Administrative Science Quarterly*, 62(2):341–374.

Guzman, J. and Kacperczyk, A. (2019). Gender gap in entrepreneurship. *Research Policy*, 48(7):1666–1680.

Hentschel, T., Heilman, M. E., and Peus, C. V. (2019). The multiple dimensions of gender stereotypes: A current look at men's and women's characterizations of others and themselves. *Frontiers in psychology*, 10:11.

Heughebaert, A. and Manigart, S. (2012). Firm valuation in venture capital financing rounds: The role of investor bargaining power. *Journal of Business Finance & Accounting*, 39(3-4):500–530.

Hinchliffe, E. (28/01/2019). Funding for female founders stalled at 2.2% of vc dollars in 2018. *Fortune*.

Ho, D. E., Imai, K., King, G., and Stuart, E. A. (2011). Matchit : Nonparametric preprocessing for parametric causal inference: Journal of statistical software, 42(8). *Journal of Statistical Software*, 42(8).

Hsu, D. H. (2004). What do entrepreneurs pay for venture capital affiliation? *The Journal of Finance*, 59(4):1805–1844.

Jackman, M. R. (1994). *The velvet glove: Paternalism and conflict in gender, class, and race relations*. A centennial book. Univ. of California Press, Berkeley, Calif.

Jost, J. T. and Kay, A. C. (2005). Exposure to benevolent sexism and complementary gender

stereotypes: Consequences for specific and diffuse forms of system justification. *Journal of personality and social psychology*, 88(3):498–509.

Kerr, W. and Nanda, R. (2009). Financing constraints and entrepreneurship. Technical report, National Bureau of Economic Research.

Köhn, A. (2018). The determinants of startup valuation in the venture capital context: a systematic review and avenues for future research. *Management Review Quarterly*, 68(1):3–36.

Kortum, S. and Lerner, J. (2000). Assessing the contribution of venture capital to innovation. *The RAND Journal of Economics*, 31(4):674.

Kray, L. J. and Thompson, L. (2004). Gender stereotypes and negotiation performance: An examination of theory and research. *Research in Organizational Behavior*, 26:103–182.

Kulik, C. T. and Olekalns, M. (2012). Negotiating the gender divide. *Journal of Management*, 38(4):1387–1415.

Lee, M. and Huang, L. (2018). Gender bias, social impact framing, and evaluation of entrepreneurial ventures. *Organization Science*, 29(1):1–16.

Manigart, S. and Meuleman, M. (2004). *Financing entrepreneurial companies: How to raise private equity as a high-growth company*. Financiële cahiers financiers. Larcier, Bruxelles.

Mazei, J., Hüffmeier, J., Freund, P. A., Stuhlmacher, A. F., Bilke, L., and Hertel, G. (2015). A meta-analysis on gender differences in negotiation outcomes and their moderators. *Psychological bulletin*, 141(1):85–104.

McDougall, P. P., Shane, S., and Oviatt, B. M. (1994). Explaining the formation of international new ventures: The limits of theories from international business research. *Journal of business venturing*, 9(6):469–487.

Miloud, T., Aspelund, A., and Cabrol, M. (2012). Startup valuation by venture capitalists: an empirical study. *Venture Capital*, 14(2-3):151–174.

OECD (2019). Levelling the playing field - dissecting the gender gap in the funding of startups.

Poczter, S. and Shapsis, M. (2018). Gender disparity in angel financing. *Small Business Economics*, 51(1):31–55.

Rubin, D. B. (1974). Estimating causal effects of treatments in randomized and nonrandomized studies. *Journal of Educational Psychology*, 66(5):688–701.

Ryan, M. K. and Haslam, S. A. (2005). The glass cliff: Evidence that women are overrepresented in precarious leadership positions. *British Journal of Management*, 16(2):81–90.

Seitz, J., Hirschfeld, A., Gilde, J., Cann, V., Komp, D., Bittner, P.-D., and Walk, V. (2020). *Künstliche Intelligenz - Wo stehen deutsche Startups?*

Sexton, D. L. and Bowman-Upton, N. (1990). Female and male entrepreneurs: Psychological characteristics and their role in gender-related discrimination. *Journal of business venturing*, 5(1):29–36.

Shafi, K., Mohammadi, A., and Johan, S. A. (2020). Investment ties gone awry. *Academy of Management Journal*, 63(1):295–327.

Skonieczna, A. and Castellano, L. (2020). Gender smart financing. investing in and with women: Opportunities for europe. *European Economy Discussion Papers*.

Sorenson, O. and Stuart, T. E. (2008). Bringing the context back in: Settings and the search for syndicate partners in venture capital investment networks. *Administrative Science*

Quarterly, 53(2):266–294.

Standaert, T. and Manigart, S. (2018). Government as fund-of-fund and vc fund sponsors: effect on employment in portfolio companies. *Small Business Economics*, 50(2):357–373.

Stuhlmacher, A. F. and Linnabery, E. (2013). Gender and negotiation: a social role analysis. In Olekalns, M. and Adair, W., editors, *Handbook of Research on Negotiation*, pages 221–248. Edward Elgar Publishing.

Stuhlmacher, A. F. and Walters, A. E. (1999). Gender differences in negotiation outcome: A meta-analysis. *Personnel Psychology*, 52(3):653–677.

Thompson, L. (1990). An examination of naive and experienced negotiators. *Journal of personality and social psychology*, 59(1):82–90.

Titlow, J. P. (29/08/2017). These women entrepreneurs created a fake male cofounder to dodge startup sexism. *Fast Company*.

Trombini, C., Berg, L. A., and Riley Bowles, H. (2020). Anger and anxiety in masculine stereotypic and male dominated (msmd) negotiating contexts: affect and the study of gender in negotiation. In Olekalns, M. and Kennedy, J. A., editors, *Research handbook on gender and negotiation*, Research handbooks in business and management, pages 186–206. Edward Elgar Publishing, Cheltenham, UK and Northampton, MA.

Voitkane, A., Johansson, J., Malmström, M., and Wincent, J. (2019). How much does the "same-gender effect" matter in vcs' assessments of entrepreneurs? *Journal of Business Venturing Insights*, 12:e00133.

Zerres, A., Hüffmeier, J., Freund, P. A., Backhaus, K., and Hertel, G. (2013). Does it take two to tango? longitudinal effects of unilateral and bilateral integrative negotiation training. *The Journal of applied psychology*, 98(3):478–491.

Appendices

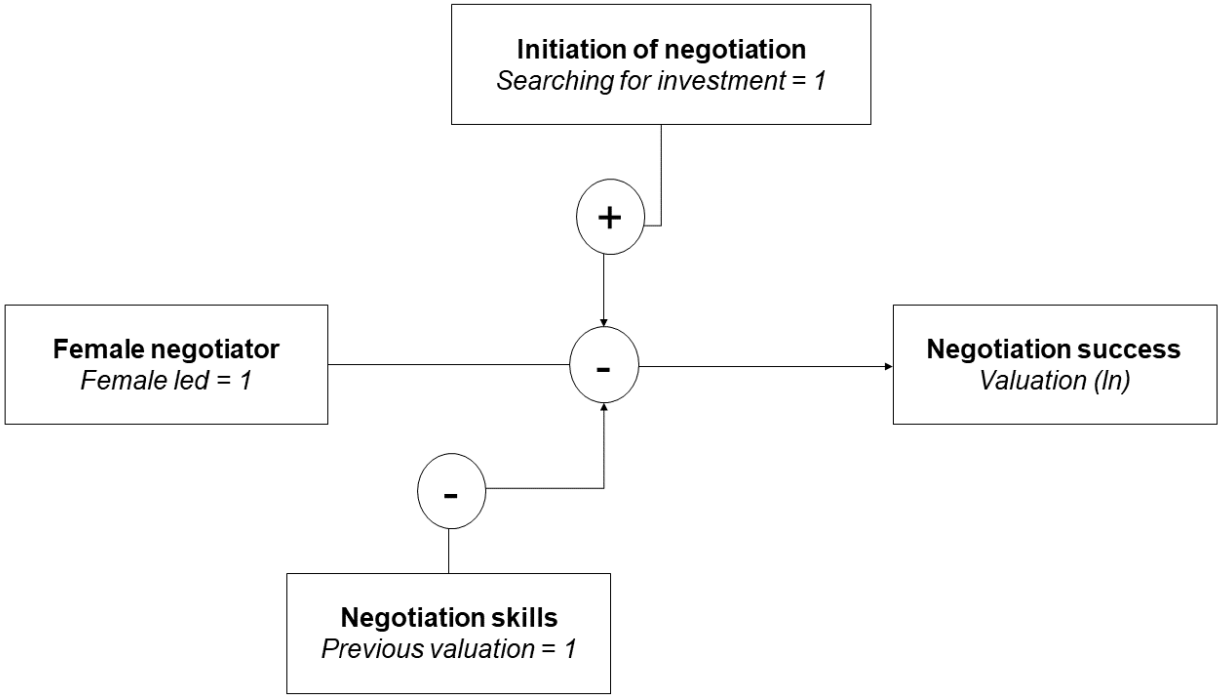


Figure 1: Theoretical framework: Theoretical constructs in bold with empirical operationalization in light

Table 1: Descriptive statistics - large sample

Statistic	N	Mean	St. Dev.	Min	Max
(1) Pre-money valuation (ln)	966	14.306	0.859	12.899	15.964
(2) Startup quality	966	4.289	2.415	1	9
(3) MBA	966	0.256	0.436	0	1
(4) CEO female (y/n)	966	0.205	0.404	0	1
(5) Valuation experience (y/n)	966	0.317	0.465	0	1

Table 2: Descriptive statistics - small sample

Statistic	N	Mean	St. Dev.	Min	Max
(1) Pre-money valuation (ln)	309	14.211	0.935	12.449	15.964
(2) Startup quality	309	4.450	2.203	1	8
(3) MBA	309	0.252	0.435	0	1
(4) CEO female (y/n)	309	0.184	0.388	0	1
(5) Valuation experience (y/n)	309	0.343	0.475	0	1
(6) Self-initiation (y/n)	309	0.628	0.484	0	1

Table 3: Correlation coefficients - large sample

	(1)	(2)	(3)	(4)	(5)
(1) Pre-money valuation (ln)	1	0.381	0.049	−0.132	0.363
(2) Startup quality	0.381	1	−0.079	−0.042	0.214
(3) MBA	0.049	−0.079	1	−0.092	0.060
(4) CEO female (y/n)	−0.132	−0.042	−0.092	1	−0.021
(5) Valuation experience (y/n)	0.363	0.214	0.060	−0.021	1

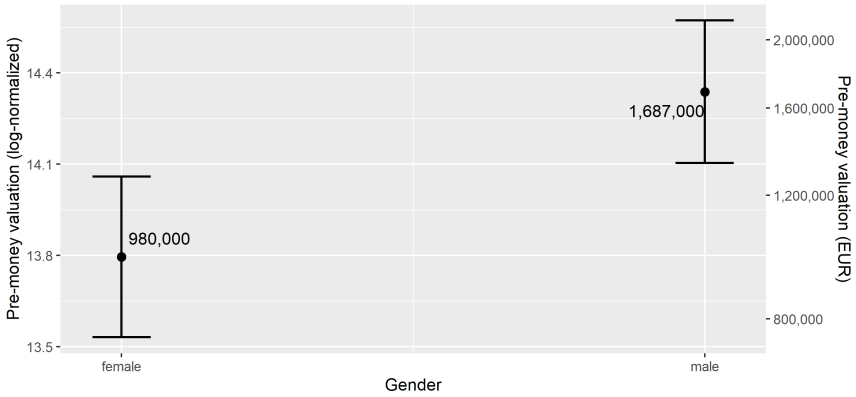
Table 4: Correlation coefficients - small sample

	(1)	(2)	(3)	(4)	(5)	(6)
(1) Pre-money valuation (ln)	1	0.248	−0.091	−0.096	0.558	−0.053
(2) Startup quality	0.248	1	−0.193	0.062	0.212	0.063
(3) MBA	−0.091	−0.193	1	−0.046	0.082	0.078
(4) CEO female (y/n)	−0.096	0.062	−0.046	1	0.043	−0.014
(5) Valuation experience (y/n)	0.558	0.212	0.082	0.043	1	0.091
(6) Self-initiation (y/n)	−0.053	0.063	0.078	−0.014	0.091	1

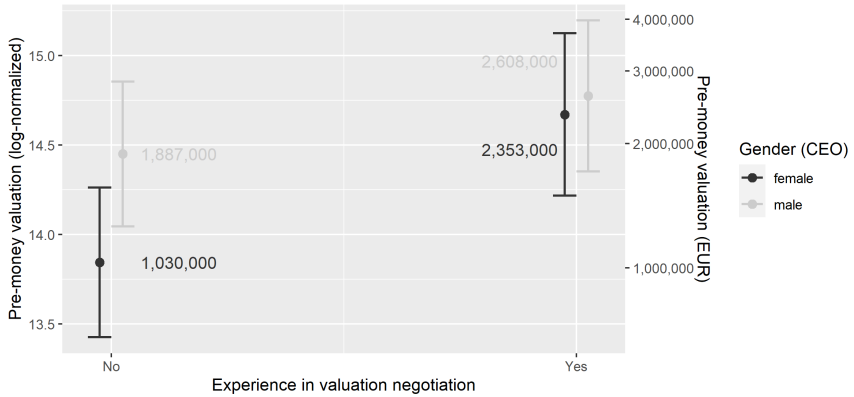
Table 5: Linear regressions

	Dependent variable:					
	Pre-money valuation (log, EUR)					
	(1)	(2)	(3)	(4)	(5)	(6)
Startup quality	0.101***	0.007	0.089***	0.069***	0.007	0.003
	(0.012)	(0.024)	(0.011)	(0.011)	(0.020)	(0.018)
MBA	0.114	0.021	0.066	−0.029	−0.053	−0.187*
	(0.061)	(0.119)	(0.060)	(0.056)	(0.103)	(0.092)
CEO: female			−0.534***			
			(0.063)			
CEO: female x Valuation experience: no				−0.929***		
				(0.075)		
CEO: male x Valuation experience: no				−0.324***		
				(0.067)		
CEO: female x Valuation experience: yes				−0.103		
				(0.089)		
Base category: CEO male						
x Valuation experience: yes						
CEO: female x Self-initiation: yes					−1.410***	
					(0.146)	
CEO: male x Self-initiation: yes					−0.248*	
					(0.103)	
CEO: female x Self-initiation: no					−0.883***	
					(0.147)	
Base category: CEO male						
x Self-initiation: no						
CEO: female x Valuation experience: no						−1.751***
x Self-initiation: yes						(0.176)
CEO: male x Valuation experience: no						−0.598***
x Self-initiation: yes						(0.163)
CEO: female x Valuation experience: yes						−0.697***
x Self-initiation: yes						(0.201)
CEO: male x Valuation experience: yes						−0.112
x Self-initiation: yes						(0.165)
CEO: female x Valuation experience: no						−1.338***
x Self-initiation: no						(0.194)
CEO: male x Valuation experience: no						−0.306
x Self-initiation: no						(0.173)
CEO: female x Valuation experience: yes						−0.384
x Self-initiation: no						(0.197)
Base category: CEO male						
x Valuation experience: yes x Self-initiation: no						
Constant	13.949***	14.810***	14.269***	14.648***	14.387***	15.157***
	(0.310)	(0.628)	(0.227)	(0.294)	(0.545)	(0.519)
Observations	966	309	966	966	309	309
R^2	0.374	0.539	0.386	0.444	0.664	0.713
Adjusted R^2	0.345	0.466	0.372	0.416	0.606	0.658
F Statistic	13.981***	9.302***	29.482***	21.350***	14.124***	18.511***

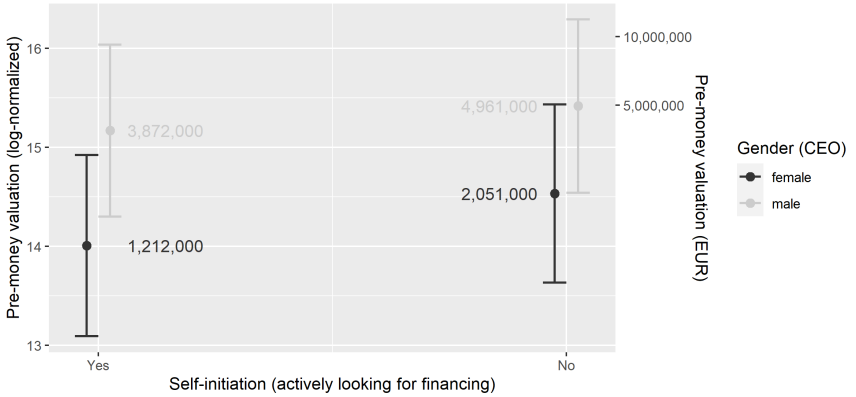
Note: *p<0.05; **p<0.01; ***p<0.001
Office and venture-period F.E.



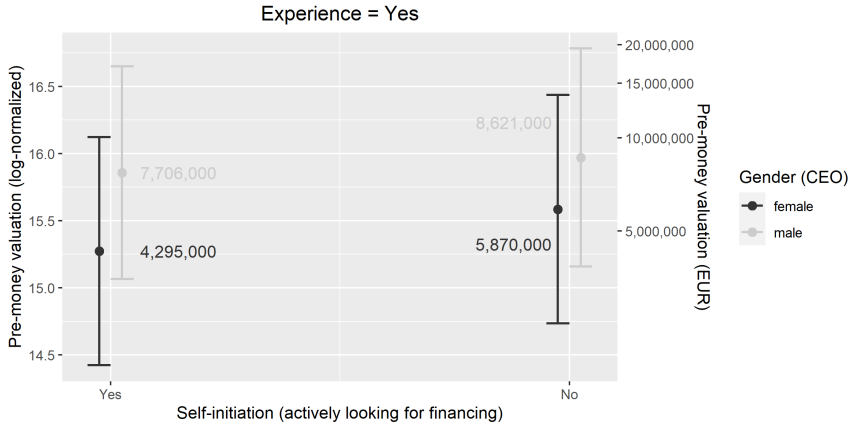
(a) Gender gap in startup pre-money valuation



(b) Experience in valuation negotiation



(c) Self-initiation of negotiation



(d) Experience and self-initiation

Figure 2: Marginal effects with 95% confidence intervals of gender (CEO) and its interactions on pre-money valuation (ln and absolute EUR amounts); point estimates with amounts in Euro (rounded to thousand); based on models 2-5 in Table 5