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Exploring the Gender-Based Funding Gap in the Global Angel Investing Market

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Spring 2020

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Introduction

Coined by University of New Hampshire professor William Wetzel in 1978, the term “angel investor” refers to high-net worth individuals who invest their personal assets in high-growth oriented entrepreneurial ventures, (Freerar et al., 1994). Angel investors invest capital in startup companies during early, pre-seed or seed funding rounds. Angel investors are arguably one of the most vital aspects to a startup’s growth trajectory, as the seed round of funding sets the foundation for future rounds of venture capital funding that ultimately enable a startup to see an opportunity for a successful exit (Sohl, 2018).

Despite the importance of the angel market, the area of angel investing is under-researched, leaving many attributes about angel investors, seed funding, and entrepreneurs seeking angel funding unknown or unproven (Drover, 2017). This research study will specifically focus on an aspect of the angel market that has been identified as a concern in other areas of private equity: the gender-based funding gap.

Like many other areas of the business world and global society, gender disparities have been identified throughout the startup investing and entrepreneurial ecosystem. For example, it is known that currently there is more entrepreneurial activity among American males than females; according to the 2018/2019 Global Entrepreneurship Monitor Report, almost 18 percent of the United States’ male population was entrepreneurially active, compared to only 13.6 percent of the United States’ female population (Bosma and Kelley, 2019). The number of active male angel investors and venture capitalists significantly outweighs the number of those that are female (Sohl, 2018). Female founders own a significantly smaller proportion of equity than male founders; a 2018 study of nearly ten thousand venture-backed companies found that female founders held only five percent of total founder and employee equity, whereas male

founders held 64 percent (Carta, 2019). This trend is also apparent in the amount of private equity funding granted to female entrepreneurs and women owned businesses. There is a funding gap in the proportion of private equity funding granted to female entrepreneurs compared to male entrepreneurs. The majority of venture capital investment goes to male owned businesses (Brush et al., 2018), leaving women owned businesses at a perceived disadvantage. Hypothetically, this decreased access to private equity funding could limit the growth potential of women owned businesses.

Most research conducted on this gender-based funding gap focuses on the issue as it relates to the venture capitalist sector; existing research on the gender-based funding gap as it relates to angel investing is limited. This literature gap is important to address, as understanding the existence and extent of the gender-based funding gap in the angel sector is crucial to identifying and understanding the implications and effects of this lack of access to risk capital on women led businesses' growth potential. For example, if women led businesses have less access to angel funding than male led businesses, they as a result could have less of an ability to grow their company to a stage worthy of further institutional investments, such as those from venture capitalists. To achieve a lucrative exit—such as an acquisition or an Initial Public Offering—a startup often needs the support of venture capital funding to achieve successful growth. However, a startup's ability to source venture capital investment is contingent on its ability to first receive pre-seed and seed funding from the angel market, as such angel funding is often necessary for a startup to achieve enough progress to attract attention from venture capitalists. By this logic, the presence of a gender-based funding gap in the angel sector could promote a continued funding gap in the venture capital sector by limiting the number of women led businesses that have access to the angel capital needed to achieve the progress necessary to

attract venture capital attention. In other words, the limitations placed on women lead business by the gender-based funding gap in the early seed stages of funding could inherently further limit their ability to secure later stage funding, and in turn limit their growth potential.

The prevalence and extent of the gap needs to be further identified for it to be addressed and improved by various policy and private initiatives aimed to improve gender equality within the financial, entrepreneurial, and overall business sectors. Since angel investors are the initial players in the private equity investment process, it is key for the gender-based funding gap to be identified and addressed in the angel sector for progress to be made in the overarching private equity market. My research will attempt to provide more clarity on the role of the funding-gap in the angel sector. In addition to providing more insight into the extent of the gender-based funding gap in the United States' angel market, it will also look at such funding gap through an international lens. Despite the presence of entrepreneurial and private equity investment activity abroad, research addressing gender-based funding dynamics in national private equity markets outside of the United States is limited. My research will also explore the presence and severity of a gender-based funding gap in various national angel markets around the globe.

Literature Review

Identifying the Proportional Funding Gap Between Female and Male Entrepreneurs in the United States Private Equity Sector

Much existing research regarding the funding disparity between female and male entrepreneurs focuses on the United States private equity ecosystem, more specifically the national venture capital sector. Such research consistently identifies the presence of an unequal distribution of venture capital funding between male and female startup founders, implying a

potential prevalence of gender bias in the venture capital sector and/or a difference in entrepreneurial behavior between men and women. One of the pioneering research projects addressing this gender-based funding gap is the Diana Project. Launched in 1999, the Diana Project was a research initiative that explored the dynamics of female entrepreneurship in the United States with an emphasis on factors influencing growth of female founded businesses. The project's initial research—which used data spanning over a 40-year time period (1953-1999)—highlighted a significant venture capital funding distribution gap between female and male entrepreneurs in the United States. In the 40 years studied, there was not a single year in which women-led businesses secured more than 4 percent of the total venture capital invested nationally within a given year (Brush et al., 2018).

Since the Diana Project, continued research has supported the continuation of the gender-based venture capital funding gap into recent years. In a 2014 study of the United States venture capital sector—which analyzed venture capital investments made in 6793 startup companies from 2011 to 2013—researchers found that companies with a woman on the leadership team and/or a female CEO received statistically significantly fewer investments and smaller deal sizes than companies with all-male teams and male CEOs (Brush et al., 2018). Over the three-year period, 15 percent of venture capital investments went to companies with a woman on the executive team. However, only 2.7 percent of companies receiving venture capital investments had a female CEO. Over the three-year period, venture capital dollar investments totaled \$50.8 billion, of which companies with a female entrepreneur on the team received just over \$10.6B, or 21 percent (Brush et al., 2018).

Another study focusing on regional venture capital ecosystems echoes the findings of the 2014 study discussed above. Using data on young ventures headquartered in California and

Massachusetts between 1995 and 2011, Guzman and Aleksandra provide additional evidence supporting the continued presence of a funding gap in the California and Massachusetts venture capital sectors. Their research found that female-lead ventures were 63 percent less likely to receive venture capital funding than male-led ventures (Guzman and Kacperczyk, 2019).

Though women entrepreneurs and women-led startups receive a significantly smaller proportion of total venture capital funding than their male counterparts, there is evidence that such proportion has grown over recent decades. Since 1999, researchers associated with the Diana Project have noticed a growth in both the proportion of female-lead companies receiving venture capital investments as well as the percentage of total venture capital dollars invested into women-led companies. The 2014 study mentioned above found that, compared to only 5 percent in 2001, the percentage of venture capital investments received by women-lead companies rose to 9 percent in 2011, 12 percent in 2012, and 18 percent in 2013. During this three-year period, the percentage of total venture capital dollars invested in women-led businesses rose from 9 percent in 2011 to 27 percent in 2013 (Brush et al., 2018).

Becker-Blease and Sohl identify a similar trend of funding disparity between genders within US the angel market. Their research provides evidence that female entrepreneurs receive a significantly smaller proportion of angel funding compared to their male counterparts. However, they also provide evidence that—contrary to surface-level assumptions—the funding gap between male and female entrepreneurs is not indicative of women owned businesses having a lesser chance at securing angel funding than male owned businesses. Rather, their research argues that the disproportionate amount of total angel investments made in women owned businesses is reflective of the lower rate at which female entrepreneurs seek funding from angel investors. Their survey of angel portals from 2000 to 2004 revealed that although women owned

businesses receive a smaller fraction of total angel investments than men owned businesses, women owned businesses submit between 5 percent and 10 percent of funding proposals compared to the 90 percent to 95 percent submitted by male owned businesses. However, the ratio of the number of deals funded to the number of deals submitted—which expresses the chance of a proposed deal getting funded—was not statistically different between women owned businesses and men owned businesses (Becker-Blease & Sohl, 2007).

Explaining the Funding Gap: Exploring Potential Contributing Factors

In addition to identifying the extent and progression of the proportional private equity funding gap between female and male founders, existing research also attempts to pinpoint factors that contribute to the funding gap (Tinkler et al., 2018). In other words, such research attempts to identify causes of the funding gap. Factors contributing to the funding gap can be generally separated into two categories: supply-side factors —those relating to behaviors and tendencies observed in investors, or the suppliers of funding—and demand-side factors—those relating to the behaviors and tendencies observed in entrepreneurs, or the demanders of funding.

Supply-side Factors

Multiple researchers identified investor bias and gender stereotypes to be relevant in explaining why male entrepreneurs receive proportionally more private equity funding than female entrepreneurs. Subjective and case-based studies showed that people, specifically investors, often stereotype “successful entrepreneurs” as being male (Brush et al., 2018). However, certain factors will play a role in how often an investor relies on gender stereotypes. For example, the more uncertainty there is associated with a startup or founder seeking funding, the more decision makers will rely on gender stereotypes and assumptions to make their decision (Tinkler et al., 2018). This is thought to be a possible explanation as to why in some studies

female entrepreneurs receive proportionally more venture capital funding when their companies are in later stages. The more developed a startup, the more performance-based evidence there is available to indicate potential success, and in turn less uncertainty. In turn, gender plays less of a role in the decision-making process (Guzman & Kacperczyk, 2019). Venture growth orientation also plays a role on an investor's reliance on gender stereotypes when making decisions; the more growth oriented a venture is, the less investors rely on gender to determine a venture's probability of success (Guzmana and Kacperczyk, 2019). That being said, women-led ventures represent a small proportion of the top growth-oriented firms. Guzmana and Aleksandra found that of California and Massachusetts-based startups ranked in the top 5 percent for growth orientation, women-led ventures accounted for only 13 percent.

Another component relevant to venture capital bias is related to gender homophily theory, which states that people tend to associate positive perceptions and trust with others who are demographically similar to themselves (Brush et al., 2018). This is specifically identified to be relevant in the venture capital sector; because the venture capital sector is dominated by men who are the primary decision makers, its structure is inherently vulnerable to homophily. Under this theory, male venture capitalists are more likely to invest in male founders because their shared gender reinforces a sense of trust (Alsos et al., 2006). In turn, the gender homophily theory would imply that because there is a high proportion of male venture capitalists to female venture capitalists, female founders are likely to receive proportionally less venture capital funding.

Demand-side Factors

Growth orientation also plays a role on the demand-side of private equity funding. Certain differences in mentalities between men and women are thought to influence men to start

more high-growth ventures that make for more attractive investments. Women more often gravitate towards founding life-style oriented businesses that allow for flexibility and security, whereas men tend to start businesses that are growth-oriented and higher-risk (Guzman & Kacperczyk, 2019). Sector also plays a role in perceived growth orientation. Female and male entrepreneurs tend to start companies in different sectors than men. Where female entrepreneurs more often gravitate towards service and retail sectors, men are more apt to founding businesses in technology, financial, and manufacturing sectors, which are often characterized as having higher growth potential and in turn receive more venture capitalist attention (Verheul & Thurik, 2001). It is often assumed that because of the nature of the sectors female entrepreneurs tend to gravitate towards, they are less growth orientated and have less need for capital or that their ventures have lower potential for high growth and returns.

The results of the Diana Project's research challenged this assumption that female entrepreneurs have less desire to establish high-growth businesses and in turn do not need equity capital, which would hypothetically provide an explanation of unequal venture capital funding distribution. In fact, the research provided evidence supporting the notion that most female entrepreneurs desired to rapidly grow their business with intentions of raising external equity-based funding to do so (Coleman & Robb, 2009).

Despite this, there is also evidence supporting that female founders seek funding at a lower rate than men. As discussed above, female founders seek private equity funding less often than male founders. Becker-Blease and Sohl provide evidence that the lower rate at which female founders seek angel funding is a potential explanation for the gender-based funding gap identified in the angel investment sector (Becker-Blease & Sohl, 2007).

Entrepreneur education and technical background can play a role in investor decision making and funding allocation, but the extent of this role can vary by gender. One study focusing on the Silicon Valley startup ecosystem found that a technical degree provides more perceived legitimacy to female founders when being evaluated by an investor, whereas it does not necessarily provide more legitimacy to male founders. The study further provided evidence that non technically trained women receive the least amount of venture capital funding (Tinkler et al., 2014).

Social capital is another factor thought to play a large role in an entrepreneur's access to funding. The venture capital sector is characterized as being tightly networked and reliant on reputation. Entrepreneurs must often rely on their social capital to source investors while venture capitalists utilize in-network recommendations and reputation when evaluating a founder (Brush et al., 2018). Male founders are observed having more social capital than female founders, providing them with more resources to source potential investors. Women are often excluded from the most resourceful networks, which gives them less access to venture capital funding and sets them at a disadvantage to their male counterparts (Guzman & Kacperczyk, 2019).

The Funding Gap on an International Scope

Less research regarding the funding gap between female and male founders has been conducted on an international or global scale. Existing research analyzing statistical evidence of the funding gap and relative contributing factors has revolved around countries with the most active private equity sectors, most notably being Germany and Norway. The next section provides a deeper overview of entrepreneurial, venture capital, and angel activity abroad. Similar trends of gender-based disparity in startup funding have been identified in the Norwegian investment ecosystem. Alsos, Isaksen, and Ljunggren provide evidence that gender plays a role

in the amount of loan and equity capital Norwegian entrepreneurs raise. Their findings identify a funding gap in which male entrepreneurs receive a larger proportion of debt and equity funding than female entrepreneurs. However, unlike the findings of Becker-Blease and Sohl, there is no significant difference between the rate at which Norwegian female and male entrepreneurs seek debt and equity-based funding. They also provide evidence that such funding gap restricts the growth potential of women owned startups (Alsos et al., 2006). Like Norway, gender also plays a role in the German venture capital market in terms of entrepreneurs' access to funding. German female entrepreneurs receive a smaller share of total venture capital funding than their male counterparts (Lins and Lutz, 2016).

Some corresponding research explores factors contributing to the funding gap noted in countries abroad. Similar entrepreneurial-specific and venture-specific variables were observed in German entrepreneurs as American entrepreneurs. German women are more likely to start a business out of necessity, whereas German men more often found a business timed with market trends or gaps. German female entrepreneurs are more likely to start new service ventures characterized by low innovation and low growth potential, whereas German male entrepreneurs more often start high-tech ventures. New service ventures with low innovation potential are less likely to receive significant venture capital funding (Lins and Lutz, 2016).

Like in the United states, educational background plays a role in investor decision making. Having a university degree is seen as a positive factor affecting venture capital decision making, as higher education "enables entrepreneurs to develop more complex and innovative business models." Despite there being strong evidence that higher education had a positive effect on a founder's ability to acquire venture capital funding, German female entrepreneurs were more disadvantaged in receiving venture capital funding even when having a university degree.

This implies that the factor of higher education was unable to bridge the gender gap in German venture capital financing (Lins and Lutz, 2016).

Growth orientation is also identified as being a relevant demand-side factor in abroad private equity markets. Studies conducted in Norway and Germany found that female entrepreneurs are less likely than male entrepreneurs to desire to grow their business, which contrasts what the Diana Project found for American female entrepreneurs. Whereas Canadian female entrepreneurs were equally as likely as men to seek to grow their business but placed more restricting maximum business size thresholds that would limit their business's potential to expand (Alsos et al., 2006). Such lower growth ambitions correlate with less access to or need for external financial resources and in turn could explain correlating gender-based funding gaps.

Gaps in Existing Research

Existing research leaves certain aspects of the gender-based private equity funding gap underexplored. Firstly, although research exists on venture capitalist and angel activity abroad, there is limited research that focuses on the presence of the gender funding gap on a larger and comparative scale. Both abroad-focused and United States-focused research places a strong focus on the venture capitalist sector. In contrast, international and national angel markets are relatively under researched. My research will focus on the cross-section of these two shortcomings to provide a better look into the prevalence of the gender-based funding gap within the angel investment sector on a multi-national scale. Some research also fails to put the gender funding gap in context of relevant entrepreneurial activity—this context is provided in my research.

Overview of Global Angel Activity

Before diving into my research evaluating the gender-based funding gap on a global scale, it is appropriate to provide a brief overview of global angel investment activity. The following overview will use deal count, total capital invested, and average deal size as variables to measure angel investment activity in each geographical region or country; deal count will provide a measurement of the frequency at which local angels invested in companies. Total capital invested and average deal size will provide measurements of the sizes of the deals that took place.

The following information on global angel activity was gathered using Pitchbook. In this research, the location of each deal is determined by the location of the company's head quarter. Based on Pitchbook data of angel deals occurring from 2010 to 2019, there were a total of 39,963 angel deals made globally in 30,973 companies, totaling a cumulative US\$ 39.84 billion of capital invested. This makes the average global deal size of this decade US\$0.99 million.

Regional Overview

North America dominates the global angel market. As shown in Table 1 below, the North American angel market accounted for the majority of global angel activity from 2010 to 2019; of the total 39,963 angel deals made globally during this time period, 25,797 occurred in North America. Of the total US\$39.84 billion angel funding invested in this decade, US\$27.89 billion was deployed in the North American market. North American angel activity represented over 64 percent of global angel deals and 70 percent of total global capital invested.

From 2010 to 2019, the next most active regional angel investment market was Europe. A total of 9,332 angel deals were made, representing a total US\$7.1 billion invested. In this decade, the European angel investment market accounted for 23.4 percent of total global angel deals and

17.9 percent of total global capital invested. The Asian angel market was the third most active region globally during this time period, accounting for 7.7 percent and 8.2 percent of total global angel deals and total global capital invested, respectively. The Middle East and Oceania had significantly less active markets during this time period, accounting for 1.4 percent and 1.5 percent of total global angel deals and only 1.4 percent and 1.6 percent of total global angel capital invested, respectively. Africa, Central America, and South America had the least amount of angel investment activity.

	Company Count	% of total	Deal Count	% of total	Capital Invested (in millions USD)	% of total
North America	19,400	62.64%	25,797	64.55%	27,891.87	70.01%
Europe	7,346	23.72%	9,332	23.35%	7,118.45	17.87%
Central America	31	0.10%	38	0.10%	82.88	0.21%
South America	276	0.89%	320	0.80%	151.32	0.38%
Asia	2,711	8.75%	3,064	7.67%	3,274.06	8.22%
Africa	234	0.76%	263	0.66%	117.74	0.30%
Middle East	493	1.59%	556	1.39%	573.35	1.44%
Oceania	482	1.56%	593	1.48%	630.49	1.58%
Total Global	30,973	-	39,963	-	39,842.04	-

Continued Regional Breakdown of Angel Activity: Top Five Regions

The top five regions—North America, Europe, Asia, Oceania, and the Middle East—cumulatively accounted for 98.4 percent of total global angel deals and 99.1 percent of total angel capital invested from 2010 to 2019.

North America

The North American angel market is driven by the United States. The United States angel market accounted for 95.2 percent of regional deal count and 95.9 percent of total regional capital invested. The Canadian angel market follows at 4.4 percent and 3.9 percent, respectively.

Europe

There are over 40 countries included in the region of Europe, 15 of which make up 92.7 percent of angel activity, as measured by total regional deal count: Belgium, Denmark, England, Finland, France, Germany, Ireland, Italy, the Netherlands, Norway, Russia, Scotland, Spain, Sweden, and Switzerland. Of these most active 15 countries, the top 10 are ranked by both total capital invested and total deal count in Table 2 below. England and France remain the top two most active angel investment markets in the European region by both variables. However, ranks three through nine vary based on variable of measurement (total capital invested or total deal count). This highlights a difference in frequency in investment versus amount of angel capital deployed in the market: some countries see fewer deals but have a proportionally larger average deal size than countries with a higher frequency of deals. For example, Switzerland is ranked ninth by total deal count, indicating that the Swiss angel market has fewer deals than other top European angel markets. However, it is ranked fourth in total capital investment, which shows that despite relatively low deal count, a larger amount of money is invested in Swiss companies by angel investors. This is also reflected in average deal size; with an average deal size of US\$1.32 million, Switzerland has the highest average deal size of all top European angel markets.

Rank by Capital Investment		% of Regional Total	Rank by Deal Count		% of Regional Total	Average Deal Size (in millions USD)	
1	England	40.41%	1	England	38.05%	England	0.81
2	France	13.44%	2	France	12.01%	France	0.85
3	Sweden	4.66%	3	Germany	6.01%	Germany	0.51
4	Switzerland	4.66%	4	Spain	5.60%	Spain	0.54
5	Germany	4.02%	5	Russia	5.26%	Russia	0.5
6	Spain	3.95%	6	Sweden	4.86%	Sweden	0.73
7	Russia	3.42%	7	Netherlands	3.58%	Netherlands	0.66
8	Netherlands	3.13%	8	Italy	3.55%	Italy	0.57
9	Italy	2.65%	9	Switzerland	2.50%	Switzerland	1.32
10	Ireland	2.57%	10	Ireland	2.28%	Ireland	0.86

Asia

The Asian angel market is mainly driven by angel activity in India, China, and Singapore. From 2010-2019, India's angel market accounted for 54 percent of total regional deal count and 36.7 percent of total regional capital invested. China and Singapore made up 22.8 percent and 7.3 percent of total regional deal count and 23.8 percent and 4.9 percent of total regional capital invested, respectively. Like Switzerland's role in the European angel market, the Hong Kong angel investment market is notable when evaluated by average deal size. Although Hong Kong only accounted for 2.4 percent of Asia's total angel deal count during this time period, it was responsible for 27.6 percent of total regional capital invested. It saw an average deal size of US\$12.56 million, compared to only US\$0.72 million in India, US\$1.17 million in China, and US\$0.72 million in Singapore.

Oceania & the Middle East

Australia and New Zealand accounted for over 99 percent of angel activity in the Oceanic region from 2010 to 2019, with Australia seeing 67.5 percent of the region's angel deals, which represented 70.3 percent of the region's total capital invested. Angel activity in the Middle East

during this time period was driven by Israel. With 63.1 percent of the region's angel deals occurring in Israel—representing 73.5 percent of the region's total capital invested—it accounted for the majority of angel activity. The next most notable Middle Eastern countries by measure of angel activity are Jordan and Lebanon, which accounted for 2.9 percent and 3.03 percent of the region's deal count and 7.2 percent and 3.5 percent of the region's total capital invested, respectively.

Top 10 Countries

For the purpose of ranking most the active national angel investment markets, total deal count will be the primary variable to measure activity, as it highlights the frequency at which angels deploy capital. Although total capital invested better highlights the overall size of a country's angel investment market, it does not provide as accurate of a measurement of the rate of activity within a market. The frequency of investment to measure activity is important to note, as it will allow me to observe countries with a larger sample size of angel deals. The more deals taken into account in my research, the more accurately I can depict the presence of a gender-based funding gap. Hence, the top 10 most active angel markets were determined by deal count and are summarized in the table below.

Table 3: Top 10 Most Active Angel Markets by Deal Count, 2010-2019

Country Rank		Deal Count	% Global Total	Capital Invested (in millions USD)	% Global Total	Company Count	Average Deal Size (in millions USD)
1	United States	24,567	61.47%	26,751.43	67.14%	18,435	1.089
2	England	3547	8.88%	2871.51	7.21%	2476	0.810
3	India	1657	4.15%	1200.69	3.01%	1410	0.725
4	Canada	1,124	2.81%	1,095.83	2.75%	877	0.975
5	France	1120	2.80%	955.3	2.40%	950	0.853
6	China	699	1.75%	781.08	1.96%	671	1.117
7	Germany	560	1.40%	285.92	0.72%	498	0.511
8	Spain	522	1.31%	280.96	0.71%	435	0.538
9	Russia	490	1.23%	243.26	0.61%	405	0.496
10	Sweden	453	1.13%	330.99	0.83%	363	0.731

Research Questions

My research explores the gender funding dynamics in the most active national angel markets identified as: the United States, England, India, Canada, France, China, Germany, Spain, and Sweden. Russia has been excluded from this research due to a lack of appropriate data available. The purpose of this research is to evaluate if the gender-based funding gap identified in the United States' venture capital sector is present in the various national angel markets, both in the United States and abroad. Due to the limited existing research on gender funding dynamics in both the United States and the international angel market, my research is guided by the following research questions:

Research Question One: Does the United States angel market see a gender-based funding gap similar to that identified in the venture capital market? Is this gap also present in other topmost active national angel investment markets? To better refine the research question and measure the funding gap.

1a. What is the frequency at which angel investors invest in women led businesses (WLB) compared to men led businesses (MLB)?

1b. What percentage of total angel capital invested do WLB receive compared to MLB?

1c. Do WLB received the same sized deals as MLB?

1d. How is each gender represented in each nation's top deals?

Research Question Two: If the gender-based funding gap is present in the various national angel markets, is it proportional to national entrepreneurial activity by gender?

Methodology

Data Aggregation

This research was conducted using data aggregated from PitchBook, focusing on angel deals occurring in 2019. For each of the nine countries of focus, I conducted a search with the following criteria; deals occurring between 01/01/2019-12/31/2019¹, company head quarter location based in the country of focus, and angel deal type. This data aggregation provided an average sample size of 125 deals per country dataset. A summary of the data collected for each country is provided in Appendix A.

Refining by Gender

To evaluate the presence of a gender-based funding gap, it was essential that each deal be able to be categorized by gender. Deals were sorted into three different gender-based categories: woman led businesses (WLB), men led businesses (MLB), or unknown gender. A deal was defined as involving a WLB if the CEO at the time of deal was a female or, if information about

¹ Given the high level of angel activity occurring in the United States, the search conducted for the United States was refined to deals occurring only January of 2019 rather than the entire year of 2019. This was done to provide a more manageable sample size.

the CEO at the time of the deal was lacking, the founder or at least one cofounder was a female.

A deal was defined as including a MLB if the CEO at the time of deal was a male or, if information about the CEO at the time of the deal was lacking, the founder or at least one cofounder was a male. A deal was defined as unknown gender if the gender of the CEO at the time of the deal or founder(s) was unknown. Deals with unknown gender were excluded from the analysis.

Data Analysis: Measuring the Funding Gap

To identify the presence of a funding gap, I evaluated factors identified in research questions 1a-1d: the frequency at which angel investors invested in WLB compared to MLB, the percentage of total invested angel capital that WLB receive, the average deal size for WLB compared to MLB, and the representation of WLB in each nation's top deals by deal size. In measuring these factors, two main variables were used: deal count and deal size.

To measure the frequency at which angel investors invested in WLB compared to MLB, I divided deal count for WLB by the total national deal count. I then did the same for MLB. To measure the percentage of total angel capital invested in WLB compared to MLB, I first summed the deal sizes of both WLB deals and MLB deals. I then divided each sum by the total amount of angel capital invested nationally. To measure average deal size for WLB compared to that of MLB, I first summed all deal sizes for both WLB deals and MLB deals. I then divided each sum by the respective total number of deals by gender, excluding deals with unknown deal sizes. To measure each gender's presence in top national angel deals, I sorted each country's deals by deal size and identified the top ten largest deals for each country of focus. The percentage of total top deal funding received by WLB is a measurement of the total amount of top ten deal capital

invested in WLB divided by the sum of the deal sizes of the top 10 deals. The same was done for MLB.

Data Analysis: Comparing the Funding Gap to Entrepreneurial Activity

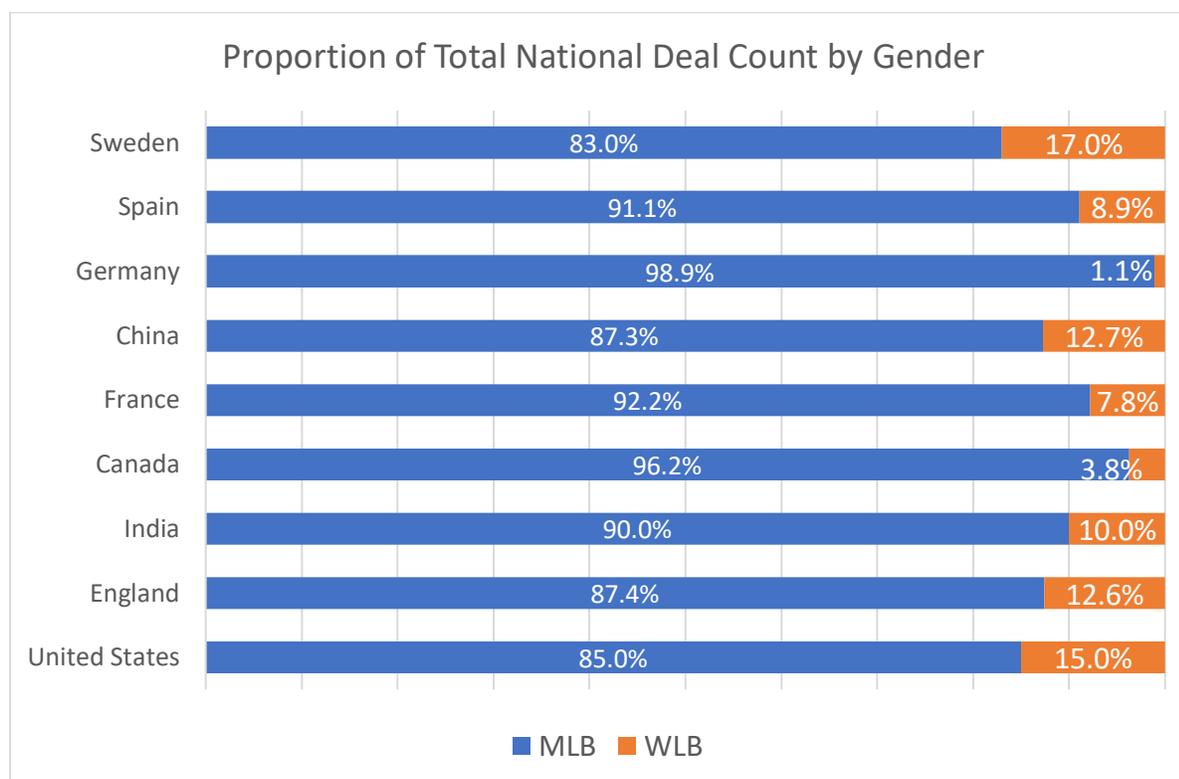
To address research question two, in addition to data aggregated from PitchBook, I also utilized data from the 2018 Global Entrepreneurship Monitor (GEM) Adult Population Survey. This survey provided an overview of entrepreneurial activity on a global scale. For this research, I specifically used GEM's Total early-stage Entrepreneurial Activity (TEA) Rate—which shows the percentage of a nation's 18-64 population who are either a nascent entrepreneur or an owner/manager of a new business—to measure entrepreneurial activity in each country of focus. GEM's Female/Male TEA ratio—which is a ratio of female TEA to male TEA—was used to measure entrepreneurial activity of females compared to males. A Female/Male TEA ratio below one would signify that there is a gender-based entrepreneurship gap favoring males, meaning that entrepreneurial activity was higher in a nation's male population than its female population.

I used the percentages gathered in the data analysis for research question one to create a Female/Male deal frequency ratio, which is the ratio of the percent of total deal count seen by WLB to that seen by MLB. I also created a Female/Male proportion of total capital ratio, which is the ratio of the percent of total angel capital invested in WLB to the that invested in MLB. I then compared these two ratios to the Female/Male TEA ratio to evaluate if the gender funding gap was proportional to the gender-based entrepreneurship gap.

Results

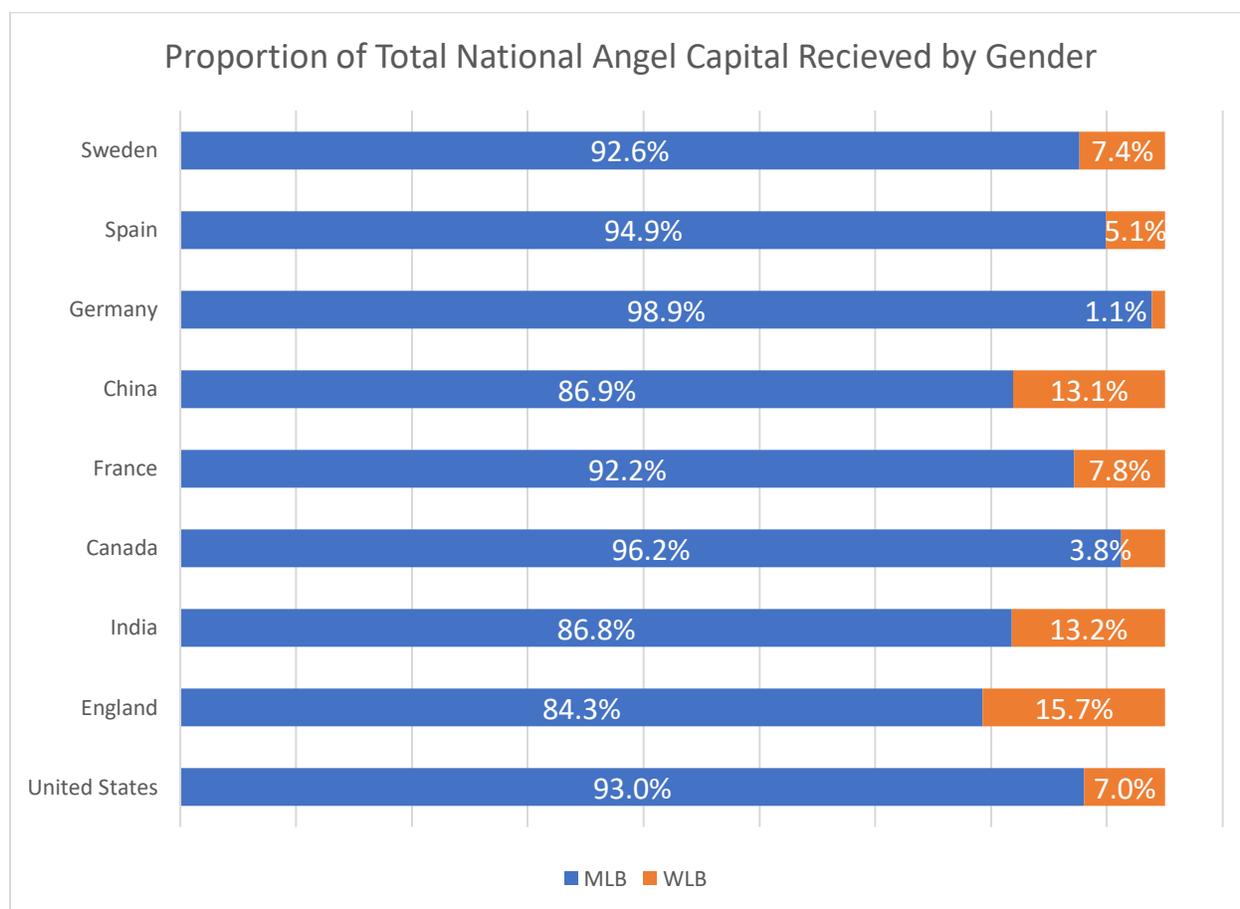
1. Identifying and measuring a gender-based funding gap across countries:

1a. Frequency at which angel investors invest in women led businesses compared to men led businesses:



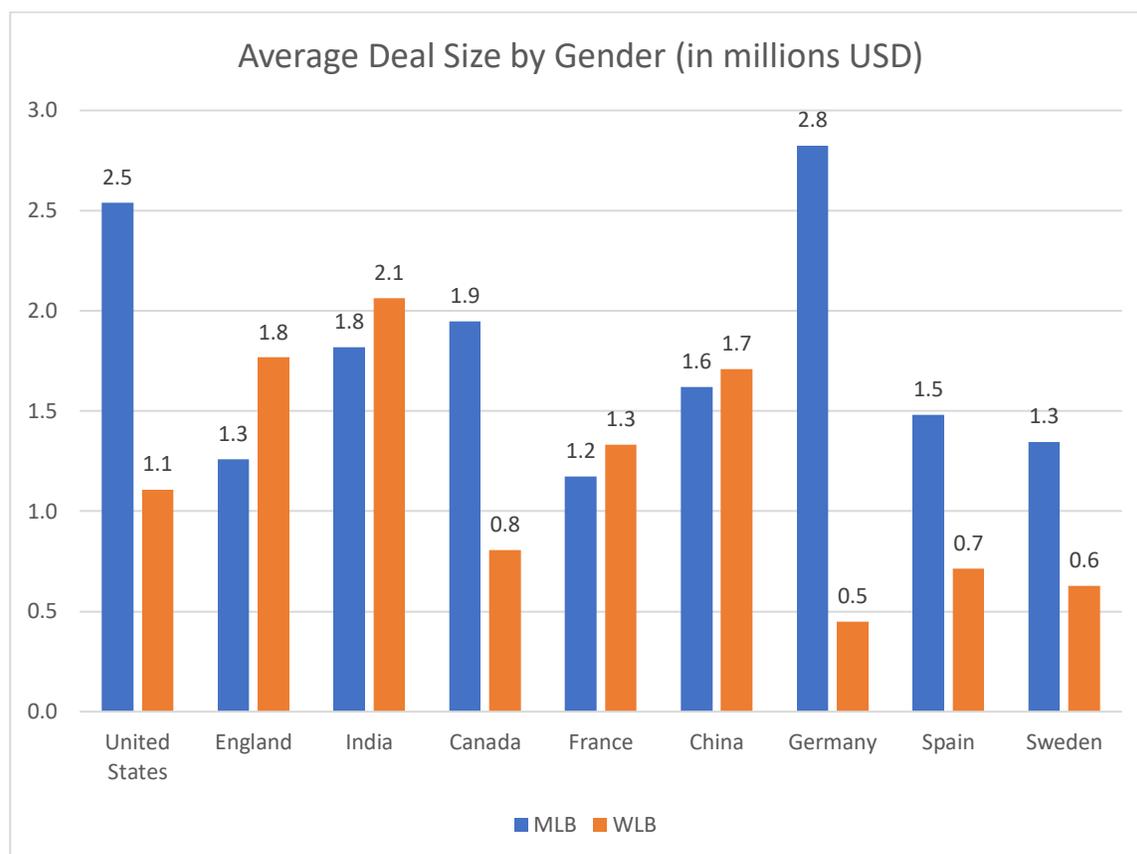
In the case of each of the nine focus countries, angel investors invested more frequently in MLB than in WLB. In no one country did WLB see more than 17 percent of total national deal count and no less than 1.1 percent. Germany and Canada saw the fewest amount of WLB deals at 1.1 percent and 3.8 percent, respectively, while Sweden and the United States saw the most at 17 percent and 15 percent, respectively. The data shows that deal count allocation is skewed in favor of MLB.

Ib. Percentage of total angel capital invested in women led businesses compared to men led businesses:



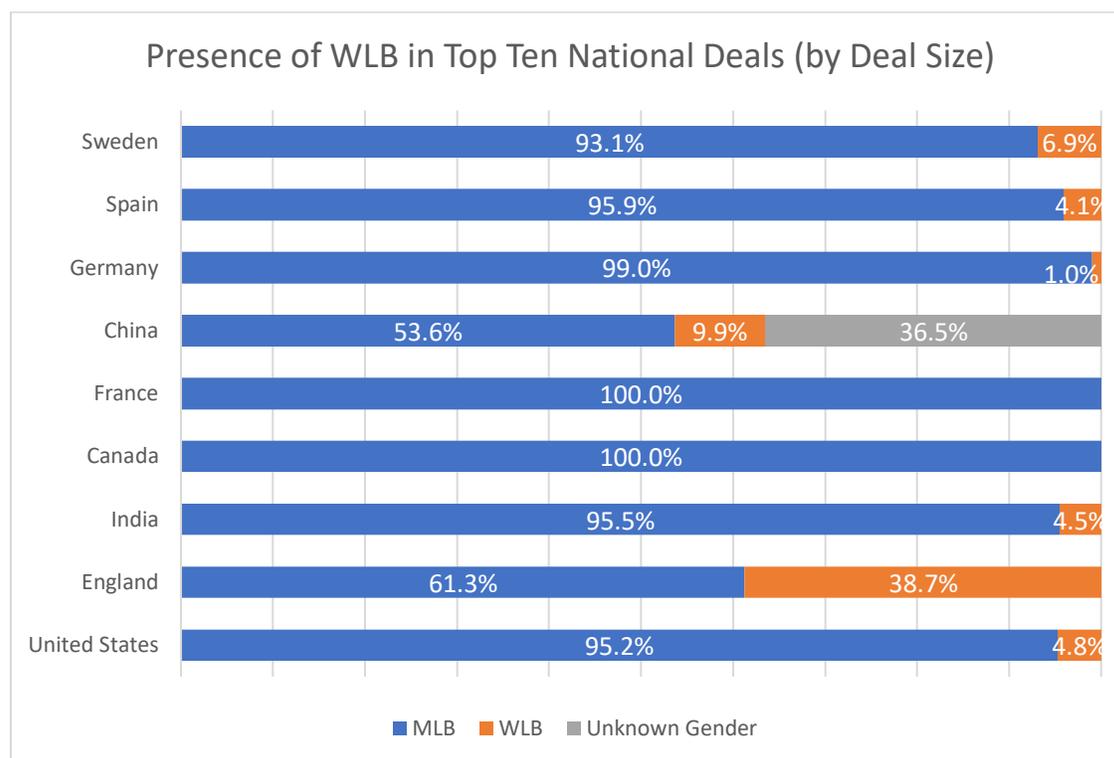
Similar to the results found measuring the frequency of angel investments by gender, in the case of each of the nine focus countries, MLB received a significantly larger proportion of total national invested angel capital than WLB. In not one country did WLB receive more than 15.7 percent of total national invested capital count and no less than 1.1 percent. Germany and Canada saw the smallest proportion of invested angel capital go to WLB at 1.1 percent and 3.8 percent, respectively, while England and China saw the largest at 15.7 percent and 13.1 percent, respectively.

1c. Average Deal Size by Gender



Unlike the results for questions 1a and 1b, the results for average deal size received by gender is not consistent across all nine countries. Only in five of the nine countries did MLB receive an average deal size larger than WLB. However, in these five cases, the difference between average deal size by gender was statistically significant, with MLB receiving between US\$0.7 million and US\$2.3 million more than WLB. In the four cases where WLB received a larger average deal size than MLB, the difference between average deal size between gender was significantly smaller: between US\$0.1 million and US\$0.5 million.

1d. Gender representation in national top deals:



The top ten deals by deal size were identified for each of the nine countries of focus.

WLB were underrepresented in each nation's top deals compared to MLB. In each country, a majority of the total top deal capital invested went to MLB, with 100 percent of top deal capital going to MLB in France and Canada. With the exception of England and China², 93.1 percent of top angel deal capital went to MLB.

² Due to data limitations, the gender associated with 3 of the top 10 deals in China could not be identified. In turn, an accurate measurement of WLB representation to China's top angel deals could not be made.

2. *The funding gap compared to entrepreneurial activity by gender:*

Gender-Based Funding Gap Ratio Comparison					
	GEM female/male TEA ratio	WLB/MLB frequency of investment ratio	Difference	WLB/MLB % of total capital ratio	Difference
United states	0.77	0.18	0.59	0.08	0.69
England	0.49	0.14	0.35	0.19	0.30
India	0.62	0.11	0.51	0.15	0.47
Canada	0.83	0.04	0.79	0.04	0.79
France	0.75	0.09	0.66	0.09	0.66
China	0.82	0.15	0.67	0.15	0.67
Germany	0.5	0.01	0.49	0.01	0.49
Spain	0.89	0.10	0.79	0.05	0.84
Sweden	0.42	0.20	0.22	0.08	0.34

Note that for each of the three ratios (GEM female/male TEA ratio, WLB/MLB frequency of investment ratio, and WLB/MLB percent of total capital ratio), a ratio of one would imply equal distribution of entrepreneurial activity, frequency of investment, or percentage of total capital between genders. A ratio below one would imply a skewed distribution in favor of males/MLB, while a ratio above one would imply a skewed distribution in favor of females/WLB. As seen in the table above, the GEM female/male TEA ratio is below one in each of the nine countries, indicating that there is a gender-based entrepreneurial gap favoring males. In other words, the male population in each of the nine countries is more entrepreneurially active than the female population. However, in each country, both the WLB/MLB frequency of investment ratio and the WLB/MLB percent of total capital ratio are significantly lower than their corresponding GEM female/male TEA ratio. Each country's WLB/MLB frequency of investment ratio is between 0.22 and 0.79 lower than its GEM female/male TEA ratio. Each country's WLB/MLB percent of total capital ratio is between 0.30 and 0.79 lower than its GEM female/male TEA ratio. There is a significant statistical difference between each country's

measured entrepreneurial activity among each gender and its measured gender-based angel investment activity. This indicates that in each national angel market, the gender-based funding gap is not proportional to the entrepreneurial activity between genders. This is an important distinction to make, as it implies that existence of a male/MLB-favoring funding gap is not necessarily caused by the lack of female entrepreneurial activity.

Conclusions & Discussion

Both the frequency at which angel investors invest in WLB and the proportion of total angel capital WLB receive provide evidence that there is an apparent gender-based funding gap within the global angel investment market. This is shown by the low frequency of angel investments in WLB compared to MLB and the low percentage of total angel capital invested in WLB compared to MLB, which exist in all nine focus countries. WLB presence in national top ten deals also provides evidence supporting the presence of a gender-based angel funding gap, as the majority of total “top ten” funding was given to MLB across all nine countries. In seven of the nine countries, over 93 percent of top angel deal capital went to MLB. However, there is not consistent evidence across countries of a gender-based funding gap when the funding gap is measured by average deal size, as WLB received a larger average deal size than MLB in four of the nine focus countries. However, in the five cases where MLB received a larger average deal size than WLB, there was a significantly greater statistical difference between the average deal by gender than in the four cases in which WLB received a larger average deal size than WLB. In other words, when average deal size was skewed in favor of MLB, the difference between MLB’s average deal size and WLB’s average deal size was significant; however, when average

deal size was skewed in favor of WLB, the difference between MLB's average deal size and WLB's average deal size was marginal at best.

Of the nine countries, Canada and Germany had the most severe gender-based funding gap based on measurements of frequency and total capital proportion, with German WLB seeing the smallest proportion of both total deal count and total national invested angel capital and Canadian WLB seeing the second smallest. Germany also had the greatest gap in average deal size between MLB and WLB, with German MLB receiving an average of US\$2.3 million more per deal than German WLB. Canada's average deal size by gender also favored MLB over WLB. WLB also saw little to no representation in both country's top ten deals, with 100 percent of Canada's top deal capital invested in MLB and 99 percent of Germany's top deal capital invested in MLB.

It is important to compare this statistical gender-based funding gap to national entrepreneurial activity of each gender, as it provides insight into whether such funding gap is unique to the angel investment sector—and in turn possibly indicative of either supply-side bias or demand-side capital seeking behavior—or if it is consistent with a corresponding gender-based entrepreneurship gap. This research provides evidence that the gender-based funding gap identified in each of the nine national angel markets is in fact not consistent with entrepreneurial activity in each country. Although there was a slight entrepreneurship gap—meaning that in each country the male population showed more entrepreneurial activity than the female population—it is not proportional to the size of the gender-based funding gap.

This provides evidence that the gender-based funding gap is not reflective of entrepreneurial activity. Therefore, it could be argued that the gender-based funding gap identified in each of the nine national angel markets is not justified or excused by the difference

in entrepreneurship activity levels among each country's male and female populations. In other words, the unequal angel investment activity among genders is not a result of a lack of active female entrepreneurs. It could be easy to assume that a gender-based funding gap is a natural result of a less entrepreneurially active female population. However, the fact that a significant gender-based funding gap exists in each national angel market, despite there being a comparable level of entrepreneurial activity between female and male populations, implies that there are other factors at play causing such gap. Although this research provides evidence of a gender-based funding gap, more research needs to be conducted to pinpoint the cause of such gap. Identifying this cause is crucial to addressing such gap through policy change and other industry initiatives.

All in all, this research expands on existing research conducted on the gender dynamics of the United States' private equity sector, providing evidence that a gender-based funding gap is not unique to the United States' venture capital sector. It also offers further insight into the gender dynamics of the greater global private equity sector, as it provides evidence supporting the presence of a gender-based funding gap in the angel investing markets of the nine countries evaluated: the United States, England, India, Canada, France, China, Germany, Spain, and Sweden. Such evidence supports the notion that angel investment activity—both in the United States and abroad—is statistically skewed and in favor of MLB. This implies that female entrepreneurs may have less access to angel investment capital, which in turn could limit the growth potential of their ventures.

This also poses a question to the role such funding gap plays in gender equality throughout the private sector; such limitations placed on female entrepreneurs by the gender-based funding gap could play a role in how many WLBs see a successful and lucrative exit, in

turn effecting the wealth and earning potential of female entrepreneurs as a whole. As a result, it could also indirectly play a role in the population of women who are eligible to be angel investors—which is often determined by wealth—in turn effecting the gender dynamics of the global angel investment population.

As discussed above, further research addressing the gender-based funding gap in international angel investment markets should focus on exploring and identifying the cause of such funding gap, for pinpointing its cause is the first step in addressing and closing the gap. For example, future research could aim to decipher whether the cause of the gender-based funding gap identified in various national markets is due to demand-side or supply-side factors; is the gap caused by behaviors of female entrepreneurs or by the nature of angel investors? Existing literature addresses this concept in the context of the United States' private equity market, but a broader, global lens should be used to evaluate the root cause of the funding gap in order to better understand the dynamics of the global angel investing sector. Doing so will not only improve the understanding of the funding gap, but it will help policy makers and industry professionals contrive more targeted—and potentially more effective—solutions in closing the gender-based funding gap in the international angel market.

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Appendices

Appendix A: Summary of Data by Country

United States			
	Company Count	Deal Count	Capital Invested
Male	215	215	472.45
Female	38	38	35.47
Unknown Gender	5	5	2.08
Total	258	258	510
England			
	Company Count	Deal Count	Capital Invested
Male	256	278	312.23
Female	37	40	58.32
Unknown Gender	38	38	26.03
Total	331	356	396.58
India			
	Company Count	Deal Count	Capital Invested
Male	104	108	121.84
Female	12	12	18.56
Unknown Gender	1	1	0.05
Total	117	121	140.45
Canada			
	Company Count	Deal Count	Capital Invested
Male	104	119	206.56
Female	12	12	8.07
Unknown Gender	0	0	0
Total	116	131	214.63
France			
	Company Count	Deal Count	Capital Invested
Male	47	47	-
Female	4	4	-
Unknown Gender	0	0	-
Total	51	51	-

China			
	Company Count	Deal Count	Capital Invested
Male	48	48	45.39
Female	7	7	6.84
Unknown Gender	5	5	20.1
Total	60	60	72.33
Germany			
	Company Count	Deal Count	Capital Invested
Male	29	30	39.55
Female	5	5	0.45
Unknown Gender	0	0	0
Total	34	35	40
Spain			
	Company Count	Deal Count	Capital Invested
Male	51	51	66.66
Female	5	5	3.57
Unknown Gender	1	1	0.18
Total	57	57	70.41
Sweden			
	Company Count	Deal Count	Capital Invested
Male	43	44	47.14
Female	9	9	3.76
Unknown Gender	0	0	0
Total	52	53	50.9