Angels or Sharks?
The Role of Personal Characteristics in Angel Investment Decisions*

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Current draft: September, 2017

Abstract
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* For comments that improved this manuscript, we thank Christophe Bonnet, Dan Bradley, Steven Levitt, Raghavendra Rau, Jared Smith, Shawn Thomas, Hao Zhao, and participants at the 2015 Annual Meeting of the Academy of Behavioral Finance & Economics (Philadelphia), 2016 Conference Finance and Investment in Creative Ventures (Maastricht), 2016 Eastern Finance Association Annual Meeting (Baltimore), 2017 Emerging Trends in Entrepreneurial Finance Conference (Hoboken, NJ), 2017 Financial Management Association European Conference (Lisbon), 2017 Global Finance Conference (Hempstead, NY), and the University of Pittsburgh. We also thank Luisa Alemany, Shawn Cassidy, James Dennison, Lora Dimitrova, Kevin Fielden, Kevin Haffey, Richard Herko, Sergey Litvinenko, Thomas Muller, Glenn Myers, Connor Norton, and Allison Yoh for excellent research assistance.

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Abstract

We use actual negotiations between angel investors and entrepreneurs to study the impact of personal characteristics on investment outcomes. We construct a unique dataset with 707 investment requests led by 1,089 entrepreneurs and find that the personal characteristics of the entrepreneur, including gender, race, and age, are correlated with requested valuations, the likelihood that an offer is received, and the implied valuation when an angel investor extends an offer. Shared personal characteristics between entrepreneurs and investors also affect the likelihood that an investor makes an offer, the entrepreneur accepts an offer, and the implied valuation when an offer is extended.

JEL classifications: G24, J14, J15, J16, L26, M13

Keywords: Angel Investor, Entrepreneurial Finance, Venture Capital
1. **Introduction**

Angel investors fill a funding gap between friends-and-family money and venture capital, and have a positive influence on both the performance and survival of startups (Cassar 2004). Due to the rapid growth of the angel investment market, venture capital often comes after an angel investment (Freear and Wetzel 1992; Carter et al. 2003) and, for many startups, is no longer the most critical source of private equity financing (Brush et al. 2002; Sohl 2003; Bygrave and Reynolds 1999). A recent study by the Center for Venture Research at the University of New Hampshire reports total angel investments of $24.6 billion in 2015, which represents an increase of 22.4 percent since 2010. During the same period, the total number of angel investors grew by 13.1 percent to over 300,000 investors. Additionally, angel investment contributed to the creation of 270,000 new jobs in the U.S. in 2015, or 3.8 jobs per investment.

We study the impact of personal characteristics on the negotiations between entrepreneurs and angel investors to better understand the factors that affect access to this important source of early-stage capital. Prior research finds that angel investors tend to base their investment decisions on observable factors thought to be correlated with venture success such as the entrepreneurs’ expertise, the market potential for the product or service, and the presence of existing or pending patents (Mason and Harrison 1996a; Greenberg 2013). However, other factors, including the perceived passion of the entrepreneur also appear to influence angel investors’ decisions (Hsu et al. 2014). Presumably, angel investors also exhibit preferences for entrepreneurs with certain personal characteristics (for example, race, gender, age). Such preferences may result from the limited information angel investors possess about entrepreneurs seeking an investment (Phelps 1972; Schwab 1986).

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3 See *The Angel Investor Market in 2015: A Buyers Market* at UNH’s Center for Venture Research.
We overcome the data limitations that make it difficult to study angel investment by codifying the first eight seasons of the reality television show Shark Tank. We augment the information gathered from Shark Tank with additional venture, entrepreneur, and investor details available from public sources (e.g., LinkedIn). The 1,089 entrepreneurs who pitch 707 ventures provide an interesting laboratory to study the factors that influence angel investment. Our evidence allows us to confirm and extend prior research that often relies on survey data, which can suffer from response bias (Hauser 1969) and may not reflect respondents’ true beliefs when certain views are met with general disapproval (Levitt 2004). In addition, the structure of Shark Tank provides a sense of the entire negotiation between entrepreneurs and investors from the initial approach to deal consummation or failure, which allows us to connect investor and entrepreneur characteristics to negotiation and deal outcomes.

We find that requested valuations are correlated with both firm and entrepreneur characteristics. For example, entrepreneurs who are female, black, and younger than age 25 tend to request lower valuations from angel investors, while Asian entrepreneurs and entrepreneurs from top universities request higher valuations. When we consider the factors that influence investment decisions, we find that angel investors are more likely to make an offer to younger ventures, firms with higher profit margins, and businesses with patents held or pending. Personal characteristics of the entrepreneur are also correlated with the likelihood that an offer is made. For example, older entrepreneurs are less likely to receive an offer from an angel investor. There is also some evidence that black entrepreneurs are less likely to receive an offer. Conditional on receiving an offer, valuations are primarily influenced by the dynamics of the negotiations. Namely, valuations are higher when multiple angel investors compete to make an investment. However, we also find evidence that black and Latino entrepreneurs receive lower valuations than
entrepreneurs of other races. Interestingly, gender is not significantly correlated with the likelihood of receiving an offer or implied valuations. This is consistent with Becker-Blease and Sohl (2007), who find that despite a lower propensity to seek an angel investment, women are equally likely to receive an investment.

We also find evidence that homophily, which refers to the tendency to favor others with common characteristics (for example, shared race or gender), is associated with the likelihood that an angel investor extends an offer, the entrepreneur accepts an offer, and the valuation implied when an offer is made. For example, female (black) investors are more likely to extend an offer to female (black) entrepreneurs. Entrepreneurs are more likely to accept an offer when both the investor and the entrepreneur are female or black. Additionally, shared characteristics tend to be correlated with valuations, as we find some evidence that black investors offer lower valuations to black entrepreneurs and that larger differences in education levels between entrepreneurs and investors are associated with lower offers. One potential explanation for the valuation results is that shared characteristics increase the angel investor’s desire to mentor the entrepreneur, but that the demands of mentorship come at the cost of lower valuations.

We contribute to the entrepreneurship literature by reporting that personal characteristics influence a wide range of interactions between angel investors and entrepreneurs, beginning with the investment request and culminating in deal completion. Namely, we find that personal characteristics of entrepreneurs are associated with requested valuations, the likelihood that an entrepreneur receives an offer, and the implied valuation when an offer is extended. Additional evidence suggests that shared characteristics influence the likelihood that an angel investor extends an offer, the entrepreneur accepts an offer, and the valuation implied by offers that are made. It is noteworthy that these results are both statistically and economically significant in our data, given
the public nature of the negotiations that take place on Shark Tank. To the extent that Shark Tank investors are conscious of perceptions or bounded by rules set by the show’s producers, one might expect the impact of personal characteristics to be even more acute in private negotiations between angel investors and entrepreneurs.

Researchers have used data from television shows to investigate the behavior of individuals for decades. Maxwell et al. (2011) suggest that reality shows and game shows approximate real world decision making, in part, because they place participants in situations with economic incentives and real-life consequences. This is also true of Shark Tank, where angel investors decide whether to invest their personal capital in genuine investment opportunities pitched by entrepreneurs. Despite our comprehensive data collection efforts, there are some important caveats. First, both entrepreneurs and angel investors on the show are highly selected, and the public does not know the selection process. They may or may not accurately represent the universe of entrepreneurs and angel investors. For example, entrepreneurs on the show tend to have excellent presentation skills and novel ideas and the angel investors are very accomplished in their respective fields. We address this selection bias using two approaches in our analysis: bootstrapping and a two-stage approach designed to capture the effects of omitted and imperfectly measured variables in our base models. We find that our results are robust to these econometric techniques.

Second, we observe an edited version of the interactions between the entrepreneurs and investors. While this editing is necessary for a prime time television program, it may result in partial information for some of the negotiations. However, we expect that key moments that are

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4 Examples of prior studies that use data from reality television and game shows include Gertner (1993), Metrick (1995), Levitt (2004), de Roos and Sarafidis (2010), Post et al. (2008), Maxwell et al. (2011), and Hartley et al. (2014).
crucial to the outcome are included in the negotiations that we observe. Because the presentations and negotiations are genuine and broadcast sequentially, we believe that the data collected provide a good foundation for the study of the impact of personal characteristics on the outcomes of negotiations between angel investors and entrepreneurs.

Third, we observe and analyze investors’ decisions based on the information revealed by entrepreneurs during the televised negotiations. Some product and entrepreneur attributes are not observable or systematically measurable across seasons (for example, product market potential and entrepreneur quality). Other potentially material variables, including sales growth rates, forecasted future sales, and entrepreneurs’ prior work experience, are not available for the vast majority of the negotiations. We improve our coverage by gathering additional information on the ventures, entrepreneurs, and investors from public data sources. Additionally, it is possible that many of the televised deals never come to fruition.5 Because investors do not receive information on the ventures prior to taping, due diligence is performed afterwards, which can cause a deal to be broken by the angel investors or entrepreneurs for a variety of reasons including legal, tax, or financial concerns.6

The remainder of this paper is structured as follows. First, we develop testable hypotheses motivated by the literature on early-stage investors’ decision making criteria. We then provide

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5 Karen Aho. Do two-thirds of Shark Tank deals fall apart? Bloomberg, July 15, 2014. We collect follow-up data from episodes of both Shark Tank and the spin-off series Beyond the Tank. We note that follow-ups that are covered during these episodes report primarily successful ventures. For this reason, the percentage of verified deals is likely to be understated.

6 For robustness, we repeat our analyses using only deals verified using episode follow-up data (unreported) and, while this verified sample size is much smaller, we find qualitatively similar results.
details on Shark Tank and discuss its codification for the construction of our data set. After discussing the data, we report the results of our analyses that study the impact of personal characteristics on the outcome of negotiations between angel investors and entrepreneurs. We conclude with a discussion of the implications of our results and avenues for additional research.

2. Angel Investor Decision Making Criteria

Despite the economic importance of angel investment, academic research on the topic is limited. While the abundant venture capital literature can provide insight into the factors that influence early-stage equity investments, angel investors are distinct from venture capital investors in several important ways. As Benjamin and Margulis (2000) note, angel investors invest their own capital, while the bulk of venture capital investment comes from pooled investor funds. Fiet (1995), Harrison and Mason (2000), and Mason and Stark (2004) highlight the differing investment objectives of angels and venture capitalists. Van Osnabrugge and Robinson (2000) find that, compared to venture capital investors, angel investors tend to have more operating experience and often expect greater involvement in the day-to-day operations of the companies in which they invest. Therefore, it is possible that some of the factors that influence angel investment are distinct from those that determine venture capital investment. Consistent with this notion, Hsu et al. (2014) find that angel investors tend to value strategic readiness for funding and passion more, and economic potential less, than their venture capital counterparts.

2.1. Venture Characteristics

If angel investors base their decisions primarily on observable venture characteristics, they should favor ventures with superior financial performance and entrepreneurs who possess the skills and network relationships necessary to be successful. Consistent with this notion, Mason and
Harrison (1996a) find that market potential is a key consideration and Greenberg (2013) finds that intellectual property protection helps a startup attract angel funding. Common deal killers include flawed or incomplete marketing strategies and unrealistic financial projections (Mason and Harrison 1996b), which underscores the fact that market and execution risks are first order concerns for angel investors (Carpentier and Suret 2015).

Prior research finds that the quality of the entrepreneur/founding team is also central for success (Landström 2007). Angel investors may prefer larger teams with a more diverse skill set. However, Collewaert (2012) notes that larger teams also introduce higher coordination costs and contrasting incentives. Concentrated human capital can foster innovation but may also introduce key human capital risk that is particularly detrimental to young, small, and high growth firms (Israelsen and Yonker 2017).

2.2. Personal Characteristics

Prior research not only demonstrates the importance of firm characteristics to investor decision making, but also shows that decisions are influenced by personal characteristics of the parties involved (for example, gender, race, age, or education). Presumably, this is also true for angel investors, who might exhibit preferences for, or against, entrepreneurs with certain personal characteristics. Such preferences might surface if, for example, angel investors use personal characteristics to make investment decisions when faced with limited information on entrepreneurs and their ventures (Phelps 1972; Schwab 1986).

Previous evidence on the impact of gender on external financing access is mixed. Cavalluzzo et al. (2002) and Muravyev et al. (2009) both find that bank loan approval rates are lower for firms managed by females. In contrast, Cavalluzzo and Cavalluzzo (1998), Blanchflower et al. (2003), Storey (2004), and Cavalluzzo and Wolken (2005) find no statistical differences between male-
and female-managed firms. Existing evidence on the relation between gender and startup firm financing indicates that female entrepreneurs are less likely to receive debt financing (Buttner and Rosen 1988; Fay and Williams 1993; Coleman 2000) and venture capital funding (Greene et al. 2001; Brush et al. 2002) than their male counterparts. The findings in Brooks et al. (2014) suggest that the funding gap may be due to the fact that female entrepreneurs’ investment pitches are viewed as less persuasive that those of male entrepreneurs. Other possible explanations for gender differences include the fact that women often have more non-business-related responsibilities and lack the deep social networks that help to support business growth compared to their male counterparts (Boden and Nucci 2000; Greene et al. 2001). Additionally, female-owned businesses are less likely to succeed if they experience discrimination from customers (Bates 2002) or suppliers (Weiler and Bernasek 2001). Gender preferences might not result in lower investment rates if female entrepreneurs respond to their potentially weak bargaining position by giving up a greater portion of their business or accepting funding at a lower valuation than male entrepreneurs. Because entrepreneur gender is thought to influence capital-raising outcomes, we predict the following:

**H1**: Female entrepreneurs request lower valuations, are less likely to receive angel funding and, conditional on funding, receive lower implied valuations.

Prior research finds that banks discriminate against minority entrepreneurs in terms of access to credit and loan approval rates (Bostic and Lampani 1999; Blanchflower et al. 2003; Blanchard et al. 2008). Minority groups are also less likely to obtain access to outside credit and, when they do, tend to pay a higher cost of capital than otherwise comparable small businesses. Huang et al. (2013) attribute lower funding rates to negative perceptions of the political skill of non-native speakers, which could be magnified for minority entrepreneurs. On the other hand, certain minority
groups might experience a positive effect if, for example, angel investors perceive that entrepreneurs from that group have a superior work ethic to that of other groups (Asakaw and Csikszentmihalyi 2014; Hsin and Xie 2014). This leads to our second hypothesis, which considers the impact of race on angel investment outcomes:

\[ H2: \text{Minority entrepreneurs request lower valuations, are less likely to receive angel funding and, conditional on funding, receive lower implied valuations.} \]

Garstka et al. (2005) find that both younger and older workers believe that they are discriminated against relative to other age groups. Levitt (2004) finds systematic, taste-based discrimination against older contestants on the reality television show Weakest Link. Presumably, age-based decision making is driven by a belief that younger or older workers are less adaptable or productive than other age groups. However, Welford (1988) fails to find evidence that older workers are less capable of learning new skills and Guest and Shacklock (2005) note both benefits and costs of an age-diverse workforce. Although research on older entrepreneurs is limited, Singh and DeNoble (2003) and Weber and Schaper (2004) suggest that financial and social capital favor older entrepreneurs when starting a business. Additionally, Baron and Ensley (2006) find that, compared to first-time entrepreneurs, experienced entrepreneurs provide richer “business opportunity” prototypes that focus more closely on items related to actually starting and running a new business. Age also has different implications for ability, motivation, and experience. Our third hypothesis posits that angel investors favor entrepreneurs with more experience:

\[ H3: \text{Older entrepreneurs request higher valuations, are more likely to receive angel funding and, conditional on funding, receive higher implied valuations.} \]

However, if angel investors place a high value on their role as mentors, they may instead favor ventures with younger entrepreneurs.
Education, including the level, prestige of the granting institution, and field of study, may serve as a signal of entrepreneur quality to potential investors. Prior research on the effects of business education on entrepreneurship outcomes is mixed. Von Graevenitz et al. (2010) find positive effects of entrepreneurship education while Lerner and Malmendier (2013) find that MBA colleagues with venture experience share stories of failure that leads to less entrepreneurship in peers. More recently, Cai et al. (2016) report that one-quarter of venture-backed startups are founded by a business school graduate and that exit outcomes are better for startups with executives with an MBA degree. We assume that education is a positive signal of entrepreneur quality to predict the following:

\[ \text{H4: Entrepreneurs with more formal education request higher valuations, are more likely to receive angel funding and, conditional on funding, receive higher implied valuations.} \]

2.3. Homophily

Homophily, which refers to the preference to associate with others who are similar to oneself, is also thought to influence investment decisions. Murnieks et al. (2011) find that venture capital investors prefer entrepreneurs with similar decision-making processes, sometimes at the expense of other investment attributes. Becker-Blease and Sohl (2007) find that angel investors are slightly more willing to invest in entrepreneurs of the same gender. Race-based homophily is also possible among angel investors as prior research finds that African-American homophily is persistent in business school social networks (Mollica et al. 2003) and that race-based homophily is positively correlated with performance (Hedge and Tumlinson 2014). Franke et al. (2006) find that venture capital investors favor entrepreneurs with similar training and experience, which suggests that commonalities in age and education level may affect investment outcomes. Additionally,
Collewaert et al. (2016) find that angel investors’ education levels are positively correlated with negotiated valuations.

We consider whether the outcomes of negotiations between angel investors and entrepreneurs provide evidence of homophily. Anecdotally, we observe angel investors on Shark Tank saying things like “you remind me of myself” to entrepreneurs. However, identifying homophily in our sample is challenging due to the limited population of angel investors. Of the investors who have appeared in more than ten episodes, only one is black and none are Latino or Asian. In addition, there are only two female investors. For these reasons, we limit our examination of homophily to gender, race, age, shared geography, and education level. Prior evidence on homophily leads us to predict the following:

\[ H5: \text{Shared personal characteristics increase the likelihood that an entrepreneur receives an offer, accepts an offer, and, conditional on receiving an offer, the implied valuation.} \]

3. Data Collection and Summary Statistics

Dal Cin et al. (1993) and Riding et al. (1995) provide a five-stage structure to frame an angel’s investment decisions. The five stages are: (1) deal origination and first impressions; (2) review of business plan; (3) screening and due diligence; (4) negotiation; and (5) consummation and deal structuring. The interactions between entrepreneurs and angel investors that take place on Shark Tank conform to this structure remarkably well. In Stage 1, entrepreneurs pitch their business to the angel investors by demonstrating their product or service. At the beginning of each pitch, entrepreneurs state their desired investment amount and the equity percentage of their company they are willing to surrender in exchange. Stage 2 follows and involves interaction between the entrepreneur and potential investors. In a shortened, sound-bite-filled version of Stage 2, we
observe discussions that typically include details on past sales, cost and price per unit, age of the
venture, and intended use of proceeds. Investors ask questions to obtain additional information and
identify the strengths and weaknesses of the entrepreneurs’ concept, product, and business model.
Typically, the angel investors do not meet the presenting entrepreneurs before the sales pitch.\(^7\)
Thus, in Stage 3 angel investors screen based on limited information provided by the entrepreneur
regarding past performance, market potential, and the angel investor’s own experience in related
firms and industries. Consistent with Maxwell et al. (2011), potential investors often withdraw at
this point due to perceived flaws with the business model or entrepreneurs. If one or more investors
is interested, negotiations commence (Stage 4). Each investor expresses their investment intention
by indicating whether they are “in” or “out.” Interested investors bid independently or in teams in
an attempt to partner with the entrepreneur.\(^8\) We observe the bidding process, competition among
angel investors, offers and counteroffers, proposed deal structure, and implied valuation. If all
investors opt out, the entrepreneur leaves empty-handed.

As of May 2017, Shark Tank has aired 8 seasons and 175 episodes. We watched each episode
to collect investment amount, equity percentage, bidding process details, and company past
performance. For information not provided during the broadcast, we supplement our data
collection using entrepreneur LinkedIn profiles and venture websites. The codification of an
example pitch, question and answer session, and negotiation is detailed in Appendix A. Our data
include 1,089 entrepreneurs seeking funding for 707 ventures. The average investment requested
by the entrepreneurs across seasons varies from $185,000 to $325,000. Just over 50 percent of the
companies strike a deal with an investor. This success rate is higher than in the larger angel

\(^7\) Jason Cochran. *8 things you didn’t know about ‘Shark Tank’*. Blog, April 3, 2013.

\(^8\) Joint bids occur frequently. The average number of angel investors participating in a deal on the show is 1.39.
investment universe, presumably because the production team pre-screens companies that appear on the show. The higher investment rate may also be due to the angel investors’ captured benefits from the publicity boost the business receives when the show airs. Nearly 13 percent of ventures turn down bids from investors due to insufficient valuation or other restrictive deal conditions.

Our hypotheses predict that the personal characteristics of entrepreneurs will affect the outcome of negotiations with angel investors. In Table 1, Panel A, we describe our sample of entrepreneurs. We report that 723 of the 1,089 entrepreneurs are male. We classify entrepreneurs into four race categories: white, black, Asian, and Latino. Based on these classifications, entrepreneurs in our sample are predominantly white (84 percent). Because manual classifications may introduce subjectivity bias, we confirm the robustness of our results using the Bayesian Improved Surname Geocoding (BISG) proxy method. BISG (Elliot et al. 2009) estimates race by combining U.S. Census Bureau data with an individual’s surname and venture location. While the algorithm is limited in its ability to identify uncommon surnames and individuals within certain locations, it identifies 67.6 percent of the entrepreneurs in our sample. Compared to our manual classification, BISG classifies fewer entrepreneurs as white and more entrepreneurs as Latino.

[Insert Table 1 here]

When not stated specifically during the show, we estimate entrepreneur age using information reported on LinkedIn and other public sources by adding 22 (18) to the year the episode airs minus the entrepreneur’s college (high school) graduation year. We report that most entrepreneurs (77.7 percent) are between 25 to 50 years old. This is intuitive, as people in this age range are often equipped with the necessary capital, motivation, work experience, and professional network

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9 See, for example, What’s a “Shark Tank” Appearance Worth? A Top Spot in the App Store at WSJ All Things D.
connections to start a new company. We find that the vast majority of the entrepreneurs are from the United States, including 41.7 percent from the western U.S.\textsuperscript{10} Finally, 72 percent of entrepreneurs hold a bachelor’s degree or higher, 11.6 percent have a business degree (BSBA or MBA), and 14.1 percent hold a degree from a university in the top 25 of the U.S. News and World Report’s 2015 university rankings.\textsuperscript{11} Multicollinearity is not a significant concern, as pairwise correlations for the various entrepreneur characteristics range from -0.20 to 0.30 (untabulated).

Seven angel investors appear regularly on the show.\textsuperscript{12} A handful of other investors make a more limited number of appearances. As described in Table 1, Panel B, the angel investors possess demographic features that are representative of the angel investor universe. According to Ramadani (2012), most angel investors are male, between 40 and 65 years old, and hold an undergraduate university degree. On Shark Tank, five of the seven main investors are male, all are between 40 and 67 years old, and all have a bachelor’s degree except Daymond John and Kevin Harrington (high school degree) and Kevin O’Leary (MBA in addition to an undergraduate degree). The estimated net worth of the regular investors ranges from $70 million to $3.4 billion. To account for the investors’ prior history and investment expertise, we include investor fixed effects in many of our models. Table 1 demonstrates that we have a comprehensive dataset that includes details on gender, race, age, geography, and education for vast majority of the entrepreneurs and all of the investors that have appeared on Shark Tank since the show’s inception.

\textsuperscript{10} We determine geographic region by classifying states according to the \textit{Census Regions and Divisions of the United States} at the U.S. Census Bureau.

\textsuperscript{11} \textit{2015 National Universities Rankings} at U.S. News and World Report.

\textsuperscript{12} The seven regular investors are listed at the top of Table 1, Panel B (O’Leary, Herjavec, Cuban, John, Greiner, Corcoran, and Harrington). Kevin Harrington no longer appears on Shark Tank.
We report venture-level summary statistics in Table 2, Panel A. At the beginning of every pitch, the presenting entrepreneur requests an investment amount (average of $285.507 in CPI-adjusted 2016 dollars) in exchange for an equity stake (16.2 percent). We measure the entrepreneur’s requested valuation as the ratio of the requested investment amount to the percentage of equity offered at the beginning of their presentation. Nearly all firms (688 out of 707) provide information about prior 12-month sales. The average firm has $0.26 of sales per dollar of requested valuation. The price-to-sales ratio of approximately 4 is lower than Sievers et al. (2013) who report multiples as high as 13. Presumably, this lower valuation reflects the mix of high growth and established businesses that appear on the show. Only 259 of the 707 ventures report prior investments. For entrepreneurs that do not report this variable, we assume that previous investment is not meaningful and assign a value of zero. We make a similar assumption for firms that do not report an existing patent or patent pending. We record gross margin and/or net profit margin if reported, defaulting to net profit margin. Often, margins are not explicitly stated. For ventures that specify the sale price and cost per unit sold, we deduce gross margins from this information. When information to calculate margins is completely missing, we fill missing values with the 2-digit industry average margin from the sample.13

[Insert Table 2 here]

The average venture is 3.21 years old, although many are startups in the purest sense, with 78 (385) founded in the same year as (within two years of) the Shark Tank episode on which they appear. The oldest firm is 39 years old. We also report the number of entrepreneurs that participate in each presentation and the geographical location of the company. A single entrepreneur appears

13 In untabulated tests, we find qualitatively similar results when we replace margin with an indicator variable that identifies profitable firms.
in 369 of the presentations, with a maximum number of 6 presenting entrepreneurs. Without due diligence before taping, investors’ expertise in certain industries plays an important role in the investment decision. Ventures come from a wide variety of industries (unreported). To control for industry-level variation, we report models that include industry fixed effects in our multivariate analyses.

Our data collection process allows us to capture specific details of the negotiation between the entrepreneurs and angel investors. We report summary statistics in Table 2, Panel B. Angels make bids for 64.6 percent of all ventures pitched, but only 51.9 percent of entrepreneurs accept a deal. When a bid is made, the average number of bids (unique bidders) is 2.49 (1.94). Entrepreneurs extend an average of 0.65 counteroffers during the negotiation process, but only 14.4 percent of deals are finalized via a counteroffer. The average number of investors per deal (1.36) indicates that multiple investor deals are common. The average entrepreneur receives approximately 68.9 percent of their requested valuation and deals with contingencies, debt, or royalties are uncommon. The summary statistics suggest that there is a great deal of heterogeneity in the intensity, nature, and outcome of the bidding process.

3.1. Selection Bias

As noted above, selection bias is a potential concern because the entrepreneurs and investors on Shark Tank are undoubtedly selected, in part, for their entertainment value. Our sample construction is similar to Maxwell et al. (2011), which suggests that the “observational interaction” approach used to gather data on angel-entrepreneur interactions “helps to reduce possible biases by observing behaviors rather than relying on BA’s recollections” (p. 213). We also take two econometric approaches to address selection bias that may result from the unknown process by which Shark Tank’s producers select participants for the show. First, we compute bootstrapped
standard errors with as many controls and fixed effects (season, industry, and investor) as the sample size permits. Bootstrapping calculates standard errors using the observed sample as the population and is often used to adjust for bias and to improve the quality of econometric inference.

Second, as a more direct way to address selection bias, we propose a new method that uses the metric that a television producer seeks to optimize: television ratings. We argue that personal (e.g. entrepreneur presentation skills, entrepreneur physical appearance, etc.) and venture (e.g. thematic episodes, etc.) characteristics chosen by the producers for a particular episode of the show will be correlated with the ratings of that episode. We obtain ratings for each episode of Shark Tank from the website *TV By the Numbers* via Wikipedia.\(^{14}\) Next, we collapse venture and entrepreneur characteristic variables across each episode and run OLS regressions that model episode ratings as a function of entrepreneur and venture characteristics. This model is based on the premise that television ratings drive entrepreneur and investors selection bias. We report the results of these regressions in Appendix B. Note that the adjusted $R^2$ statistic for each regression is high (~70 percent). We use the predicted residual from this regression, *Ratings Residual*, in subsequent specifications to address the ratings-driven selection process of the show’s producers and to capture the effects of omitted and imperfectly measured variables in our models, including those related to sample bias.\(^{15}\)

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\(^{15}\) Specifically, we use the residuals from Model 2 of Appendix B in subsequent analyses. Results using the residuals from the other models reported in Appendix B are qualitatively similar.
4. Personal Characteristics and Negotiation Outcomes

Our hypotheses predict that the outcome of negotiations between angel investors and entrepreneurs are related not only to the financial characteristics of the investment, but also to the personal characteristics of the parties involved. We expect to find that gender, race, age, and education are associated with requested valuations, the probability that an entrepreneur receives an offer, and the implied valuation when an offer is received. If homophily affects the outcome of negotiations, we should observe that shared personal characteristics are correlated with the likelihood that an entrepreneur receives an offer, the entrepreneur accepts an offer, and the implied valuation when an offer is received. We empirically investigate these issues in the sections that follow.

4.1. Entrepreneur’s Requested Valuation

We examine the determinants of requested valuation in Table 3. It is reasonable to expect that valuations are shaped, in part, by the financial characteristics of the ventures. Consistent with this expectation, we find that the entrepreneurs of ventures with higher sales and prior investment request higher valuations. Interestingly, ventures with lower profit margins also request higher valuations. This result may reflect the entrepreneur’s expectation of cost savings and future margin expansion.

[Insert Table 3 here]

In Table 3, we also include personal characteristics in the regression models. Model 1 includes a full list of control variables while Models 2 through 4 include only the significant personal characteristics. Model 3 includes the variable Ratings Residual to address selection bias and Model 4 reports results with bootstrapped standard errors. Overall, the results tend to support our predictions on the relation between entrepreneur characteristics and requested valuations.
Consistent with our first hypothesis (H1), we find that teams with female entrepreneurs request significantly lower valuations.\textsuperscript{16} We also report that race and age are correlated with requested valuations in a manner that is consistent with H2 and H3. Specifically, teams with black (Asian) entrepreneurs tend to request lower (higher) valuations and teams comprised of younger entrepreneurs (average age of less than 25) request lower valuations than older teams of entrepreneurs. We also find that that teams with a top 25 educated member tend to request higher valuations, which supports the predicted relation between education and requested valuations (H4). These results are evident with the inclusion of a full complement of venture and personal characteristics and season, industry, and geographical region fixed effects.\textsuperscript{17}

\textbf{4.2. Entrepreneur Receives / Angel Investor Extends an Offer}

In Table 4 we examine the personal characteristics that influence angel investors’ decisions to extend an investment offer. We begin by reporting logistic regressions in Panel A, where the dependent variable is set to one when an angel investor extends an offer to the entrepreneur, and zero otherwise. The control variables and specifications mirror those discussed in conjunction with Table 3, with one minor difference. Rather than controlling for sales, as we did in Table 3, we control for the sales-to-valuation ratio in Table 4. This change helps to capture the entrepreneur’s expected valuation, which may influence the decision to invest. The results for the financial variables indicate that higher sales-to-requested valuation ratios and higher margins increase the likelihood than an angel investor extends an offer to invest. We find that the likelihood that an offer is made decreases with venture age, which suggests that investors are hesitant to invest in

\textsuperscript{16} In a contemporaneous working paper, Proczter and Shapsis (2016) also find evidence that female entrepreneurs request lower valuations.

\textsuperscript{17} Unreported results using the BISG race classifications are qualitatively similar.
older firms that may be seeking funds to save a dying business. Consistent with the notion that intellectual property protection is valuable for entrepreneurial ventures, the presence of patents significantly increases the likelihood that an offer is extended. Finally, ventures pitched by a single entrepreneur are less likely to receive an offer, which is consistent with angel investors having concerns with respect to key man risk.

*Insert Table 4 here*

The personal characteristics reported in Table 4, Panel A provide mixed support for our hypotheses (H1-H4), which predict that entrepreneur gender, race, age, and education influence the likelihood that the entrepreneur receives an angel investment. The results indicate that investors are reluctant to invest in ventures with older (average age above 50) entrepreneurs. Whether or not this result is due to age discrimination is unclear, but we return to this issue in our discussion of Panel B. In Model 3, we report evidence that black (BISG defined) entrepreneurs are less likely to receive an offer from an angel investor. All specifications, with the exception of bootstrapping in Model 4, include 2-digit SIC industry fixed effects.¹⁸

In Table 4, Panel B, we test the prediction that shared characteristics (homophily) increase the likelihood that an angel investor makes an offer to an entrepreneur (H5). In untabulated tests, we find that both the investor and entrepreneur (a portion of the entrepreneurial team) are female in 7.02 (11.13) percent of the investor-entrepreneur pairings. Black investor and black entrepreneurial team pairings occur for 1.49 percent of the observations. We also create an

¹⁸ We also consider the impact of variation in the characteristics among members of the entrepreneur team (for example, teams with both male and female entrepreneurs). However, we find no significant correlation between gender diversity or racial diversity and the likelihood that an investor makes an offer (untabulated). We thank an anonymous referee for proposing this line of inquiry.
indicator variable that identifies instances where the investor state of origin or residence matches the state of residence of any of the entrepreneurial team members (26.8 percent of observations). The investor is on average 16.7 years older than the entrepreneurial team and holds a higher education level. As in Panel A, we report logistic regressions where the dependent variable is set to one when an angel investor extends an offer to an entrepreneur, and zero otherwise. The various models reported in Table 4, Panel B employ a variety of fixed effects to control for Shark Tank seasons, industry, and investors.

Consistent with Table 4, Panel A, venture characteristics are strongly correlated with the likelihood that an angel investor extends an offer. Sales-to-requested valuation ratios, margin, and patents (venture age and individual entrepreneurs) are positively (negatively) correlated with the probability that an offer is made. More importantly, we find evidence of homophily in angel investors’ decisions. Specifically, we find evidence that female (black) angel investors are more likely to make an offer to a female (black) entrepreneur. The negative coefficient on education level relative to the investor suggests that angel investors do not place high value on higher education. A shared geography also increases the likelihood that an offer is made.

4.3. Entrepreneur Accepts an Offer

In Table 5, we test the prediction that shared characteristics influence entrepreneurs’ decisions to accept an offer (H5). We report logit regressions where the dependent variable is set to one when an investor and entrepreneur strike a deal, and zero otherwise. Because multiple investors can extend an investment offer to the same venture, the number of observations is greater than 707, as ventures that receive multiple offers appear in the sample one time for each offer received. In these instances, the venture and entrepreneur characteristics are identical but the investor characteristics differ. We collapse characteristics across the entrepreneurs and match
proportionally against the investor characteristics. Again, we employ a variety of fixed effects to control for Shark Tank seasons, industry, and investors along with the venture-level controls used in Tables 3 and 4 (unreported). Not surprisingly, entrepreneurs are more likely to accept offers that are closer in value to their requested valuation. Entrepreneurs also tend to favor syndicates of angel investors, as the number of investors in the offer is positively correlated with deal acceptance. Ventures that receive more total bids (make counteroffers) are less (more) likely to accept an offer.

Consistent with H5, we find that entrepreneurs are more likely to accept an offer when the angel investor and entrepreneur are both female or black. This result is consistent with prior research that finds evidence of gender- and race-based homophily (for example, Becker-Blease and Sohl 2007; Mollica et al. 2003). We again find that the relative ages of the investor and entrepreneur are impactful, as (relatively) younger entrepreneurs are more likely to accept an offer from an angel investor. This may result from the value of the mentorship that younger investors expect to receive from more experienced angel investors.

4.4. Implied Valuation Based on Extended Offers

Conditional on reaching a deal with investors, we turn our attention to valuation in Table 6. Our hypotheses predict lower valuations for female, minority, younger, and less educated entrepreneurs. In addition, we expect higher valuations when angel investors and entrepreneurs share personal characteristics. We take two approaches to study valuation. In Panel A, we study the impact of personal characteristics on the valuation received when an offer is accepted. In these tests, we measure valuation as the ratio of valuation received to the initial valuation requested. In Panel B, we measure valuation as the ratio of the maximum offer made by an angel investor to the initial valuation requested by the entrepreneur. We then execute Tobit regressions to consider the
impact of shared characteristics on the best offers that angel investors make to entrepreneurs. In addition to the independent variables discussed in conjunction with prior tests, we include the number of investors who remain active in the negotiations to control for the entrepreneur’s relative bargaining power. We also control for deals that include debt or royalties and deals reached on a counteroffer. To address selection bias that might result from the fact that we consider only ventures that receive an investment offer, we also include the inverse mills ratio from Table 4, Panel A, Model 2.19

[Insert Table 6 here]

We begin with a discussion of the Table 6, Panel A results. Interestingly, competition among angel investors appears to be one of the driving factors when it comes to valuations, as the number of bidders remaining at the time of the offer is highly significant in each model. Of the remaining offer specific variables, only the variables capturing debt/royalty deals and deals made on counteroffers are consistently significant. The results indicate that entrepreneurs tend to demand higher valuations for commitments of cash flow and receive lower valuations when their counteroffer is accepted. The only personal characteristic that is reliably correlated with valuations is the indicator variable identifying black entrepreneurs. The negative coefficient suggests that black entrepreneurs receive lower valuations for their businesses than entrepreneurs of other races. This result supports H2 and confirms prior research that finds that minority groups tend to pay a higher cost of capital than otherwise comparable small businesses (Blanchflower et al. 2003).

In Table 6, Panel B, we consider the impact of shared characteristics on angel investors’ implied valuations. Unreported venture controls indicate that maximum offers are positively correlated with the sales-to-requested valuation ratio, prior investment amount, and patents.

19 Results are similar using the inverse mills ratio from other logit models in Table 4.
Maximum offers are also lower for older ventures and ventures that have more than one entrepreneur. Competition among bidders and club deals are associated with larger offers. Similar to the results in Panel A, entrepreneurs demand higher valuations when committing cash flow in the form of interest payments or royalties.

Two shared characteristics are related to maximum offer size. First, the evidence suggests that black angel investors make lower offers to black entrepreneurs. However, the coefficient is statistically significant in only one of the four models reported. Second, relative education level is negatively correlated with the maximum offer. This implies, counterintuitively, that angel investors place lower valuations on businesses with more educated entrepreneurial teams. This is consistent with prior evidence that angel investors derive utility from their role as mentors. Presumably, advanced education lessens the value / desirability of the mentorship provided by angel investors.

5. Conclusions

The reality television show Shark Tank provides a unique laboratory for studying the impact of personal characteristics on the outcomes of negotiations between angel investors and entrepreneurs. Prior research on angel investors’ investment decisions finds that ventures with superior financial performance, protected intellectual property, and entrepreneurs who possess the skills and network relationships necessary to be successful are more likely to receive an investment (for example, Mason and Harrison 1996a; Greenberg 2013). Our results are consistent with prior findings. However, we also find evidence that negotiations between angel investors and entrepreneurs are influenced by personal characteristics, including gender, race, and age.
We find that requested valuations are correlated with both venture and entrepreneur characteristics. Female, black, and young entrepreneurs tend to request lower valuations from angel investors, while Asian entrepreneurs and entrepreneurs from top universities often request higher valuations. Older entrepreneurs are less likely to receive an offer from an angel investor, while race also appears related to the likelihood that an offer is extended. Conditional on receiving an offer, valuations are primarily influenced by the number of angel investors competing to make an investment. We also find evidence that black entrepreneurs receive lower valuations than entrepreneurs of other races.

Shared personal characteristics are also associated with the likelihood that an angel investor extends an offer, the entrepreneur accepts an offer, and the valuation implied by investment offers. Female investors are more likely to extend an offer to female entrepreneurs and black investors are more likely to make an investment offer to black entrepreneurs. Deal completion is more likely when both the investor and entrepreneur are female or black. We find that greater investor competition mitigates the impact of these personal characteristics on venture valuation.

Our results provide strong evidence to support the notion that personal characteristics are associated with the outcomes of negotiations between angel investors and entrepreneurs. Interestingly, our results are evident in negotiations that take place on a popular, prime time television show. Given the public nature of the negotiations that we study, future research might find that the effects of personal characteristics are even stronger when the negotiations take place behind closed doors.
References


Appendix A: Data construction process

Figure 1 provides an example (Titin: Season 6, Episode 7) of how a shark-company negotiation is codified.

Entrepreneur Name: Patrick Whaley
Gender: Male, Age: 26
State: GA, Marital Status: Married
Education Level: BS, Georgia Institute of Technology
Company Founded: 2005, Location: Alpharetta (GA), Entrepreneurs: 1
Age, State, Education, Company Founding Date Obtained from https://www.linkedin.com/in/whaleypatrick

00:01:55 I'm here seeking $500,000 for a 5% equity stake in my company.
Requested Investment: $500,000, Requested Percentage: 5%
Requested Valuation: $10,000,000

00:02:00 Titin is a patented, form-fitting, weighted compression gear...
Patent: Yes, Industry Code: 3949 (Sport and Athletic Goods)

Sales: $2,400,000
Prior Investment: $1,000,000
Profit Margin: 0.30

00:03:54 Whaley: So, last month, we almost broke $1 million in revenue.
00:05:33 Whaley: $1.4 million in purchase orders that I can't fulfill...

00:04:36 Whaley: We burned through the entire investment within six months.
00:04:39 Robert: How much was the investment?
00:04:41 Whaley: It was about $1 million.

00:04:56 Whaley: We're about 30% net profit.

00:06:58 Mark: I'm out.

Mark ID-Venture ID: Out (Action 1)

00:07:36 Robert: I'm out.

Robert ID-Venture ID: Out (Action 2)

00:07:50 Lori: But it's not hitting me as something that I want to invest in, and so, for that reason, I'm out.

Lori ID-Venture ID: Out (Action 3)

00:08:11 Kevin: I'll give you $500,000 for 15%.

Kevin ID-Venture ID: In (Action 4)
Investment Amount: $500,000
Equity Percentage: 15%
Valuation Offered: $3,333,333

00:09:19 Daymond: So I'm... I'm willing to give you the $500K for 20%.

Daymond ID-Venture ID: In (Action 5)
Investment Amount: $500,000
Equity Percentage: 20%
Valuation Offered: $2,500,000

00:13:36 Whaley: I'm fine with a $5 million valuation if we can get there, we can make this thing a stratospheric success.

00:13:55 Kevin: Mmm—10%? It's not enough equity. It's too small.

Kevin ID-Venture ID: In (Action 6)
Counteroffer: Yes
Investment Amount: $500,000
Equity Percentage: 10%
Valuation Offered: $5,000,000

00:14:27 Whaley: Daymond... I'd love to take your offer.

Action 5 accepted, action 4 and 6 rejected.
Appendix B: Episode ratings and selection bias

Appendix B reports OLS regressions using Shark Tank episode ratings (in millions of viewers) as the dependent variable. Independent variable means, including industry representation and region, are calculated across ventures in each episode. Residuals from these regressions are used to address selection bias. *T*-statistics calculated with standard errors clustered by season are presented in parentheses. ***, **, and * indicate statistical significance at the 1, 5, and 10 percent levels respectively.

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Table 1: Entrepreneur and investor descriptive statistics

Table 1 provides summary statistics of entrepreneur (Panel A) and angel investor (Panel B) characteristics from the reality show Shark Tank. If not stated explicitly on the show, characteristics such as geographical residence, age, and education status are obtained from public sources (for example, LinkedIn). Race is approximated both manually (Asian includes individuals who are Chinese, Japanese, Indian, and from surrounding countries) and using the U.S Census Bureau’s Bayesian improved surname geocoding method (BISG) with the entrepreneur’s surname and venture zip code. Net worth is obtained from public sources (for example, Fortune). Dollar values are reported in 2016 dollars.

### Panel A: Entrepreneur characteristics

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<td>Bid Rate (%)</td>
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<td>John Paul DeJoria</td>
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<td>Troy Carter</td>
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Table 2: Venture and negotiation descriptive statistics

Table 2 provides descriptive statistics for venture and negotiation level data collected from Shark Tank. We set Sales, Prior Investment, and Patent to zero if these variables are not reported during the televised negotiations. If Margin is not reported, we use the 2-digit SIC industry average of other ventures presented on Shark Tank. A bid is recorded if an investor(s) makes a specific offer. We record the investment amount, equity percentage, contingencies, and other characteristics (debt, royalties) associated with the bid. If the parameters of the deal are specified by the entrepreneur after the initial requested investment, we record a counteroffer flag. An example of venture/negotiation data collection is reported in Appendix A. Dollar values are reported in 2016 dollars.

Panel A: Venture characteristics

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Panel B: Negotiation characteristics

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# Table 3: Entrepreneurs’ requested valuation

Table 3 includes OLS analyses of financial factors and personal characteristics on the log-transformed pre-negotiation venture valuation requested by entrepreneurs. *T*-statistics calculated with standard errors clustered by season and industry (2-digit SIC code) are presented in parentheses. Specification 4 displays bootstrapped standard errors. ***, **, and * indicate statistical significance at the 1, 5, and 10 percent levels respectively.

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<td>Yes</td>
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<td><strong>Industry FE</strong></td>
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<td>Yes (SIC2)</td>
<td>Yes (SIC2)</td>
<td>Yes (SIC1)</td>
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<td>Yes</td>
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Table 4: Venture receives investment offer

Table 4, Panel A, reports logistic analyses of the impact of financial factors and personal characteristics on the likelihood that an entrepreneur receives an offer. Panel B considers that likelihood of an investor making an offer given shared personal characteristics with the entrepreneur(s). Specification 3 employs alternative BLS-based race classifications while specification 4 reports bootstrapped standard errors. Z-statistics calculated with standard errors clustered by season and industry (2-digit SIC code) are presented in parentheses. ***, **, and * indicate statistical significance at the 1, 5, and 10 percent levels respectively.

Panel A: Entrepreneur characteristics

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### Panel B: Shared characteristics

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Table 5: Entrepreneur accepts investment offer

Table 5 reports logistic regressions that consider the impact of financial factors and personal characteristics on the likelihood that an entrepreneur(s) accepts an investment offer. To control for selection bias, we include the inverse mills ratio from Model 2 of Table 4, Panel B. Specification 3 employs alternative BISG-based race classifications while specification 4 reports bootstrapped standard errors. Z-statistics calculated with standard errors clustered by season and industry (2-digit SIC code) are presented in parentheses. ***, **, and * indicate statistical significance at the 1, 5, and 10 percent levels respectively.

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Table 6: Implied valuation conditional on offer

Table 6 reports Tobit analyses of the impact of financial factors and personal characteristics on the valuation received in an accepted offer (Panel A) and the percentage of an individual angel investor’s maximum valuation (Panel B) relative to the venture’s initial requested valuation. To control for selection bias, we include the inverse mills ratio from Model 2 of Table 4, Panel A (Panel B). Specifications 3 employs alternative BISG-based race classifications while specifications 4 reports bootstrapped standard errors. Z-statistics calculated with standard errors clustered by season and industry (2-digit SIC code) are presented in parentheses. ***, **, and * indicate statistical significance at the 1, 5, and 10 percent levels respectively.

### Panel A: Percent of initial valuation received

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### Panel B: Maximum offer / requested valuation

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<td>-0.0520**</td>
<td>-0.0586***</td>
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<td>0.9897**</td>
<td>0.8584**</td>
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