

# Identity and Entrepreneurship

Oliver Falck<sup>+</sup>, Stephan Heblich<sup>\*</sup>, Elke Luedemann<sup>‡</sup>

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<sup>+</sup> Ifo Institute for Economic Research, Poschingerstr. 5, D-81679 Munich (Germany), Phone: +49 89 9224 1370, Fax: +49 89 9224 1460, Email: [falck@ifo.de](mailto:falck@ifo.de), CESifo and Max Planck Institute of Economics.

<sup>\*</sup> Max Planck Institute of Economics, Entrepreneurship, Growth, and Public Policy Group, Kahlaischestr. 10, D-07745 Jena (Germany), Phone: +49 3641 686 733, Fax: +49 3641 686 710, Email: [heblich@econ.mpg.de](mailto:heblich@econ.mpg.de).

<sup>‡</sup> Ifo Institute for Economic Research, Poschingerstr. 5, D-81679 Munich (Germany), Phone: +49 89 9224 1369, Fax: +49 89 9224 1460, Email: [luedemann@ifo.de](mailto:luedemann@ifo.de)

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## Abstract

Following Akerlof and Kranton (2000), we incorporate the concept of identity into a stylized model of occupational choice and analyze whether an individual's identity affects his or her decision to become an entrepreneur. We argue that an entrepreneurial identity results from an individual's socialization, i.e., parental and peer influence and societal norms. Empirically, we apply an instrumental variables approach to PISA data and find that having an entrepreneurial peer group has a positive effect on an individual's entrepreneurial intentions. More precisely, we identify endogenous effects (Manski, 1995). Furthermore, having entrepreneurial parents increases an individual's intention to become an entrepreneur.

JEL Codes: J24; L26; Z13

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## 1. Introduction

There is a great deal of research into what motivates an individual to become an entrepreneur, taking into consideration extant conditions and institutions that either support or impede entrepreneurial intentions.<sup>1</sup> One major finding in this research is that entrepreneurs are willing to accept a lower expected income than what standard economic models of occupational choice would suggest (Evans & Leighton 1989; Hamilton 2000), suggesting that there is some type of nonpecuniary value to being an entrepreneur that, at first glance, makes little sense from a standard economic perspective. However, drawing on well-established insights from the fields of sociology and psychology, Akerlof and Kranton (2000) introduced the concept of *identity*, meaning a person's self-image, into an economic utility function. They argue that individuals earn additional utility from an identity that matches their ideals. Eventually, this nonmonetary incentive can explain occupational choices that vary from what would be optimum for a rational actor in a standard economic model.

Akerlof and Kranton (2000) present a wide range of examples where the choice of identity affects individual interactions and, hence, economic outcomes. These include gender discrimination in the workplace, the economics of poverty, social exclusion, and the household division of labor. More recently, they have extended their identity series with papers on identity and schooling (Akerlof & Kranton 2002) and identity and the economics of organization (Akerlof & Kranton 2005). They encourage further research

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<sup>1</sup> For instance, Kihlstrom and Laffont (1979) analyze occupational choice with regard to an individual's risk aversion, Lucas (1978) considers innate abilities, and Lazear (2005) stresses the importance of an individual's mix of skills. Yet others analyze the impact of external constraints (e.g., Holtz-Eakin et al.

into economics and identity and suggest two possible paths of investigation: analyzing other settings and analyzing identity over space and time.<sup>2</sup> In this paper, we choose entrepreneurship as setting and argue that identity plays an important role in explaining an individual's motivation to become an entrepreneur, with consequent effects on his or her economic future. We posit that an entrepreneurial identity is shaped by entrepreneurial parents and entrepreneurial peers.

To test our assumptions empirically, we employ PISA data and find evidence that, indeed, having entrepreneurial parents and/or entrepreneurial peers increases the likelihood that an individual will have entrepreneurial intentions. With respect to the type of peer effects, we use an instrumental variables approach to identify endogenous peer effects (Manski, 1995). Moreover, we find some evidence that the strength of this influence varies across countries. When we complement our research by looking at data from the World Value Survey, we find that this variation across countries is interrelated to some extent with the strength of family ties and the role of friends in the specific society.

The rest of the paper is organized as follows. In Section 2, we first sketch our hypothesized connection between identity and entrepreneurship. Focusing on how an entrepreneurial identity originates lays the groundwork for our idea that an individual's parents and his or her social environment will play an important role in the shaping of that identity. In Section 3, we describe our data and then, in Section 4, we set out the empirical strategy we use to test our theory of identity and entrepreneurship. Section 5

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1994; Michelacci & Silva 2007), social contacts (e.g., Bauernschuster et al. 2008; Stuart & Sorenson 2005). For an extensive overview, see Parker (2004).

<sup>2</sup> Other work based on Akerlof and Kranton's approach includes Allen (2008) and Davis (2007).

presents the results of our empirical analysis. Section 6 looks at differences between the influence of entrepreneurial peers and that of entrepreneurial parents on the intention to become an entrepreneur. Section 7 concludes.

## **2. Identity and Entrepreneurship**

### *Identity as a Contribution to Standard Economic Theory*

Although a familiar and well-developed concept in the fields of psychology and sociology, *identity*, defined as a person's sense of self, has not attracted too much interest among economists,<sup>3</sup> until Akerlof and Kranton (2000) introduced the concept to this field.<sup>4</sup> Akerlof and Kranton argue that standard economics that is based on the concept of methodological individualism mainly concentrates on maximizing given objective functions of individual or collective agents, such as consumers or firms. In this setup, all individuals are aware of their own motivations and then maximize their utility or profits independently of each other. However, an individual's utility actually might not be determined exclusively by individual considerations but also influenced by social desirability considerations, i.e., by an individual's view of *who he or she is* and what the individual and others *should* or *should not* do to live up to this ideal concept of the self. In consequence, norms and prescriptions arise endogenously from social interaction and then affect individual behavior. Therefore, overall outcomes are likely to differ from what is predicted by models based on methodological individualism because "norms of

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<sup>3</sup> "Because of its explanatory power, numerous scholars in psychology, sociology, political science, anthropology, and history have adopted identity as a central concept. This paper shows how identity can be brought into economic analysis, allowing a new view of many economic problems" (Akerlof & Kranton 2000: 716).

<sup>4</sup> An exemption is the work by Sen (1977).

appropriate and inappropriate behavior differ across space and time” (Akerlof & Kranton 2005: 12).

People’s interactions usually produce externalities that affect movement toward socially beneficial equilibria. Hence, how an individual’s utility depends on the utility or the actions of others must be taken into consideration when investigating individuals’ true motivation. To account for that, Akerlof and Kranton (2000) introduce a modified utility function that considers identity as a motivation for behavior. In this utility function, identity arises from assignment to social categories. When maximizing their utility, individuals strive to live up to their ideal, which might be someone they know or even an imaginary person possessed of desirable characteristics. An obvious example of an ideal is the founder or prophet of the religion one believes in, but an ideal could also be an outstanding scientist like Einstein, a successful businessperson, or simply a “good” parent. For the individual, the ideal combines one or a set of characteristics a person would like to emulate and failing to do so can result in feelings of shame and other distress. In economic terms, the individual suffers a loss in utility that depends on the distance of his or her behavior from that of the self-chosen ideal. And as the interpretation of an ideal and the corresponding identity-based utility is also affected by an individual’s environment and other’s actions, identity formation is a dynamic process in which choice of identity also and of necessity affects economic decisions and thus should be taken into account.

Akerlof and Kranton’s (2000) concept of identity is a further development of Akerlof’s (1997) initial contribution on social distance and social decisions. Extending previous work by Becker (1991) and Becker and Murphy (1993), Akerlof (1997) points out that

social decisions differ categorically from conventional economic decisions because “social decisions have social consequences whereas economic decisions do not. While my network of friends and relatives are not affected in the least by my choice between apples and oranges, they will be affected by my educational aspirations, my attitudes and practices toward racial discrimination, my childbearing activities, my marriage or divorce, and my involvement in drugs” (Akerlof 1997: 1006).

To capture these externalities, Akerlof (1997) presents two models: people either try to increase social distance (status seeking) or align themselves more closely (conformist behavior) with certain social categories. Akerlof then analyzes how these motivations affect movement toward socially beneficial equilibria. In this framework, social categories are exogenously given. However, social categories really do not just burst into being full-blown, but arise endogenously through feedback loops, such as when one person’s actions have meaning for and evoke responses in others (Manski 1995). This more sophisticated view of social categories is a more recent development (Akerlof and Kranton 2000) and is the basis for our analysis.

### *Identity and Entrepreneurship*

One area where the influence of identity on behavior and economic outcomes is likely to provide additional explanatory power is the field of entrepreneurship. Research in this field owes a large debt to the seminal contributions of Schumpeter (1912) and Knight (1921), which, when taken together, comprise an entrepreneur’s most essential attributes: innovativeness, opportunity recognition, and acceptance of a certain degree of risk (Baumol 1968). In a nutshell, Schumpeter sees the independent entrepreneur as the

ultimate source of economic development by being the one who recognizes the potential of an invention and introduces it to the market. By innovating, the entrepreneur initiates a process of creative destruction in which the new constantly replaces the old. With time, this ongoing crowding-out process guarantees that resources are shifted to the most productive sectors. As to what drives the entrepreneurial spirit, Schumpeter rather romantically describes it as “the will to conquer,” “the dream and the will to found a private kingdom,” and “the joy of creating, of getting things done” (1912: 93).

From a standard economic perspective, the Schumpeterian motivation for entrepreneurial action—conquering, founding, and creating—that helps the entrepreneur to overcome Knightian (1921) uncertainty inherent in the endeavor seems rather lyrical than theory driven. Arrow (1962) provides some weightier economic reasoning when he argues that, under uncertainty, information becomes a commodity with economic value, implying that those individuals who find a way to overcome uncertainty can appropriate a pioneer rent that is in itself an incentive to engage in entrepreneurial action (Kanbur & Ravi 1990; Hamilton 2000). However true this may be, it still does not answer the crucial question of why some people manage to overcome uncertainty better and more successfully than others, that is: Why are some people more entrepreneurial than others? We argue that the concept of identity can help answer this question.

The answer cannot be found in a purely economic environment, however, but will need to be looked for in an interdisciplinary arena. On the supra-individual level, the quest leads us to sociological network theory, which stresses the importance of social embeddedness (Coleman 1988; Granovetter 1985; Hayek 1937). According to this theory, social networks provide access to information that makes the future more predictable and thus

decreases uncertainty (cf. Bauernschuster et al. 2008; Sanders & Nee 1996; Stuart & Sorenson 2005). On the individual level, we need to look to the emerging field of behavioral economics where psychology comes into play (Kahneman & Tversky, 1979).<sup>5</sup> According to this field, many factors, including optimism, self-assessment, autonomy, and overall job satisfaction, influence the ideal that an individual will try to live up to (cf. Camerer & Lovallo 1999; Wu & Knott 2006). Thus, choosing an entrepreneurial identity means that an individual mentally frames certain situations as being entrepreneurial and then adjusts his or her behavior accordingly. The individual tries to live up to, or emulate, a real or imagined character, for example, Bill Gates or the Schumpeterian Entrepreneur, who is a personification of the entrepreneur he or she would like to be. Consequently, the would-be entrepreneur suffers a loss in utility if his or her behavior strays from this ideal, thus determining the individual's situation-dependent utility (Kahneman & Tversky 1979).

#### *A Stylized Occupational Choice Model with Identity*

To formally integrate identity into the entrepreneurship decision, let us consider the standard occupational choice model initially introduced by Kilstrom and Laffont (1979). In the simplest form of this model, potential entrepreneurs  $E$  choose between starting a business, thereby earning a random income  $\tilde{y}_E$ , or being dependently employed  $D$  and earning a given income  $y_D$ . Given his or her individual risk aversion, the potential entrepreneur will start and run a business as long as the expected utility from future

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<sup>5</sup> Note in this regard that there is a growing literature on entrepreneurial behavior in the field of strategic management research that focuses on entrepreneurial behavior from a psychological perspective. See, e.g., Baron (1998) and Mitchell and Shepherd (2008).

profits and entrepreneurial work effort  $e_E$  exceeds the utility from future earnings from dependent employment and the corresponding work effort  $e_D$  :

$$Eu(\tilde{y}_E, e_E) \geq u(y_D, e_D) \quad (1).$$

This occupational choice model incorporates the standard utility a worker receives from income and work effort in the respective occupation at a given level of risk aversion. However, according to Akerlof and Kranton (2000), an individual's utility might very well also be influenced by whether or not the occupation matches the individual's self-image.

To integrate this possibility into the model, we employ a parsimonious utility function, similar to the one presented in Akerlof and Kranton (2005), that incorporates an identity element into the standard economic utility function. Accordingly, the identity utility from working in occupation category  $c$  with  $c = \{E; D\}$  may be summarized as

$$u(y; e; c) = \ln y_c - e_c + I_c \quad (2),$$

where  $y_c$  is the individual's income from having an occupation in category  $c$ . Utility from income is captured by  $\ln y_c$ , which satisfies the standard assumption of increasing utility with increasing in income given a risk-averse individual. Moreover,  $e_c$  is the effort level required for the occupation and  $I_c$  is the identity-related utility an individual gains from working in his or her ideal occupation.

Thus, an individual who regards herself as an entrepreneur  $E$  and has chosen to be an entrepreneur will have the identity utility  $I_E$  and choose an effort level  $e_E$  in the

entrepreneurial occupation. This perceived entrepreneurial identity makes some individuals feel that they can never work hard enough to succeed—indeed, there is an old saying to the effect that being an entrepreneur means getting to choose which 24 hours of the day one works. At the same time, this never-ending task and the inherent risk of failure might scare some others, thereby leading to a loss of identity utility. This was the case if the choice of becoming an entrepreneur is not so much a choice as an obligation, for example, a person forced to take over the family business, even though the person would prefer a nine-to-five job working for someone else. This person is perceived by others as an entrepreneur and, indeed, acts as one, but has never viewed such a situation as ideal for him- or herself. By contrast, an individual who regards herself as being an entrepreneur but works as a dependent employee suffers from not having ideal utility  $I_E$  and will choose an effort level  $e_D$  that is necessary to meet given requirements, but is not necessarily the amount of effort she would expend,  $e_E$ , if engaged in her ideal entrepreneurial occupation such that  $e_D \leq e_E$ .

Integrating the extended utility function of Equation (2) into the occupational choice Equation (1) yields a simple model of occupational choice that considers both the economic and identity components of an individual's utility. Accordingly, a person with an entrepreneurial identity will choose to become an entrepreneur if

$$\sum_{i=1}^N (p_i \ln y_{iE}) - e_E \geq \ln y_D - e_D - I_E \quad (3),$$

where  $\sum_{i=1}^N (p_i \ln y_{iE})$  captures the expected entrepreneurial income in a discrete formulation with N possible outcomes, each occurring with a probability  $p_i$ .  $I_E$  captures the identity utility from being an entrepreneur and  $e_E$  is the ideal effort expended as an entrepreneur. Therefore, an individual would choose to be an entrepreneur even though it means both a lower income and more effort if the ideal utility from being an entrepreneur is high enough, i.e., exceeds the utility from working as a dependent employee at a given wage  $y_D$  and effort  $e_D$ . The utility derived from living up to one's entrepreneurial ideal goes much farther toward explaining the decision to become an entrepreneur than that provided by Schumpeter's more romantic "will to conquer" (1912: 93).

#### *The Transmission of an Entrepreneurial Identity*

According to Schumpeter, the entrepreneur is the driver of innovation and change in an economic system.<sup>6</sup> Accordingly, there is a keen interest into the question of how best to develop and educate entrepreneurs. It is nearly standard practice now for business schools to offer entrepreneurship courses, in which students learn how to write business plans, meet successful entrepreneurs who tell their powerful and attractive success stories, and also often receive individual-level technical advice and assistance in starting up a business.<sup>7</sup> However, having an entrepreneurial identity, as we define it in this paper, is

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<sup>6</sup> See Baumol (1968) and, for a formal integration of Schumpeter's ideas into economic (growth) theory, Aghion and Howitt (1992).

<sup>7</sup> See Kuratko (2005) for further details about the emergence of entrepreneurship education. See also the European Commission's (2006) report on "Entrepreneurship Education in Europe" and Oosterbeek et al. (2008) for an empirical attempt to evaluate the impact of entrepreneurship education.

not something that can be taught.<sup>8</sup> students can be taught specific practices and techniques, but they cannot be schooled in the famous “will to conquer.” This essential attribute of entrepreneurship is more likely to develop out of a person’s background and experience.<sup>9</sup>

Economic research on what factors drive the formation of cognitive and non-cognitive skills usually adopts a life-cycle perspective, and stresses the important influence of experiences during early childhood years (cf. Heckman 2006; Cunha and Heckman 2007)<sup>10</sup>. The reasoning for why early childhood experiences have proven so important is that later investments in skills build on foundations that are laid down earlier. The fact that young children spend most of their time with their parents can help explain the strong impact of parental background on educational attainment and student performance we observe across countries all over the world (e.g. OECD 2007a, b). Considering that identity, along with various skills, is taught by parents and in school (cf. Akerlof & Kranton 2005: 12), it seems plausible to assume that an entrepreneurially-inclined identity is similarly learned, that is, since an individual’s parents are his or her initial role models and thus have a seminal influence on the child’s self-image across the lifespan, if the parents are entrepreneurial, it is quite possible that their child will choose that sort of identity also (cf. Bandura 1977).<sup>11</sup> This view is also in line with the labor economic

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<sup>8</sup> In support of this statement, note that Oosterbeek et al. (2008) find that a leading entrepreneurship education program has no effect on college students’ intention to become an entrepreneur. Their empirical analysis is based on difference-in-differences methodology.

<sup>9</sup> “The power of example to activate and channel behavior has been abundantly documented. ... One can get people to ... converse on particular topics, to be inquisitive or passive, to think innovatively or conventionally, and to engage in almost any course or action by having such conduct exemplified” (Bandura 1986: 206).

<sup>10</sup> However, it is important to note that independent research from the fields of developmental psychology and neuroscience emphasizes the role of early childhood experiences as well (cf. Heckman, 2006).

<sup>11</sup> This assumption is also in line with findings by the Harvard Center for Entrepreneurial History. Miller (1952) and also Neu and Gregory (1952) both find that the most influencing business men during in the

literature on intergenerational transmission of labor market outcomes, i.e., income (cf. Solon 1999). Thereby, Björklund et al. (2007) emphasize that both nature and nurture are at play in the intergenerational transmission of socioeconomic status.

Once entered, the informal school environment, with its various social categories and expectations (e.g., nerds, jocks, or burnouts as described in Coleman 1961), along with the formal school philosophy geared toward producing “certain types of human beings” (Bloom 1987: 26) are additional critical influences on the development of identity.<sup>12</sup> Based on interviews, Eckert (1995) for example found that the jocks’ lives lie between the boundaries of the school and its extracurricular activities. This suggests that the influence of peers at school is more pronounced than neighborhood effects. It is largely how well one does at school, academically or socially, that determines one’s future occupation and, thus, taken to its logical extreme, the welfare of all society. Therefore, we follow this line of reasoning and assume that the initial influence on identity originates with parents and that the self-image thus formed, even if only partially, will have an impact on the child’s engagement with the school environment and how he or she interacts and is influenced by peers.

Assuming that children of school age are rather not aware of which occupation would ideally complement her skills and thus earn the highest future returns while nevertheless identities are formed that influence the future occupational choice, we will now concentrate on the identity part of the occupational choice presented in Equation (3). To

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period of the great American Industrialization from 1870-1910 came from landowning or entrepreneurial families.

<sup>12</sup> “The people with whom one regularly associates, either through preference or imposition, delimit the behavioral patterns that will be repeatedly observed, and hence, learned most thoroughly” (Bandura 1986: 55).

this end, we develop hypotheses and then analyze how an entrepreneurial identity is influenced by parents and peers.

### *The Development of an Entrepreneurial Identity*

A child's identity and predilection for a certain occupation—entrepreneurial or not—depends on what he or she has experienced at home from her parents' identity and their working life. Or, as Marshall (1920) put it, “as years pass on, the child of the working man learns a great deal from what he sees and hears going on around him.” Here, we follow the lead of Aldrich *et al.* (1998), Dunn and Holtz-Eakin (2000), and Hout and Rosen (2000) and assume that entrepreneurial parents leave an especially pronounced mark on their children due to “their ability to provide contact between their children (while the children are relatively young) and the business workplace. ... As the child receives continued exposure to the family business, he picks up, almost without realizing it, a working knowledge of how to run a business enterprise” (Lentz & Laband 1990: 564). Recent literature (cf. Dohmen *et al.* 2006) emphasizes that this also includes the intergenerational transmission of risk attitudes. This leads to our first hypothesis.

***Hypothesis 1:*** Children are likely to adopt their parents' identity. Hence, having parents who are entrepreneurs should have a positive impact on the child's intention to become an entrepreneur as well.

Children are also heavily influenced by their peers' ideas about the ideal job (Banduras 1977). Let us assume that a certain fraction of a child's peers think of themselves and others as future entrepreneurs, although perhaps not in that exact terminology at this point. These peers think it would be “cool” to be your own boss, run your own business, and not have to take orders from anyone else. These particular children are quite likely

very intelligent, adventurous, possibly bored with a school curriculum targeted at slower and more docile children. They are in short, fun to hang out with, and “leaders of the pack.” And leadership, argues Baumol (1968), is one of the major ingredients for entrepreneurial success.<sup>13</sup> Since these entrepreneurial peers are so attractive and fun to be around, it is plausible that they could have a great deal of influence on other children’s identity choice. Accordingly, the second hypothesis has to do with peer groups.

*Hypothesis 2:* The larger the entrepreneurial peer group, the more pronounced an individual’s entrepreneurial identity will be. Hence, the size of the entrepreneurial peer group should have a positive impact on the child’s intention to become an entrepreneur.

In the following section, we put these two hypotheses to an empirical test in an attempt to discover whether our theoretical arguments that parents and peers play an important role in the development of an entrepreneurial identity hold true.

### **3. Data**

We use data from the 2006 cycle of the Programme for International Student Assessment (PISA) (OECD, 2007a, 2007b) to empirically test our two hypotheses. The main objective of PISA is to assess the scientific, mathematical, and reading literacy of the student population in each of 57 participating countries. PISA is a representative sample of all 15-year-olds enrolled in school. Thus, in most of the countries assessed, the target population comprises young people near the end of their compulsory schooling. As for

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<sup>13</sup> The entrepreneur’s job is “to locate new ideas and to put them into effect. He must lead, perhaps even inspire; he cannot allow things to get into a rut and for him today’s practice is never good enough for

the PISA sampling procedure, most countries employ a two-stage sampling technique. The first stage draws a (usually stratified) random sample of schools in which 15-year-old students are enrolled. In the second stage, a random sample of 35 of the 15-year-old students in each of these schools is drawn, with each 15-year-old student in a school having an equal chance of being selected.

In addition to the performance tests, students provide detailed information on their personal characteristics and family backgrounds. Moreover, school principals report details on their schools' resource endowments and institutional settings.

Our main variable of interest is the students' response to the question of what kind of job they intend to have when they are about 30 years old. Students are asked to write down the job title, which is then given a four-digit ISCO-88 code (International Standard Classification of Occupations; ILO 1990). Table 1a contains descriptive statistics of the students' intended occupations at age 30. Several caveats apply here: This variable measures students' *intentions* to become entrepreneurs, and thus might not be a good predictor for his or her *actual* future occupational *choice*.

We argue that, at the age of 15, students have, for the most part, not collected any labor market experiences, and hence do not yet know whether they possess the necessary abilities to become a successful entrepreneur. In other words, we assume that their intentions to become an entrepreneur are not driven by ability considerations, but rather based on their identity which is, at that stage, fully developed, and, as outlined above, influenced by parents' and peers' entrepreneurial identity.

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tomorrow. ... He is the individual who exercises what in the business literature is called 'leadership'" (Baumol 1968: 65).

<< Table 1a about here >>

The students also provide information on their mother’s and father’s occupation, which again is given a four digit ISCO-88 code (see Table 1b for descriptive statistics).

<< Table 1b about here >>

For both the students’ intended occupations and the parents’ actual occupations we construct a dummy variable that takes the value 1 if the occupation is entrepreneurial, and 0 otherwise. Moreover, we employ two different definitions of an entrepreneurial occupation, as shown in Table 1c: (i) a broad definition of entrepreneurial occupation containing all ISCO-88 codes starting with 13xx (*Definition 1*), and (ii) a more restrictive definition excluding agriculture, forestry, and fishing professions (*Definition 2*). All codes reflect occupations that are related to running small enterprises. Indeed, running a small business is commonly regarded as a good proxy for entrepreneurship (cf. Parker 2009).

Table 1c: Classification of Entrepreneurial Occupations According to Definition 1 and Definition 2

ISCO-88 Code		Definition 1	Definition 2
1300	[SMALL ENTERPRISE] GENERAL MANAGERS	✓	✓
1310	[SMALL ENTERPRISE] GENERAL MANAGERS [incl. Businessman, Trader, Manager nfs]	✓	✓
1311	[Small enterprise] General managers agriculture, forestry & fishing [incl. Farm Manager, Self-employed Farmer with personnel]	✓	
1312	[Small enterprise] General managers manufacturing	✓	✓
1313	[Small enterprise] General managers construction [incl. Building Contractor]	✓	✓
1314	[Small enterprise] General managers wholesale & retail trade [incl. Shop Owner/Manager, Retail Owner/Manager, Merchant]	✓	✓
1315	[Small enterprise] General managers restaurants & hotels [incl. Manager Camping Site, Bar Owner/Manager, Restaurateur]	✓	✓
1316	[Small enterprise] General managers transp., storage, & communications [incl. Owner Small Transport Company]	✓	✓
1317	[Small enterprise] General managers business services [incl. Manager Insurance Agency]	✓	✓

1318	[Small enterprise] General managers personal care, cleaning, etc. services [incl. Owner Laundry]	✓	✓
1319	[Small enterprise] General managers nec [incl. Manager Travel Agency, Manager Fitness Center, Garage Owner]	✓	✓

Our reason for making this distinction is that entrepreneurship in agriculture differs from that in other fields with respect to the share of individuals who run their own business. Moreover, the importance of agriculture differs across countries. Due to tradition and institutions, firm succession by children—often the son—is more common in agriculture than in other fields.

To measure peer effects, we calculate the share of students intending to be in an entrepreneurial occupation at the age of 30 at the school level.<sup>14</sup> Table 1 d provides descriptive statistics on this variable, as well as the percentage of missing values.

<< Table 1d about here >>

For the purpose of the following analyses, observations with missing values for any of these three variables are deleted. Our dataset thus contains 232,343 students from 28 of the 30 OECD countries. Switzerland is excluded because no student from that country reported intending to be in any kind of an entrepreneurial occupation at age 30. As we control in most specifications for a large number of background variables to minimize potential biases from omitted variables at the school level, we also dropped France from the sample because no school-level background information is provided for any of the schools sampled in this country.

<sup>14</sup> More precisely, this share is calculated after excluding individual  $i$ , and hence referred to as  $\overline{ExOCC}_{-isc}^{peers}$  in our estimated regression equations shown below.

Since the PISA database provides a rich set of control variables, we are able to control for other influencing factors at the individual or school level. Among the student and family background variables, there is information on the student's gender, a set of dummies representing the student's current grade, a dummy for grade repetition, two indicators for the student's immigrant status, an indicator for the language spoken at home, and, finally, the scores from the student's performance in the three tested domains—science, mathematics, and reading. Regarding family background, we control for the family's socioeconomic background, the parents' educational attainment, and home possessions (as a measure of family wealth).

At the school level, we control for the size of the community where the school is located and school size, along with several aggregated measures of the schools' socioeconomic composition. We also use different measures of school resources and institutional settings, e.g., school autonomy and the use of accountability practices. Appendix A1 contains the full list of all background variables included in the estimations.<sup>15</sup>

#### **4. Econometric Model**

To discover what determines a student's intention of being in an entrepreneurial occupation at age 30, we estimate cross-country regressions controlling for different sets of background variables at the student and school levels. We include country dummies to remove unobserved heterogeneity across countries.

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<sup>15</sup> See Fuchs and Wößmann (2007) for an overview of common controls in empirical analysis based on PISA data.

In particular, we estimate the following probit regression equation where the outcome variable  $ExOCC_{isc}$  is the conditional probability of student  $i$  in school  $s$  and country  $c$  intending to be in an entrepreneurial occupation at age 30

$$P(ExOCC_{isc} = 1) = \Phi\left(\alpha \cdot OCC_{isc}^{parents} + \beta \cdot \overline{ExOCC}_{-isc}^{peers} + X\right) \quad (4)$$

where  $X \equiv B_{isc}\gamma + R_{sc}\delta + I_{sc}\theta + \varphi_c \cdot C_c$

$B_{isc}$  : vector of family background variables

$R_{sc}$  : vector of school resource variables

$I_{sc}$  : vector of institutional characteristics of school  $s$  in country  $c$

$C_c$  : vector of country dummies

Our main interest lies in the parameters  $\alpha$ , the coefficient on parents' actual entrepreneurial activity ( $OCC_{isc}^{parents}$ , Hypothesis 1), and  $\beta$ , the coefficient on the share of students at school intending to be in an entrepreneurial occupation at age 30, ( $\overline{ExOCC}_{-isc}^{peers}$ , Hypothesis 2).

To account for the two-stage survey sampling design, we use clustering robust linear regression, where standard errors are clustered at the school level (cf. Moulton 1986; Deaton 1997: 74–78). Furthermore, we weight each student by the inverse of his or her sampling probability (DuMouchel & Duncan 1983; Wooldridge 2001). In all cross-country regressions, we also give each country equal weight in the estimation.

To be able to interpret the coefficient  $\beta$  on the share of entrepreneurial peers at school as a true peer effect, we need to go beyond a cross-sectional regression analysis and show that the observed partial correlation between an individual's entrepreneurial intention and her peers' entrepreneurial intention is in fact due to some form of social interaction (Manski 1995). Manski (1995) identifies two broad forms of social interaction. In the

first, youth behavior is influenced by the prevalence of that behavior in the group (endogenous effects). In our model of occupational choice, this would mean that an individual's intention to become an entrepreneur is influenced by her peers' intentions to become entrepreneurs. In the second form of social interaction, youth behavior is influenced by exogenous characteristics of the youth's reference group. In our model, this would mean that an individual's intention to become an entrepreneur is influenced by her peers' background characteristics (exogenous or contextual effects).

Manski (1995) raises the possibility of spurious estimates of peer-group effects that may be erroneously interpreted as true endogenous or contextual effects: the so-called correlated effects. These can arise when youths in the same reference group express the same occupational intentions because they share a common set of unobserved characteristics. Students and their peers are very likely to be subject to the same influences when they attend the same school, influences both observed and unobserved by an econometrician. To minimize the bias from the observed shared influences, we include numerous control variables in the regression equation (see the term  $X$  in Equation (4)). We address the problem of unobserved shared influences at the school level by means of an instrumental variable probit model. In particular, we use the share of students with entrepreneurial parents as an instrument for the share of students with entrepreneurial intentions at school level. The identifying assumption is that there are no exogenous effects, i.e., that the share of parents at school who are entrepreneurs does not have a direct effect on an individual's intention to become an entrepreneur.

We use schools as the relevant sphere for interaction with the peer group (as opposed to neighborhoods, for instance). Following Gaviria and Raphael (2001), we argue that since

students interact primarily during school hours, the estimated effects are more likely to reflect the influence of peers rather than the influence of peer background factors. In Manski's (1995) terms, we are assuming that there are no contextual effects. Our assumption is that any influence peers might have on students' entrepreneurial intentions is through the peers' own entrepreneurial intentions. The predominance of endogenous peer effects over contextual effects is also found in studies on the smoking behavior of adolescents (Norton *et al.* 1998) or on adolescent overweight (Trogdon *et al.* 2008).

Although our instrumental variable approach addresses the problem of correlated effects, it does not address the issue of endogenous sorting of households across schools. This sorting could arise if entrepreneurial parents sort across regions and, eventually, schools according to their willingness to invest in their children's future. However, this should not be a predominant problem in the case of entrepreneurial parents, as it is most likely that entrepreneurs are regionally "sticky" (Feldman 2001), meaning that, in general, entrepreneurs are either life-long residents of the region (Michelacci and Silva, 2007) or have lived there for at least several years (Greene *et al.*, 2008; Keeble and Walker, 1994; Saxenian, 1999). Nevertheless, we reinvestigate this issue in the robustness checks.

## **5. Results**

For all probit regression results, we report both average marginal effects and probit regression coefficients.

### *Cross-Country Results*

Tables 2a and 2b contain the results of a cross-country probit regression of the students' intention of being in an entrepreneurial occupation at age 30 on a dummy indicating their

parents' actual entrepreneurial occupation, as well as their school's share of students intending to be in an entrepreneurial occupation at age 30.

<< Tables 2a and b about here >>

Table 2b shows that, at the sample means of all regressors, the students' parents actually being in an entrepreneurial occupation increases the probability of the student intending to be in an entrepreneurial occupation at age 30 by between 2 and 3 percentage points (Hypothesis 1).

Moreover, both tables show that our results are robust to the inclusion of different sets of covariates, which does not change the sign and significance of the estimated coefficients.

We can also conclude from these tables that the results are insensitive to the definition of entrepreneurial occupation used, i.e., we rule out the possibility that a correlation between parents' actual entrepreneurial occupation and a child's intended entrepreneurial occupation is driven simply by different countries having different shares of employment in the agricultural sector, where, due to a possibly more traditional farm ownership succession, the impact of parents' occupation on one's own intended occupation may be stronger. In the following, we therefore restrict ourselves to *Definition 1*, the broader definition of an entrepreneurial occupation that includes the agricultural sector.

#### *Instrumental Variables Estimation*

Tables 3a and 3b present the estimation results of our instrumental variables probit regression. We instrumented the size of the entrepreneurial peer group with the share of students at school who have entrepreneurial parents. The coefficient on our peer group

variable is highly positively significant in the specifications that do not include any controls except country dummies (i.e., Model 3-1 in Columns (1) and (2)). In the specification including the entire set of control variables (Model 3-2), the coefficient is similar in size, but no longer statistically significant, indicating a multicollinearity problem due to the large number of controls included in this model.

<< Tables 3a and b about here >>

Table 3b contains the marginal effects of our two main explanatory variables, evaluated at the sample means of all regressors. Accounting for the endogeneity of the share of entrepreneurial peers at school, our IV estimates suggest that, evaluated at the sample means of all other regressors, an increase in the share of entrepreneurial peers at school by one standard deviation leads to an increase in the predicted probability of a student having entrepreneurial intentions by between 1.1 and 1.4 percentage points, depending on the specification<sup>16</sup>. Given that, on average in our sample only 2.7% of the students report having entrepreneurial intentions (cf. Table 1b), our estimated endogenous effect seems sizeable. If there was no endogeneity problem in our sample, and if the standard probit estimates reported in Table 2 could thus be interpreted causally, the results would suggest a somewhat smaller peer effect of 0.5 to 0.6 percentage points. We conclude that unobserved shared influences appear to lead to an underestimation of the endogenous effect in a standard probit model. Our interpretation, however, rests on the assumption that exogenous peer effects are absent.

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<sup>16</sup> We obtain this number by calculating the discrete difference between the predicted probability of a student who attends a school where the size of the entrepreneurial peer group is one standard deviation above the mean and who has average values on all other regressors, and the predicted probability of a student having average values on all regressors (including the size of the entrepreneurial peer group). This

With our instrumental variables approach, we get the same estimate for the effect of having entrepreneurial parents which results from the standard probit model. The effect amounts to, around 1.5 to 3.2 percentage points, evaluated at the sample means of all regressors.

### *Robustness Checks*

#### *1. Alternative definition of the peer group*

Although our instrumental variable approach (Section 5.2) addresses the problem of correlated effects, there remains the potential econometric problem of endogenous sorting of students into schools. This sorting could arise if entrepreneurial parents sort across schools according to their willingness to invest in their children's future. As our main robustness check, we use a different definition of the peer group that allows us to estimate a model with school fixed effects: we define the peer group as students attending the same school and grade. One could argue that defining the peer group as students attending the same class would be more appropriate. However, PISA data do not contain information about classes. We thus follow Schneeweis and Winter-Ebmer (2007) and define the peer group as students attending the same school and grade.

This alternative specification allows us to address the potential problem of endogenous sorting of students into schools, because we are now able to estimate our regression equation of interest using school fixed effects (in addition to the country fixed effects).

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is different from the corresponding marginal effect evaluated at the sample means which we report in Tables 2b and 3b.

In this school fixed effects specification, we can only analyze schools with at least two different grade levels, and observations from schools with only one grade level had to be discarded. Moreover, we only used observations from the two most common grade levels in the respective country, i.e. from grade nine and ten in most countries, and dropped all other observations. Lastly, we restricted our sample to peer groups of at least five students.

We are thus left with a sample of 90,266 students from 14 countries<sup>17</sup> and 843 schools. This corresponds to a considerable reduction in sample size, but enables us to assess whether endogenous sorting of students into schools is potentially biasing our results (and in particular the estimate of our peer group effect).

Because of the incidental parameters problem that arises when estimating fixed effects in non-linear models when group sizes are small, we do not estimate an IV probit regression model in this case. Instead, we estimate an instrumental variables linear probability model with both country and school fixed effects. Similar to the approach taken above (the results of which are shown in Table 3), we instrument the share of entrepreneurial peers in the same school and grade with the share of peers with entrepreneurial parents in the same school and grade.

Table 4 contains the results of this specification. Columns (1) and (2) differ only with respect to the control variables included. Column (1) does not contain any control variables besides the student's parents' entrepreneurial status, our measure of the peer group, and school and country fixed effects. In addition to that, the specification shown in

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<sup>17</sup> The 14 countries are Australia, Austria, Belgium, Canada, the Czech Republic, Germany, Spain, Hungary, Italy, Luxembourg, the Netherlands, Portugal, Slovakia and Turkey.

column (2) controls for a number of individual and family background variables.<sup>18</sup> In the specification without controls (column (1)), we find significant effects for both parents' entrepreneurial status and for the size of the entrepreneurial peer group. The effect of parents' entrepreneurial status is still significant in the specification including control variables, but only half in size, amounting to 2.5 percentage points. Our estimate for the peer group effect is between 3.4 and 3.7 percentage points, although it fails to reach statistical significance in the specification including control variables shown in column 2 (the corresponding p-value is 0.136). We conclude that this specification check generally supports our previous findings, indicating that endogenous sorting of students into schools is a minor problem.

## *2. Subsample who did not change schools—PISA 2003*

As an a different robustness check to address the potential issue of endogenous sorting of students into schools, we run probit and IV probit regressions using PISA 2003 data. In the PISA 2003, students provided information on how many times they had changed schools during primary and lower secondary education (ISCED 1 and 2); PISA 2006 does not contain any similar information.

Our PISA 2003 sample is smaller than the PISA 2006 sample since our dependent variable, a measure of students' entrepreneurial intentions, was part of the optional Educational Career Questionnaire, which was administered in only 17 OECD countries. Models 5-1 and 5-2 in Table 5a report the results of standard probit and IV probit analyses for our full (i.e., 17 countries) PISA 2003 sample. Given this somewhat different

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<sup>18</sup> For details see the variables listed in Appendix A1 under the heading "Individual and family background variables"; all variables listed there except the grade dummies were used as control variables.

subsample of countries, it is remarkable that both estimates are very similar to the results we obtain from PISA 2006 data (shown in Tables 2 and 3 above).

<< Tables 5a and b about here >>

To minimize the problem of endogenous sorting of students into schools, we restrict our PISA 2003 sample to those students who never changed schools during ISCED1 (Primary Education) and ISCED2 (Lower Secondary Education). The rationale behind this is that, for this subsample, students' parents have opted to not change schools *during* ISCED 1 and 2. This solves the problem of endogenous sorting across schools *during* students' schooling career, but does not rule out the possibility of endogenous sorting at the *beginning* of ISCED 1 and 2.

The results of this robustness check are set out in Models 5-3 and 5-4. Our estimates for both the endogenous effect of the entrepreneurial peer group as well as the effect of having a parent who is an entrepreneur are slightly bigger than the ones we obtain from our full PISA 2003 sample. We conclude that endogenous sorting during a student's schooling career appears to be a minor problem.

### *3. Anti-test: Different outcome variables*

Another way of assessing the robustness of our results, as well as the validity of our model, is to conduct anti-tests, namely, by estimating our cross-country probit and IV probit models using the same regressors as in the models underlying Tables 2 and 3, but with a different outcome variable.

In the first anti-test, we construct a dummy variable taking the value one if a student intends to work as an “Administrative Associate Professional.” In the second anti-test, we construct a dummy variable taking the value one if a student intends to become a “Large Enterprise Director and Chief Executive” or a “Large Enterprise Operation Department Manager.” If for either of these two anti-tests, we find a significant “effect” of our main explanatory variables of interest, namely, “either parent is an entrepreneur” or “size of the entrepreneurial peer group,” our theoretical model and/or our empirical approach will be called into question.

<< Tables 6a and b about here >>

In Columns (1)–(4) of Tables 6a and 6b we report the results of our second anti-test. Parents’ entrepreneurial status is not statistically significantly associated with students’ intentions to become a “Large Enterprise Director and Chief Executive” or “Operation Department Manager.” The coefficient on the entrepreneurial peer group variable is statistically significantly positive in both probit specifications. However, the sign of the coefficient on the entrepreneurial peer group reverses in our instrumental variables specification.

Columns (5)–(8) of Tables 6a and 6b contain the estimation results for the second anti-test. Again, the coefficient on parents’ entrepreneurial status is not significant in either the probit or instrumental variables probit specification. Moreover, only in the simple probit specification in Column (1) is the coefficient on the variable “size of the entrepreneurial peer group” statistically significantly positively related to our dependent variable, although the association is only about one-third that in the corresponding probit

model using students' entrepreneurial intentions as an outcome variable, possibly indicating an omitted variable bias due to unobserved regressors at school level. This coefficient is no longer statistically significant in the specification including control variables or in the IV specification.

Overall, the results of these two anti-tests support our theoretical model and the validity of our empirical approach. At the very least, the results of the anti-tests do not support the hypothesis that an omitted variable bias due to an unobserved variable at school level is biasing our findings.

#### *4. Subsample "ISCED designation is general"*

As a third robustness check, we restrict our sample to only those students enrolled in programs that are not pre-vocational or vocational, according to the information on program destination (ISCEDD) contained in the PISA 2006 data set.<sup>19</sup> The rationale behind this approach is that students in pre-vocational or vocational programs are assumed to be more aware of which occupation they are best suited for compared to students in general programs, which could make it difficult to concentrate on the identity part of the occupational choice.

<< Tables 7a and b about here >>

Columns (1)–(4) of Tables 7a and 7b show the results for the subsample of students not enrolled in vocational or pre-vocational programs; Columns (5)–(8) contain the results for

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<sup>19</sup> However, the classification in PISA 2006 (ISCED designation) appears problematic in at least two cases: in Germany, 97.5 percent of all students are enrolled in programs that give access to the next program level (as opposed to direct access to the labor market), while in the United Kingdom, over 90 percent of all students are enrolled in programs that give direct access to the labor market.

the subsample of students in programs that lead to direct access to the labor market. For the students not enrolled in pre-vocational or vocational programs, the coefficient on parental entrepreneurial status is significantly positive and similar in size to that in the standard probit model contained in Tables 2 and 3. Also, the peer effect remains significantly positive in the subsample of students not enrolled in pre-vocational or vocational programs. It is interesting to note, however, that the peer effect appears to be somewhat bigger in the subsample of students in programs that lead to direct access to the labor market (see Columns (5)–(8) in Tables 7a and 7b). These results show that the endogenous peer effect we observe in our full sample is not merely driven by those students who plan to enter the labor market in the near future and who may thus have already collected first labor market experiences in the form of internships or hands-on training in school. This supports our argument that students' occupational intentions are not chiefly driven by consideration of ability.

## **6. Per-Country Results**

The cross-country regression described in Equation (4) assumes that the influence of the parents' actual entrepreneurial status and the peers' intended occupation at age 30 on an individual's intention to be in an entrepreneurial occupation at age 30 is constant across countries, i.e.,  $\alpha$  and  $\beta$  are assumed to be constant across countries. We now relax this assumption by re-estimating Equation (4) separately for each country, a procedure that reveals some heterogeneity in  $\alpha$  and  $\beta$  across countries.

Tables 8a and 8b show the results of probit regression analyses conducted separately for each of the 28 OECD countries. We see that there is a strong heterogeneity in the effect

of actual parental entrepreneurial occupation and the school's share of students intending to be entrepreneurs later in their lives. Parental entrepreneurial status has the strongest influence in Slovakia, the Czech Republic, the Netherlands, Belgium, and Italy. Peers' intentions of a future entrepreneurial occupation have the strongest impact in Slovakia, the United Kingdom, Korea, the Czech Republic, and Hungary.

<< Table 8 a and b about here >>

Having shown the between-country heterogeneity of parent and peer influence on establishing an individual's occupational identity, we now attempt to explain the observed differences between countries with differences in values and social prescriptions across countries (cf. DiMaggio 1994; North 1990). Information on values and social prescriptions across countries is derived from the World Value Survey 2005 (WVS). The questionnaire contains information on different types of attitudes, religion, and preferences. We are primarily interested in two statements:

- One of my main goals in life has been to make my parents proud ( $V_c^{parents}$ )
- I make a lot of effort to live up to what my friends expect ( $V_c^{friends}$ )

Each respondent can *strongly agree* (=1), *agree* (=2), *disagree* (=3), or *strongly disagree* (=4) with the statements. From the WVS 2005-06, results are available for 15 of our 28 countries. Table 9 presents the recoded country means, whereby a higher value indicates that people in that country generally agree with the statement and a smaller value indicates that people generally disagree with the statement. The correlation between the two variables is positive and the correlation coefficient amounts to 0.65. These two variables might reflect differences between a collectivistic and an individualistic society.

<< Table 9 about here >>

To test whether differences between countries in the importance of family ties and friends are associated with the observed differences in the impact of parents' actual and peers' intended entrepreneurial status, we estimate a modified version of Equation (4) by extending Equation (1) to include interaction terms between the respective social values and prescriptions. This leads to the following equation

$$P(ExOCC_{isc} = 1) = \Phi \left( \alpha \cdot OCC_{isc}^{parents} + \vartheta \cdot V_c^{parents} \cdot OCC_{isc}^{parents} + \beta \cdot \overline{ExOCC}_{-isc}^{peers} + \rho \cdot V_c^{friends} \cdot \overline{ExOCC}_{-isc}^{peers} + X \right) \quad (5)$$

where we interact the parents' actual entrepreneurial status ( $OCC_{isc}^{parents}$ ) with the aggregated WVS variable "One of my main goals in life has been to make my parents proud" ( $V_c^{parents}$ ) in order to account for the family's importance to the individual's identity. In a similar way, we interact the peers' intended occupation at age 30 ( $\overline{ExOCC}_{-isc}^{peers}$ ) with the aggregated WVS variable "I make a lot of effort to live up to what my friends expect" to measure the importance of friends to the individual's identity. We expect positive interaction effects for both variables derived from the WVS and parents' entrepreneurial status and peers' intended entrepreneurial status, respectively.

Table 9 shows the results of different specifications of the probit model summarized in Equation (5). The left column shows the results of the basic model without any interaction terms. Comparing these results to those obtained from the full, i.e. 28-country, sample (cf. Table 2), we observe that the results are overall very similar, with a tendency for the coefficient on the entrepreneurial peer group to be somewhat smaller in the 15-country sample.

As for the interpretation of the probit regression coefficients on any interaction terms in the model, a word of caution is required. It is important to note that, in general, the interaction effect could be nonzero even if the estimated probit regression coefficient on the interaction term is not significantly different from zero. Moreover, in general, the sign of the estimated interaction term does not necessarily indicate the sign of the interaction effect (cf. e.g. Ai & Norton, 2003). Therefore, we calculated the respective marginal effects for the interpretation of probit coefficients.<sup>20</sup>

<< Table 10 about here >>

The marginal effect of the variable “goal of wanting to make parents proud”, evaluated at the sample means of all regressors, is not significantly different from zero in any of the specifications shown in Table 10. We thus conclude that this cultural value is not associated with a higher impact of the parents’ entrepreneurial status. In contrast, in countries where people report making a lot of effort to live up to their friends’ expectations, on average compared to the international mean of this variable, the impact of peers’ entrepreneurial intentions on an individual’s later entrepreneurial occupation is significantly stronger, judging by the marginal effect which is between 12.7 and 18.8 percentage points. In all specifications, this marginal effect of the interaction term is statistically significant at the 1%- level, indicating that these results are quite robust to the inclusion of different sets of individual and school background variables.

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<sup>20</sup> As Ai & Norton (2003) point out, this marginal effect cannot be calculated using Stata’s built-in mfx command. We calculated the respective marginal effects using our own Stata code, which is available upon request.

## 7. Summary

In this paper we analyze the relationship between an individual's identity and his or her intention of becoming an entrepreneur. In our theoretical model, identity is assumed to be shaped by the individual's parents and peers. Analyzing data from the Programme for International Student Assessment (PISA) 2006, we find that having parents in an entrepreneurial occupation has a positive impact on an individual's intention to become an entrepreneur (Hypothesis 1). Controlling for students' test scores, for example, as well as for their family's socioeconomic background, does not alter the results, indicating that omitted variable bias due to unobserved ability of parents and students is a minor problem. Similarly, having entrepreneurially inclined peers increases the probability of the student intending to become an entrepreneur. In particular, we address Manski's (1995) reflection problem by means of an instrumental variable strategy, using the share of students at school who have entrepreneurial parents as an instrument for the share of entrepreneurially inclined peers at school. Assuming that contextual effects are absent in our setting, we conclude that there are endogenous peer effects on the intention to become an entrepreneur, supporting our second hypothesis. These results are robust to the inclusion of school fixed effects in a subsample of the PISA 2006 data, and are robust when using PISA 2003 data and when restricting the sample to students who did not change school during ISCED1 and ISCED2. For the latter group, endogenous sorting across schools is less likely.

Furthermore, we find important differences across countries regarding the impact of parental entrepreneurial status on the child's intention to become an entrepreneur. The same holds for the impact of entrepreneurial peers in school. Our data support the idea

that cultural differences in the value assigned to friends accounts for the observed heterogeneity of the impact of entrepreneurial peers across countries. However, we find little evidence that the importance of family ties is related to the impact of parents' entrepreneurial status on an individual's entrepreneurial intentions.

With regard to entrepreneurship education, offering entrepreneurship classes at business schools might be a good way for students to learn the tools necessary to run a business, but it is not likely that any sort of course can work to develop an entrepreneurial identity. Techniques and procedures can be learned, but the entrepreneurial spirit necessary for their successful deployment cannot—this essential attribute is the result, instead, of the environment in which an individual has grown up.

We therefore conclude that fostering an entrepreneurial identity is a long-run task that needs to begin at an early age, both for individuals and for society at large, as we have found that it is the entrepreneurial characteristics of both parents and peers that have the most influence on the formation of an entrepreneurial identity. However, our data do not allow discovery of the exact transmission mechanism behind this phenomenon and we thus strongly encourage further research that focuses on the intertemporal development of an individual's entrepreneurial identity.

## References

- Aghion, P., and P. Howitt (1992). "A Model of Growth Through Creative Destruction." *Econometrica*, 60(2), 323–51.
- Ai, C., and Norton, E.C. (2003). "Interaction terms in logit and probit models", *Economics Letters*, 80, 123-129.
- Akerlof, G. A. (1997). "Social Distance and Social Decisions." *Econometrica*, 65(5), 1005-1027.
- Akerlof, G. A. and R. E. Kranton (2002). "Identity and Schooling: Some Lessons for the Economics of Education." *Journal of Economic Literature*, 40(4), 1167–1201.
- Akerlof, G. A. and R. E. Kranton (2005). "Identity and the Economics of Organizations." *Journal of Economic Perspectives*, 19(1), 9–32.
- Akerlof, G. A., and R. E. Kranton (2000). "Economics and Identity." *Quarterly Journal of Economics* 105(3), 715–53.
- Aldrich, H., L. A. Renzulli, and N. Langton (1998). "Passing on Privilege: Resources Provided by Self-Employed Parents to Their Self-Employed Children." *Research in Social Stratification and Mobility*, 16, 291–317.
- Allen, J. (2008). "Relative Age, Identity and Schooling: An Extension of the Akerlof/Kranton Model Which Solves a Puzzle." *Journal of Socio-Economics*, 37, 343–52.
- Arrow, K. J. (1962). "Economic Welfare and the Allocation of Resources for Innovation," in: R. R. Nelson (ed.), *The Rate and Direction of Inventive Activity*, 609–26. Princeton, NJ: Princeton University Press.
- Bandura, A. (1977). *Social Learning Theory*. Englewood Cliffs, NJ: Prentice Hall.
- Bandura, A. (1986). *Social Foundations of Thought and Action*. Englewood Cliffs, NJ: Prentice Hall.
- Baron, R. A. (1998). "Cognitive Mechanisms in Entrepreneurship: Why and When Entrepreneurs Think Differently Than Other People." *Journal of Business Venturing*, 13(4), 275–94.
- Bauernschuster, S., O. Falck, and S. Heblich (2008). *Occupational Choice and Social Contacts Across Regions*. Jena Economic Research Papers 2008-079.
- Baumol, W. (1968). "Entrepreneurship in Economic Theory." *American Economic Review*, 58(2), 64–71.
- Becker, G. S. (1991). "A Note on Restaurant Pricing and Other Examples of Social Influences on Price." *Journal of Political Economy*, 99, 1109-1116.

- Becker, G. S., and K. M. Murphy (1993). "A Simple Theory of Advertising as a Good or Bad." *Quarterly Journal of Economics*, 108, 941-964.
- Björklund, A., M. Jäntti, and G. Solon (2007). *Nature and Nurture in the Intergenerational Transmission of Socioeconomic Status: Evidence from Swedish Children and Their Biological and Rearing Parents*. Working Paper, Michigan State University.
- Bloom, A. (1987). *The Closing of the American Mind*. New York: Simon and Schuster.
- Camerer, C., and D. Lovallo (1999). "Overconfidence and Excess Entry: An Empirical Approach." *American Economic Review*, 89, 306-18.
- Coleman, J. S. (1961). *The Adolescent Society: The Social Life of the Teenager and Its Impact on Education*. New York: Free Press.
- Coleman, J. S. (1988). "Social Capital in the Creation of Human Capital." *American Journal of Sociology*, 9, 95-121.
- Cunha, F., and J. Heckman (2007). "The Technology of Skill Formation." *American Economic Review*, 97(2), 31-47.
- Davis, J. B. (2007). "Akerlof and Kranton on Identity in Economics: Inverting the Analysis." *Cambridge Journal of Economics*, 31, 349-62.
- Deaton, A. (1997). *The Analysis of Household Surveys: A Microeconometric Approach to Development Policy*. Baltimore: Johns Hopkins University Press.
- DiMaggio, P. (1994). Culture and Economy. In: N.J. Smelser, and R. Swedberg (Eds.): *The Handbook of Economic Sociology*, 368-402. New Jersey: Princeton University Press.
- Dohmen, T, A. Falk, D. Huffman, and U. Sunde (2006). *The Intergenerational Transmission of Risk and Trust Attitudes*. IZA Discussion Paper No. 2380.
- DuMouchel, W. H., and G. J. Duncan (1983). "Using Sample Survey Weights in Multiple Regression Analyses of Stratified Samples." *Journal of the American Statistical Association*, 78(383), 535-43.
- Dunn, T., and D. Holtz-Eakin (2000). "Financial Capital, Human Capital, and the Transition to Self-Employment: Evidence from Intergenerational Links." *Journal of Labor Economics*, 18(2), 282-305.
- Eckert, P. (1995). "Trajectory and forms of institutional participation. In: L. J. Crockett and A. C. Crouter (Eds.): *Pathways Through Adolescence*, 175-195, New Jersey: L. Erlbaum.
- European Commission (2006). "Entrepreneurship Education in Europe: Fostering Entrepreneurial Mindsets Through Education and Learning." *Final Proceedings of the Conference on Entrepreneurship Education in Oslo*.

- Evans, D. S., and L. S. Leighton (1989). "Some Empirical Aspects of Entrepreneurship." *American Economic Review*, 79, 519–35.
- Feldman, M. P. (2001). "The Entrepreneurial Event Revisited: Firm Formation in a Regional Context." *Industrial and Corporate Change*, 10(4), 861–891.
- Fuchs, T., and L. Wößmann (2007). "What Accounts for International Differences in Student Performance? A Re-Examination Using PISA Data." *Empirical Economics*, 32(2–3), 433–64.
- Gaviria, A., and S. Raphael (2001). "School-based Peer Effects and Juvenile Behavior." *The Review of Economics and Statistics*, 83(2), 257–268.
- Granovetter, M. (1985). "Economic Action and Social Structures: The Problem of Embeddedness." *American Journal of Sociology*, 91, 481–510.
- Greene, F., K. Mole, and D. J. Storey (2008). *Three Decades of Enterprise Culture*. London: Palgrave.
- Hamilton, B. H. (2000). "Does Entrepreneurship Pay? An Empirical Analysis of the Returns of Self-Employment." *Journal of Political Economy*, 108, 604–31.
- Hayek, F. A. von (1937). "Economics and Knowledge." *Economica, New Series*, 4(13), 33–54.
- Heckman (2006). Skill Formation and the Economics of Investing in Disadvantaged Children. *Science*, 312, 1900–1902.
- Holtz-Eakin, D., D. Joulfaian, and H. S. Rosen (1994). "Sticking It Out: Entrepreneurial Survival and Liquidity Constraints." *JP.E.* 102, 53–75.
- Hout, M., and H. Rosen (2000). "Self-Employment, Family Background, and Race." *Journal of Human Resources*, 35, 670–92.
- International Labour Organisation (ILO) (1990). *International Standard Classification of Occupations: ISCO-88*. Geneva: International Labour Office.
- Kahneman, D., and A. Tversky (1979). "Prospect Theory: An Analysis of Decision Under Risk." *Econometrica*, 47(2), 263–92.
- Kanbur, S., and M. Ravi (1990). "Entrepreneurial Risk Taking, Inequality, and Public Policy: An Application of Inequality Decomposition Analysis to the General Equilibrium Effects of Progressive Taxation." *Journal of Political Economy*, 90, 1–21.
- Keeble, D., and S. Walker (1994). "New Firms, Small Firms and Dead Firms: Spatial Patterns and Determinants in the United Kingdom." *Regional Studies* 28: 411–427
- Kihlstrom, R. E., and J.-J. Laffont (1979). "A General Equilibrium Entrepreneurial Theory of Firm Formation Based on Risk Aversion." *Journal of Political Economy*, 87, 719–48.

- Knight, F. H. (1921). *Risk, Uncertainty and Profit*, New York: Houghton Mifflin.
- Kuratko, D. F. (2005). "The Emergence of Entrepreneurship Education: Development, Trends, and Challenges." *Entrepreneurship Theory and Practice*, 29(5), 577–98.
- Lazear, E. P. (2005). "Entrepreneurship." *Journal of Labor Economics*, 23, 649–80.
- Lentz, B. F. and S. Laband (1990). "Entrepreneurial Success and Occupational Inheritance Among Proprietors." *Canadian Journal of Economics*, 23(3), 101–17.
- Lucas, R. E. Jr. (1978). "On the Size Distribution of Business Firms." *Bell Journal of Economics*, 2, 508–23.
- Manski, C.F. (1995). *Identification Problems in the Social Sciences*. Cambridge: Harvard University Press.
- Marshall, A. (1920). *Principles of Economics*, 8<sup>th</sup> ed. London: MacMillan.
- Michelacci, C., and O. Silva (2007). "Why So Many Local Entrepreneurs?" *Review of Economics and Statistics*, 89(4), 615–33.
- Miller, W. (1952). The Business Elite in Business Bureaucracies. In: W. Miller (Ed.): *Men in Business: Essays in the History of Entrepreneurship*, 286-305. Cambridge: Harvard University Press.
- Mitchell, R., and D. Shepherd (2008). "To Thine Own Self be True: Images of Self, Images of Opportunity, and Entrepreneurial Action." *Journal of Business Venturing*, in press.
- Moulton, B. R. (1986), "Random Group Effects and the Precision of Regression Estimates." *Journal of Econometrics*, 32(3), 385–97.
- Neu, I.D., and F.W. Gregory (1952). The American Industrial Elite in the 1870s: Their Social Origins. In: W. Miller (Ed.): *Men in Business: Essays in the History of Entrepreneurship*, 193-211. Cambridge: Harvard University Press.
- North, D.C. (1990). *Institutions, Institutional Change, and Economic Performance*. New York: Cambridge University Press.
- Norton, E. C., R. C. Lindrooth, and S. T. Ennett (1998). "Controlling for the Endogeneity of Peer Substance Use on Adolescent Alcohol and Tobacco Use." *Health Economics*, 7, 439-453.
- Oosterbeek H., M. van Praag, and A. IJsselstein (2008). *The Impact of Entrepreneurship Education on Entrepreneurship Competencies and Intentions: An Evaluation of the Junior Achievement Student Mini-Company Program*. IZA Discussion Paper No. 3641.
- Organisation for Economic Co-operation and Development (OECD) (2007a). *PISA 2006 Science Competencies for Tomorrow's World. Volume 1: Analysis*. Paris: OECD.

- Organisation for Economic Co-operation and Development (OECD) (2007b). *PISA 2006 Science Competencies for Tomorrow's World. Volume 2: Data*. Paris: OECD.
- Parker, S. C. (2004). *The Economics of Self-Employment and Entrepreneurship*. Cambridge: Cambridge University Press.
- Parker, S. C. (2009). Small firms and innovation, forthcoming in: D. B. Audretsch et al. (eds.), *Handbook of Research on Innovation and Entrepreneurship*. Cheltenham: Edward Elgar.
- Saxenian, A. 1999. *Silicon Valley's New Immigrant Entrepreneurs*, San Francisco: Public Policy Institute of California.
- Sanders, J. M., and V. Nee (1996). "Immigrant Self-Employment: The Family as Social Capital and the Value of Human Capital." *American Sociological Review*, 61, 231–49.
- Schneeweis, N., Winter-Ebmer, R. (2007). Peer Effects in Austrian schools. *Empirical Economics*, 32, 387 – 409.
- Schumpeter, J. A. (1912). *The Theory of Economic Development*. New York: Oxford University Press.
- Sen A. (1977). Rational Fools: A Critique of the Behavioral Foundations of Economic Theory, *Philosophy and Public Affairs*, 6, 317-344.
- Solon, G. (1999): "Intergenerational mobility in the labor market." In O. Ashenfelter and D. E. Card (Eds.) *Handbook of Labor Economics*, 1761-1800, North Holland, Elsevier.
- Stuart, T. E., and O. Sorenson (2005). "Social Networks and Entrepreneurship," in: S. Alvarez, R. Agarwal, and O. Sorenson (eds.), *The Handbook of Entrepreneurship: Disciplinary Perspectives*, 211–28. Berlin: Springer.
- Trogdon, J. G., J. Nonnemaker, and J. Pais (2008). "Peer effects in adolescent overweight." *Journal of Health Economics*, 27, 1388-1399.
- Wooldridge, J. M. (2001). "Asymptotic Properties of Weighted M-Estimators for Standard Stratified Samples." *Econometric Theory*, 17(2), 451–70.
- Wu, B., and A. M: Knott (2006). "Entrepreneurial Risk and Market Entry." *Management Science*, 52(9), 1315–30.

## Appendix

### Appendix A1. List of control variables from the PISA school and student background questionnaires

#### Individual and family background variables

- Student is female
- Student is first generation immigrant
- Student is a second generation immigrant
- Student speaks the test language or other national language most of the time or always at home
- Grade (set of dummy variables)
- Student has ever repeated a grade
- Test scores (Mathematics, Science, Reading)
- Student's PISA index of economic, social and cultural status
- Highest level of educational attainment of parents, converted into an index of years of schooling (PARED)
- PISA Index of home possessions (HOMEPOS)

#### School background variables

- School located in a small town or village (fewer than 15 000 people)
- School located in a city (with over 100 000 people)
- School size
- School average PISA index of economic, social and cultural status (ESCS)
- Share of native students at school
- Share of students at school with at least one parent being in an entrepreneurial occupation
- Share of girls at school

#### Institutional characteristics

##### **a. Admission practices, selectivity and ability grouping**

- School with ability grouping for all subjects within school
- School with high academic selectivity of school admittance

##### **b. School management and funding**

- School being privately managed
- Proportion of school funding from government sources

##### **c. Parental pressure and school competition**

- School with high level of competition
- School with high levels of perceived parental pressure

##### **d. Accountability**

- School informing parents of children's performance relative to other students in school
- School informing parents of children's performance relative to national benchmarks
- School informing parents of students' performance relative to other schools
- School posting achievement data publicly
- School using achievement data for evaluating principals
- School using achievement data for evaluating teachers
- School using achievement data for allocating resources to schools
- School with achievement data tracked over time

##### **e. School autonomy 1**

- School autonomy index in staffing
- School autonomy index in budgeting
- School autonomy index in educational content

**School autonomy 2**

- Index of relative responsibility of school staff in allocating resources (RESPRES)
- Index of the relative level of responsibility of school staff in issues relating to curriculum and assessment (RESPCURR)

**f. School resources**

- School average number of students per teacher
- School-level index of teacher shortage
- School average number of computers for instruction per student
- School-level index of quality of school educational resources
- Students' learning time for regular lessons in school
- Students' learning time for out-of-school lessons
- Students' learning time for self-study or homework

**g. Business influence and activities**

- Students participate in job fairs, lectures (at school) by business or industry representatives or visits to local businesses or industries at least once a year
- some students receive some training within local businesses as part of school activities during the normal school year
- Business and industry have a considerable influence on the curriculum

**h. Career guidance**

- Career guidance is provided by teachers at school
- Career guidance is provided by specific career guidance counsellors employed at school or regularly visiting the school

**Table 1a. Descriptive statistics: percentage of students intending to be in an entrepreneurial occupation at age 30**

	1300	1310	1311	1312	1313	1314	1315	1316	1317	1318	1319	Any 13xx	13xx without 1311	% missing
AUS	0.30%	1.75%	0.03%	0.06%	0.05%	0.20%	0.31%		0.02%	0.08%	0.41%	3.21%	3.17%	13.45%
AUT	0.52%				0.02%	0.09%	0.55%		0.03%	0.15%	0.20%	1.56%	1.56%	17.63%
BEL		0.35%	0.15%		0.20%	0.58%	0.66%	0.03%	0.03%		1.47%	3.47%	3.31%	9.57%
CAN			0.40%	0.02%	0.26%	0.17%	0.23%	0.04%	0.04%	0.05%	0.06%	1.27%	0.87%	5.04%
CHE												0.00%	0.00%	9.32%
CZE		5.40%	0.33%	0.15%	0.02%	0.14%	0.80%	0.07%	0.07%		1.10%	8.09%	7.76%	20.86%
DEU	0.05%	0.40%	0.02%			0.05%	0.15%	0.03%	0.01%		0.21%	0.92%	0.90%	21.01%
DNK						0.55%	0.08%		0.03%		0.07%	0.73%	0.73%	6.33%
ESP	0.82%	0.69%	0.01%		0.04%	0.01%	0.16%				0.05%	1.79%	1.78%	20.02%
FIN		1.06%			0.05%	0.07%	0.17%	0.04%			0.21%	1.60%	1.60%	9.55%
GBR	0.12%	1.27%	0.06%	0.03%	0.29%	0.48%	0.38%	0.04%	0.17%	0.17%	0.22%	3.21%	3.15%	6.75%
GRC	0.06%	0.39%	0.02%	0.05%	0.25%	0.54%	0.28%		0.02%	0.04%	0.22%	1.88%	1.86%	20.52%
HUN						0.51%	0.21%		0.03%	0.03%	0.51%	1.28%	1.28%	18.37%
IRL		1.78%	0.09%		0.19%	0.22%	0.33%	0.07%	0.02%	0.35%	0.19%	3.25%	3.15%	10.42%
ISL	0.03%	0.85%				0.03%	0.09%					0.99%	0.99%	23.68%
ITA	0.10%	1.12%	0.10%	0.04%	0.17%	1.91%	0.52%	0.00%	0.03%	0.06%	0.23%	4.29%	4.19%	7.96%
JPN	0.71%											0.71%	0.71%	13.73%
KOR		2.32%	0.02%	0.02%	0.08%	0.81%	0.20%	0.06%	0.02%	0.02%		3.54%	3.52%	3.44%
LUX		1.33%		0.02%		0.14%	0.76%	0.02%	0.05%	0.02%		2.34%	2.34%	7.47%
MEX	0.40%	0.03%	0.02%	0.01%	0.03%	0.30%	0.19%	0.02%	0.00%		0.01%	1.01%	0.99%	16.92%
NLD		0.24%	0.61%	0.27%	0.23%	2.29%	2.19%	0.06%	0.10%		1.11%	7.11%	6.50%	3.70%
NOR	0.23%	0.62%	0.02%		0.03%	0.55%	0.43%	0.09%		0.06%		2.03%	2.01%	19.07%
NZL		2.74%	0.66%		0.03%	0.44%	0.92%			0.11%	0.10%	5.00%	4.34%	12.26%
POL					0.07%	0.09%	0.36%	0.04%			0.91%	1.46%	1.46%	12.72%
PRT		0.03%					0.14%				0.02%	0.19%	0.19%	4.04%
SVK	0.24%	3.52%	0.03%	0.02%	0.15%	1.42%	0.17%	0.03%	0.17%		0.02%	5.78%	5.74%	12.77%
SWE		2.49%	0.07%	0.02%	0.15%	0.96%	0.50%	0.02%	0.14%		0.25%	4.60%	4.53%	8.58%
TUR	0.34%			0.04%	0.35%	1.44%	0.17%	0.02%		0.42%	0.05%	2.83%	2.83%	20.44%
USA			0.02%		0.08%	0.31%	0.40%		0.12%	0.28%	1.57%	2.77%	2.75%	7.19%
All 15cnt	0.18%	0.96%	0.11%	0.03%	0.11%	0.64%	0.46%	0.02%	0.04%	0.08%	0.37%	3.00%	2.89%	
All 28cnt	0.14%	0.99%	0.09%	0.02%	0.11%	0.51%	0.40%	0.02%	0.04%	0.07%	0.32%	2.71%	2.62%	

**Table 1b. percentage of students intending to be in an entrepreneurial occupation, and percentage of students with parents in an entrepreneurial occupation, by country**

	Percentage of students who report that...				Percentage of missing values	
	either parent is an entrepreneur (definition 1)	either parent is an entrepreneur (definition 2)	they intend to be in an entrepreneurial occupation at age 30 (definition 1)	they intend to be in an entrepreneurial occupation at age 30 (definition 2)	parents' occupation	students' intended occupation
<b>AUS</b>	10.92%	10.69%	3.21%	3.17%	1.94%	13.45%
<b>AUT</b>	7.43%	7.40%	1.56%	1.56%	0.80%	17.63%
<b>BEL</b>	9.69%	9.33%	3.47%	3.31%	1.09%	9.57%
<b>CAN</b>	9.62%	6.69%	1.27%	0.87%	1.58%	5.04%
<b>CZE</b>	21.16%	20.56%	8.09%	7.76%	1.60%	20.86%
<b>DEU</b>	4.18%	4.16%	0.92%	0.90%	5.17%	21.01%
<b>DNK</b>	2.30%	2.19%	0.73%	0.73%	1.57%	6.33%
<b>ESP</b>	7.30%	7.28%	1.79%	1.78%	0.71%	20.02%
<b>FIN</b>	4.20%	4.20%	1.61%	1.61%	0.81%	9.55%
<b>GBR</b>	13.70%	13.46%	3.21%	3.15%	3.92%	6.75%
<b>GRC</b>	19.36%	19.06%	1.88%	1.86%	1.01%	20.52%
<b>HUN</b>	4.37%	4.15%	1.28%	1.28%	1.15%	18.37%
<b>IRL</b>	13.72%	13.28%	3.25%	3.15%	2.79%	10.42%
<b>ISL</b>	9.27%	9.23%	1.00%	1.00%	2.51%	23.68%
<b>ITA</b>	17.80%	17.01%	4.29%	4.19%	0.79%	7.96%
<b>JPN</b>	7.23%	7.23%	0.71%	0.71%	2.67%	13.73%
<b>KOR</b>	29.24%	28.87%	3.54%	3.52%	0.53%	3.44%
<b>LUX</b>	8.87%	8.70%	2.36%	2.36%	1.35%	7.47%
<b>MEX</b>	3.30%	3.27%	1.01%	0.99%	1.37%	16.92%
<b>NLD</b>	12.60%	10.58%	7.11%	6.50%	1.29%	3.70%
<b>NOR</b>	11.40%	11.21%	2.03%	2.01%	2.71%	19.07%
<b>NZL</b>	17.75%	14.43%	5.00%	4.34%	2.09%	12.26%
<b>POL</b>	9.60%	9.54%	1.46%	1.46%	0.81%	12.72%
<b>PRT</b>	2.26%	2.26%	0.19%	0.19%	0.48%	4.04%
<b>SVK</b>	6.02%	5.74%	5.78%	5.75%	0.77%	12.77%
<b>SWE</b>	16.78%	16.04%	4.60%	4.53%	1.14%	8.58%
<b>TUR</b>	16.18%	16.18%	2.83%	2.83%	0.77%	20.44%
<b>USA</b>	9.52%	9.27%	2.77%	2.75%	3.54%	7.19%
<b>All 28 cnt</b>	10.96%	10.46%	2.71%	2.62%		
<b>All 15 cnt</b>	12.24%	11.68%	3.00%	2.89%		

Note: based on PISA2006, not imputed data, weighted by the inverse of students' sampling probabilities

**Table 1d. Descriptive statistics for the size of the entrepreneurial peer group, by country**

	<b>Minimum</b>	<b>Maximum</b>	<b>Mean</b>	<b>Std. Deviation</b>
<b>AUS</b>	0.000	0.321	0.031	0.032
<b>AUT</b>	0.000	0.500	0.014	0.042
<b>BEL</b>	0.000	0.341	0.034	0.044
<b>CAN</b>	0.000	0.202	0.012	0.025
<b>CZE</b>	0.000	0.364	0.075	0.075
<b>DEU</b>	0.000	0.143	0.009	0.024
<b>DNK</b>	0.000	0.218	0.007	0.022
<b>ESP</b>	0.000	0.192	0.017	0.030
<b>FIN</b>	0.000	0.101	0.016	0.024
<b>GBR</b>	0.000	0.289	0.031	0.044
<b>GRC</b>	0.000	0.528	0.018	0.036
<b>HUN</b>	0.000	0.177	0.012	0.031
<b>IRL</b>	0.000	0.230	0.031	0.039
<b>ISL</b>	0.000	0.137	0.010	0.020
<b>ITA</b>	0.000	0.571	0.041	0.054
<b>JPN</b>	0.000	0.115	0.007	0.018
<b>KOR</b>	0.000	0.242	0.035	0.042
<b>LUX</b>	0.000	0.589	0.023	0.035
<b>MEX</b>	0.000	0.326	0.009	0.026
<b>NLD</b>	0.000	0.238	0.068	0.055
<b>NOR</b>	0.000	0.174	0.020	0.032
<b>NZL</b>	0.000	0.188	0.048	0.046
<b>POL</b>	0.000	0.504	0.014	0.023
<b>PRT</b>	0.000	0.068	0.002	0.009
<b>SVK</b>	0.000	0.590	0.055	0.063
<b>SWE</b>	0.000	0.334	0.044	0.044
<b>TUR</b>	0.000	0.179	0.028	0.038
<b>USA</b>	0.000	0.250	0.027	0.035
<b>All 28 cnt</b>	0.000	0.590	0.026	0.043
<b>All 15 cnt</b>	0.000	0.571	0.028	0.041

Note: the size of the entrepreneurial peer group is measured as the share of students in one's school intending to be entrepreneurs at age 30 (calculated after excluding individual i) based on entrepreneurship definition 1

**Table 2a. Cross-country regressions, probit regression coefficients**

Dependent variable:	Model 1		Model 2		Model 3	
	students' entrepreneurial intentions (definition 1)	students' entrepreneurial intentions (definition 1)	students' entrepreneurial intentions (definition 2)	students' entrepreneurial intentions (definition 2)	students' entrepreneurial intentions (definition 2)	students' entrepreneurial intentions (definition 2)
either parent is an entrepreneur (definition 1)	0.461*** (0.025)	0.336*** (0.047)	0.456*** (0.026)	0.346*** (0.048)		
size of the entrepreneurial peer group (definition 1)	2.764*** (0.192)	2.782*** (0.327)	2.775*** (0.195)	2.859*** (0.327)		
either parent is an entrepreneur (definition 2)					0.476*** (0.026)	0.350*** (0.049)
size of the entrepreneurial peer group (definition 2)					2.817*** (0.196)	2.878*** (0.336)
Background variables	no	yes	no	yes	no	yes
Observations	232,343	65,983	232,343	65,983	232,343	65,983
Countries	28	24	28	24	28	24

Notes: Standard errors in parentheses; all models contain country fixed effects; each country is given equal weight

Missing values were not imputed

\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

**Table 2b. Cross-country regressions, marginal effects after probit (evaluated at the sample means)**

Dependent variable:	Model 1		Model 2		Model 3	
	students' entrepreneurial intentions (definition 1)	students' entrepreneurial intentions (definition 1)	students' entrepreneurial intentions (definition 2)	students' entrepreneurial intentions (definition 2)	students' entrepreneurial intentions (definition 2)	students' entrepreneurial intentions (definition 2)
either parent is an entrepreneur (definition 1)	0.032*** (0.002)	0.016*** (0.003)	0.031*** (0.002)	0.016*** (0.003)		
size of the entrepreneurial peer group (definition 1)	0.134*** (0.009)	0.100*** (0.013)	0.131*** (0.009)	0.098*** (0.012)		
either parent is an entrepreneur (definition 2)					0.033*** (0.003)	0.016*** (0.003)
size of the entrepreneurial peer group (definition 2)					0.132*** (0.009)	0.099*** (0.013)
Background variables	no	yes	no	yes	no	yes
Observations	232,343	65,983	232,343	65,983	232,343	65,983
Countries	28	24	28	24	28	24

Notes: Standard errors in parentheses; All regressions contain country fixed effects; each country is given equal weight

Missing values were not imputed

\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

**Table 3a. Instrumental variables probit**

	<b>Model 3-1</b>	<b>Model 3-2</b>
	(1)	(2)
<b>Dependent variable: students' entrepreneurial intentions (definition 1)</b>		
either parent is an entrepreneur (definition 1)	0.451*** (0.025)	0.317*** (0.048)
size of the entrepreneurial peer group (definition 1)	5.178*** (1.798)	5.241 (3.406)
Background variables	no	yes
Observations	232,343	65,604
Countries	28	24
F-statistic	54.98	54.87

Notes: Table shows probit coefficients, standard errors are in parentheses; all models contain country fixed effects; each country is given equal weight

Missing values were not imputed

\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

Size of the entrepreneurial peer group instrumented by share of parents at school that are entrepreneurs

The F-statistic tests the significance of the excluded instrument in the first stage regressions

**Table 3b. Instrumental variables probit , marginal effects (evaluated at the sample means)**

	<b>Model 3-1</b>	<b>Model 3-2</b>
	(1)	(2)
<b>Dependent variable:</b>	<b>students' entrepreneurial intentions (definition 1)</b>	<b>students' entrepreneurial intentions (definition 1)</b>
either parent is an entrepreneur (definition 1)	0.032*** (0.002)	0.015*** (0.003)
size of the entrepreneurial peer group (definition 1)	0.255*** (0.096)	0.191 (0.151)
Background variables	no	yes
Observations	232,343	65,604
Countries	28	24

Notes:

\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

**Table 4. Cross-country regressions, Peer group defined as students attending the same grade and school; PISA 2006; Instrumental variables linear regression (linear probability model)**

	Regression coefficients (LPM)	
	(1)	(2)
<b>Dependent variable:</b> <b>students' entrepreneurial intentions (definition 1):</b>		
either parent is an entrepreneur (definition 1)	0.051*** (0.005)	0.025*** (0.007)
size of the entrepreneurial peer group (definition 1)	0.317** (0.137)	0.293 (0.197)
Background variables	no	yes
Observations	89,688	26,871
Countries	14	12
F-statistic	28.52	22.89

Notes: Standard errors in parentheses; both models contain country and school fixed effects; each country is given equal weight

Missing values were not imputed

\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

The F-statistic tests the significance of the excluded instrument in the first stage regressions

**Table 5a. Cross-country regressions, probit regression coefficients PISA 2003**

	Model 4-1		Model 4-2		Model 4-3		Model 4-4	
	full sample		full sample		Did not change schools		Did not change schools	
	probit estimates		IV probit estimates		probit estimates		IV probit estimates	
<b>Dependent variable: students' entrepreneurial intentions (definition 1):</b>								
either parent is an entrepreneur (definition 1)	0.399*** (0.027)	0.434*** (0.038)	0.385*** (0.029)	0.411*** (0.041)	0.418*** (0.036)	0.444*** (0.053)	0.400*** (0.041)	0.430*** (0.056)
size of the entrepreneurial peer group (definition 1)	3.244*** (0.239)	2.883*** (0.362)	6.970*** (1.354)	8.284*** (1.301)	3.601*** (0.379)	3.804*** (0.564)	9.243*** (2.594)	10.420** (3.049)
Background variables	no	yes	no	yes	no	yes	no	Yes
Observations	110,242	46,632	110,242	46,632	67,751	29,959	67,751	29,959
Countries	17	13	17	13	16	12	16	12
F-statistic			38.73	35.08			27.73	20.02

Notes: Standard errors in parentheses; all models contain country fixed effects; each country is given equal weight

Missing values were not imputed

\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

The F-statistic tests the significance of the excluded instrument in the first stage regressions

**Table 5b. Cross-country regressions, marginal effects after probit, calculated at the sample mean (PISA 2003)**

	Model 5-1		Model 5-2		Model 5-3		Model 5-4	
	full sample		full sample		Did not change schools		Did not change schools	
	probit estimates		IV probit estimates		Probit estimates		IV probit estimates	
<b>Dependent variable: students' entrepreneurial intentions (definition 1)</b>								
either parent is an entrepreneur (definition 1)	0.023*** (0.002)	0.027*** (0.003)	0.023*** (0.002)	0.027*** (0.003)	0.023*** (0.003)	0.024*** (0.004)	0.023*** (0.003)	0.025** (0.004)
size of the entrepreneurial peer group (definition 1)	0.135*** (0.010)	0.123*** (0.016)	0.302*** (0.068)	0.383*** (0.076)	0.137*** (0.015)	0.138*** (0.021)	0.377*** (0.132)	0.415** (0.162)
Background variables	no	yes	no	yes	no	yes	no	yes
Observations	110,242	46,632	110,242	46,632	67,751	29,959	67,751	29,959
Countries	17	13	17	13	16	12	16	12

Notes: Standard errors in parentheses; all models contain country fixed effects; each country is given equal weight

Missing values were not imputed

\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

**Table 6a. Robustness check: Antitest, probit and IV probit coefficients**

	Probit	ivprobit	probit	ivprobit	probit	ivprobit	probit	ivprobit
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<b>Dependent variable:</b>	<b>'Administrative Associate Professionals'</b>				<b>'[Large Enterprise] Directors and Chief Executives, [Large Enterprise Operation] Department Managers'</b>			
either parent is an entrepreneur (definition 1)	-0.042 (0.048)	-0.022 (0.044)	-0.048 (0.079)	-0.061 (0.076)	0.025 (0.041)	0.018 (0.038)	-0.082 (0.070)	-0.087 (0.068)
size of the entrepreneurial peer group (definition 1)	1.124*** (0.372)	-5.554* (3.224)	1.126** (0.486)	-4.374 (4.934)	0.858** (0.377)	3.031 (2.970)	1.062 (0.595)	-5.987 (5.226)
Background variables	No	no	yes	yes	no	no	yes	yes
Observations	226,498	226,498	64,404	64,030	226,498	226,498	62,427	62,072
Countries	27	27	23	23	27	27	22	22
F-statistic		54.98				54.98		

Notes:

\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

The F-statistic tests the significance of the excluded instrument in the first stage regressions

**Table 6b. Robustness check: Antitest, average marginal effects after probit and IV probit, evaluated at the sample mean of all regressors**

	probit	ivprobit	probit	ivprobit	probit	ivprobit	probit	ivprobit
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<b>Dependent variable:</b>	<b>'Administrative Associate Professionals'</b>				<b>'[Large Enterprise] Directors and Chief Executives, [Large Enterprise Operation] Department Managers'</b>			
either parent is an entrepreneur (definition 1)	-0.000 (0.000)	-0.000 (0.001)	-0.001 (0.001)	-0.001 (0.001)	0.001 (0.001)	(0.068) (0.000)	-0.001 (0.001)	-0.001 (0.001)
size of the entrepreneurial peer group (definition 1)	0.012*** (0.004)	-0.075 (0.062)	0.013** (0.006)	-0.064 (0.090)	0.019** (0.008)	0.067 (0.069)	0.013* (0.007)	-0.096 (0.120)
Background variables	no	no	yes	yes	no	no	yes	yes
Observations	226,498	226,498	64,404	64,030	226,498	226,498	62,427	62,072
Countries	27	27	23	23	27	27	22	22

Notes:

\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

**Table 7a. Robustness check: General vs. vocational programme designation, regression coefficients**

	ISCEDD GENERAL				ISCEDD VOCATIONAL			
	probit	probit	ivprobit	ivprobit	probit	probit	ivprobit	ivprobit
<b>Dependent variable:</b>	<b>students' entrepreneurial intentions (definition 1)</b>							
either parent is an entrepreneur (definition 1)	0.432*** (0.029)	0.333*** (0.052)	0.423*** (0.028)	0.332*** (0.052)	0.474*** (0.118)	-0.159 (0.207)	0.409*** (0.099)	-0.149 (0.199)
size of the entrepreneurial peer group (definition 1)	2.430*** (0.244)	2.438*** (0.383)	4.624** (1.792)	6.495* (3.524)	2.756*** (0.671)	3.508** (1.512)	7.896* (4.393)	13.420** (3.835)
Background variables	no	yes	no	yes	no	yes	no	yes
Observations	175,859	50,793	175,859	50,793	20,307	5,323	20,307	5,323
Countries	26	22	26	22	10	8	10	8
F-statistic			40.76	22.55			13.90	29.22

Notes:

\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

The F-statistic tests the significance of the excluded instrument in the first stage regressions

**Table 7b. Robustness check: General vs. vocational programme designation, regression coefficients marginal effects (evaluated at the sample mean of all regressors)**

	ISCEDD GENERAL				ISCEDD VOCATIONAL			
	probit	probit	ivprobit	ivprobit	probit	probit	ivprobit	ivprobit
<b>Dependent variable:</b>	<b>students' entrepreneurial intentions (definition 1)</b>							
either parent is an entrepreneur (definition 1)	0.030*** (0.003)	0.016*** (0.003)	0.030*** (0.003)	0.017*** (0.003)	0.036*** (0.013)	-0.003 (0.003)	0.033*** (0.012)	0.000 (0.003)
size of the entrepreneurial peer group (definition 1)	0.119*** (0.012)	0.087*** (0.015)	0.230** (0.094)	0.247 (0.160)	0.145*** (0.033)	0.068* (0.034)	0.466 (0.368)	0.097*** (0.018)
Background variables	no	yes	no	yes	no	yes	no	yes
Observations	175,859	50,793	175,859	50,793	20,307	5,323	20,307	5,323
Countries	26	22	26	22	10	8	10	8

Notes:

\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

**Table 8a. Per country regressions, probit regression coefficients**

	either parent is an entrepreneur		size of the entrepreneurial peer group		N
AUS	0.235***	(0.075)	1.546	(1.058)	13,966
AUT	0.632***	(0.141)	4.183***	(1.241)	4,912
BEL	0.612***	(0.088)	3.673***	(0.649)	8,799
CAN	0.641***	(0.081)	2.477*	(1.334)	22,456
CZE	0.552***	(0.083)	2.428***	(0.401)	5,885
DEU	0.700***	(0.200)	-4.365	(4.384)	4,804
DNK	0.199	(0.387)	1.729	(2.780)	4,492
ESP	0.705***	(0.107)	2.693***	(1.000)	19,536
FIN	0.515***	(0.161)	1.334	(2.047)	4,692
GBR	0.411***	(0.105)	4.511***	(0.496)	12,899
GRC	0.601***	(0.175)	-2.524	(2.655)	4,832
HUN	0.380*	(0.209)	8.891***	(1.136)	4,437
IRL	0.210*	(0.111)	0.760	(1.623)	4,545
ISL	0.269	(0.231)	2.593	(4.592)	3,749
ITA	0.689***	(0.057)	3.419***	(0.378)	21,676
JPN	0.520***	(0.170)	6.432***	(2.130)	5,845
KOR	0.133*	(0.075)	4.190***	(0.610)	5,147
LUX	0.489***	(0.125)	4.155***	(0.407)	4,515
MEX	0.393***	(0.120)	6.110***	(1.836)	30,757
NLD	0.479***	(0.090)	1.279**	(0.648)	4,825
NOR	0.597***	(0.171)	-0.981	(2.598)	4,646
NZL	0.331***	(0.089)	1.246	(0.958)	4,776
POL	0.477***	(0.131)	1.472	(1.948)	5,517
PRT	0.793***	(0.272)	17.599***	(2.637)	5,101
SVK	0.676***	(0.121)	3.401***	(0.378)	4,708
SWE	0.422***	(0.150)	-0.060	(1.098)	4,422
TUR	0.386**	(0.164)	2.527	(1.939)	4,920
USA	0.394***	(0.108)	2.453***	(0.903)	5,484

Notes:

Standard errors in parentheses

\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

based on entrepreneurship

definition 1

model without control variables

**Table 8b. Per country regressions, average marginal effects after probit**

	either parent is an entrepreneur		size of the entrepreneurial peer group		N
AUS	0.020***	(0.008)	0.114	(0.078)	13,966
AUT	0.034***	(0.013)	0.132***	(0.041)	4,912
BEL	0.066***	(0.013)	0.264***	(0.046)	8,799
CAN	0.034***	(0.007)	0.078*	(0.041)	22,456
CZE	0.086***	(0.017)	0.305***	(0.048)	5,885
DEU	0.034**	(0.016)	-0.101	(0.107)	4,804
DNK	0.005	(0.011)	0.032	(0.052)	4,492
ESP	0.047***	(0.012)	0.099***	(0.034)	19,536
FIN	0.031**	(0.015)	0.049	(0.074)	4,692
GBR	0.037***	(0.013)	0.318***	(0.035)	12,899
GRC	0.039**	(0.019)	-0.122	(0.135)	4,832
HUN	0.016	(0.012)	0.263***	(0.026)	4,437
IRL	0.018	(0.011)	0.058	(0.123)	4,545
ISL	0.014	(0.013)	0.106	(0.183)	3,749
ITA	0.077***	(0.009)	0.277***	(0.029)	21,676
JPN	0.015*	(0.008)	0.110***	(0.036)	5,845
KOR	0.011	(0.007)	0.331***	(0.051)	5,147
LUX	0.034**	(0.013)	0.202***	(0.024)	4,515
MEX	0.015***	(0.006)	0.157***	(0.040)	30,757
NLD	0.083***	(0.020)	0.174**	(0.086)	4,825
NOR	0.046**	(0.021)	-0.049	(0.133)	4,646
NZL	0.040***	(0.013)	0.126	(0.097)	4,776
POL	0.023**	(0.009)	0.048	(0.063)	5,517
PRT	0.012	(0.009)	0.096***	(0.020)	5,101
SVK	0.111***	(0.028)	0.367***	(0.040)	4,708
SWE	0.050**	(0.024)	-0.006	(0.104)	4,422
TUR	0.034*	(0.019)	0.176	(0.135)	4,920
USA	0.032***	(0.012)	0.150***	(0.053)	5,484

Notes:

Standard errors in parentheses

\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

based on entrepreneurship definition 1

model without control variables

**Table 9. Descriptive Statistics, World Value Survey 2005-06, by country**

<b>country</b>	<b>One of my main goals in life has been to make my parents proud.</b>	<b>I make a lot of effort to live up to what my friends expect.</b>
<b>AUS</b>	2.79	2.19
<b>DEU</b>	2.44	2.17
<b>ESP</b>	2.99	2.52
<b>FIN</b>	2.24	2.35
<b>GBR</b>	2.97	2.26
<b>ITA</b>	2.83	2.63
<b>JPN</b>	2.73	2.53
<b>KOR</b>	2.95	2.90
<b>MEX</b>	3.29	2.74
<b>NLD</b>	2.68	1.82
<b>NZL</b>	2.60	2.15
<b>POL</b>	3.19	2.54
<b>SWE</b>	2.31	2.16
<b>TUR</b>	3.48	3.07
<b>USA</b>	2.91	2.13
<b>Mean 15cnt</b>	2.83	2.41
<b>Std. 15 cnt</b>	0.34	0.32

Note: country means; original variables were re-coded such that higher values indicate more influence of parents and friends, respectively.

**Table 10. Cross-country regressions, interaction with values, probit regression coefficients**

Dependent variable: students' entrepreneurial intentions	Model 1			Model 2			Model 3			Model 4		
either parent is an entrepreneur	0.419*** (0.032)	0.350*** (0.049)	0.355*** (0.060)	0.419*** (0.032)	0.342*** (0.048)	0.325*** (0.055)	0.421*** (0.032)	0.351*** (0.049)	0.356*** (0.060)	0.420*** (0.032)	0.344*** (0.048)	0.326*** (0.055)
size of the entrepreneurial peer group	2.442*** (0.278)	2.268*** (0.465)	2.081*** (0.470)	2.444*** (0.277)	2.268*** (0.462)	2.066*** (0.466)	2.595*** (0.266)	2.653*** (0.455)	2.409*** (0.498)	2.595*** (0.265)	2.647*** (0.452)	2.382*** (0.493)
strong family ties * either parent is an entrepreneur				-0.061 (0.139)	-0.186 (0.188)	-0.407* (0.219)				-0.057 (0.138)	-0.157 (0.185)	-0.387* (0.219)
importance of friends * size of the entrepreneurial peer group							2.491*** (0.790)	5.052*** (1.348)	3.492*** (1.292)	2.484*** (0.788)	5.006*** (1.325)	3.389*** (1.270)
Background variables (ind+sch)	no	yes	yes	no	yes	yes	no	yes	yes	no	yes	yes
Background variables (ind+sch+institutions)	no	no	yes	no	no	yes	no	no	yes	no	no	yes
Observations	149,266	71,812	40,657	149,266	71,812	40,657	149,266	71,812	40,657	149,266	71,812	40,657
Countries	15	15	12	15	15	12	15	15	12	15	15	12

Notes: Standard errors in parentheses; all models contain country fixed effects; each country is given equal weight; missing values were not imputed

\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

based on entrepreneurship definition 1