**Peer effect? An Empirical Essay on the Influence of Friends on the Entrepreneurial Intention of Students of a Brazilian Federal Institute of Technology**

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**ABSTRACT**

A key variable to explain entrepreneurial behavior is the network of relationships. However, peer effects estimation is remarkably challenging. One of the main obstacles to this estimation is the reflection problem because of the endogenous character of social relations. A proper identification of peer effects requires strategies that capture the degree of peer interaction and the direction of influence exerted by individuals. An alternative to overcome the endogeneity problem is the use of network analysis. Thus, this study applies network analysis to estimate peer effects in entrepreneurship intention using an original survey of students from a Brazilian vocational training institution. We show that being friends with an entrepreneur is associated with an increase of approximately 10 percentage points in the probability of an individual having an entrepreneurial intention, which is almost five times greater than the effect of having entrepreneurial classmates. In addition, the results indicate that males are more likely to be entrepreneurs when at least one of their peers is of the same gender. Instead, female peers had a negative effect on same-gender focal individuals.

*Key words*: Peer effect; Entrepreneurship; Instrumental Variable; Network Analysis.

**RESUMO**

Uma variável chave para explicar o comportamento empreendedor é a sua rede de relacionamentos. No entanto, a estimativa de efeitos de pares é extremamente desafiadora. Um dos principais obstáculos a essa estimação é o problema da reflexão de Manski, devido ao caráter endógeno das relações sociais. Uma identificação adequada dos efeitos de pares requer estratégias que capturem o grau de interação entre pares e a direção da influência exercida pelos indivíduos. Uma alternativa para superar o problema da endogeneidade é o uso da análise de rede. Assim, este estudo aplica a análise de redes para estimar os efeitos de pares na intenção de empreender usando uma pesquisa original de estudantes de uma instituição de formação profissional brasileira. Mostramos que ser amigo de um empreendedor está associado a um aumento de aproximadamente 10 pontos percentuais na probabilidade de um indivíduo ter uma intenção empreendedora, o que é quase cinco vezes maior do que o efeito de ter colegas de classe empreendedores. Além disso, os resultados indicam que os homens são mais propensos a serem empreendedores quando pelo menos um dos seus pares é do mesmo sexo. Já as mulheres com pares empreendedoras apresentaram uma menor intenção de empreender em relação àquelas que tinham pares empreendedores do sexo masculino.

**Palavras-chave**: Efeito dos Pares; Empreendedorismo; Variável Instrumental; Análise de Redes.

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# 1 Introduction

A key variable to explain entrepreneurial behavior is the network of relationships (Gianetti & Simonov, 2009; Hacamo & Kleiner, 2018). Through the interaction with entrepreneurs, it is possible to acquire information about new business opportunities, deal with the problem of information asymmetry in a given segment, share management techniques and obtain information about funding sources (Falck et al., 2012; Kacperczyc, 2013; Markussen & Roed, 2017). Accordingly, a series of studies sought to estimate the peer effect on entrepreneurship propensity. However, the literature is not consensual about such relationshipon entrepreneurial activity and, in addition, previous studies suffers from methodological issues.

The estimation of peer effects is remarkably challenging (Angrist, 2014). One of the main obstacles to this estimation is the reflection problem, as highlighted by Manski (1993), because of the endogenous character of social relations. From this perspective, it is not possible to distinguish whether the behavioral decision of an individual is caused by the behavior of a reference group or whether the behavior of a group is represented by the sum of the individual actions of its members. It would only be possible to distinguish these forms of interaction with access to prior information about the reference group composition and how relationships are structured.

Gianetti and Simonov (2009), Falck et al. (2012) and Kacperczyc (2013) estimated an effect on entrepreneurship propensity and found an association between peers and entrepreneurship. On the other hand, Lerner and Malmendier (2013) indicated that having entrepreneurial peers do not increase the likelihood of new business success. Instead, they found that it decreases the likelihood of opening unsuccessful businesses. Finally, some authors estimated the effect of gender on the relationship between peers in entrepreneurship. Lafortune et al. (2013), Markussen and Røed (2017) and Hacamo and Kleiner (2018) are a part of this branch of the literature that found that gender enhances the diffusion of entrepreneurial behavior among peers.

Although the issue has been studied, a proper identification of peer effects requires strategies that capture the degree of peer interaction and the direction of influence exerted by individuals. Falck et al. (2012) and Kacperczyk (2013), for example, used the educational origin of individuals as proxy to capture the relationship between pairs, considering as pairs those who belonged to the same educational institution in a given period. This strategy, however, cannot guarantee that surveyed members had actually interacted and exerted peer influence.

An alternative to overcome the endogeneity problem of estimating peer effects is the use of network analysis (Bramoullé, Djebbari, & Fortin, 2009; Goldsmith-Pinkhan & Imbens, 2013). Network analysis allows the separation of the exogenous from the endogenous effects of the social interactions, with the endogenous effect as the difference in the mean of an individual's results if the results are changed directly by its peers (Bramoullé et al., 2009; Goldsmith-Pinkham & Inbems 2011).

The present study applies network analysis to estimate peer effects in entrepreneurship intention using an original survey of students from a Brazilian vocational training institution. It contributes to the entrepreneurship literature by addressing the substantive issue of peer effect with a survey design and analysis that addresses the methodological shortcomings of previous studies. We surveyed students of the Federal Institute of Technology of Rio Grande do Norte (IFRN), located in Northeast Brazil. The sample was composed of students just below workforce age - the interviewees were students of the joint high school and vocational training program. This allows for surveying participants who have an occupational choice not yet shaped by previous work experiences (Falck et al., 2012; Kacperczyc, 2013).

Our dependent variable is the entrepreneurial intention, which was constructed as a dummy based on the Entrepreneurial Intention Index of Liñán and Chen (2009). Those who had an entrepreneurial intention higher than 7 were considered as entrepreneurs (Liñán & Chen, 2009). We performed a sensitivity analysis with the index being greater than 6 and up to 8, with similar results. We considered as pairs individuals that have a direct link in the network (neighbors). The network analysis generated two key independent variables: the variable "GeodesicEnt", which represents the shortest path between an individual and an entrepreneur in the network, and the variable "PeerEnt", that represents if the individual has at least one entrepreneurial neighbor. Our main hypothesis is that having an entrepreneurial peer positively affects an individual's propensity to become an entrepreneur (Falck et al., 2012, Kacperzyc, 2013, Markussen & Roed, 2017). Understanding this effect enriches the discussion of the driving factors of entrepreneurship. From the methodological point of view, this study contributes to the field of entrepreneurship by proposing the use of network analysis to the estimation of peer effects.

We show that being friends with an entrepreneur is associated with an increase of approximately 10 percentage points in the probability of an individual having an entrepreneurial intention, which is almost five times greater than the effect of having entrepreneurial classmates.

# 2 Theoretical Framework

The literature on peer effect and entrepreneurship can be clustered into three main themes. The first one concerns the peer effect on the propensity for entrepreneurship. This grouping includes studies such as those of Gianetti and Simonov (2009), Falck et al. (2012) and Kacperczyc (2013). The second cluster is related to the relationship between peer effect and success in entrepreneurship. This group of papers includes Obukhova et al. (2012), Lerner and Malmendier (2013) and Field, Jayachandran, Pande, and Rigol (2015). The latest trend concerns the gender perspective in the relationship between peer effect on entrepreneurship, which is composed of studies of Lafortune et al. (2013) and Markussen and Roed (2017).

Regarding the set of studies on entrepreneurial peers and business creation, Gianetti and Simonov (2009) evaluated the peer effect on the propensity of an individual to become an entrepreneur. The authors sought to identify whether a higher number of entrepreneurs residing in a neighborhood increased the likelihood of an individual becoming an entrepreneur, as well as raising the propensity to invest more capital in the business. They argued that there is a non-monetary reward in business activity, such as social status and prestige provided by the activity and the desire to start a new venture, which would increase the utility of being an entrepreneur (Cole et al., 1992). The analysis of the results shows that individuals residing in neighborhoods with a higher concentration of entrepreneurs are more likely to become entrepreneurs.

Unlike Gianetti and Simonov (2009), Falck et al. (2012) assessed the transmission of business identity through school peers. This identity (self-image perceived by the individual) is associated with a set of non-pecuniary rewards that in addition to economic factors make up the function of an individual's occupational choice. The authors argue that identity plays a vital role in an individual's entrepreneurial intention by creating a sense of social acceptance and status associated with entrepreneurial behavior, making the profession attractive not only by economic factors. To assess whether entrepreneurial peers are associated with career choice, the authors used data from the Program for International Student Assessment (PISA) (2006) from 28 countries of the OECD (Organization for Economic Co-operation and Development), and the sample consisted of 204,073 15-year-old students.

The results corroborate the evidence that the peer effect positively affects the entrepreneurial intention of the individuals. Such results are in line with Gianetti and Simonov (2009), who found similar results. In this way, the peer effect would be a catalyst for non-financial rewards, increasing the propensity for entrepreneurial activity.

Following similar argumentation, Kacperczyk (2013) analyzed the social transmission of entrepreneurial behavior through university colleagues. This study aimed to investigate whether the probability of starting a business increases by influence of classmates. The main arguments for this are the transmission of information about new business opportunities and the reduction of uncertainty associated with entrepreneurship. In this way, the entrepreneurial intention would be shaped by the social context and not by the institutional impact of the universities. The author used the Logistic Regression method with panel data. The sample consisted of 4,489 observations for the period from 1979 to 2006 and was made up of investment fund managers.

The results point to a robust social influence in the propensity for entrepreneurship. Further analysis of the results showed that social influence has a more significant effect when carried out by geographically close classmates and colleagues who have the same gender as the focal subject. Together, the results uncovered new avenues of social transmission of entrepreneurship and strengthened the evidence for the role of contextual influences in entrepreneurship training.

Such studies have demonstrated empirical evidence for the peer effect on entrepreneurship. However, one of the fragilities found is that they were considered as pairs individuals who were contemporaries in an educational institution or reside in the same region, even though they have never had any interaction.

In addition to estimating the peer effect on entrepreneurship propensity, Obukhova et al. (2012), Lerner and Malmendier (2013) and Field et al. (2015) sought to evaluate whether having entrepreneurial peers increased the probability of success in creating a new business. The authors argue that prior entrepreneurship experience could lead to sharing of management practices as well as helping new entrepreneurs validate their business ideas.

Obukhova et al. (2012) evaluated the effect of social and economic networks on the performance of startups in Beijing. To do so, the authors used OLS Regression models to compare whether repatriated entrepreneurs would perform similarly to entrepreneurs who did not work or study abroad. Based on two perspectives - institutional and networking - the results pointed out that returnee entrepreneurs performed less well than local entrepreneurs. The main reasons for this result are, first of all, a discrepancy between the institutional environments between the country of origin and the country where the individual resided, and the possibility that the repatriated entrepreneurs do not have a robust network of contacts in that country, considered an important variable in the performance of a business. Entrepreneurs who graduated in the country of origin presented a higher performance than those who graduated abroad, and this result was attributed to the formation of contact networks in the university environment. The authors reinforce the importance of the university environment in the formation of contact networks for entrepreneurs, given the possibility of obtaining information on business opportunities, access to financing sources, as well as the possibility of dealing with the asymmetric information environment of a business sector.

Lerner and Malmendier (2013) evaluated whether there was a relationship between peer effect and success in the formation of a new enterprise. The companies were classified as unsuccessful and successful. The criterion used to estimate whether a company was considered successful was whether its net annual revenue was more than one million dollars. 42% of businesses were considered to be successful. The authors used a database of Master of Business Administration students at the Harvard Business School. The sample consisted of 5,897 class alumni from 1997 to 2004.

They found a negative relationship between the proportion of students with previous experience as an entrepreneur and the rate of students without an entrepreneurial background who became entrepreneurs after graduation. However, they found a derived result that classes with a larger number of students who were already entrepreneurs formed a smaller fraction of new entrepreneurs with businesses considered to be unsuccessful. The authors attribute this result to the possibility that the peers assist in a more adequate formulation of a business idea and improvement of a business idea, or, in another perspective, help to abandon an idea that has the least potential of success in the market.

Field et al. (2015) evaluated whether the shortage of entrepreneurial peers contributes to the gender disparity observed in business success and whether there is any negative effect on women facing more restrictive social norms. The authors argued that the presence of colleagues could create a more supportive social environment, fostering the participants' business confidence, as well as awakening a sense of competitiveness and pressure to achieve better performance throughout the course. In addition, the presence of a peer could motivate the creation of new networks of contacts and, ultimately, raise the aspirations of the participants.

Thus, studies by Obukhova et al. (2012), Lerner and Malmendier (2013) and Field et al. (2015) pointed out that the effect of entrepreneurial peers not only encourages the creation of a new business but also helps the success of start-up companies.

The last group of research on peer effect and entrepreneurship was composed by the studies of Lafortune et al. (2013) and Markussen and Røed (2017). These studies pointed to the moderating nature of gender in the relationship between peer effect and business creation. Such studies point to homophily as the fostering factor of the gender in the peer effect.

Lafortune et al. (2013) estimated the peer effect in professional and entrepreneurial training programs for low-income women in Chile. The study is based on the hypothesis that clustering in similar pairs would increase the efficacy of these training programs because, according to Duflo et al. (2011), homophilic groups present better learning performance than heterogeneous groups. The authors carried out an experiment in the labor training program called *Mujer Trabajadora y Jefa de Hogar*, carried out nationally by the Chilean National Service for Women (SERNAM). The results show that, from the point of view of effectiveness (an increase of average salary and formal employment) of the training program, the pairs appeared to have no influence. However, when the propensity for entrepreneurship is estimated, the results pointed out that having entrepreneurial peers increases the probability of group members having an intention to undertake.

The other study on the role of gender was conducted by Markussen and Røed (2017). They argued that the peer effect is also an explanatory variable of gender inequality in entrepreneurial activity. The authors considered the hypothesis of homophily, as pointed out by Lindquist et al. (2015), to indicate that same-sex entrepreneurship pairs increase the propensity for entrepreneurship, given that the peer effect is motivated by inspirational models and by information sharing, factors reinforced by homophily. The results showed that entrepreneurial behavior is influenced by the existence of entrepreneurial peers in the neighborhood, at school and in the family. Notably, this influence is enhanced by individuals of the same gender, which the authors point out as one of the causes for explaining gender inequality in entrepreneurial activity.

In summary, the literature review presented studies that estimated a positive association between the peer effect and the propensity for entrepreneurship. It is noteworthy that the pairs of the educational environment were frequent in the review.

# 3 Materials and Methods

## 3.1 Data Collection and Methodological Design

As a data collection strategy, a survey was conducted to obtain information on the social interaction between individuals at the Federal Institute of Rio Grande do Norte, Campus Nova Cruz. The IFRN is a member of the Brazilian Federal Network of Professional, Scientific and Technological Education, a government institution which mainly works in technical and technological education, but with a scope that extends from basic education to doctoral programs. The network is composed of 38 Institutes, which together have 644 units in over 500 Brazilian cities.

To capture the direct interaction between classmates, an instrument composed of 47 questions was distributed to 287 students of the Technical Program in Business, Computer Science and Chemistry. Twelve high school classes – composed of at least 15 regular students – were polled. The data collection was done between February and March of 2018. The questions encompassed the dimensions "Peer Interaction," "Entrepreneurial Intention," "Personal Attitude," "Subjective Norm," "Perceived Behavioral Control," "Fear of Failure," "Risk Aversion," and "Role Models." Also, nine variables were collected on the interviewee's profile.

We performed a Confirmatory Factor Analysis to reduce the dimension of control variables scales used to measure Entrepreneurial Intention, Perceived Behavioral Control, Subjective Norms, and Financial and Psychological Risk Aversions. We considered as peers the network neighbors of the focal individual. We used network analysis to identify close ties between the members of each class. Finally, we use IV Probit and 2SLS regression models to estimate the peer effect on the entrepreneurial intention of the individuals.

Regarding the dimension of interaction between peers, the participant was asked to indicate up to five classmates that he/she judged to have a higher degree of interaction. After indicating the friends, the individual was asked to answer questions related to his/her relationship with such colleagues, including the propensity to interact with them on personal issues, career issues, and, finally, to indicate the possibility of associating with these colleagues if they wanted to start a business. The development of this dimension in the instrument was motivated by the literature gap in capturing the interaction between individuals who shared an educational environment. Some of the ways to measure these interactions were through proxies, such as that used by Kacperczyk (2013), which considered those individuals who studied at the same educational institution in a given period. However, such estimates did not allow to estimate if these individuals had some interaction.

The literature on intergenerational transmission of entrepreneurial behavior usually estimates the influence of parents and grandparents on the individual's propensity for entrepreneurship through dummy variables, assigning value 1 if the ancestor is an entrepreneur, as in Laspita et al. (2012), Lindquist et al. (2015) and Hoffmann et al. (2015). To test whether role models motivate this intergenerational transmission, we covered a range of professional inspirations relative to the focal individual's parents, grandparents, and relatives. Besides, the dimension "Role Models" also sought to estimate if the focal individual was professionally inspired by other individuals, such as friends who study at the same institution, friends who do not study at the institution and his/her teachers.

We used the parents' profession as an instrument of peer entrepreneurship (Lindquist et al., 2015, Markussen & Roed, 2017) given that the majority of the students were not legally able to start a business due to their age group. In order to cover the assumptions for the use of the instrumental variable, the career of the peers’ parents must be associated with the career choice of the pairs and should not be correlated with the error term. Falck et al (2012), Lindquist et al. (2015) and Markussen and Roed (2017) have found empirical evidence that the entrepreneurial behavior of parents is positively associated with children's choice of careers. On the exogeneity assumption, for the instrument to be valid, it is necessary to assume that students taking the same class should be more likely to interact during school hours (the exclusion restriction), which means that the entrepreneurial behavior of the parents of the peers affects the focal individual only through their peers. In this case, we assume that students don’t interact with peers’ parents on a regular basis.

To estimate the other dimensions contained in the instrument, the questionnaires of Minnitti and Nardone (2007) for the dimension "Fear of Failure" were taken into account; the questionnaire of Liñán and Chen (2009) for the dimensions "Entrepreneurial Intention," "Subjective Norm," "Perceived Behavior Control," and "Personal Attitude". The model of Liñán and Chen (2009) was used by several works, such as Shinnar et al. (2012), Kautonen et al. (2013) and Giacomin, Janssen, and Shinnar (2015); and, finally, adaptations were made to Dohmen, Falk, Huffman, Sunde, Schupp, and Wagner (2011) to estimate "Risk Aversion". This risk measurement instrument was used and validated by several studies on entrepreneurship, especially Caliendo et al. (2013) and Lönnqvist et al. (2015).

It should be noted that, in order to plot social networks of influence among individuals of a given classroom, it was necessary to establish a minimum number for the application of the instrument so that there was a greater variability of interaction loops. The criterion is that each group possessed a minimum of 15 students to attend the gathering. In total, 287 individuals from 12 classes were enrolled.

## 3.2 Variables

### 3.2.1 Dependent Variable

Our dependent variable is the Entrepreneurial Intention Index, which was constructed as a dummy based on the Entrepreneurial Intention Index of Liñán and Chen, 2009. Those who had an entrepreneurial intention higher than 7 were considered as entrepreneurs (Liñán & Chen, 2009). We performed a sensitivity analysis with the index being greater than 6 and up to 8, with similar results. We considered as pairs individuals that have a direct link in the network (neighbors). The network analysis generated two key independent variables: the variable "GeodesicEnt", which represents the shortest path between an individual and an entrepreneur in the network, and the variable "PeerEnt", that represents if the individual has at least one entrepreneurial neighbor. This study’s main hypothesis is that having an entrepreneurial peer positively affects an individual's propensity to become an entrepreneur (Falck et al., 2012, Kacperzyc, 2013, Markussen & Roed, 2017). Understanding this effect enriches the discussion of the driving factors of entrepreneurship. From the methodological point of view, this study contributes to the field of entrepreneurship by proposing the use of network analysis to the estimation of peer effects.

### 3.2.2 Variable of Interest

We developed two variables of interest in order to estimate the peer effect. The first one consists of a dummy variable, based on the construction of social networks of classrooms in the IFRN. Prior studies such as Bramoullé, Djebbari, and Fortin (2009) and Goldsmith-Pinkham and Imbens (2013) point to the possibility of using social networks as a way of estimating the peer effects. However, due to data limitations and econometric modeling, there are no studies that measure the peer effect on entrepreneurship through network analysis, which represents a methodological gap in the literature.

For the construction of the network model, each participant was asked to indicate classmates with whom he/she considers as a friend, whom they talk about career, and individuals that he/she considers to be a partner. This measure allowed us to identify whether the influence between individuals is unidirectional or bilateral since it was possible to cross-analyze the individuals' responses. As most of the students at this stage were students of the joint high school and vocational training program, they were not yet old enough to enter the job market or start a company. Thus, to overcome this limitation, the variable "Entrepreneur Parents" was used as the instrumental variable of entrepreneurship. This strategy was used by the studies of Falck et al. (2012), Lindquist et al. (2015) and Markussen and Røed (2017), presenting high consistency. The authors argue that entrepreneurial behavior is transmitted considerably by parents, whether by genetic or behavioral factors and thus can be considered a good predictor of an individual's entrepreneurial behavior. We considered as peers individuals that have a direct link in the network (neighbors). The network analysis generated two key independent variables: the variable "GeodesicEnt," which represents the shortest path between an individual and an entrepreneur in the network, and the variable "PeerEnt," that represents if the individual has at least one entrepreneurial neighbor.

### 3.2.3 Control Variables

The variables selected for control measures in this study emanated from two factors associated with entrepreneurship. Firstly, a set of variables related to the "Personal" factor was estimated, being represented by the demographic characteristics of the individuals and by their respective entrepreneurial profile characteristics. Next, we included variables related to the "Social" factor, represented by the individual's background and educational background.

The literature review pointed out that males were more prone to enterprising activity. Thus, it was expected that the male gender had a positive effect. The gender variable is a dummy variable, and its use has been assigned a value of 1 for males and 0 for the female observations.

Concerning age, prior studies such as Kautonen et al. (2014), Minola et al. (2015) and Laspita et al. (2012) report that there is a point at which the propensity for entrepreneurship is maximized. Thus, age has a concave (inverted U) effect on the propensity for entrepreneurship. To estimate the nonlinear character of the variable "Age", its quadratic term was included. Age was measured in years, being configured as a discrete quantitative variable.

Still, on the personal traits, there is evidence of positive association between cognitive abilities and the decision to become entrepreneurial, as in Baron (2003), Caliendo et al. (2011) and Hartog et al. (2010). Due to the operational difficulties of measuring abilities, we used the student's Cumulative Grade Point Average (CGPA), which was standardized by course. The expected effect is that individual skills have a positive association with the propensity to start a new venture.

The inclusion of the family background is justified by the possibility of intergenerational transmission of the entrepreneurial behavior (Colombier & Masclet, 2008, Chlosta et al., 2012, Hoffmann et al., 2015, Lasquita et al., 2012;2015; Wyrwich, 2015). Thus, to control the effects of intergenerational transmission of entrepreneurial behavior, the categorical variables "Entrepreneurial Father" and "Entrepreneurial Mother", and the interaction term "Entrepreneurs Parents" were used as controls. Also, we included the terms of interaction for "Entrepreneur Father and Son" and between "Entrepreneurial Mother and Daughter". The use of these last two terms of interaction was to identify the variation between the transmission of entrepreneurial behavior between parents and offspring of the same sex.

Concerning the educational environment, the literature review indicated that students’ courses associated with the business area had a higher propensity to start a new venture. The main argument is that such courses, as well as courses in entrepreneurship, promote skills associated with entrepreneurial behavior, such as leadership skills, business strategy, economic-financial evaluation and production management, entrepreneurship skills. Besides, information on new business and risks associated with entrepreneurship can emerge in such environments. In this way, the variable "Management" was included, representing the courses associated with this axis.

In addition to the cited variables, controls associated with the entrepreneurial behavior of individuals, such as "Personal Attitude," "Subjective Norm," "Perceived Behavior Control," "Risk Aversion" and "Fear of Failure" were included. Among this group of variables, "Personal Attitude," "Subjective Norm" and "Perceived Behavioral Control" derives from the Theory of Planned Behavior (Ajzen 1991).

"Personal Attitude" refers to a set of evaluative and affective considerations by which an individual appreciates a particular behavior (Ajzen, 2001). The form of measurement used was composed of five statements, on a scale of 1 to 10, which together represent the respective factor. It was expected a positive effect of personal attitude on entrepreneurial intention.

The "Subjective Norm" represents the social approval of a particular reference group (Ajzen, 2001). In the entrepreneurial context, it represents the level of approval to become an entrepreneur exercised by the social group in which an individual is inserted (Liñán & Chen, 2009). In order to measure this construct, we used nine questions on a scale of agreement, covering the level of appreciation of the entrepreneurial activity by relatives and friends of the focal individual. The literature review pointed to the positive effects of the subjective norm on entrepreneurial intention.

"Perceived Behavior Control" refers to the ease in performing such behavior, as well as being under control of its unfolding. In the entrepreneurial context, it is associated with the self-perception of the individual about his ability to play the role of an entrepreneur. This dimension was composed of six questions, measured in scales of 1 to 10. The previous studies have shown positive effects of the "Perceived Behavior Control" on the entrepreneurial intention.

Thus, it was expected that these three variables were positively associated with an individual's "Entrepreneurial Intentions." In addition to these, the behavior variables "Risk Aversion" and "Fear of Failure" were considered controls.

For the measurement of "Risk Aversion," the risk measures of Dohmen et al. (2010) and an adaptation of the model of Dohmen et al. (2011) were considered. The first one consists of a list of 10 decisions with two options, the first one with known probabilities and the second with a safe return. On the other hand, the second form of measurement consisted of a scale of propensity to take risks in different dimensions of life, such as in the career and practice of extreme sports. These scales were validated by several studies on entrepreneurship, such as Caliendo et al. (2012), Koudstaal et al. (2014) and Lönnqvist et al. (2015). It was decided to use several forms of "Risk Aversion" funding due to differences in the literature. Studies such as Caliendo, Fossen, and Kritikos (2010), Minnitti and Nardone (2007) and Shinnar, Giacomin and Janssen (2012) point to a negative association between "Risk Aversion" and "Entrepreneurial Intentions." Thus, it was expected that the more risk-tolerant, the more likely individuals would become entrepreneurs.

For the "Fear of Failure" estimate, it was asked whether this factor is a constraint to opening a new venture. It was expected that this variable would be negatively associated with the propensity for entrepreneurship. It is highlighted that this variable is pointed out in the literature as one of the constraint factors of female participation in the entrepreneurial activity. Thus, a term of interaction between the variables "Fear of Failure" and "Feminine Gender" was also included, so that it expects negative results of this parameter on the propensity for entrepreneurship (Minnitti & Nardone, 2007). Thus, the "Personal Factor" was composed of a set of five sociodemographic variables and five behavioral variables.

# 3.3 Descriptive Statistics

This section presents the descriptive statistics. The sample consisted of 287 students of the joint high school and vocational training program in Business Administration, Computer Science, and Chemistry. Data collection was conducted through the use of Google Forms® between February and March 2018. Twelve high school classes were enrolled which contained at least 15 regular students. Table 1 shows the descriptive statistics of the sample.

Table 1 - **Descriptive Statistics**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Variables** | **Average** | **SD** | **Min** | **Max** |
| GeodesicEnt | 1.167 | 0.793 | 0 | 4 |
| Fear of Failure | 4.404 | 2.767 | 1 | 10 |
| Role Model Father | 5.721 | 3.380 | 1 | 10 |
| Role Model Mother | 6.505 | 3.174 | 1 | 10 |
| Age | 17 | 1.137 | 14 | 21 |
| FathEnt | 0.195 | 0.397 | 0 | 1 |
| MothEnt | 0.0697 | 0.255 | 0 | 1 |
| GenderM | 0.446 | 0.498 | 0 | 1 |
| Management | 0.369 | 0.483 | 0 | 1 |
| Cumulative Grade Point Average | 75.48 | 9.086 | 43.91 | 96.72 |
| Students per Class | 25.01 | 5.61 | 17 | 37 |
| E. Intention | 0.216 | 0.412 | 0 | 1 |
| PeerEnt | 0.498 | 0.501 | 0 | 1 |
| Personal Atittude 1 | 5.930 | 2.268 | 1 | 10 |
| Personal Atittude 2 | 6.017 | 2.634 | 1 | 10 |
| Personal Atittude 3 | 7.603 | 2.529 | 1 | 10 |
| Personal Atittude 4 | 6.770 | 2.667 | 1 | 10 |
| Personal Atittude 5 | 4.857 | 2.744 | 1 | 10 |
| Perceived Behavioral Control 1 | 4.714 | 2.171 | 1 | 10 |
| Perceived Behavioral Control 2 | 4.307 | 2.344 | 1 | 10 |
| Perceived Behavioral Control 3 | 4.470 | 2.356 | 1 | 10 |
| Perceived Behavioral Control 4 | 3.941 | 2.579 | 1 | 10 |
| Perceived Behavioral Control 5 | 3.965 | 2.553 | 1 | 10 |
| Perceived Behavioral Control 6 | 5.369 | 2.224 | 1 | 10 |
| Risk Aversion (Fin) | 3.460 | 2.876 | 0 | 10 |
| Risk Aversion\_Lottery | 1.941 | 1.191 | 0 | 5 |
| Risk Aversion 1\_Career | 7.289 | 2.238 | 1 | 10 |
| Risk Aversion2\_Financing | 6.704 | 2.109 | 1 | 10 |
| Risk Aversion 3\_Sports | 6.049 | 2.835 | 1 | 10 |
| Risk Averion 4\_Strangers | 3.265 | 2.181 | 1 | 10 |

*Source:* Authors (2019).

The variable "GeodesicEnt" represents the shortest path (geodetic path) between an individual *i* in the class *j* to an entrepreneur who is part of his class. The average short path was 1.16. The largest geodesic path between an individual and an entrepreneur was 4 ties, which means that the focal individual is 3 people away until he reaches an entrepreneur.

The average age of the sample is 17 years. The youngest student was 14 years old, and the oldest was 21 years old. Approximately 44% of the students are male. Concerning the entrepreneurial activity, 21.1% of the individuals intend to be entrepreneurs in the future (EntIE). 19.5% of the respondents are offspring of an entrepreneurial father (FathEnt), and approximately 7% are the children of an entrepreneurial mother (MothEnt). It is noteworthy that these percentages also consider informal entrepreneurs. Finally, 49% of the individuals have at least one enterprising friend (neighbor in the social network of the class to which the individual is a part).

# 4 Analysis and Discussion of Results

In order to test the reliability and feasibility of the instruments, we estimated the instrumental variables as the fraction of children of entrepreneurial parents by class (% Father), the fraction of children of entrepreneurial mothers by class (% Mother), and both of them as instruments of the percentage of entrepreneurs per class. The best-fit model was the one that used entrepreneurial parents together, with a partial R² coefficient of determination of 65.24%. In addition, to test the strength of the instrument, we used the Cragg-Donald F-Statistic, in which the null hypothesis is that the instrument(s) used is(are) weak. We also performed the comparison between the Probit and IV Probit models. Regarding the variable of interest, the Average Marginal Effect of the percentage of students per class was 0.0226 in the Probit model, and 0.247 in the two-stage model (Appendix B).

Table 2 shows the average marginal effects of the two-stage Probit model (IV Probit). The dependent variable (Dummy) is measured by the entrepreneurial intent of individuals. Those who had an average entrepreneurial intention higher than 7 were considered entrepreneurs (Liñán & Chen, 2009).

Table 2 - **Average Marginal Effect IV Probit Models**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Variables** | **(1)** | **(2)** | **(3)** | **(4)** |
| **Model 1** | **Model 2** | **Model 3** | **Model 4** |
| PeerEnt | 0.103\* | 0.102\* | 0.108\* | 0.107\* |
|  | (0.0616) | (0.0619) | (0.0616) | (0.0625) |
| % EntClass | 0.0226\*\* | 0.0205\*\* | 0.0208\*\* | 0.0201\* |
|  | (0.0104) | (0.0101) | (0.0100) | (0.0104) |
| FatherEnt | 0.181\*\* | 0.179\*\* | 0.187\*\* | 0.181\*\* |
|  | (0.0739) | (0.0743) | (0.0737) | (0.0743) |
| MotherEnt | 0.187\*\* | 0.185\*\* | 0.181\*\* | 0.187\*\* |
|  | (0.0899) | (0.0904) | (0.0897) | (0.0909) |
| Factor\_ARFin | 0.0708\*\*\* | 0.0719\*\*\* | 0.0746\*\*\* | 0.0783\*\*\* |
|  | (0.0263) | (0.0264) | (0.0262) | (0.0265) |
| Factor\_ARPsi | -0.00693 | -0.00762 | -0.00772 | -0.00809 |
|  | (0.0228) | (0.0238) | (0.0238) | (0.0245) |
| Factor\_PBC | 0.0382 | 0.0364 | 0.0372 | 0.0390 |
|  | (0.0265) | (0.0264) | (0.0265) | (0.0268) |
| Factor\_SN | 0.0492\* | 0.0492\* | 0.0480\* | 0.0518\* |
|  | (0.0288) | (0.0288) | (0.0287) | (0.0290) |
| Fear of failure | 0.00233 | 0.00312 | 0.00256 | 0.00145 |
|  | (0.00917) | (0.00911) | (0.00909) | (0.00924) |
| Management | -0.0959\* | -0.0962 | -0.101\* | -0.0897 |
|  | (0.0583) | (0.0585) | (0.0582) | (0.0587) |
| CGPA | -0.00400 | -0.00455\* | -0.00440 |  |
|  | (0.00289) | (0.00273) | (0.00273) |  |
| GenderM | 0.0316 | 0.0335 |  |  |
|  | (0.0523) | (0.0525) |  |  |
| Age | 0.0140 |  |  |  |
|  | (0.0256) |  |  |  |
| **Correctly Classified** | 78,60% | 79,01% | 79,42% | 78,19% |
| **Observations** | 287 | 287 | 287 | 287 |

*Note.* Standard-errors are in parentheses*.* \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

The variable of interest "PeerEnt" shows a positive and statistically significant association with the entrepreneurial intention. In the estimates presented, being friends with an entrepreneur is associated with an increase of approximately 10 percentage points in the probability of an individual having an entrepreneurial intention.

In the first model, the variables "PeerEnt", "% EntClass", "FatherEnt", "MotherEnt", "Factor\_ARFin" and "Factor NS", are statistically significant and have positive parameters. In addition, the variable "Management" – a dummy variable which represents Business Management students - was significant at 10%, but it had a negative association with the entrepreneurial intention of the individuals in the sample.

The variable of interest "PeerEnt" is associated with an increase of approximately 10.3 percentage points in the probability of an individual to show an entrepreneurial intention. The positive variation of 1% in the "% EntClass" variable is associated with an increase of approximately 2.26 percentage points in the probability of an individual having an entrepreneurial intention. In this way, the effect of the peer (PeerEnt) is almost five times greater than the effect of having entrepreneurial classmates. These results corroborate the hypothesis of Algan, Dalvit, Do and Zenou (2018) that the effect of the pairs is enhanced by the proximity between the individuals. They studied the influence of networks of friendship on political opinion in France and showed that the friendships ties have considerably greater effect than the influence of individuals that only belong to the same group.

## **4.1 Hypothesis test of Gender Homophily**

Given the non-consensual gender effect results in entrepreneurial behavior highlighted by previous studies, this section aims to test the hypothesis of gender homophily. We estimate the effect of the pairs between individuals of the same sex. From this perspective, there would be a greater peer effect among those of the same gender (Markussen & Røed, 2017).

The Probit models have as their dependent variable the "Entrepreneurial Intention", the value 1 is assigned to those individuals with an entrepreneurial intention above 7 (Linãn & Chen, 2009). The 2SLS estimates use the mean of the entrepreneurial intention scale. Table 3 presents the estimates of peer effects by gender.

Table 3 - **Average Marginal Effect – Gender Homophily**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Variables** | **Male Effect**  **2SLS** | **Female Effect 2SLS** | **Male Effect IV Probit** | **Female Effect**  **IV Probit** |
| %EntClass | 0.0930\* | 0.0930\* | 0.119\*\* | 0.119\*\* |
|  | (0.0538) | (0.0538) | (0.0551) | (0.0551) |
| PeerEnt | 0.666\*\* | 0.666\*\* | 0.628\*\* | 0.628\*\* |
|  | (0.290) | (0.290) | (0.283) | (0.283) |
| 1.PeerEntM#1. Male | 0.997\*\* |  | 1.221\* |  |
|  | (0.498) |  | (0.672) |  |
| 1.PeerEntF#1. Female |  | -0.997\*\* |  | -1.221\* |
|  |  | (0.498) |  | (0.672) |
| FatherEnt | 1.181\*\*\* | 1.181\*\*\* | 0.792\*\* | 0.792\*\* |
|  | (0.370) | (0.370) | (0.347) | (0.347) |
| MotherEnt | 0.937\* | 0.937\* | 0.271 | 0.271 |
|  | (0.501) | (0.501) | (0.410) | (0.410) |
| Factor\_ARFin | 0.293\*\* | 0.293\*\* | 0.362\*\*\* | 0.362\*\*\* |
|  | (0.124) | (0.124) | (0.126) | (0.126) |
| Factor\_ARPsi | -0.0115 | -0.0115 | -0.0253 | -0.0253 |
|  | (0.0129) | (0.0129) | (0.109) | (0.109) |
| Factor\_PBC | 0.301\*\* | 0.301\*\* | 0.108 | 0.108 |
|  | (0.135) | (0.135) | (0.123) | (0.123) |
| Factor\_SN | 0.289\*\* | 0.289\*\* | 0.168 | 0.168 |
|  | (0.130) | (0.130) | (0.134) | (0.134) |
| Fear of Failure | 0.0104 | 0.0104 | 0.0324 | 0.0324 |
|  | (0.0451) | (0.0451) | (0.0431) | (0.0431) |
| Management | -0.507\* | -0.507\* | -0.341 | -0.341 |
|  | (0.281) | (0.281) | (0.261) | (0.261) |
| CGPA | -0.0196 | -0.0196 | -0.0111 | -0.0111 |
|  | (0.0144) | (0.0144) | (0.0138) | (0.0138) |
| Age | 0.126 | 0.126 | 0.00528 | 0.00528 |
|  | (0.126) | (0.126) | (0.125) | (0.125) |
| Constant | 5.367\* | 4.379 | -0.461 | -1.033 |
|  | (2.844) | (2.794) | (2.848) | (2.820) |
| **Observations** | 287 | 287 | 287 | 287 |
| **R²** | 0.307 | 0.307 |  |  |

*Note.* Standard-errors are in parentheses*.* \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

The results show that the interaction term between the male-to-male variable and the male variable, "PeerEntM # Male", presented a positive and statistically significant effect at 5%, with the parameter being 0.997 units higher than the effect of male peers on women. The interaction term "PeerEntF # Female", which evaluates the effect of the pairs exerted on women with female pairs, also presented a statistically significant parameter at 5%. However, the parameter showed a negative sign, indicating that those women who have entrepreneurial pairs of women are less likely to entrepreneurship than those who have male pairs. These findings are similar to the results of Hacamo and Kleiner (2018), which found negative effects on the transmission of the entrepreneurial behavior among women.

# 5 Concluding Remarks

We estimated models including the variable "PeerEnt" in order to verify if proximity among classmates would enhance the *peer effect*. We found evidence that the social transmission of entrepreneurial behavior is five times greater in the case of individuals being friends with respect to the case of individuals who only share the same classroom. In addition, the results indicate that males are more likely to be entrepreneurs when at least one of their peers is of the same gender. Female pairs had a negative effect on same-gender focal individuals, a similar result as that of Hacamo and Kleiner (2018).

Further, the influence of parents on the propensity of their offspring entrepreneurial behavior was statistically significant and positive, corroborating the hypothesis of intergenerational transmission of the entrepreneurial behavior. The control variables related to the entrepreneurial behavior and the subjective norm were also statistically significant. Therefore, individuals who are inserted in the social context in which the entrepreneurial activity is seen in a positive way present greater entrepreneurial intention, as pointed out by Krithika and Venkatachalam (2014) and Saraih et al. (2018). In addition, the lower aversion to individuals' financial risks, the higher their entrepreneurial intention, corroborating the findings of Caliendo et al. (2010), Koudstaal et al., (2014), Lönnqvist et al., (2015), Minniti and Nardone (2007) and Shinnar et al. (2012).The main theoretical contribution of this field research is that we find evidence that the social transmission of entrepreneurial behavior would be mainly caused by individuals who have close ties in a given group, corroborating the hypothesis of Algan et al. (2018). From the methodological perspective, the use of network analysis in association with instrumental variables approach to identify the peer effect allowed to overcome Manski reflection problem (1993), one of the greatest challenges in identifying the peer effect pointed out by literature.

As main limitations, it is highlighted that due to the nature of the sample, the "Entrepreneurial Intention" scale was used as the dependent variable. Although it has been validated in the literature on entrepreneurship, it is not possible to affirm that, in fact, the individuals with high entrepreneurial intention will engage in a business activity in a future time.

As avenues for future research, we suggest the longitudinal monitoring of student groups, allowing the combination between social networks and fixed effects models, thus controlling unobserved factors associated with the dynamics between individuals. In addition, it would be relevant to verify the relationship between entrepreneurial intent and the opening of a business enterprise.

# References

Ajzen, I. (1991). The theory of planned behaviour. Organizational Behaviour and Human Decision Processes, 50 (2), 179-211. 509-526. doi: 10.1016/0749-5978(91)90020-T

Ajzen, I. (2001). Nature and operation of attitudes. Annual Review of Psychology, 52(1), 27-58.

Algan, Y., Dalvit, N., Do, Q. A., & Zenou, Y. (2018). Friendship Networks and Political Opinions: A Natural Experiment among Future French Politicians. [Working Paper Political Economy Seminar] IOSS- Harvard University, Boston.

Angrist, J. D. (2014). The perils of peer effects. Labour Economics, 30, 98-108. doi: 10.1016/j.labeco.2014.05.008

Baron, Robert A. (2003). Human resource management and entrepreneurship: Some reciprocal benefits of closer links. Human Resource Management Review, 13 (2), 253-256. doi: 10.1016/S1053-4822(03)00016-0.

Bramoullé, Y., Djebbari, H., & Fortin, B. (2009). Identification of peer effects through social networks. Journal of Econometrics, 150(1), 41-55.

Burton, M. D., Sørensen, J. B., & Beckman, C. M. (2002). Coming from good stock: Career histories and new venture formation. In Social structure and organizations revisited (pp. 229-262). Emerald Group Publishing Limited.

Caliendo, M., & Kritikos, A. (2012). Searching for the entrepreneurial personality: New evidence and avenues for further research. Journal of Economic Psychology, 33 (2), 319-324.

Caliendo, M., Fossen, F., & Kritikos, A. (2010). The impact of risk attitudes on entrepreneurial survival. Journal of Economic Behavior & Organization, 76(1), 45-63.

Caliendo, M., Fossen, F., & Kritikos, A. S. (2014). Personality characteristics and the decisions to become and stay self-employed. Small Business Economics, 42(4), 787-814.

Chlosta, S., Patzelt, H., Klein, S. B., & Dormann, C. (2012). Parental role models and the decision to become self-employed: The moderating effect of personality. Small Business Economics, 38 (1), 121-138.

Colombier, N., & Masclet, D. (2008). Intergenerational correlation in self employment: some further evidence from French ECHP data. Small Business Economics, 30 (4), 423-437.

Criaco, G., Sieger, P., Wennberg, K., Chirico, F., & Minola, T. (2017). Parents’ performance in entrepreneurship as a “double-edged sword” for the intergenerational transmission of entrepreneurship. Small Business Economics, 49 (4), 841-846.

Dohmen, T., Falk, A., Huffman, D., & Sunde, U. (2010). Are risk aversion and impatience related to cognitive ability?. American Economic Review, 100 (3), 1238-60.

Dohmen, T., Falk, A., Huffman, D., Sunde, U., Schupp, J., & Wagner, G. G. (2011). Individual risk attitudes: Measurement, determinants, and behavioral consequences. Journal of the European Economic Association, 9 (3), 522-550.

Falck, O.; Heblich, S.; Luedemann, E. (2012). Identity and entrepreneurship: do school peers shape entrepreneurial intentions? Small Business Economics.39 (1), 39-59.

Field, E., Jayachandran, S., Pande, R., & Rigol, N. (2016). Friendship at work: Can peer effects catalyze female entrepreneurship? American Economic Journal: Economic Policy, 8 (2), 125-53.

Giannetti, M., & Simonov, A. (2009). Social interactions and entrepreneurial activity. Journal of Economics & Management Strategy, 18 (3), 665-709.

Goldsmith-Pinkham, P., & Imbens, G. W. (2013). Social networks and the identification of peer effects. Journal of Business & Economic Statistics, 31 (3), 253-264.

Guerrero, M., & Urbano, D. (2012). The development of an entrepreneurial university. The Journal of Technology Transfer, 37(1), 43-74.

Hacamo, I., & Kleiner, K. (2018). Updating Beliefs: Do Peers Promote or Discourage Entrepreneurship? [Working Paper Social Science Research Network] Social Science Research Network, https://papers.ssrn.com/sol3/papers.cfm?abstract\_id=3088068.

Acessed 12 may 2018.

Hartog, J., Van Praag, M., & Van Der Sluis, J. (2010). If you are so smart, why aren't you an entrepreneur? Returns to cognitive and social ability: Entrepreneurs versus employees. Journal of Economics & Management Strategy, 19 (4), 947-989.

Hoffmann, A., Junge, M., & Malchow-Møller, N. (2015). Running in the family: parental role models in entrepreneurship. Small Business Economics, 44 (1), 79-104.

Jackson, M. O. Social and Economic Networks.New Jersey: Princeton University Press, 2010.

Kacperczyk, Aleksandra J. (2013). Social Influence and Entrepreneurship: The Effect of University Peers on Entrepreneurial Entry. Organization Science.24(3), 664 -683.

Kautonen, T., Down, S., & Minniti, M. (2014). Ageing and entrepreneurial preferences. Small Business Economics, 42(3), 579-594.

Koudstaal, M., Sloof, R., & Van Praag, M. (2015). Risk, uncertainty, and entrepreneurship: Evidence from a lab-in-the-field experiment. Management Science, 62(10), 2897-2915.

Krithika, J., & Venkatachalam, D. B. (2014). A study on impact of subjective norms on entrepreneurial intention among the business students in Bangalore. IOSR Journal of Business and Management, 16(5), 48-50.

LaFortune, J., J. Tessada, and M. Perticara (2013): Are (Random) Friends Good for Business? Peer Effects in Training and Entrepreneurship Courses, Mimeo.

Laspita, S., Breugst, N., Heblich, S., & Patzelt, H. (2012). Intergenerational transmission of entrepreneurial intentions. Journal of Business Venturing, 27(4), 414-435.

Lerner, J., & Malmendier, U. (2013). With a little help from my (random) friends: Success and failure in post-business school entrepreneurship. The Review of Financial Studies, 26(10), 2411-2452.

Liñán, F., & Chen, Y. W. (2009). Development and Cross‐Cultural application of a specific instrument to measure entrepreneurial intentions. Entrepreneurship Theory and Practice, 33(3), 593-617.

Lindquist, M. J., Sol, J., & Van Praag, M. (2015). Why do entrepreneurial parents have entrepreneurial children? Journal of Labor Economics, 33(2), 269-296.

Lönnqvist, J. E., Verkasalo, M., Walkowitz, G., & Wichardt, P. C. (2015). Measuring individual risk attitudes in the lab: Task or ask? An empirical comparison. Journal of Economic Behavior & Organization, 119, 254-266.

Manski, C. F. (1993). Identification of endogenous social effects: The reflection problem. The Review of Economic Studies, 60(3), 531-542.

Markussen, S., & Røed, K. (2017). The gender gap in entrepreneurship–The role of peer effects. Journal of Economic Behavior & Organization, 134, 356-373.

Minniti, M., & Nardone, C. (2007). Being in someone else’s shoes: the role of gender in nascent entrepreneurship. Small Business Economics, 28(2), 223-238.

Minola, T., Criaco, G., & Obschonka, M. (2016). Age, culture, and self-employment motivation. Small Business Economics, 46(2), 187-213.

Obukhova, E., Wang, Y., & Li, J. (2012). The power of local networks: returnee entrepreneurs, school ties, and firm performance. In Working paper. {only that?}

Peterman, N. E., & Kennedy, J. (2003). Enterprise education: Influencing students’ perceptions of entrepreneurship. Entrepreneurship Theory and Practice, 28(2), 129-144.

Saraih, U. N., Aris, A. Z. Z., Mutalib, S. A., Ahmad, T. S. T., & Amlus, M. H. (2018). Examining The Relationships between Attitude Towards Behaviour, Subjective Norms and Entrepreneurial Intention among Engineering Students. In MATEC Web of Conferences (Vol. 150). EDP Sciences.

Shinnar, R. S., Giacomin, O., & Janssen, F. (2012). Entrepreneurial perceptions and intentions: The role of gender and culture. Entrepreneurship Theory and Practice, 36(3), 465-493.

Souitaris, V., Zerbinati, S., & Al-Laham, A. (2007). Do entrepreneurship programmes raise entrepreneurial intention of science and engineering students? The effect of learning, inspiration and resources. Journal of Business Venturing, 22(4), 566-591.

Wyrwich, M. (2015). Entrepreneurship and the intergenerational transmission of values. Small Business Economics, 45(1), 191-213.

# Appendix A – Reliability and validity of the Instrument

Table 4 - **Correlation between the instruments**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Variable** | **R²** | **R² Adjusted** | **R² Partial** | **F** | **Prob > F** |
| %EntPerClass  (%FathEnt & %MothEnt) | 0.6524 | 0.6294 | 0.5454 | 217.784 | 0.0000 |
| %EntPerClass (%FathEnt) | 0.3207 | 0.2789 | 0.1114 | 24.9022 | 0.0000 |
| %EntPerClass  (%MothEnt) | 0.6386 | 0.6165 | 0.5273 | 438.987 | 0.0000 |

Source: The authors (2019).

Table 5 - **Comparison Between the Instuments**

|  |  |  |  |
| --- | --- | --- | --- |
| **Variables** | **%FathEnt and**  **% MothEnt** | **% FathEnt** | **%MothEnt** |
| **Model 1** | **Model 2** | **Model 3** |
|  |  |  |  |
| %EntPerClass | 0.0247\*\* | 0.0209 | 0.0253\*\* |
|  | (0.0103) | (0.0159) | (0.0103) |
| FathEnt | 0.114\* | 0.115\* | 0.113\* |
|  | (0.0625) | (0.0631) | (0.0624) |
| MothEnt | 0.193\*\* | 0.199\*\* | 0.192\*\* |
|  | (0.0912) | (0.0935) | (0.0911) |
| CGPA | -0.00395 | -0.00432 | -0.00390 |
|  | (0.00292) | (0.00320) | (0.00291) |
| Age | 0.0103 | 0.00729 | 0.0109 |
|  | (0.0259) | (0.0280) | (0.0259) |
| GenderM | 0.0434 | 0.0478 | 0.0426 |
|  | (0.0526) | (0.0550) | (0.0526) |
| Management | -0.0840 | -0.0849 | -0.0834 |
|  | (0.0582) | (0.0590) | (0.0581) |
| Factor\_RSFin | 0.0700\*\*\* | 0.0713\*\*\* | 0.0697\*\*\* |
|  | (0.0265) | (0.0269) | (0.0265) |
| Factor\_RAPsy | -0.0112 | -0.0116 | -0.0112 |
|  | (0.0242) | (0.0244) | (0.0241) |
| Factor\_PBC | 0.0372 | 0.0374 | 0.0370 |
|  | (0.0266) | (0.0269) | (0.0266) |
| Factor\_SN | 0.0540\* | 0.0559\* | 0.0536\* |
|  | (0.0290) | (0.0297) | (0.0290) |
| FearofFailure | 0.00297 | 0.00313 | 0.00291 |
|  | (0.00927) | (0.00935) | (0.00925) |
| **Observations** | 287 | 287 | 287 |

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

Table 6 - **Average Marginal Effects Probit and IV Probit**

|  |  |  |
| --- | --- | --- |
| **Variables** | **Probit** | **IV Probit** |
| %EntPerClass | 0.0226\*\*\* | 0.0247\*\* |
|  | (0.00728) | (0.0103) |
| FathEnt | 0.115\* | 0.114\* |
|  | (0.0627) | (0.0625) |
| MothEnt | 0.196\*\* | 0.193\*\* |
|  | (0.0907) | (0.0912) |
| CGPA | -0.00414 | -0.00395 |
|  | (0.00285) | (0.00292) |
| Age | 0.00865 | 0.0103 |
|  | (0.0255) | (0.0259) |
| GenderM | 0.0457 | 0.0434 |
|  | (0.0522) | (0.0526) |
| Management | -0.0843 | -0.0840 |
|  | (0.0585) | (0.0582) |
| Factor\_RAFin | 0.0708\*\*\* | 0.0700\*\*\* |
|  | (0.0264) | (0.0265) |
| Factor\_RAPsy | -0.0114 | -0.0112 |
|  | (0.0243) | (0.0242) |
| Factor\_PBC | 0.0373 | 0.0372 |
|  | (0.0268) | (0.0266) |
| Factor\_SN | 0.0551\* | 0.0540\* |
|  | (0.0289) | (0.0290) |
| FearofFailure | 0.00308 | 0.00297 |
|  | (0.00931) | (0.00927) |
| **Correctly Classified** | 79.42% | 79.42% |
| **Observations** | 287 | 287 |

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

Table 7 - **2SLS Models**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | (1) | (2) | (3) | (4) |
| Variables | Model 1 | Model 2 | Model 3 | Model 4 |
|  |  |  |  |  |
| %EntPerClass | 0.100\* | 0.0744 | 0.0784 | 0.0747 |
|  | (0.0567) | (0.0533) | (0.0534) | (0.0544) |
| PeerEnt | 0.549\* | 0.521\* | 0.591\*\* | 0.553\* |
|  | (0.301) | (0.301) | (0.301) | (0.302) |
| FathEnt | 1.225\*\*\* | 1.196\*\*\* | 1.288\*\*\* | 1.225\*\*\* |
|  | (0.388) | (0.388) | (0.387) | (0.388) |
| MothEnt | 1.314\*\* | 1.285\*\* | 1.241\*\* | 1.276\*\* |
|  | (0.519) | (0.519) | (0.521) | (0.526) |
| Factor\_ARFin | 0.321\*\* | 0.325\*\* | 0.347\*\*\* | 0.366\*\*\* |
|  | (0.130) | (0.131) | (0.131) | (0.132) |
| Factor\_ARPsy | -0.0167 | -0.0184 | -0.0192 | -0.0187 |
|  | (0.0135) | (0.0134) | (0.0135) | (0.0136) |
| Factor\_PBC | 0.368\*\*\* | 0.356\*\* | 0.372\*\*\* | 0.365\*\* |
|  | (0.141) | (0.141) | (0.141) | (0.143) |
| Factor\_SN | 0.325\*\* | 0.324\*\* | 0.320\*\* | 0.334\*\* |
|  | (0.136) | (0.136) | (0.137) | (0.139) |
| FearofFailure | 0.00571 | 0.0144 | 0.00595 | -0.00183 |
|  | (0.0474) | (0.0469) | (0.0469) | (0.0472) |
| Management | -0.547\* | -0.557\* | -0.631\*\* | -0.547\* |
|  | (0.295) | (0.296) | (0.295) | (0.293) |
| CGPA | -0.0251\* | -0.0303\*\* | -0.0282\* |  |
|  | (0.0150) | (0.0144) | (0.0144) |  |
| GenderM | 0.421 | 0.448\* |  |  |
|  | (0.273) | (0.272) |  |  |
| Age | 0.151 |  |  |  |
|  | (0.131) |  |  |  |
| Constant | 4.108 | 7.206\*\*\* | 7.239\*\*\* | 5.159\*\*\* |
|  | (2.935) | (1.230) | (1.239) | (0.469) |
|  |  |  |  |  |
| Observations | 287 | 287 | 287 | 287 |
| R² | 0.235 | 0.232 | 0.223 | 0.209 |

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

Table 8 - **Average Marginal Effect – Sensitivity Analysis**

|  |  |  |  |
| --- | --- | --- | --- |
|  | (1) | (2) | (3) |
| Variables | Model IE>6 | Model IE>7 | Model IE>8 |
|  |  |  |  |
| %EntPerClass | 0.00128 | 0.0226\*\* | 0.0290\*\* |
|  | (0.0132) | (0.0104) | (0.0120) |
| PeerEnt | 0.150\*\* | 0.103\* | 0.0856\*\*\* |
|  | (0.0662) | (0.0616) | (0.0174) |
| FathEnt | 0.312\*\*\* | 0.181\*\* | 0.168\*\* |
|  | (0.0868) | (0.0739) | (0.0847) |
| MothEnt | 0.305\*\* | 0.187\*\* | 0.226\* |
|  | (0.141) | (0.0899) | (0.116) |
| Factor\_ARFin | 0.0451 | 0.0708\*\*\* | 0.0699\*\* |
|  | (0.0297) | (0.0263) | (0.0288) |
| Factor\_ARPsy | -0.00689 | -0.00693 | -0.0110 |
|  | (0.00923) | (0.0228) | (0.0276) |
| Factor\_PBC | 0.0652\*\* | 0.0382 | 0.0658\*\* |
|  | (0.0321) | (0.0265) | (0.0304) |
| Factor\_SN | 0.0385 | 0.0492\* | 0.0499 |
|  | (0.0318) | (0.0288) | (0.0318) |
| FearofFailure | -0.00902 | 0.00233 | 0.00804 |
|  | (0.0108) | (0.00917) | (0.0105) |
| Management | -0.174\*\*\* | -0.0959\* | -0.0859 |
|  | (0.0669) | (0.0583) | (0.0654) |
| CGPA | -0.00780\*\* | -0.00400 | -0.00575\* |
|  | (0.00342) | (0.00289) | (0.00332) |
| GenderM | 0.0360 | 0.0316 | 0.0518 |
|  | (0.0627) | (0.0523) | (0.0598) |
| Age | 0.0248 | 0.0140 | 0.0336 |
|  | (0.0305) | (0.0256) | (0.0289) |
|  |  |  |  |
| Observations | 287 | 287 | 297 |

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

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