

Matthew effect in Entrepreneurship Funding¹.

Central Thesis. Receiving external funding increases the likelihood of new firm creation and reduces quitting rates (Hechavarría, Matthews, & Reynolds, 2016). However, previous research revealed that the probability of being funded is not directly related to entrepreneurship talent. Some nascent entrepreneurs' characteristics such as wealth, ethnicity, and other intangibles, like human and social capital, increase their likelihood of being funded (Frid, Wyman, Gartner, and Hechavarria, 2016; Frid, 2014; Gartner, Frid, and Alexander, 2012). Merton (1968) developed a framework to explain why higher status actors derive greater rewards than others in a lower hierarchy do for performing a similar activity. The Matthew effect² emerges when rewards are allocated based on previous accomplishments and not on the efforts made for obtaining that specific reward. In this way, a self-reinforcing mechanism appears in a rewarding system. Through the lenses of the Matthew effect theory, this research aims to study the reinforcing mechanisms of entrepreneurship funding and its implications for the entrepreneurial process.

Other fields tested the Mathew effect, such as science and technology studies (Petersen et al., 2013; Zuckerman, 1972), economics, (Pereira and Suárez, 2017; Antonelli and Crespi, 2013; Medoff, 2006), and education (Glasswell, 2001; Stanovich, 1986). Two theoretical considerations make the “Matthew Effect” worth investigating in entrepreneurship studies. First, the existing asymmetrical information between lenders and nascent entrepreneurs (NEs), and second the high transaction costs of the small business loan market. Asymmetrical information (Rothschild and Stiglitz, 1976; Akerlof, 1970) occurs when there is unbalanced information between supply and demand, leading to inefficient outcomes in specific markets. Since new ventures typically do not disclose financial

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² Inspired in the Bible verse found in the Gospel of Matthew: “For whosoever hath, to him shall be given, and he shall have more abundance: but whosoever hath not, from him shall be taken away even that he hath.”

information about their trade, products, and services, asymmetric information is particularly problematic for this type of loans (Berger and Udell, 1998; Akerlof, 1970). Lenders have to monitor borrowers, implicating a second theoretical argument to study the Matthew effect in entrepreneurship: the high transaction costs (Coase, 1937) of the entrepreneurial loans market. While these costs are not problematic for larger companies, they can make these loans unreachable for NEs. Consequently, on the supply side lenders are typically not willing to borrow capital for small companies, while on the demand side nascent small firms are off the market (Ang, 1992). However, NEs can reduce the asymmetrical information and transaction costs by developing signals for lenders, such as business plans or financial projections. Also, patents infer reputation for NEs' (Hsu, 2004; Lounsbury and Glynn, 2001). Funders interested in high-tech new ventures seek for signals of NEs' prior accomplishments, like patents (Hsu, 2007).

On the other hand, a primary driver of acquiring external funding is that there is personal wealth. Low-wealth entrepreneurs are less likely to get external funding (Frid, Wyman, Gartner, and Hechavarria, 2016; Frid, Wyman, and Coffey, 2016; Frid, 2014; Reynolds, 2011). The same logic applies for social capital: an individual can accumulate social capital, and entrepreneurs' previous career trajectories have a remarkable impact on its growth, as shown by Burton et al. 2002. Uzzi (1999) also argued that entrepreneurs' capacity to meet financial selection criteria is a mixture of their firm's characteristics as well as its relationships embedded in social networks. Are the start-ups recurrently funded more likely to survive and or accelerate its launch? Which is more critical to receive external funding, entrepreneurs efforts towards developing signals or the effect of being a wealthier and well-connected entrepreneur? This paper aims to answer these questions, intending to falsify the Matthew effect hypothesis in entrepreneurship.

Methodology. Receiving external funding is an event that can happen several times during the new venture's gestational phase. Thus, time is a central dimension of this study, and longitudinal studies offer the appropriate data-structures to follow NEs through time. The Panel Study of Entrepreneurial Dynamics (PSED) is a longitudinal sample of individuals attempting to start businesses in the US that offers substantial advantages, as being unique for being a representative sample of new ventures in their initial stages. In this sense, PSED allows the researcher to avoid biases of other entrepreneurial longitudinal studies (Gartner, Shaver, Carter & Reynolds, 2004). For this research, PSED-I and II were matched. This last exercise resulted in 2044 cases. Due to attrition and missing observations, the number of cases was reduced to 1501 NEs.

Previous efforts to understand external funding during startup gestation did not account for censoring (Frid, 2014; Gartner et al., 2012). Also, since external funding can happen repeatedly, a methodological approach designed to understand recurrent events is needed. Previous studies ignored the recurrence nature of funding (Hechevarria *et al.* (2016), which biases the estimators (Amorim and Cai, 2015; Allison, 2014; Mills, 2011; Twisk, Smidt, and De Vente, 2005). Thus, event history models were performed, first, to test if being externally funded many times during the gestational phase affects startup creation and survival. Then, recurrent event models were applied to falsify the Matthew effect hypothesis. In Appendix 1 the variables are described.

Several advantages arise for the use of recurrent event models. NEs can be more "frail" than others when for example they are better informed about funding sources, how to fill forms, the funding process in general and other unobservable characteristics that make them more prone to receive financing. When there is heterogeneous susceptibility to the risk of recurrent events, the frailty model can be applied (Amorim and Cai, 2015). Also, if it is reasonable to assume that the

occurrence of an event affects its recurrence, a conditional frailty model can deal with this issue, by letting the baseline hazard to vary for each event (Box-Steffensmeier and De Boef, 2006).

Findings: Cox regressions were applied to new firm founding and quitting the start-up process, using a similar model as Hechevarria *et al.* (2016), adding a new categorical variable. It measures whether the startup has not received any monitored funding (=0), received it one time (=1), or at least two times (=2). The hazard of disengagement from the entrepreneurial process for start-ups that received external monitored funding is 73% of those that did not receive; start-ups which received monitored funding two or more times during gestation were revealed to be 30% of those that start-ups that did not receive any funding (Table 2). Compared to start-ups that never received funding, those funded at least two times are 54% more likely to become a firm. This effect is insignificant when comparing firms that receive external funding one time to those that were never funded. Thus, recurrent funding increases ventures' survival and accelerate creation.

Two Cox regressions with a frailty component (standard and conditional) using gap-times were fitted to understand the factors related to recurrent funding. To the previous covariates that Frid, Wyman, Gartner, and Hechavarria, (2016) applied to understand factors associated with receiving external funding, we add measurements of wealth, human, social, and signals developed by entrepreneurs that can reduce asymmetrical information to lenders (Appendix A). In model 3 (standard frailty model) there is a significant within-entrepreneur correlation ($\Theta = 1.11, p < 0.001$). In the conditional frailty model (stratified by funding event number), while still significant, the random effect is reduced close to zero ($\Theta = 0.17, p < 0.001$). Hence, this is a signal that factors associated with receiving funding previously made entrepreneurs less heterogeneous.

Conditional on the unmeasured heterogeneity, event dependence and covariates, Model 4 indicates that the odds of a wealthier entrepreneur to get externally funded since the last funding is about

2:1 in comparison to the non-wealthy. Social capital variables also explain recurrent financing: for every one-year increase of NEs' managerial experience, the hazard of getting externally funded since the last one funding goes up by an estimated 2.5%. The effect of external helpers is surprising: an increase in the number of helpers is associated with a decrease in getting external funds by 15% since the last funding event. However, this negative relationship can be explained by the fact that entrepreneurs seek helpers mostly to get funding, and if it finally happens then obviously the need for getting monitored external funding decreases. The efforts that entrepreneurs can make for reducing asymmetrical information and transaction costs for lenders can help them in getting funded. While patents and trademarks did not show significant results, unsurprisingly developing financial projections is the signal that accounts for the highest hazard in getting funded: almost 2 to 1 are the odds of being funded again for those entrepreneurs that had developed financial projections to those that did not. Business plan accounts for an interesting effect: the hazard of entrepreneurs with an unwritten and non-formally written business plan increases the likelihood of getting recurrently funded by 84% and 105% compared to those that do not have one. However, the hazard of getting funded for those that have a formal written business plan exhibited the expected direction of the hazard is significant, but only at 90% of confidence.

Implications: The analysis of the Matthew effect in entrepreneurship funding offers some interesting insights. Receiving previous funding reduces heterogeneity among entrepreneurs; thus, from a methodological perspective, event dependency must be considered when analyzing funding for entrepreneurs. The last could be an effect of entrepreneurs' learning or due to their new venture legitimization, but in either way, exposing entrepreneurs to hands-on financial practice can increase their likelihood of receiving funding recurrently. The strong positive effect of financial projections makes the last argument stronger too. Social capital and wealth verified to be strong

predictors of recurrent financing, as well as signals developed to reduce asymmetrical information. Thus, entrepreneurship education, with particular attention to financial skills and business plans, can reduce the gap of the less wealthy and worst-connected privileged entrepreneurs in receiving external funding, and in this way, better exploit the entrepreneurial talent of the economy.

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