

# ***Assisting Invention and Innovation as Needed: Analysis of Student's Entrepreneurial Criteria – An International Comparison***

***by Walter Ruda, Thomas A. Martin, Rubén Ascúa, and Benjamin Danko***

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*This paper comes along with the empirical project “Invention and Innovation in an International Context – Foundation and Entrepreneurship of Students” (GEST-study). It presents findings of a cross-national survey of entrepreneurial criteria of students in industrialized and developing countries within the pre-foundation process. According to a procedural reference framework and the Foundation ambition types-model the investigation aims to identify how to develop applicable entrepreneurship support programs that consider target group differentiated the situational requirements of students in Argentina and Germany as representative countries and are appropriate to assist students as well as alumni in launching and commercializing their inventions.*

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## ***Introduction***

The business environment has been pressurized noticeably and globally by the economic and financial crisis in the last months. Similarly to prior recessions the labor market condition is deteriorating remarkably (Krugman 2009). This circumstance traditionally leads to more necessity driven business start-ups (Weber 2009). By reason that the labor shortage affects especially young people processing or just having completed their education and seeking work, self-employment as vocational alternative has to be imparted particularly to this aim group (Ofstad 2008).

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In this connection, entrepreneurial education and assistance focus primarily students and academics, due to their superior generating of (fundamental) inventions and innovations—mainly in the fields of business administration, engineering, and informatics—that finally result in the creation of stable as well as qualified employment (Braukmann 2003; Koch 2002; Martin, and Ruda 2001; Uebelacker 2005). However, high potential firms—with its structure changing effects that develop new markets via product, process and service inventions and thus boost the innovative capacity—cover the least start-up fraction. Therefore, a solely effort toward heightening the start-up quantity is not able to solve this problem (Reinemann 2007).

Consequently, it is necessary to upgrade entrepreneurial education and assistance at colleges/universities so that students are capable of maturing to potential entrepreneurs and finally quest for and dare becoming self-employed. In order to accomplish this aim, it is required gaining information about the student desideratum regarding firm creation, because the students themselves are the deciders concerning their potential start-up activity.

However, the pre-foundation process as individual developing and deciding process of potential entrepreneurs (Ruda, Martin, and Danko 2008b) with its fundamental economic momentousness (Ruda, and Martin 2000; Mellewigt, and Witt 2002) is largely unexplored (Mellewigt, Schmidt, and Weller 2006). Nevertheless, the pre-foundation process usually represents the firm's decisive level of development (Ofstad 2008). According to that, gathering empirical data regarding entrepreneurial criteria of students and academics is essential in order to grasp how to enhance entrepreneurial education and support programs (Volery, and Müller 2006). Although multiple empirical results lead to the conclusion that entrepreneurial decision-making and responsibility is teach- and learnable, no accordance exists concerning the basic conception of entrepreneurship education (Gibb 2002; Volery, and Müller 2006). Educating a general entrepreneurial competence is postulated and demands a subject-oriented analysis of student requirements during the pre-foundation process. Furthermore, the design of entrepreneurial support programs—that, so far, primary are geared only towards foundation resolute students and academics—has to follow a target group differentiated transfer of entrepreneurial competencies (Braukmann 2003). Only a personally-oriented analysis about conducive and obstructive procedures within the pre-foundation process will identify how to raise foundation quantity as well as quality based on adequate entrepreneurial education and assistance.

Developed nations normally show lower foundation quotas than developing countries (Bosma, Jones, Autio, and Levie 2008). Because of exceptions lower foundation activities are not simply due to economic wealth. Necessarily otherwise existing causes can only be researched through international comparisons of entrepreneurial criteria. The paper aims highlighting, if students also show these differences and discusses implications regarding the implementation of a holistic or an individualistic conception of entrepreneurship education and assistance. This comparison focuses Germany as industrialized nation and Argentina as developing country, especially because they seem being representative in an international context (Bosma, and Harding 2007) and are categorized at least as potential technology leaders (Fukada-Parr et al. 2001). Further points (jobless rates, educational levels, researchers in R&D) also predict that students and academics in these countries—that are both categorized as high human developed—should originate above-average innovations (Watkins et al. 2007). Especially the comparatively to the other high human developed nations superior unemployment rates in Argentina and Germany anticipate upper necessity driven business foundations in these analyzed two countries.

Hence, the starting point of an international comparison of developing and developed nations regarding student entrepreneurial criteria within the pre-start-up process within these two countries can be categorized as expedient and aims the upgrading of entrepreneurial education and assistance not solely in Argentina and Germany.

## ***Research Design***

Based on existing literature and empirical studies the influencing factors within the pre-foundation process have been identified in order to develop a standardized questionnaire. The survey's methodology is related to the theoretical reference framework of Ruda, Martin, and Danko (2008a; 2009) which illustrates the basic factors that impact students' and academics' dispositions towards foundation and entrepreneurship.

The paper presents results of a large scale survey. More than 2,100 under- and postgraduated students—primarily of business administration, engineering, and informatics—at four German and four Argentine universities were questioned between 2007 and/or 2008 within lectures. Therefore, the sample includes also students with (long-time) work, managerial, and foundation experience.

## ***Descriptive Results***

In both countries students of business administration represent the biggest fraction, followed by engineering and informatics. Students between the first and third semester as well as postgraduated students are underrepresented in the Argentine sample. Whereas almost a third of the students in Germany are female, this is case for more than the half of the students in Argentina. Each samples consist mostly of students between 20 and 25 years, but altogether, the German students are older.

In reference to the *Foundation ambition types-model* of Ruda, Martin, Ascúa, and Danko (2008), in each country the *Foundation Layman* (has dealt with foundation not at all) represents circa half of the sample. The *Foundation Sensitized* (has considered foundation not yet) is included 12 percent in Germany and 18 percent in Argentina. Remarkable divergencies exist concerning the *Foundation Interested* (has already considered foundation but has not started to prepare foundation) as well as the *Foundation Preparer* (is already engaged in the foundation process). Former exist a three tenths in Germany and only about one tenth in Argentina, latter is with 13 percent typified more than two times stronger in Argentina. The *Founder* (has already founded) is represented in both samples with round five percent. Overall, students in Germany seem to show a higher foundation propensity than students in Argentina (Figure 1).

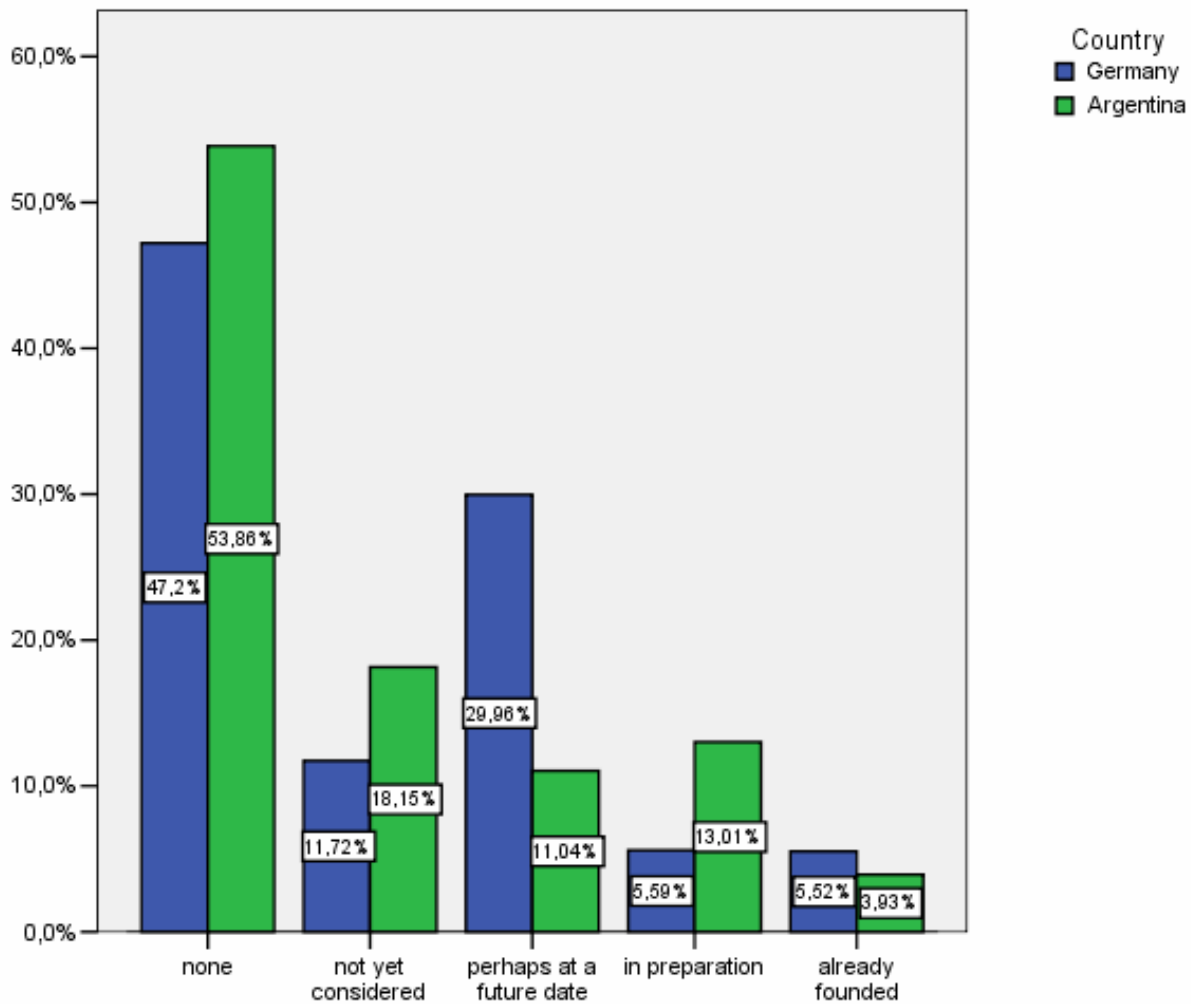
According to this, the foundation climate in the country of studying is evaluated by the students in Argentina 12 percent points worse than by the students in Germany. Argentine students show a little risk aversion, whereas German students usually are more willing to take risks. In contrast, more Argentine students have a foundation idea in mind (36 percent) than their German counterparts (32 percent). Furthermore, of the former 53 percent estimate to found in future (on average in four years), in Germany only 39 percent (averaged with four and a half years).

Concerning foundation motives, in Argentina *self-actualization* as well as *miscellaneous* tend being very relevant, in Germany only relevant to the students. *Realizing own ideas* as most important motive in Germany also is more fundamental to Argentine students. In both countries *higher income* is a relevant foundation motive, but to the students in Germany generating a *high income* is more aspired. *Autonomy*, *prestige* and *having power* are more important in Germany, whereas *flexible hours of work* are more vitally in Argentina. The *foundation motivation from economic necessity* is more relevant to German students (Figure 2).

Students in Germany usually have dealt longer with entrepreneurship than their Argentine fellow students and have used more sources of entrepreneurial information, although they are surrounded less frequently by self-employed persons in their private environment. Moreover, they have more experience in personnel management than students in Argentina so that of the latter three quarter strive for team foundations, compared to six tenths in Germany. More than a third of the Argentine students

prefer a sideline based self-employment, opposite to three tenths of their German counterparts. In Germany the students estimate needing 4.8 years of self-employed activity to be established on the market and approximately 190,000 euros as seed capital, whereas the Argentine students expect needing almost one year longer and only about 75,000 euros to start up their business. With three quarter the latter are more willing to pay for business start-up consultation, in opposite to 64 percent of the German students.

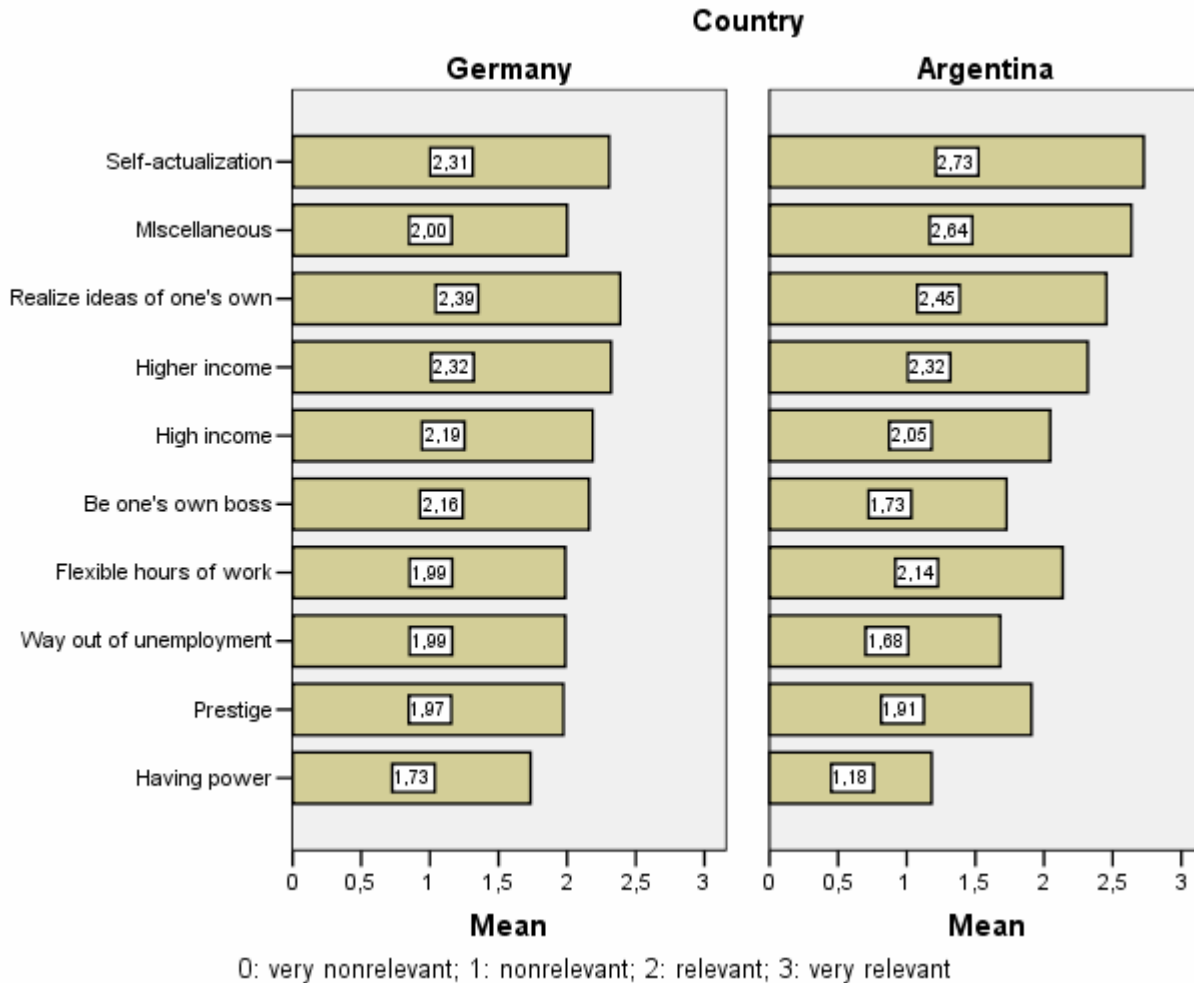
**Figure 1**  
**Extent of having dealt with foundation**



Regarding foundation difficulties, in both countries *missing equity* is evaluated as most foundation obstructive. In Argentina the *politico-economic environment* and *extensive official channels* typify being higher start-up barriers than in Germany, where in return *own financial risk* as well as *missing outside capital* and *missing customer contacts* seem to be more hindering concerning firm creation. The *cyclical state*, *low profit* and *low turnover* represent being higher foundation difficulties to the Argentine students than to their German counterparts. But in Germany students show stronger hurdles in respect of having discovered the *adequate business idea* and the *right foundation partner* than in Argentina. Furthermore, German students anticipate *fear of failure*, *missing courage* as well as *support of family and friends* as more foundation impedimental, contrary to Argentine students to whom *know-*

how deficit, missing entrepreneurial qualification and missing available time are more foundation obstructive (Figure 3).

**Figure 2**  
**Foundation motives**



With respect to desired university support, students in Argentine constantly show stronger requirements. In both countries *courses* as well as *contact courses with enterprises* are subject to the most relevant support measures, whereas *business games* and *miscellaneous* solely are more important in Argentina. German students are interested mostly in *coaching and consulting* and also in *specific contact points* that likewise are relevant to Argentine students (Figure 4).

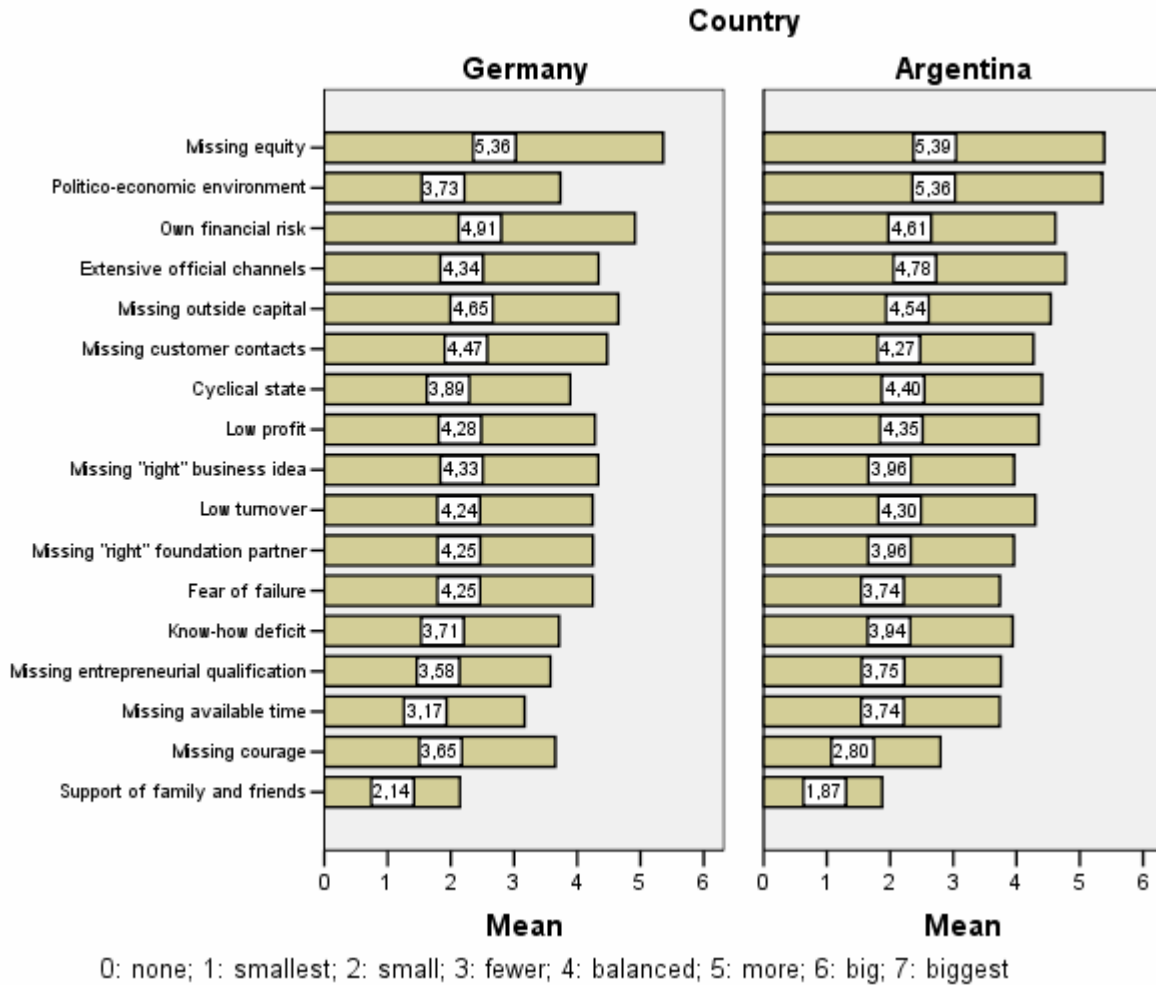
### **Hypotheses**

Referring to the Global Entrepreneurship Monitor, Argentina presents higher Early-Stage Entrepreneurial Activity Rates than Germany not only in the population between 18 and 64 years but also in the—with the samples mostly corresponding—age group between 18 and 34 years (Bosma, Jones, Autio, and Levie 2008).

Regarding the Human Development Report, Argentina shows with 10.6 percent a higher unemployment rate than Germany with 8.4 percent (Watkins et al. 2007).

In reference to Hofstede’s cultural dimensions, Argentina tends to be more collectivistic and possesses a higher uncertainty avoidance (Hofstede 2006).

**Figure 3  
Foundation Barriers**



Thus, the following hypotheses are derived:

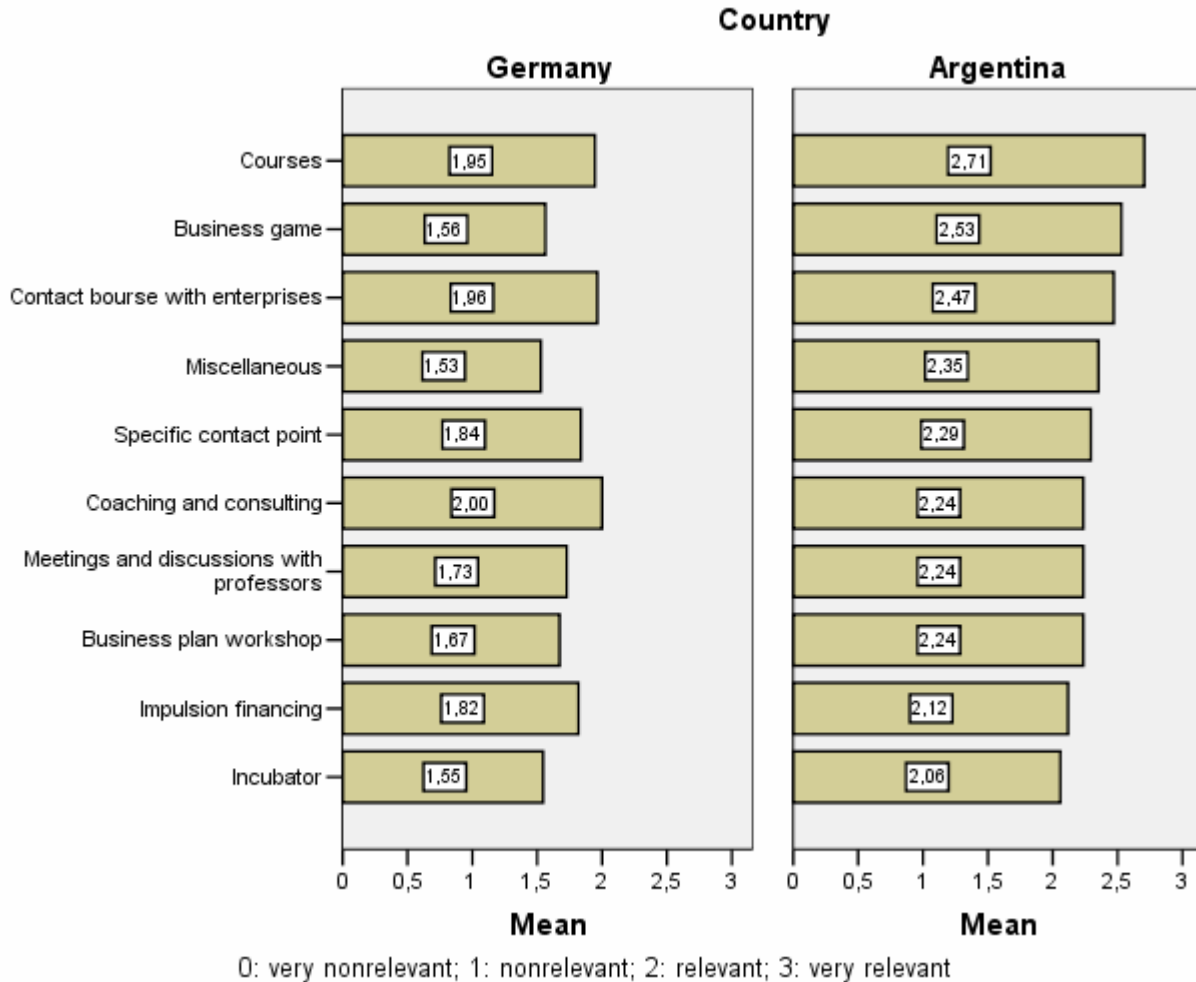
- H1: The student foundation probability differs in the analyzed countries.*
- H2: The student foundation propensity differs in the analyzed countries.*
- H3: The foundation motivation from economic necessity differs in the analyzed countries.*
- H4: The preference for team foundations differs in the analyzed countries.*
- H5: The risk propensity differs in the analyzed countries.*

Table 1 illustrates the following results of the hypotheses tests:

On the one hand students in Argentina show most significantly a stronger foundation probability than students in Germany (approving the first hypothesis), but on the other hand students in Germany represent very significantly a stronger foundation propensity than students in Argentina (confirming the second hypothesis). However, the direction of the interdependency is opposed to the expectance.

Argentine students indicate most significantly a higher foundation motivation from economic necessity than German students, affirming the third hypothesis. Because students in Argentina exhibit most significantly a stronger preference for team foundations than students in Germany, the fourth hypothesis is supported. Like assumed, German students present most significantly a higher risk propensity so that the fifth hypothesis is accepted.

**Figure 4**  
**Desired University Support**



***International Comparison of Foundation Barriers and Assistance Requirements***

This chapter analyzes significant differences between students in Argentina and students in Germany concerning foundation barriers as well as foundation assistance requirements to generate indications for the suitability for a holistic or individualistic approach regarding the target group differentiated analysis of the respective entrepreneurial criteria in order to draw conclusions in terms of an appropriate design of entrepreneurial support programs at universities.

Table 2 highlights the international comparison of foundation barriers. Referring to *missing entrepreneurial qualification, missing customer contacts, missing equity, missing outside capital, own financial risk, low turnover and low profit* no significant differences between German and Argentine students exist so that the target group differentiated analysis of these foundation barriers should be done

in a cross-national procedure. Students in Germany consider *missing “right” business ideas, missing courage, support of family and friends and fear of failure* most significantly and *missing “right” foundation partners* significantly as stronger foundation difficulties than their counterparts in Argentina. Hence, these foundation hurdles should be taken up in the target group oriented analysis in the context of the German sample. Argentine students estimate *missing available time, the politico-economic environment, the cyclical state and extensive official channels* most significantly and *know-how deficit* significantly as higher foundation restrictive. Thus, these foundation barriers are included within the aim group differentiated analysis of the Argentine sample.

**Table 1**  
**Hypotheses Tests**

Hypothesis	Spearman Correlation	Significance Level <i>p</i>
H1: The student foundation probability differs in the analyzed countries	.279	.000 (***)
H2: The student foundation propensity differs in the analyzed countries	-.066	.003 (**)
H3: The foundation motivation from economic necessity differs in the analyzed countries	.082	.000 (***)
H4: The preference for team foundations differs in the analyzed countries	.166	.000 (***)
H5: The risk propensity differs in the analyzed countries	-.109	.000 (***)

\*\*Significant at  $p \leq .01$  (very significant).

\*\*\*Significant at  $p \leq .001$  (most significant).

**Table 2**  
**International Comparison of Foundation Barriers**

Foundation Barrier	Spearman Correlation	Significance Level <i>p</i>
Missing “right” business idea	-.107	.000 (***)
Missing “right” foundation partner	-.058	.011 (*)
Missing entrepreneurial qualification	.005	.819 (ns)
Missing courage	-.186	.000 (***)
Missing available time	.086	.000 (***)
Missing customer contacts	-.014	.528 (ns)
Missing equity	.025	.271 (ns)
Missing outside capital	-.020	.390 (ns)
Know-how deficit	.048	.039 (*)
Own financial risk	-.027	.240 (ns)
Low turnover	.031	.177 (ns)
Low profit	.036	.115 (ns)
Support of family and friends	-.122	.000 (***)
Politico-economic environment	.384	.000 (***)
Cyclical state	.105	.000 (***)
Fear of failure	-.095	.000 (***)
Extensive official channels	.082	.000 (***)

ns: not significant at  $p > .05$  (not significant).

\*Significant at  $p \leq .05$  (very significant).

\*\*Significant at  $p \leq .01$  (very significant).

\*\*\*Significant at  $p \leq .001$  (most significant).

Table 3 contains the international comparison of foundation assistance requirements. In respect of

*business plan workshops, contact bourses with enterprises and meetings and discussions with professors* no significant divergencies exist, for which reason the aim group oriented analysis of these support provision follows a cross-national approach. To students in Germany *coaching and consulting* are most significantly and *specific contact points* are significantly more important than to students in Argentina. Both encouragement methods will be picked up in the aim group oriented analysis of the German sample. Argentine students demand *Courses, business games, impulsion financing and incubators* most significantly and *miscellaneous* very significantly stronger than German students. Hence, these foundation assistance are considered in the target group oriented analysis of the Argentine sample.

**Table 3**  
**International Comparison of Foundation Assistance Requirements**

Foundation Assistance Requirement	Spearman Correlation	Significance Level <i>p</i>
Courses	.431	.000 (***)
Business game	.289	.000 (***)
Business plan workshop	.028	.207 (ns)
Contact bourse with enterprises	.034	.130 (ns)
Meetings and discussions with professors	-.023	.308 (ns)
Coaching and consulting	-.089	.000 (***)
Impulsion financing	.126	.000 (***)
Specific contact point	-.044	.049 (*)
Incubator	.080	.001 (***)
Miscellaneous	.336	.002 (**)

ns: not significant at  $p > .05$  (not significant).

\*Significant at  $p \leq .05$  (very significant).

\*\*Significant at  $p \leq .01$  (very significant).

\*\*\*Significant at  $p \leq .001$  (most significant).

### ***Foundation Ambition Types Differentiated Holistic Proposals***

Corresponding to business creation, entrepreneurship education should follow a procedural and progressive character and presupposes a continuous entrepreneurial learning process of the students (Koch 2006) that satisfies the immense personal momentousness of the foundation decision. Also the development of a concrete foundation intention follows a processual character like shown in the *Foundation ambition types-model* of Ruda, Martin, Ascúa, and Danko (2008). Due to these existant diverse foundation ambition types, entrepreneurial education has to consider a necessary foundation didactical target group differentiation (Braukmann 2003).

Figure 5 highlights the foundation barriers that are investigated foundation ambition group-oriented in a cross-national approach. Both *missing entrepreneurial qualification* and *own financial risk* decline with an expanding foundation propensity, presumably because with higher entrepreneurial qualification the risk value is perceived lower. Hence, to boost student start-up activity (Argentine and German) universities are requested to impart constantly and manifoldly entrepreneurial qualification. To be enabled to create a firm equity as well as credit capital are required. With stronger foundation intention *missing equity* represents a smaller foundation hurdle. However, the relevance of *Missing outside capital* as foundation barrier rises until a concrete start-up interest exists and afterwards drops—like *missing equity*—conspicuously. With higher foundation tendency the nascent entrepreneurs seem to feel up more intensely to save or to borrow money. At this, universities could act as loan brokers. With higher developed foundation propensities the foundation difficulties regarding *missing customer*

contacts, low turnover as well as low profit decline almost constantly, that is networking support by universities could be a appropriate to encourage student entrepreneurial activity.

**Figure 5**  
**Holistic Foundation Barriers concerning Foundation Ambition Types**

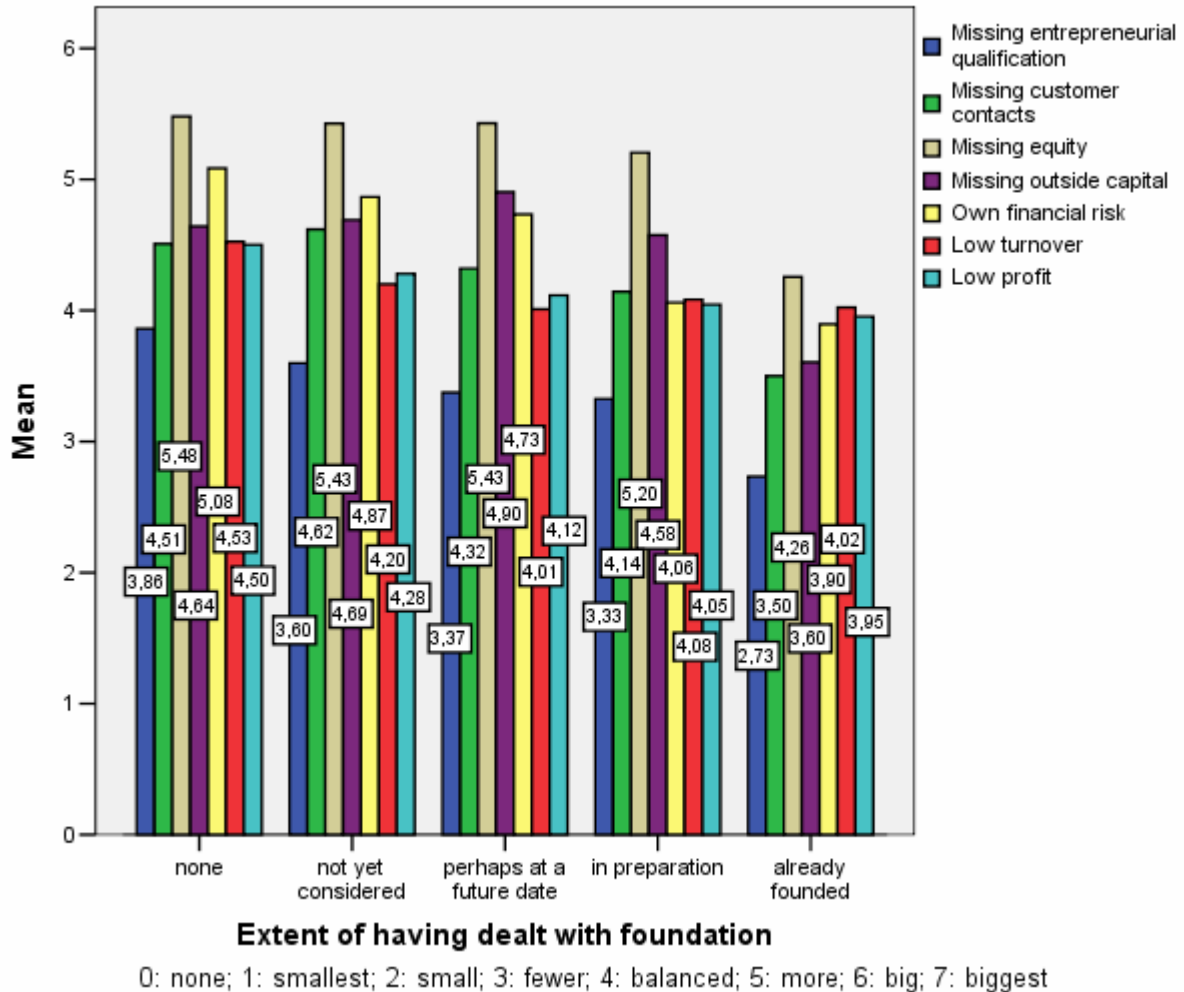
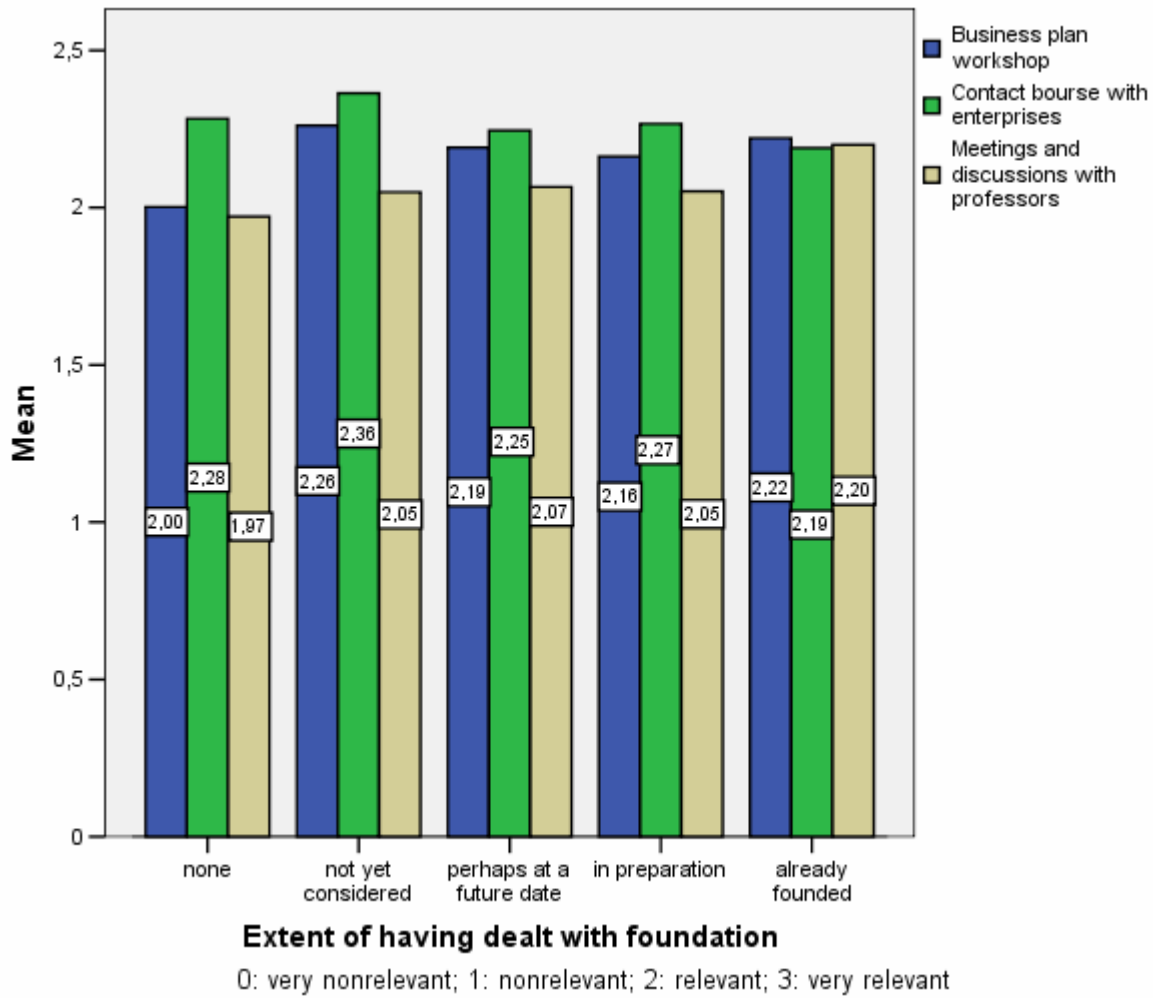


Figure 6 depicts foundation assistancies which are analyzed holistically referring to the foundation ambition types. Foundation laymen and especially foundation sensitized students attach above-average importance to *Contact bourses with enterprises*. Therefore, they should be a starting point within entrepreneurial education, in order to overview some special issues of innovative young firms. *Business plan workshops* should be implemented as integrated university support. Because of the lower relevancy to foundation laymen, it seems that to this aim group the high impact of this pivotal foundation instrument is so far unknown so that it has to be communicated to them by the Argentine as well as German universities. With higher foundation ambition the students prefer more *meetings and discussions with professors* regarding entrepreneurship. In this connection not only potential founders, but also founders as well as (foundation disposed) alumni with work experience could benefit from such an encouragement.

**Figure 6**  
**Holistic Desired University Support concerning Foundation Ambition Types**



***Foundation Ambition Types Differentiated Country-specific Proposals***

This chapter examines foundation propensity-oriented and country-specific those foundation barriers and assistance requirements that seem to be more relevant in the corresponding country than in the counterpart.

Figure 7 points out foundation ambition type differentiated the—to students in Germany—relevant foundation barriers within the German sample. Foundation laymen and even more to foundation sensitized anticipate *missing “right” business ideas* as more foundation hindering than the other foundation intention groups. Altogether, the importance of this foundation difficulty declines with advanced foundation propensity. This is also the case for *missing courage* as well as *fear of failure*. Over the years of studying students occupy themselves more intensely with their specific field so that they become more qualified to make inventions. The resulting stronger self-confidence regarding the adequacy of their generated foundation ideas causes a decrease of the estimation of *missing courage* and *fear of failure* as foundation hurdles. Hence, particularly German universities should assist student foundation creativity through a permanent confrontation with entrepreneurship in order that more inventions result in innovations. Opposite to the founder to all other foundation ambition types *missing “right” foundation partners* are constantly a much stronger foundation difficulty. So, German

universities are required to provide networking support in order to enhance team foundations. *Support of family and friends* as the lowest foundation hurdle is more relevant to the foundation interested and most important to the foundation preparers—that is in the phase in which this support is needed mostly.

**Figure 7**  
**Foundation Barriers concerning Foundation Ambition Types in Germany**

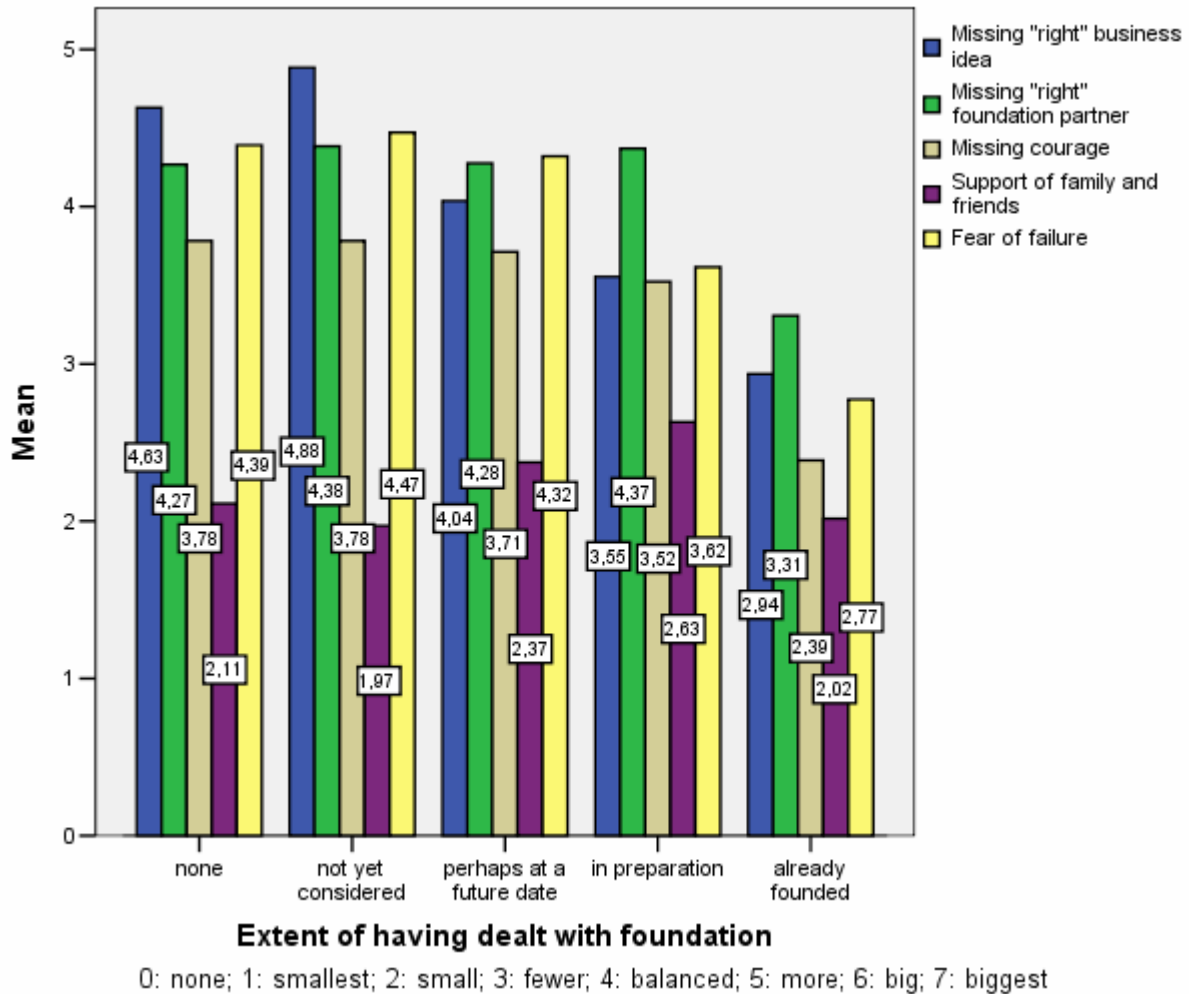


Figure 8 depicts foundation propensity grouped the—to students in Germany—decisive foundation assistance requirements within the scope of the German sample. *Coaching and consulting* as well as *specific contact points* are demanded stronger by the German students until a concrete foundation interest has been developed. However, the relevancy of these both support measures declines while preparing foundation and increases again in the foundation phase and after foundation respectively. *Specific contact points* represent particularly to founders the highest demand. Apparently, also in the foundation phase concrete open questions occur to the young entrepreneurs that should be clarified through university support in the realms of *coaching and consulting* as well as *contact points* concerning entrepreneurial issues—without neglecting alumnis whose concrete foundation intentions emerge also after several years of work experience.

**Figure 8**  
**Desired University Support concerning Foundation Ambition Types in Germany**

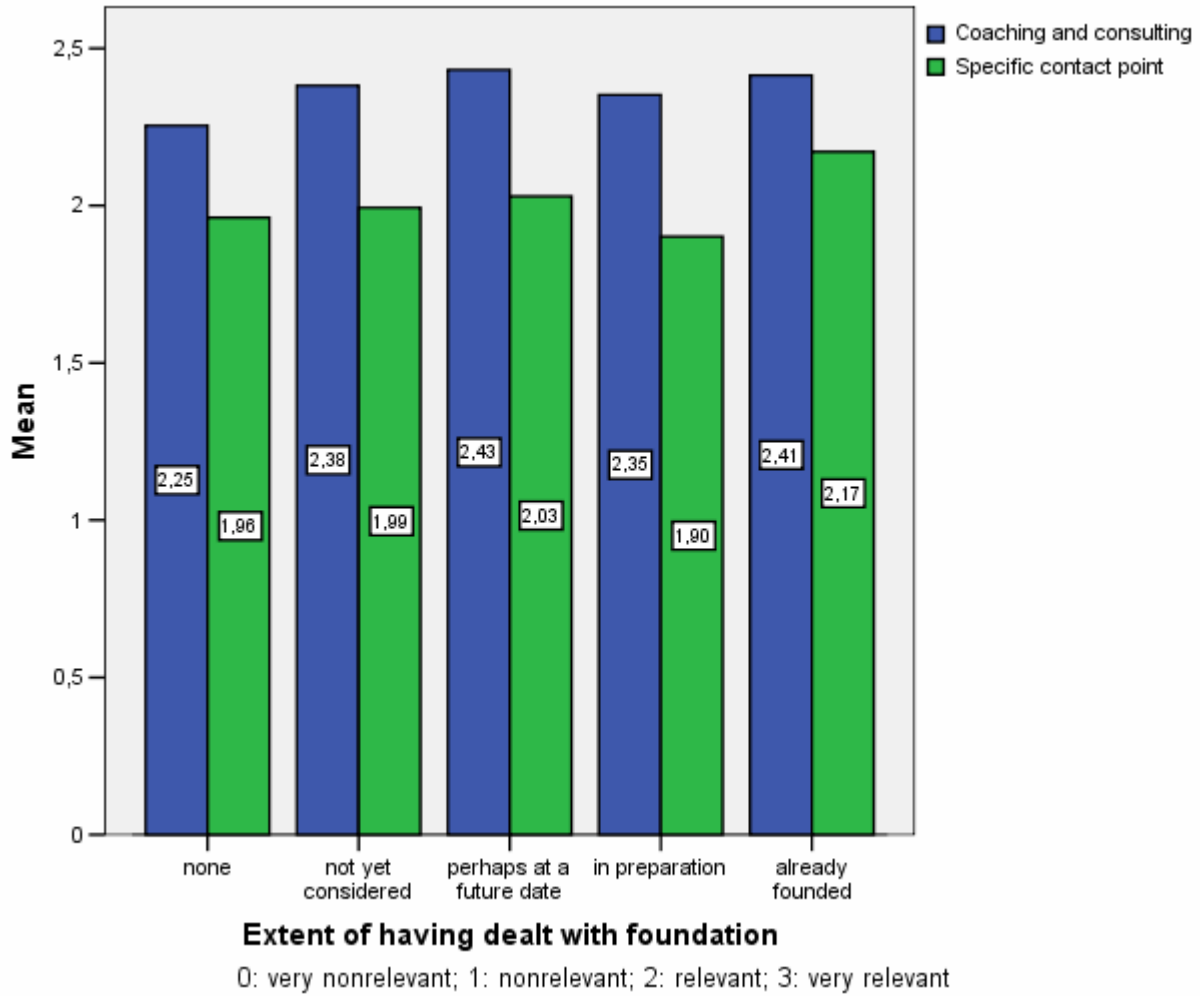
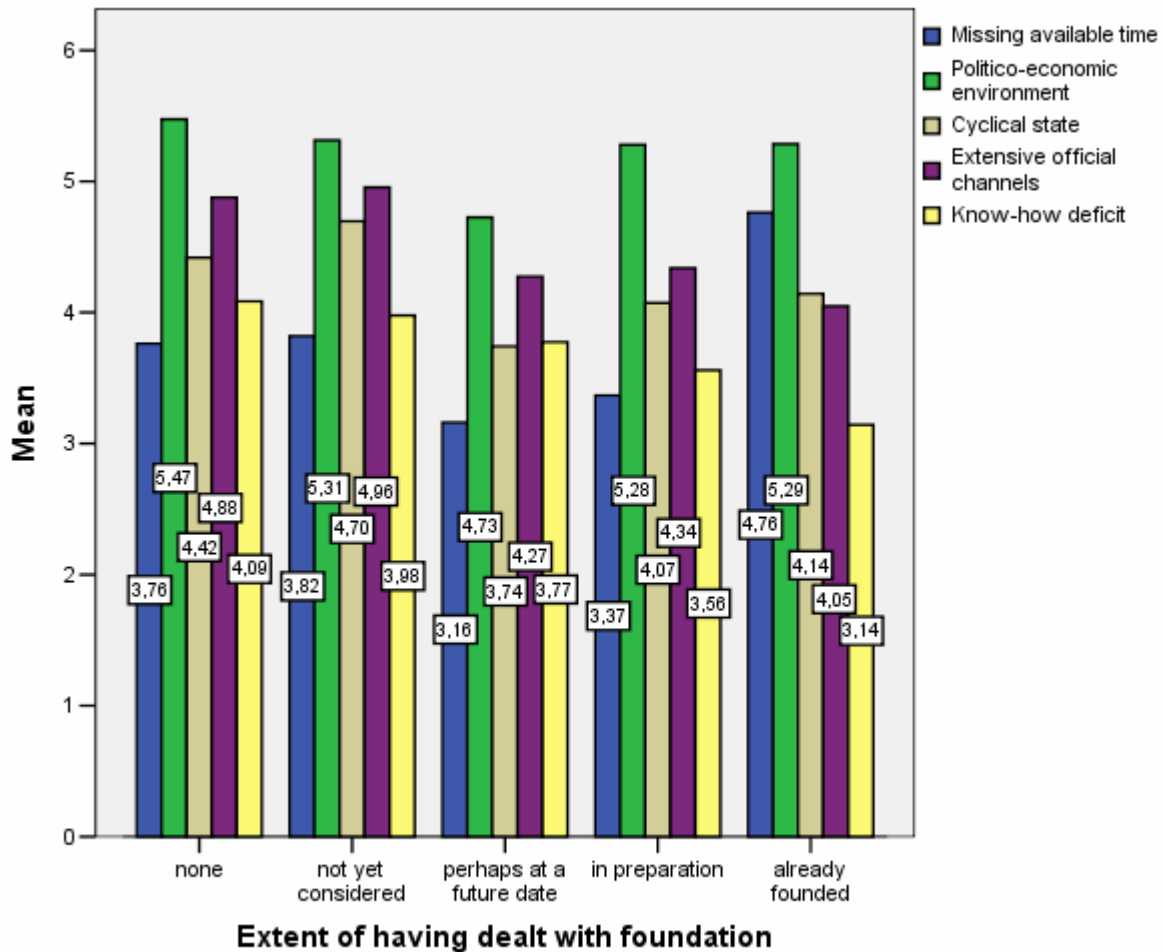


Figure 9 shows foundation tendency-oriented the—to students in Argentina—relevant foundation barriers within the Argentine sample. *Missing available time* as foundation difficulty is less important to the Argentine foundation interested and preparers, presumably because they take their time for occupying themselves with their potential entrepreneurial activity. However, to the founders this foundation hurdle is far above average, due to the fact that they also have to deal with their business activity. Along with generating a foundation interest the *politico-economic environment*, the *cyclical state* as well as *extensive official channels* become lower foundation barriers in Argentina, but in case of starting to prepare foundation these constraints climb up again. However, the estimation of *extensive official channels* as a foundation barrier declines again after foundation, by reason that the bigger part has been handled by the young entrepreneurs. In respect of the *politico-economic environment* and the *cyclical state* the Argentine economic policy is requested to take foundation beneficial actions. With a lower anticipation of *know-how deficit* as foundation difficulty Argentine students show a higher foundation ambition so that (especially commercial) knowledge transfer should be provided continuously to students by (Argentine) universities in order to assist student innovations.

**Figure 9**  
**Foundation Barriers concerning Foundation Ambition Types in Argentina**



0: none; 1: smallest; 2: small; 3: fewer; 4: balanced; 5: more; 6: big; 7: biggest

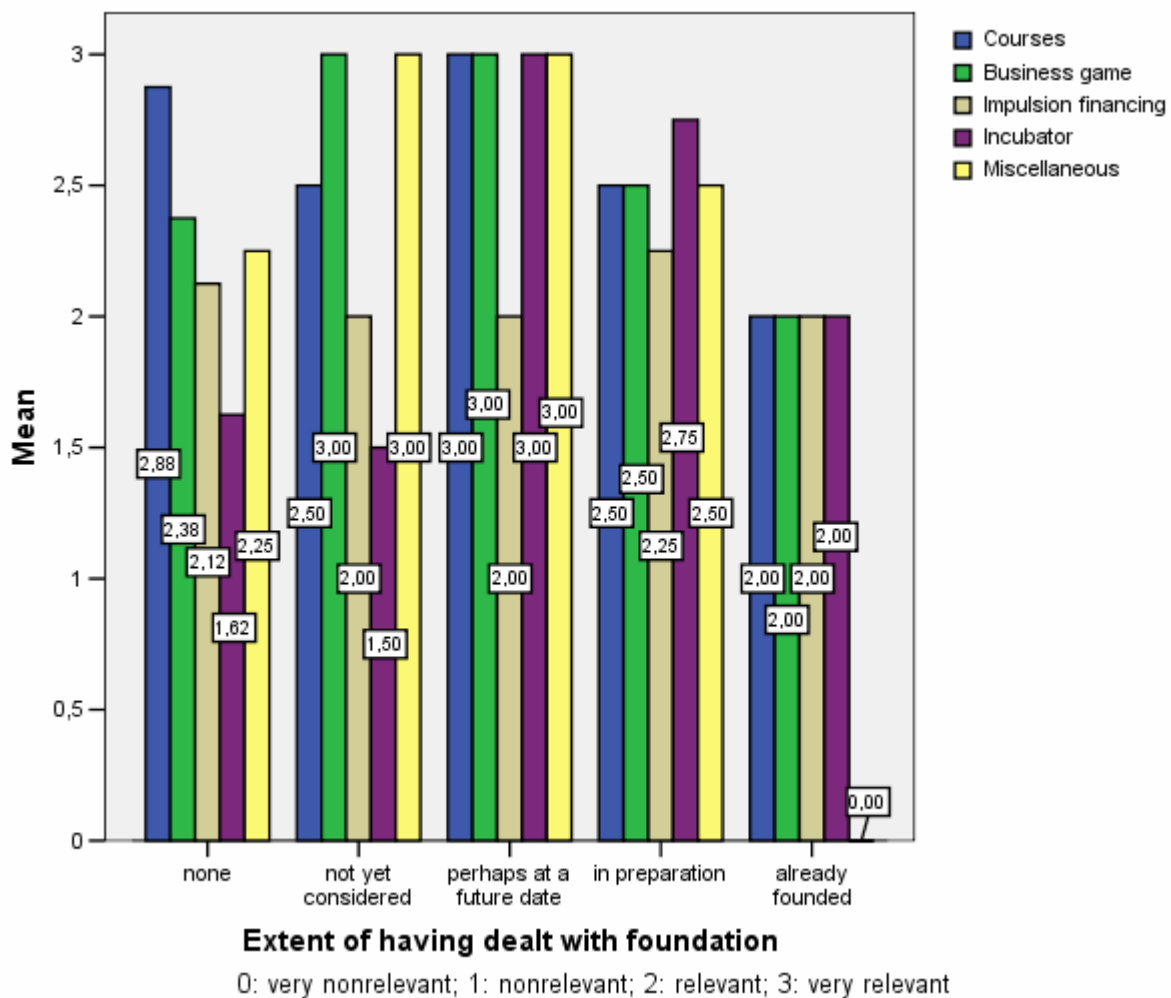
Figure 10 illustrates foundation ambition grouped the—to students in Argentina—relevant foundation assistance requirements in respect of the Argentine sample. *Courses* as entrepreneurial assistance at universities can be categorized as being essential to the Argentine students right from the start of their studying. The foundation laymen prefer this fundamental support, but it is also to the founders still relevant. *Business games* and *miscellaneous* foundation assistance should focus primarily on foundation sensitized and interested without neglecting the other foundation ambition types. As expected, an university *impulsion financing* is mainly requested by the foundation preparers to whom this supportive measure often could be pivotal in order to realize a business start-up. With an existent foundation interested students in Argentina increasingly demand *incubators* as entrepreneurial assistance which should accompany potential founders whilst their development to young entrepreneurs.

### ***Implications and Further Research Demand***

Upgrading of entrepreneurship education and foundation assistance at universities presupposes a target group oriented requirements analysis of students. Not only foundation willing students and nascent entrepreneurs but also foundation laymen and young entrepreneurs—that is students with all foundation ambition values—have to be respected by entrepreneurial support programs. In this regard,

a simple differentiation between foundation interested and uninterested students and a solely or mainly focussing on the former group is not satisfactory, considering that also foundation unsensitized students are potential entrepreneurs—possibly with seminal business ideas. Universities are requested to encourage all of their undergraduated and postgraduated students—without neglecting alumni—to entrepreneurial activity on the basis of a demand-oriented assistance that has to consider students’ entrepreneurial criteria in the context of the pre-foundation process. Students and academics as possibly founders of high potential firms need a positive entrepreneurial climate, foundation-specific basic knowledge and entrepreneurial skills as well as an appropriate infrastructure at their universities in order to launch and commercialize their inventions. Adequate entrepreneurial education and assistance has to be offered target group appropriately without neglecting alumni who often develop a concrete foundation intention after several years of work and leadership experience. Students should consider their universities—the place where they are prepared for professionalism—as competence centers and contact points regarding dependent work as well as self-employment.

**Figure 10**  
**Desired University Support concerning Foundation Ambition Types in Argentina**



Due to usually diverse entrepreneurial activities in developing and developed countries, the international comparison of Argentina and Germany regarding students’ entrepreneurial criteria

analyzes on the one hand whether also students present these different foundation quotes. On the other hand, such an empirical study seems to enable knowledge and references how to develop adequate and innovating entrepreneurship support programs both in a cross-national and country-specific approach—according to cultural and environmental situations as well as general and specific requirements.

Further continuous empirical research also in other developing as well as industrial nations is postulated in order to generate in-depth knowledge how to assist appropriately students' business creation within the scope of a global economic and financial crisis that shifts unemployed to self-employed work—a fundamental reason to establish purposive prerequisites so that students are able to develop integrated entrepreneurial competencies.

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