

The Entrepreneurial Mind

Lecture 12 – Entrepreneurial Risk Attitudes

Lecturer:

Fidela Reyes Balajadia

Associate Professor 2

University of the Assumption, Philippines

Lecture Learning Objectives

At the end of the lecture, you will be able to:

- Demonstrate mathematical and graphical skills in solving computational problems involving expected utility theory;
- Classify different typology of risk-taking attitudes and distinguish each;
- Describe entrepreneurial risk attitudes across populations; and
- Differentiate entrepreneurial risk attitudes set against business start-ups.

Overview

Bounded rationality causes risks in human activity. This lecture examines entrepreneurial attitudes toward business risk. It examines specifically the research findings regarding the measurement, differentiation and determination of the impact of risk attitudes on the entry, growth and success of firms. It also discusses the relationship between risk behaviors and self-efficacy and optimism.

Entrepreneurial Risk Behavior

Risk plays a big role in the business world, especially for those looking for very profitable business opportunities. In fact, over half of start-ups are no longer operating after six years, and 75% of entrepreneurs exit with no equity (Astebro et al, 2014). Despite the risk, many people go into business every year due to risk tolerance. To link risk to entrepreneurship, Knight (1921) proposed that successful entrepreneurs possess the ability to measure the probability of the future outcome of risk as opposed to uncertainty where future outcomes are difficult to determine. For example,

1. diversification measured by the variance of performance of each alternative reduces real risk. Although there was a distinction between risk and uncertainty, subsequent conceptualization continued to combine them. Several models have been developed to predict the level of risk aversion and how it affects the decision to enter the business.

2. Khilstrom and Laffont (1979) develop a model linking risk aversion to individuals who become employees and low-risk aversion to those who become entrepreneurs.

Feng and Rauch (2015) provided simpler forms and extensions of the model. Astebro et al. (2014) developed the standard expected utility model of risk preference as a function of utility over wealth. The model could predict that most people have utility functions with risk aversion who prefer to work with low pay than those who prefer the possibility of huge gains but risky entrepreneurial ventures. Thus, holding other factors constant such as entrepreneurial ability and financing limitations, the individual's preferences over risk can play a critical role in determining entrepreneurial entry decisions. The literature describes

risk attitudes, risk preferences, risk tolerance, risk aversion, and risk propensity. All usages of the concept attempt to answer whether something in an individual's personality predisposes them to take on the risky conditions of entrepreneurship and the personality trait on outcomes.

Methods of Measuring Risk Attitudes

One way to measure risk attitude is through self-assessment. In most cases, the questions asked to vary depending on the level of specificity, because many of them come from longitudinal surveys not suited to entrepreneurship (Kerr et al., 2017). As a result, they do not generate entrepreneur-specific attitudes towards the real risk. For instance, using GSOEP panel data, Caliendo et al. (2009) include the general risk-attitude question; Ekelund et al. (2005) used indirect questions about general risk attitudes; and Block et al. (2015) use a self-scoring question. The most obvious problem of self-reported risk-aversion measures is that an individual has incomplete knowledge of oneself, about his/her own unique psychology relative to risk-taking. Hence, highly prone to response bias. For instance, entrepreneurs are frequently found to be overconfident (Astebro et al., 2014), possibly skewing self-reported results, possibly in cases of the lower-risk decision but pessimistic in a high level of risk decision-making. In addition, general attitudes may not specify attitudes toward the start-up processes, as one's risk attitude toward investing in an asset could be unrelated to one's risk attitude toward one's financial career. Some researchers use company-specific assumptions to measure risk attitudes.

Other researchers use self-confidence or self-knowledge to look at entrepreneurs' investment portfolios and evidence of activity that may indicate their risk attitudes. There are wide and varied questions ranging from general financial risk-taking and more entrepreneurship-specific settings. Likewise, situational questions may elicit disposition toward risk propensity in business venturing and are more reliable than general risk attitude questions from self-report surveys. Similarly, at the firm level, Hall and Woodward (2010) used a model-based approach to back out what the relative risk aversion of an entrepreneur has to be for a wealth level and external guaranteed earnings option, given the wide distribution of eat outcomes.

Expected Utility Model and Risk Aversion

A popular risk model in economics is the expected utility hypothesis used as a guide for evaluating decisions involving uncertainty. **Expected utility theory** describes situations where Individuals must decide without knowing which outcomes may result from that decision, i.e., decision making under uncertainty. In expected utility models, individuals will choose the action that will cause the highest expected utility, which is the

sum of the products of probability and utility overall outcomes. As shown in Figure 1, the decision made will depend on the person's risk aversion level and the utility. This model shows that the utility of money does not equate to the total value of money but to the level of risks. For example, the reasons why people may buy insurance policies to cover themselves against a variety of risks. The expected value from paying for insurance would be to lose out monetarily, but, the possibility of huge losses could lead to a serious decline in utility because of diminishing marginal utility of wealth. Although the expected utility hypothesis is standard in economic modeling, largely because of its simplicity and convenience, it has been found to violate some psychological experiments (Kerr et al., 2017). For many years, psychologists and economic theorists have been developing new theories to explain these deficiencies. Given a choice between more risky and less risky investments with identical expected monetary returns, a risk averter selects the less risky investment and a risk seeker selects the riskier investment. Faced with the same choice, the risk-neutral investor is indifferent between the two investment projects. Some individuals prefer high-risk projects and the corresponding potential for substantial returns, especially involving relatively small sums of money.

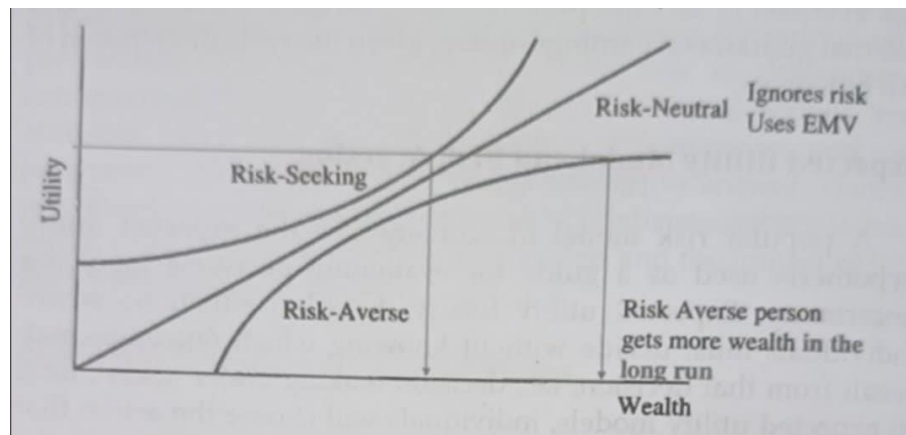


Figure 1. Different Risk Attitudes

Entrepreneurs, innovators, inventors, speculators, and lottery ticket buyers are all examples of individuals who sometimes display risk-seeking behavior. Risk-neutral behavior is common in some business decision-making. However, most managers and investors predominantly risk averters involving substantial monetary amounts. Figure 1 shows the hypothetical utility function of risk-averse, risk neutral and risk seeker respectively.

For purposes of discussion, consider a risk averse individual with mathematical function express as $\phi(x) = \sqrt{x}$. His wealth initially is 5,000. The probability $P = 1/2$ that he will lose 3,000. An investment company inform him that he can insure his

investment against risk but he must pay premium for the insurance. How much would the individual pay for the insurance?

The expected utility formula is $E(x) = \sum_{i=1}^n (1-p) + p_{\{i\}} X_{\{i\}} = p_i x_i + (1-p_{\{1\}})(x_{\{2\}}) = \sqrt{(p_{\{1\}}x_{\{1\}} + (1-p_{\{1\}})(x_{\{2\}}))$ the expected utility of losing 3,000 and expected utility of not losing 3,000.

The expected utility of no insurance is $E(X_{wi0}) = \frac{1}{2} \sqrt{(5,000-3,000)} + \frac{1}{2} \sqrt{5000} = 22.36 + 35.35 = 57.71$.

The expected utility with insurance is $E(x) = \sqrt{5,000 - \text{premium}}$. To determine the insurance premium, we should compare the value of expected utility with and without insurance.

$\sqrt{5000 - \text{premium}} = 57.71$ $(\sqrt{5,000 - \text{premium}})^2 = (57.71)^2 = 5,000 - \text{premium}$
 $= 3,330.44$ Premium 1,669.55 $E(X_{wt}) = \sqrt{5,000 - 1,669.55} = \sqrt{3,330.45} = 57.71$

The expected utilities are because of insurance. However, if the premium is larger than 1,669.55, the expected utility of having an insurance decreases, hence, decision is likely to insure since the expected utility of no insurance is smaller.

For risk-seeking individual the expected utility function say in lottery is $\mu(x) = x^2$ A person initially has 50 and probability of gaining 100 is $p = 1/2$ The expected utility of not gambling 50 is:

$E(x_{not}) = (50)^2 = 2,500$ And the expected utility of gambling 50 is: $E(X_{gamble}) = \frac{1}{2} (100)^2 + \frac{1}{2} (0)^2 = 5000$

Hence, a risk-seeking individual will gamble his 50 since the expected utility of gambling of 5,000 is larger than not gambling with an expected utility of only 2,500.

Using the same example, if the individual is risk neutral then his function is linear. If the expected utility function is $\mu = \frac{1}{2} x$ then the expected utility not gamble is $E(X_{not}) = \frac{1}{2} (50) = 25$ and the expected utility of gambling $E(X_{gamble}) = \frac{1}{2} (\frac{1}{2} 100) + (\frac{1}{2} 0) = 25$.

Risk Attitudes of Entrepreneurs vs. other Populations

Studies compare the risk attitudes of entrepreneurs to managers in the same industrial sectors, the general population, and other groups of entrepreneurs with different skill levels and motivations. Lazear (2005) used a large sample of over 5,000 graduates and found a variation of industry-level earnings among the first job selected-is positively correlated with the probability of later entering entrepreneurship (earning is a control variable given the breadth of skill sets important for entrepreneurship). Since earning has

confounded the relationship between skills, motivation, and entrepreneurial entry, a need to re-establish the relationship between the independent and dependent variables. Using a very different approach, Hall and Woodward (2010) find that entrepreneurs must have a relatively high-risk tolerance. Evidence shows risk attitudes of entrepreneurs versus business managers are inconclusive. While it is straightforward to understand why entrepreneurs may be more risk-tolerant than managers, some argue that other attributes, like the high need for achievement that both groups possess, equalize or obscure the simplest predictions (e.g. Atkinson, 1957). In a meta-analysis of 14 studies, Stewart and Roth (2001) find that the risk propensity of entrepreneurs is greater than that of managers. This conclusion contradicts with Miner and Raju (2004), who present data from 14 other studies by means of projective techniques to measure risk preferences rather than self-report measures. They find entrepreneurs are more risk avoidant than managers.

Other studies avoid the influence of self-confidence and self-knowledge gap by looking directly at the showed investment metrics of individuals and firms or other behaviors that would reveal risk preferences (e.g., Puri and Robinson, 2007; Brown et al., 2006; Uusitalo, 2001). For instance, on the individual level. Hvide and Panos (2014) measured risk preference through stock market participation, personal leverage, and the fraction of wealth invested in the stock market. Lazear (2005) used the standard deviation of industry-wide earnings in **the** individual's first job to measure how willing the person is to tolerate earnings-related risk. At the firm level, Caggese (2012) used expenditure behavior to measure risk attitudes with the assumption that research for introducing new products is riskier than investing in improving existing products. Xu and Ruef (2004) further examined the "myth of the risk-tolerant entrepreneur."

They compared the risk attitudes of entrepreneurs to the general population, using PSED data to analyze the reactions of 1,261 nascent entrepreneurs and general population participants in a series of business investment decisions. They used two models, "strategic" model of risk tolerance based on investment choices, which captures situational risk tolerance in taking a specific strategy or executing a specific action. The other is a "non-strategic" model of risk tolerance based on information bias about business success, which captures pre-dispositional risk tolerance. The researchers concluded that the PSED entrepreneurs are significantly more risk-averse than the general population, proposing that risk-averse individuals enter highly risky endeavors mostly because they value "identity fulfillment" and their autonomy more highly than any Pecuniary benefits.

Other researchers measure heterogeneity within entrepreneurial groups. Both Stewart and Roth (2001) and Miner and Raju (2004) find that there are large differences

between entrepreneurs whose primary goal is venture growth versus those whose focus is on Producing family income. Block et al (2015) expanded the distinctions by comparing opportunity and necessity motivations among a sample of 1,526 entrepreneurs through an email questionnaire asking participants to show their willingness to take risks regarding, start-ups and the amount they would invest in a hypothetical investment lottery. The study finds that opportunity entrepreneurs are more willing to take risks than necessity entrepreneurs, and those with motivation by creativity are more risk-tolerant than other entrepreneurs. In summary, while the literature on entrepreneurial risk attitudes is sizable and growing, no uniform consensus on how risk preferences should elicit and how they differ between populations. Perhaps a new and more complete synthesis lurks around the corner, but progress to such an end is not clear in recent studies. This needs more work to redefine populations to better understand risk aversion among entrepreneurs. This also requires further exploration of differences between actual risk taken on by entrepreneurs and the perceptions of the risk they hold (e.g., Palich and Bagby, 1995). It is not entirely clear whether risk attitudes can be separated from over-optimism and overconfidence in measurement, a distinction that is meaningful theoretically (Parker, 2009).

Effect of Risk Attitudes in the Start-up Process

A large literature looks at the impact of entrepreneurial risk attitudes on the likelihood of starting a venture and on the eventual success. Cramer et al. (2002) considered 1,500 individuals from 1952, 1983, and 1993 allowing for a long-time span for entrepreneurial choices to come about. While the study found evidence that risk aversion reduces entrepreneurial entry, the researchers did not feel confident enough in the link to deem it a causal relationship. In a very different setting, Gürol and Atsan (2006) administered a random sample of 400 fourth-year university students who intend to start their own business ventures show higher risk-taking propensity than non-inclined students. Similarly, using the income gamble questions, Ahn (2010) found that relative risk tolerance has a large, positive, and statistically significant effect on the probability of entering self-employment. An individual with a higher level of risk tolerance is more likely to enter self-employment. Brown et al (2011) used 14,305 observations from the Panel Study of Income Dynamics, find that willingness to take financial risk correlates positively with future self-employment. Other international studies include Ekelund et al. (2005), which analyze psychometric data from the Birth Cohort Study. They find that harm avoidance carries a negative effect on the individual's probability of being self-employed. Caliendo et al. (2009) observed in the GSOEP that individuals with lower risk aversion are more likely to become self-employed if they are coming out of regular employment but risk aversion does not explain entry for those coming out of unemployment or inactivity. Across the studies, the weight of the evidence suggests that individuals with

greater risk tolerance are more likely to enter entrepreneurship, but same measures of risk aversion for different populations of potential entrepreneurs and comparison groups should be further examined which are more directional than quantitative. The realities of business venturing (and subsequent rates of failure) make it quite reasonable that a would-be entrepreneur needs to be one who can tolerate a lot of risks, but it is very important to consider various situational factors. For example, designing unemployment insurance benefits or future universal basic income schemes, would aid policymakers to have an accurate understanding of the relative degrees of risk tolerance in their population. Individuals who are risk-tolerant may be more likely to exit unemployment by starting their own business, versus looking for paid work, if getting small incentives from the government (e.g. Hombert et al., 2017).

Risk Tolerance and Growth and Success Entrepreneur

Contrary to the strong consensus among researchers that risk tolerance favors business creation, it is unclear whether risk attitudes impact the long-term success of firms. In a meta-analysis of about sixty studies, Zhao et al. (2010) found that risk propensity positively associated with early entrepreneurial intentions, but is not related to entrepreneurial performance (defined through evidence of survival, growth and profitability of the enterprise at the study level). Similar results are found by Kessler et al. (2012) among founders for assessed venture success and business survival. Hvide and Panos (2014) hypothesized that the businesses risk-tolerant individuals might underperform over the long run, because more of these individuals select into entrepreneurship (thus bringing more mediocre ideas) than among risk-averse individuals (who thus might only be tempted to start firms with the very best ideas). The authors gathered an impressive dataset of 400,000 males who were fully employed in 1993-1994. They identified 6,300 who subsequently became entrepreneurs, defined in 2007. Investment data show that common-stock investors, who shaving a majority stake in a new firm take on individual financial risks, are about 50% more likely to start a firm, but their firms have roughly 25% lower sales and 15% lower return on assets during the annual observation period between 2000 and 2010. This type of study represents an important frontier in this area of research.

Korunka et al. (2003) surveyed and compared 314 nascent entrepreneurs and 627 new business owner-managers and found that those who become successful (self-assessed) displayed a medium risk-taking propensity. It is possible that while the high risk-takers are not the most successful, some risk-taking propensity is helpful toward business success. This hypothesis of a non-relationship between risk tolerance and firm performance is worthy of study in larger samples. Hyytinen et al. (2015) used an innovative approach that combines interview data from an early start-up period with

national business register data to track firm survival. Their main interest was in the firm's innovativeness (rather than that of the entrepreneur) but they also asked about the risk attitudes of the entrepreneur. They found that risk-loving entrepreneurs that operate innovative firms are much less likely to have their firms survive over a three-year follow-up period compared to risk-loving entrepreneurs running less innovative operations.

The main effect for risk-attitude is not significant in the firm survival models without this business model (i.e., "innovativeness") interaction, while the interacted model displays a positive partial correlation between entrepreneurial risk preference and firm survival. In contrast, Cucculelli and Ermini (2013) found that firms run by risk-loving entrepreneurs tend to perform better in their sample of 178 entrepreneurs running Italian manufacturing firms in 2007. The authors compared firms that introduce new products with those without new product innovations. Risk attitudes are measured with a hypothetical lottery question, and are then matched with firm-level product portfolios and other financial data. A separate analysis of risk-averse versus risk-loving entrepreneurs reveals that the introduction of a new product affects firm growth positively (and significantly) only in the sample of firms owned by risk-loving individuals. The risk-loving entrepreneurs are also somewhat more likely to introduce new products in the first place showing that they may indeed stimulate firm growth through innovation.

Probability of Exiting Entrepreneurship

Caliendo et al. (2010) measured in GSOEP datasets that risk attitudes have a non-relationship with entrepreneurial survival, as the exit rates of medium risk takers are 40% lower than those for low and high-risk takers. While a positive relationship emerges from the literature regarding risk taking and initial entry into self-employment, there appears to be a more complex relationship between risk taking and growth/exit choices. These early results need further verification using data from other countries and different entrepreneurial populations.

Entrepreneurial Self-efficacy, Risk Attitudes, and Optimism

Many researchers investigate the relationship between ESE and risk propensity. For example, Zhao et al. (2005) in a survey sample of 265 MBA students found that the effects of risk propensity (and perceived learning from entrepreneurship-related courses and previous entrepreneurial experience) is fully mediated by an individual's ESE. Similarly, Densberger (2014) considered whether risk propensity is a side effect of high ESE. In 49 in-person interviews with entrepreneurs, the author concluded that high ESE allows entrepreneurs to be comfortable taking risks. Barbosa et al. (2007) took a more complex approach by considering the roles of risk preference and cognitive style on four

types of ESE and entrepreneurial intentions. Surveying 528 entrepreneurship program students in several European countries, they found that high risk-preference students hold higher levels of entrepreneurial intentions and opportunity identification efficacy.

Meanwhile, individuals with low-risk preference had higher levels of relationship efficacy and tolerance efficacy. These outcomes appear to support claims that higher risk preferences select for entrepreneurial qualities, while lower risk preferences select for managerial qualities. Researchers also consider that entrepreneurs may enter the risky world of business venturing because they over-assess their likelihood of positive returns. In a comprehensive literature review of the topic, Astebro et al. (2014) examined the re-entrepreneurial activity. Optimism refers to a general disposition toward having unrealistic beliefs in good outcomes, while Astebro et al. (2014) used Moore and Healy's (2008) framework of overconfidence as expressions of overestimation and over-placement. Overestimation refers to estimating one's abilities to be greater than they really are, while over placement refers to estimating one's abilities to be greater than they really are relative to another group. Both versions of overconfidence appear to encourage people to enter entrepreneurship at higher rates than average, and they may also encourage people to make riskier decisions. Astebro et al. (2014) pointed out that while it is often difficult to distinguish between the effects of optimism, overestimation, and over-placement, the effects psychologically operate on different levels of specificity. Optimism applies to all situations, while overestimation applies to a set of situations that reference a specific skill, and over-placement applies in a specific situation that involves a specific reference group, such as a certain market. Because of these differences, Astebro et al. (2014) asserted that it is important to understand their distinctions for effective policymaking.

Researchers measure the correlation between general optimism and entrepreneurial activity using different predictive responses to future outcomes. For example, a research question is whether entrepreneur's optimism is a good predictor overall. Shane (2009) found that entrepreneurs are generally positive in their performance estimates. Using data from the Global Entrepreneurship Monitor (GEM), Shane found entrepreneurs believe five times more often than occurs in reality that they will have at least higher sales. In contrast, Bengtsson and Ekeblom (2014) examined monthly survey data of 153 entrepreneurs and non-entrepreneurs regarding their beliefs about future nationwide economic conditions that spans 13 years. Comparing forecasts to economic reality, they noted that entrepreneurs have higher optimism about the economy, but less forecasting error.

However, the forecasting error component of this study may be inconclusive given the economic growth between 1996 and 2009 generally exceeded expectations of the

general public. Additionally, this study compares entrepreneurs to the general population, who may be less informed about economic trends than entrepreneurs whose very work requires them to consider economic conditions. The general trend appears to be that while optimistic people are more likely to enter into entrepreneurship they make riskier entrepreneurial decisions and incur greater losses to income. Puri and Robinson (2007) compared self-estimates of life expectancy from the Survey of Consumer Finance with actuarial tables. Those who overestimate their lifespan are more likely to be entrepreneurs, and the most optimistic are more likely to make high-risk financial decisions. Landier and Thesmar (2009) compared French entrepreneurs' own expectations of future income with linked panel data, and found that overconfident entrepreneurs are more likely to use short-term debt financing. Perhaps due to riskier decision-making, the optimistic entrepreneurs earn less than pessimistic entrepreneurs. Dawson et al. (2014) compared earning expectations from the household panel study from 1991 to 2008 with future earnings as an entrepreneur. Controlling for ability and environmental factors, the researchers reported that optimistic entrepreneurs earn less than pessimistic entrepreneurs, with the difference being highest at the top of the earning scale and insignificant at the bottom. Likewise, it is more difficult to find out whether forecasts stem from general optimism or overconfidence within a more specific context or a market. Åstebro et al. (2007) attempted to test apart the effects of optimism and overconfidence by comparing 820 inventor-entrepreneurs with non-entrepreneurs in Canada with two scales-the forecasting of one's score on a general knowledge test and a general belief that "good things will happen." Inventor-entrepreneurs tend to both overestimate their scores and be more optimistic. The researchers then compared measures of optimism and overconfidence with data from the Inventors' Assistance Program at the Canadian Innovation Centre that advised inventor-entrepreneurs to either end efforts or continue through with launch. While overestimation does not affect investment of time and money, optimism increases expenditures of time and money even when prospects are said to be limited. Entrepreneurs may enter competitive markets with a small chance of venture success for overestimation of their own abilities vis-à-vis competitors or because they simply enjoy competitive environments.

Camerer and Lovallo (1999) presented a scenario to university students in which pay depends on rank. When asked whether they would like to receive their rank randomly or based on performance on a trivia quiz, those with high estimations of their abilities are more likely to select the trivia quiz. Interestingly, Holm et al. (2013) used a similar approach and found that Chinese entrepreneurs are more likely to enter skill-based competitions even if they do not over place themselves, suggesting that entrepreneurs may be drawn to competition regardless of overconfidence. Bernardo and Welch (2001) describe herding behavior for entrepreneurship. In conclusion, research provides clear hypotheses why entrepreneurs are optimistic and overconfident, and, why these traits

may be of room remains for further inquiry and sharpening of results, this part of the literature is more developed and cohesive than many other areas of entrepreneurial characteristics research.

General Summary of the Research Findings

Results showed mixed results. Entrepreneurs are more open to experience, conscientious, and extraverted than the average populations while other studies revealed that entrepreneurs are less conscientious, agreeable, and extraverted. The levels of openness to experiences relate positively with the levels of entrepreneurial intention. Entrepreneurs have higher self-efficacy in innovation and risk-taking while innovativeness correlates with the Big Five personality traits. Higher ESE correlates positively with the likelihood of nascent entrepreneurs to operate and succeed in business. Extensive findings support the relationship between locus of control and innovativeness, entry, growth, and success. High need for achievement predicts entry into entrepreneurship and varies across cultures. In some studies, entrepreneurs have risk tolerance but risk-averse in other studies. There is extensive support that entrepreneurs have higher risk tolerance than managers and general populations.

However, the findings are incongruous on account of the lack of consensus on how to measure risk preferences. Studies involving students revealed that higher risk tolerance has a higher positive effect on probability of entry into the entry of entrepreneurship. Students with the greater weight of evidence that high-risk tolerance is more likely to enter entrepreneurship. Higher risk tolerant is likely to succeed and operate in innovation firms and perform better. Risk attitudes have no relationship with entrepreneurial survival. There appear to have a complex relationship between risk-taking and growth and exit choices. For MBA student's ESE fully mediates with risk propensity. Higher risk preferences hold higher levels of entrepreneurial intentions and opportunity identification. **Opportunistic individuals** are more likely to make risky entrepreneurial decisions. **Optimistic entrepreneurship** earns less than pessimistic people. Entrepreneurs are optimistic and confident but deleterious to the business.

Reference:

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