TI 2004-130/3
Tinbergen Institute Discussion Paper

The Impact of the Locus-of-Control Personality Trait on the Earnings of Employees vis-à-vis Entrepreneurs

Mirjam van Praag[1]
Justin van der Sluis[1]
Arjen van Witteloostuijn[2]

[1] *Faculty of Economics and Econometrics, University of Amsterdam, and Tinbergen Institute,*
[2] *University of Groningen, the Netherlands, and University of Durham, UK.*

Tinbergen Institute
The Tinbergen Institute is the institute for economic research of the Erasmus Universiteit Rotterdam, Universiteit van Amsterdam, and Vrije Universiteit Amsterdam.

Tinbergen Institute Amsterdam
Roetersstraat 31
1018 WB Amsterdam
The Netherlands
Tel.: +31(0)20 551 3500
Fax: +31(0)20 551 3555

Tinbergen Institute Rotterdam
Burg. Oudlaan 50
3062 PA Amsterdam
The Netherlands
Tel.: +31(0)10 408 8900
Fax: +31(0)10 408 9031

Please send questions and/or remarks of non-scientific nature to driessen@tinbergen.nl.
Most TI discussion papers can be downloaded at http://www.tinbergen.nl.

THE IMPACT OF THE LOCUS-OF-CONTROL PERSONALITY TRAIT ON THE EARNINGS OF EMPLOYEES *VIS-À-VIS* ENTREPRENEURS

Mirjam van PRAAG

(University of Amsterdam, The Netherlands)

Justin van der SLUIS

(University of Amsterdam, The Netherlands)

and

Arjen van WITTELOOSTUIJN

(University of Groningen, The Netherlands & University of Durham, UK)

First draft

August 2004

Correspondence address: Arjen van Witteloostuijn, University of Groningen, Faculty of Economics, Department of International Economics & Business, P.O. Box 800, 9700 AV Groningen, The Netherlands, a.van.witteloostuijn@eco.rug.nl.

Abstract

In the management literature, the locus-of-control concept has been applied extensively over the past three decades. This research note reports the results of a panel data study among a representative sample of 6,111 US young citizens who have been interviewed on a regular basis over a period of about two decades. In addition to this, various relevant personality traits and parental background characteristics have been administered before the first wave and before these young people started working. By analyzing this panel dataset, we offer three contributions to the locus-of-control literature. First, we test for the robustness of the locus-of-control effect on individual performance (in terms of hourly earnings) in the context of this impressive panel data context. Second, we explore whether or not the performance impact of the locus-of-control personality trait is different for employees *vis-à-vis* entrepreneurs. Third, we check whether the performance effect of an individual's locus-of-control score interacts with her or his level of education. Our findings reveal that internality affects earnings positively, that this effect is stronger for entrepreneurs, and that education positively interacts with internality.

Locus of control is a personality trait that was introduced by Rotter in 1966 in the context of his social learning theory. Locus of control is defined as an individual's general expectancy of the outcome of an event as being either within or beyond her or his personal control and understanding (Rotter, 1966). On the one hand, an individual with an external locus-of-control personality trait tends to perceive an event as beyond her or his control, and attributes the outcomes of the event to chance, luck, as under control of powerful others, or as unpredictable because of great contextual complexity. On the other hand, a person with an internal locus-of-control personality trait tends to believe that the event is contingent upon her or his own behavior or her or his own relatively permanent characteristics. In the psychological literature, there is ample evidence that locus of control is a fundamental and stable personality trait, with clear behavioral consequences (Boone & De Brabander, 1993). For example, externality is positively correlated with a higher risk of experiencing stress (Kobasa, Maddi & Kahn, 1982), a lower inclination to take risk and a higher preference for conservative behavior (Baron, 1968), and a lower capability to handle information (Coppel & Smith, 1980).

In the management literature, the locus-of-control concept has been applied extensively over the past three decades. As Boone, De Brabander and van Witteloostuijn (1996: 668) have observed, "[t]he face validity of this construct for studying the influence of [entrepreneurs and managers] follows directly from its definition, as leading a company is in essence a persistent attempt to control the environment." Indeed, an entrepreneur's or manager's locus-of-control internality has been reported to be positively related with, for instance, innovative strategies (Miller, Kets de Vries & Toulouse, 1982; Mueller & Thomas, 2001), financial performance (Govindarajan, 1889; Lee & Tsang, 2001) and organizational survival (Anderson, 1977; Boone, De Brabander & Hellemans, 2000). Clearly, an individual's locus-of-control personality trait has a significant impact upon her or his behavior and performance as an entrepreneur or a manager.

Similarly, much previous work has corroborated a similar logic in the job or task context, and the behavior and performance of individual employees. For example, internal employees have been shown to outperform their external counterparts in achievement-related domains such as their career and education (Andrisani & Nestel, 1976; Semeijn, Boone, van der Velden & van Witteloostuijn, 2004). Generally speaking, externals prefer relatively well-structured and routine-like tasks, whilst internals are more involved with complex and skills-dependent activities (Rotter, 1966; Spector, 1982). Recently, Spector *et al.* (2002) report impressive evidence as to the impact of locus of control on well-being at work – i.e., job satisfaction and psychological well-being – in the context of a large international study in 24 geopolitical entities across five continents, emphasizing the moderating influence of collectivistic and individualistic national cultures.

The current research note reports the results of a panel data study among a representative sample of 6,111 U.S. citizens who have been interviewed on a regular basis over a period of about two decades. Specifically, our analyses explore the American National Longitudinal Survey of Youth (NLSY) for the period of 1979 to 2000. Next to a series of control variables, this dataset includes measures of the respondents' locus-of-control personality trait, measured when they were young, their level of education and their (hourly) earnings in every year they participated in the labor market from 1979 to 2000, as well as their status of employee or entrepreneur in each of these years. By analyzing this panel dataset, we offer three contributions to the literature. First, we test for the robustness of the locus-of-control effect on individual performance (in terms of earnings) in the context of an impressive panel data context with more than 6,000 individuals over a period of more than two decades. Second, we explore whether or not the performance impact of the locus-of-control personality trait is different for employees *vis-à-vis* entrepreneurs. Third, we check whether the impact of an individual's locus-of-control score interacts with her or his level of education.

Theory

As indicated in the introduction, the evidence about the positive impact of locus-of-control internality on individual performance is impressive, having been confirmed time and again in a wide range of different settings over about three decades. For instance, internal individuals tend to be more successful labor market entrants (Semeijn *et al.*, 2004), business unit managers (Govindarajan, 1989), and small-firm entrepreneurs (Boone *et al.*, 1996) than their external counterparts. In a nutshell, the underlying logic is that internal individuals outperform external persons in achievement-dependent contexts because their positive control expectencies are associated with a lower vulnerability to stress (Anderson, 1977), a larger learning capability (Boone *et al.*, 2002), a higher capacity to process information (Lefcourt, 1982), and a higher propensity to behave pro-actively (Miller & Toulouse, 1986). This argument suggests a straightforward positive main effect of locus-of-control internality on individual performance.

> *Hypothesis 1 (H1): An individual's locus-of-control internality is positively associated with her or his earnings as an employee or as an entrepreneur.*

Although employees can of course be engaged in achievement-related tasks, this is particularly the case for entrepreneurs. The very nature of entrepreneurship implies risk-taking and stress, and the need to engage in pro-active behavior and adaptive learning, as is well known since the seminal contribution of Schumpeter (1934). This is clear from the key definitions of entrepreneurship that dominate in the literature (Shane & Venkataraman, 2000; Dollinger, 2003). For example, Knight (1921) and McClelland (1961) emphasize the distinguishing role of risk-taking, Schumpeter (1934) and Gartner (1985) the key activity of innovation, and Kirzner (1973) and Stevenson, Roberts and Grousbeck (1989) the importance of the discovery and pursuit of opportunities. Running a business of your own is very different from being engaged in tasks – however challenging and complex they might be – for the sake of a boss. Not only is the decision discretion of an entrepreneur much

larger, but also the residual claim nature of the latter's earnings implies much more achievement-dependency than an employee's fixed compensation scheme, with or without a variable (performance-related) component. So, we expect that the performance impact of an individual's locus-of-control personality trait is larger for entrepreneurs than for employees.

Hypothesis 2 (H2): The positive correlation of locus-of-control internality and earnings is stronger for entrepreneurs than for employees.

A final issue relates to the role of education. The literature on the impact of education on earnings is large. Inspired by human capital theory (Becker, 1964), an argument that dominates labor economics is that formal education, next to work experience, is the major determinant of an individual's earnings. This assumption is based on straightforward productivity logic, and has received ample empirical support. Standard neo-classical economics argues that an employee's wage must be and will be set equal to her or his marginal productivity. Human capital theory adds to that the argument that an employee's productivity is positively associated with her or his level of education (Mincer, 1974). Taking both sides of the coin together implies that highly educated people can be expected, on average, to earn more than their lowly educated counterparts, *ceteris paribus* (Blackburn & Neumark 1993 & 1995). Similarly, empirical evidence suggests that entrepreneurial performance is positively affected by education (Cooper, Gimeno-Gascon & Woo, 1994; van der Sluis, van Praag & Vijverberg, 2003; van der Sluis, van Praag & van Witteloostuijn, 2004). Rather than simply controlling for education, we explore the interaction of the individual's level of education with her or his locus-of-control personality trait. Here our argument is twofold. First, particularly highly educated employees and entrepreneurs can reap the earnings-increasing opportunities offered by the high-achievement tasks that match so well with locus-of-control internality, because higher education's very aim is to develop competencies that fit with performing well in complex tasks.

Second, it is highly likely that individuals with stronger internal locus-of-control beliefs select their education levels more deliberately such that they will reap higher benefits from any education level.

Hypothesis 3 (H3): An individual's locus-of-control internality is particularly (positively) correlated with her or his earnings for highly educated individuals (for both employees and entrepreneurs).

Design

Sample. The NLSY79 (henceforth NLSY, for short) is a nationally representative sample of 12,686 young men and women who were 14 to 22 years old when they were first surveyed in 1979. The NLSY participants were interviewed annually ever since, up until 1994. Since then, they have been interviewed on a bi-annual basis. The overall sample covers three sub-samples. The first sub-sample is a representative cross-section of young people living in the Unites States in 1979, who were born between January 1 1957 and December 31 1964. This is the sub-sample we will explore in this research note. After dropping all farmers, people working less than 300 hours a year, persons who report working while still in school, entrepreneurs who were also employed for a considerable amount of time, and workers earning less than one dollar an hour, we end up with an effective sub-sample of 6,111 individuals. The second supplementary sub-sample of 5,295 individuals includes an over-representation of minorities, and the third sub-sample of 1,280 participants is focused exclusively on the military. We run our analyses for the period from 1979 to 2000.

Measures. Our dependent variable is the natural logarithm of the hourly earnings in U.S. dollars averaged over a year. The first independent variable is the individual's locus-of-control personality trait, measured with a shortened Rotter scale (see below). The locus-of-control personality trait has been measured at a very young age before people entered the labor market. This is important because if an individual's locus-of-control personality trait would be time variant, the causality of the relationship could otherwise not be assessed. Our second independent variable is a

time-varying dummy, indicating the individual's employee (0) or entrepreneurial (1) status. We define an entrepreneur as someone for whom self-employment is the primary working activity during the year. The third independent variable – education – is proxied by the number of years of completed education. Finally, our fourth independent variable is the product term of the locus-of-control score and the education measure. Additionally, we added nine control variables: academic abilities (ASVAB scores), age (or year of birth) and age squared, gender (0 for females and 1 for males), marital status (0 for being unmarried and 1 for being married), health (0 if an influence on the job is absent, and 1 otherwise), living in a city (0) or on the countryside (1), region (0 for living in non-Southern States, and 1 otherwise), Hispanic background (1, and 0 otherwise), and being of black (1) or white (0) ethnicity. Our measures are summarized in the codebook in the Appendix.

Two remarks are worth making. First, we construct a measure of academic abilities on the basis of the individual's scores on the Armed Services Vocational Aptitude Battery (ASVAB), as administered in 1979-1980. The ASVAB is an IQ-like test that includes ten components of which the factors (1) General science, (2) Arithmetic reasoning, (3) Word knowledge, (4) Paragraph comprehension and (5) Mathematical knowledge have a high g-loading (Hernstein & Murray, 1994). Following previous studies (Bishop, 1991; Blackburn & Neumark, 1993 & 1995), we combine these five sub-scores into one academic ability score. Following Blackburn and Neumark (1993), we filter out the age effect by regressing the normalized test scores on seven age dummies, subsequently incorporating the individuals' residuals as the new test scores in our analyses.

The second remark relates to NLSY's instrument for measuring an individual's locus-of-control personality trait. Earlier work relies predominantly on Rotter's (1966) original I-E scale, which includes 23 forced-choice and six filler items. To keep the length of the NLSY questionnaire within reasonable bounds, NLSY's locus-of-control measure is based on only four of Rotter's original 23 forced-choice questions. The designers of the NLSY selected the strongest four

indicators of an individual's locus-of-control personality trait, based on the extant psychometric evidence in 1979. Each indicator can assume values from 1 (extreme external orientation on the item) to 4 (extreme internal orientation on the item). The resulting summed and, for the ease of interpretation, scaled locus-of control score may range from 0 (external responses throughout) to 100 (internal responses throughout). With hindsight, the use of an abbreviated Rotter scale such as the NLSY's is in line with Lefcourt's (1982) advice to design tailor-made locus-of-control scales that fit with the purpose of the study at hand (Goldsmith, Veum & Darity, 1997).

Method. Because of the panel nature of our dataset, we decided to run random-effects regressions, in which a vector of age, birth year and year dummies corrects for age, cohort and macroeconomic effects. That is, as Deaton (2000) suggested with his decomposition technique, we transformed all dummies so that the year effects add up to zero, and are orthogonal to a time trend. We could not use a fixed-effects method to correct for unobserved individual differences, because a number of our key variables reveal very low or no individual-specific variation over time (e.g, education and the locus-of-control measure). Without longitudinal variation in key variables, as in our case, fixed-effect regressions cannot be used (Wooldridge, 2002). In our random-effects estimations, we control for essential individual differences by including control variables (such as the ASVAB score) and by applying IV methodology (see below).

An important issue in an analysis of the impact of variables, like education, that result from individual decision-making on performance outcomes is the estimation biases that may result from the endogeneity of such independent variables. Many of our variables can be treated as exogenous, either because of their very nature (e.g., age and gender) or due to their early date of administration (i.e., the ASVAB test and locus-of-control scale). In our setting, the endogeneity issue relates to the education variable, both in terms of the main effect as well as in combination with the locus-of-control score in the interaction product term. Following Blackburn and Neumark's (1993 & 1995)

analyses of the returns to education for employees based on the same dataset, we explored family background variables in the context of an Instrumental Variables (IVs) method. The NLSY includes a series of such variables that can be used for our purposes, varying from the parents' level of education and the number of (elder) siblings of the respondent to the number of magazines present in the parental household. In the Appendix, we list the IVs that proved to work well in our analyses (for the education level of employees and entrepreneurs separately). These are almost identical to the instruments used by Blackburn and Neumark (1993 & 1995).

We ran separate analyses to test for the absence or presence of endogeneity (available upon request). First, we produced a first-stage regression that included the family background variables as potential determinants of education. With a Chi-square test we selected the IVs that were of good quality. Subsequently, we performed the Hausman test to check for the relevance of using an IV methodology. If education is an exogenous variable, the residuals of the first-stage regression should not be related to our dependent variable – the natural log of hourly earnings. The education residuals proved to be significant, however, indicating that instrumentation in necessary. Therefore, in the second-stage regression, as reported below, we included the instrumented education variable, denoted by Educationhat. As a final check, we performed the Sargan test on the validity of the selected IVs. For the sub-sample of employees, we end up with seven IVs and one endogenous variable, which gives a test statistic of $N * R^2 = 4.2$ with six degrees of freedom and a p-value of 0.64. For the subsample of entrepreneurs the Sargan test statistic is $N * R^2 = 4.7$ with six degrees of freedom and a p-value of 0.58. Hence, the null hypothesis of the exogeneity of the IVs is not rejected: the selected IVs are valid for both sub-samples in the sense that they do not impact upon performance directly, but only indirectly via education. Similar tests for the Education * Locus-of-control product term revealed that in the interaction analyses endogeneity is not an issue, implying

that this variable can be treated as exogenous. Hence, in the analyses reported below we include Educationhat and the Education * Locus-of-control product term.

Evidence

Table 1 reports the usual descriptives. The data reveal substantial across-individual variation in the key variables, such as education, locus-of-control trait and (logged) hourly earnings, as could be expected. Multicollinearity is not an issue. As can be expected from the very nature of entrepreneurship, the (logged) average hourly income of entrepreneurs (14.38) is substantially above the employees' (10.32), whilst entrepreneurs face a much larger spread than do employees (26.72 and 15.85, respectively). Moreover, in the entrepreneurial sub-sample married white males are over-represented, *vis-à-vis* the employee sub-sample, which is again in line with earlier work (cf. the meta-analysis by van der Sluis, van Praag & Vijverberg, 2003). Interestingly, entrepreneurs reveal higher mean locus-of-control scores than employees. This is in accordance with what could be expected from the extant locus-of-control literature, suggesting that internal individuals are more likely to opt for a relatively challenging and risky career, such as the one of an entrepreneur.

[INSERT TABLE 1 ABOUT HERE]

Tables 2 and 3 report the estimation results for six model specifications, three for employees (Table 2) and three for entrepreneurs (Table 3). Models 1 and 4 are benchmark regressions, with a constant and the control variables only. Subsequently, Models 2 and 5 include the main effects of education (i.e., Educationhat) and the locus-of-control personality trait, applying the IV method. Finally, Models 3 and 6 introduce the interaction effect of education and the locus-of-control personality trait. The F-statistics indicate that adding variables to, first, the benchmark models and, second, the main-effects specifications does indeed increase the model fit.

[INSERT TABLES 2 AND 3 ABOUT HERE]

The results for the control variables are similar across both IV estimations for employees and entrepreneurs, respectively. The coefficient estimates for all control variables are significant in Models 2 and 3 for employees, with the exception of Hispanic ethnicity. Logged hourly earnings are significantly higher for male, married, healthy and white employees with high academic ability in urban areas outside the Southern region, as could be expected. For the entrepreneurial sub-sample, a similar pattern of results is obtained, albeit with a lower number of significant estimates and a lower R-squared. Entrepreneurs are significantly associated with higher (logged) hourly earnings if they are white males with high academic ability working in cities. The effects of marital status, health, Southern region and Hispanic ethnicity are insignificant. Academic ability is also positively and significantly associated with entrepreneurial performance. However, both for employees and entrepreneurs, the positive effect only emerges when our main independent variables are not included, as can be seen by comparing Models 2 and 5 to Models 1 and 4, respectively. Hence, it is highly likely that the positive influence of academic ability is washed away by the dominant impact of education, as this pair of variables is highly and positively correlated (see Table 1). Another notable result emerging from Models 2 and 5 is that the returns to education are substantial, and higher for entrepreneurs than for employees (see Van der Sluis, van Praag & van Witteloostuijn, 2004).

Hypothesis 1 focuses on the main effect of the individual's locus-of-control personality trait on income performance. For the sake of interpretation, we focus on Models 2 (employees) and 5 (entrepreneurs), as the main – or simple – effects may be difficult to interpret in the full model specification (Models 3 and 6, respectively) due to high multicollinearity with the interaction product terms and the need to set a benchmark case (Jaccard & Turrisi, 2003). In effect, the main effects may even switch sign after the introduction of the product term, which indeed happens to the locus-of-control coefficients in our models. In both main effect Models 2 and 5, though, the individual's

locus-of-control score coefficient is significant, positively affecting the incomes of both employees (with $p < 0.01$) and entrepreneurs (with $p < 0.05$). Hence, Hypothesis 1 finds strong support in our data. Clearly, an individual's locus-of-control internality is positively associated with (logged) hourly earnings, for both employees and entrepreneurs.

Hypothesis 2 argues that the individual's locus-of-control trait impact is larger for entrepreneurs *vis-à-vis* employees. To check this, we must examine the size of the estimated coefficients in Model 2 (employees) and Model 5 (entrepreneurs). Indeed, as predicted, the estimated locus-of-control coefficient for the entrepreneurial sub-sample is twice as large as the one for the employee sub-sample, with betas of 0.002 and 0.001, respectively. This is in line with Hypothesis 2's prediction. Being more internal doubles the associated income increase of entrepreneurs, compared to employees: a 10 per cent points increase in an individual's summed locus-of-control score renders a one to two per cent higher income (for employees and entrepreneurs, respectively). Note that the lower significance level in the entrepreneurs' regression is probably due to the much smaller number of observations.

Hypothesis 3 deals with the education level * locus-of-control trait interaction. For that, we turn to Model 3 (employees) and Model 6 (entrepreneurs). Clearly, as expected, we observe that both product terms' coefficients are positive and highly significant (with $p < 0.01$). That is, the positive contribution of an individual's locus-of-control internality is larger for higher educated employees and entrepreneurs. Or alternatively, individuals with more external locus-of-control beliefs choose their education levels more economically. This provides clear evidence for Hypothesis 3. In Figure 1, the interaction curves are plotted, showing that extra education changes the marginal returns to LoC at the same rate ~~with identical slopes~~ for employees and entrepreneurs.

[INSERT FIGURE 1 ABOUT HERE]

So far, we have implicitly assumed that an individual's level of locus of control does not affect her or his choice of employment status – i.e., as entrepreneur or as employee. However, such a selective sample might lead to a sample-selection bias (Wooldridge, 2002). It may, for instance, be the case that individuals with high internality are selecting into self-employment. The descriptive statistics suggest that entrepreneurs are associated with higher internal locus-of-control beliefs, on average. This selectivity in combination with increasing returns to internality might provide an alternative, but non-causal, interpretation of the result that entrepreneurs reap more benefits from their internality than do employees. However, when putting this alternative explanation to the test, we find that the returns to internality are linear, and that there is no significant selection effect. Hence, selectivity is no issue, and hence does not provide an alternative explanation for our findings.

Appraisal

This research note's empirical contribution is that our analyses provide convincing evidence for the positive impact of an individual's locus-of-control internality on the (logged) hourly earnings of employees and entrepreneurs. This evidence is particularly convincing because we explored a unique panel dataset with 6,111 U.S. citizens who were followed over a 21-year period. As the respondents were selected when they were very young, before important career decisions were taken, and because the relevant questionnaire was administered at the very beginning of the time window, the NLSY data strongly suggest a causality that runs from internality to income. With a dataset like the NLSY, we can confidently move beyond simple association findings. Moreover, the type of data collected in the NLSY project is so rich that we could control for many alternative explanations, as well as for endogeneity (of education).

From a theoretical perspective, the NLSY data offered the opportunity to investigate differences of employees *vis-à-vis* entrepreneurs, as well as interaction effects with the individual's

level of education. First, we argued that the impact of an individual's locus-of-control personality trait is likely to be more pronounced for entrepreneurs, compared to employees, given the very nature of internality and entrepreneurship. Second, we hypothesized that an individual's level of education would interact positively with her or his locus-of-control personality trait, for both employees and entrepreneurs, due to the high education – complex task fit. We find strong support for both hypotheses.

From a managerial perspective, our results suggest that education, the locus-of-control trait and their interaction are all important drivers of the performance of employees and entrepreneurs. As far as employees are concerned, this implies that an organization might benefit from HRM investments in education and locus-of-control training programs. For example, training modules may be offered that reduce the external employees' illusion-of-no-control beliefs. Such oftentimes unrealistic beliefs might be prevented or 'repaired' by so-called Outward Bound programs, which may facilitate a locus-of-control shift toward internality (Marsh, Richards & Barnes, 1986). By doing so, these techniques may help external employees – and hence their organizations – to increase their educational performance. With respect to entrepreneurs, similar conclusions can be drawn: ~~i~~Investments in educational and locus-of-control training programs may stimulate entrepreneurial performance. In effect, our study suggests that such investments are likely to be even more productive for entrepreneurs than for employees.

Of course, there are ample opportunities for future research. We would like to conclude with briefly referring to two examples of such future work. For one, we only distinguished employees from entrepreneurs. However, there are different types of employees, as well as different types of entrepreneurs. For instance, in future work we would like to run separate analyses for managers, and to estimate the impact of the entrepreneur's locus-of-control personality trait on different measures of the performance of her or his venture (e.g., venture growth). Additionally, the NLSY data offer

ample opportunities to study career issues. After all, the career moves of the 6,111 participants can be tracked over a 21-year period. In so doing, different career sequences can be distinguished, and their determinants can be studied.

References

Anderson, C. R. 1977. Locus of control, coping behaviors and performance in a stress setting: A longitudinal study. ***Journal of Applied Psychology***, 62: 446-451.

Andrisani, P. J., & G. Nestel. 1976. Internal-external control as contributor to and outcome of work experience. ***Journal of Applied Psychology***, 61: 156-165.

Baron, R. A. 1968. Authoritarianism, locus of control, and risk taking. ***Journal of Psychology***, 68: 141-143.

Becker, G. S. 1964. ***Human capital***. Chicago: University of Chicago Press.

Bishop, J. H. 1991. Achievement, test scores, and relative wages. In M. H. Kosters (Ed.), ***Workers and their wages: Changing patterns in the United States***. Washington, D.C.: The AEI Press.

Blackburn, M. L., & D. Neumark. 1993. Omitted-ability bias and the increase in the return to schooling. ***Journal of Labor Economics***, 11: 521-544.

Blackburn, M. L., & D. Neumark. 1995. Are OLS estimates of the return to schooling biased downward?: Another look. ***Review of Economics and Statistics***, 88: 217-230.

Boone, C., & B. De Brabander. 1993. Generalized versus specific locus of control expectancies of chief executive officers. ***Strategic Management Journal***, 14: 619-626.

Boone, C., B. De Brabander, M. Carree, G. de Jong, W. van Olffen, & A. van Witteloostuijn. 2002. Locus of control and learning to cooperate in a Prisoner's Dilemma game. ***Personality and Individual Differences***, 32: 929-946.

Boone, C., B. De Brabander, & J. Hellemans. 2000. Research note: CEO locus of control and small firm performance. ***Organization Studies***, 21: 641-646.

Boone, C., B. De Brabander, & A. van Witteloostuijn. 1996. CEO locus of control and small firm performance: An integrative framework and empirical test. ***Journal of Management Studies***, 33: 667-699.

Cooper, A. C., F. J. Gimeno-Gascon, & C. Y. Woo. 1994. Initial human and financial capital as predictors of new venture performance. ***Journal of Business Venturing***, 9: 371-395.

Coppel, D. B., & R. E. Smith. 1980. Acquisition of stimulus-outcome and response-outcome expectancies as a function of locus of control. ***Cognitive Therapy and Research***, 4: 179-188.

Deaton, A. 2000. ***The analysis of household surveys***. Johns Hopkins University Press.

Dollinger, M. J. 2003. ***Entrepreneurship: Strategies and resources*** (3rd edition). Upper Saddle River, NJ: Prentice Hall.

Gartner, W. B. 1985. A conceptual framework for describing the phenomenon of new venture creation. ***Academy of Management Review***, 10: 696-706.

Goldsmith, A. H., J. R. Veum, & W. Darity Jr. 1997. The impact of psychological and human capital on wages. ***Economic Inquiry***, XXXV: 815-829.

Govindarajan, V. 1989. Implementing competitive strategies at the business unit level: Implications of matching managers to strategies. ***Strategic Management Journal***, 10: 251-270.

Hernstein, R. J., & C. Murray 1994. *The Bell curve*. New York: The Free Press.

Jaccard, J., & R. Turrisi. 2003. ***Interaction effects in multiple regression*** (2nd edition). Thousand Oaks London New Delhi: SAGE Publications.

Kirzner, I. M. 1973. ***Competition and entrepreneurship***. Chicago: University of Chicago Press.

Knight, F. H. 1921. ***Risk, uncertainty and profit***. Boston, MA: Houghton Mifflin.

Kobasa, S. C., C. Maddi, & S. Kahn. 1982. Hardiness and health: A prospective study. ***Journal of Personality and Social Psychology***, 42: 168-177.

Lee, D. Y., & E. W. K. Tsang. 2001. The effects of entrepreneurial personality, background and network activities on venture growth. ***Journal of Management Studies***, 38: 583-603.

Lefcourt, H. M. 1982. ***Locus of control: Current trends in theory and research***. Hillsdale, NJ: Lawrence Erlbaum.

Marsh, H. W., G. E. Richards, & J. Barnes. 1986. Multidimensional self-concepts: The effect of participation in an Outward Bound program. ***Journal of Personality and Social Psychology***, 50: 195-204.

McClelland, D. 1961. ***The achieving society***. New York: John Wiley.

Miller, D., & J. M. Toulouse. 1986. Chief executive personality and corporate strategy and structure in small firms. ***Management Science***, 32: 1389-1409.

Miller, D., M. R. Kets de Vries, & J. M. Toulouse. 1982. Top executive locus of control and its relationship to strategy-making, structure, and environment. ***Academy of Management Journal***, 25: 237-253.

Mincer, J. 1974. ***Schooling, experience, and earnings***. New York: National Bureau of Economic Research.

Mueller, S. L., & A. S. Thomas. 2001. Culture and entrepreneurial potential: A nine country study of locus of control and innovativeness. ***Journal of Business Venturing***, 16: 51-75.

Rotter, J. B. 1966. Generalized expectancies for internal versus external control of reinforcement. ***Psychological Monographs: General and Applied***, 80: whole number 609.

Schumpeter, J. A. 1934. ***The theory of economic development***. Cambridge, MA: Harvard University Press.

Semeijn, J., C. Boone, R. van der Velden, & A. van Witteloostuijn. 2004. Graduates' personality characteristics and labor market entry: An empirical study among Dutch economics graduates. ***Economics of Education Review***, 23: forthcoming.

Shane, S., & S. Venkataraman. 2000. The promise of entrepreneurship as a field of research. ***Academy of Management Review***, 25: 217-226.

Sluis, J. van der, C.M. van Praag, & A. van Witteloostuijn. 2004. Comparing the returns to education for entrepreneurs and employees. *Working paper*. Amsterdam: University of Amsterdam.

Sluis, J. van der, C.M. van Praag, & W. Vijverberg. 2003. Entrepreneurship, selection and performance: A meta-analysis of the role of education. *Working Paper*. Amsterdam: University of Amsterdam.

Spector, P. E. 1982. Behavior in organizations as a function of employee's locus of control. ***Psychological Bulletin***, 91: 482-497.

Spector, P.E., G. L. Cooper, J. I. Sanchez, M. O'Driscoll, K. Sparks, P. Bernin, A. Büssing, P. Dewe, P. Hart, L. Lu, K. Miller, L. Renault de Moraes, G. M. Ostrognay, M. Pagon, H. D. Pitariu, S. A. Y. Poelmans, P. Radhakrishnan, V. Russinova, V. Salamatov, J. F. Salgado, S. Shima, O.-L. Siu, J. Benjamin Stora, M. Teichmann, T. Theorelli, P. Vlerick, M. Westman, M. Widerszal-Bazyl, P. T. Wong, & S. Yu. 2002. Locus of control and well-being at work: How generalizable are Western findings? ***Academy of Management Journal***, 45: 453-466.

Stevenson, H., M. Roberts, & H. Grousbeck. 1989. ***New business venture and the entrepreneur***. Homewood, IL: Irwin.

Wooldridge, J. M. 2002. ***Econometric analysis of cross section and panel data***. Boston, MA: MIT Press.

Table 1: Descriptives

Employees	Mean	SD	Min.	Max.	Hrinc	LoC	Edu	Age	Sex	Mar	Heal	City	South
Hrincome	10.32	15.85	1	945									
LoC	49.94	28.56	0.11	97.59	.06 **								
Education	12.89	2.39	0	20	.19 **	.22 **							
Age	28.17	5.66	16	43	.23 **	.05 **	20 **						
Sex	0.52	0.50	0	1	.07 **	.02 **	-.07 **	.00					
Marital status	0.50	0.50	0	1	.09 **	.03 **	.06 **	.27 **	-.04 **				
Health	0.02	0.15	0	1	-.01 **	-.01 **	-.04 **	.03 **	-.04 **	.00			
City residence	0.22	0.42	0	1	-.08 **	-.06 **	-.13 **	-.09 **	.02 **	.06 **	.00		
Southern region	0.33	0.47	0	1	-.05 **	-.06 **	-.12 **	.01 **	-.03 **	.02 **	.00	.15	
Hispanic ethnicity	0.06	0.24	0	1	-.01 **	-.05 **	-.10 **	.00	.01 **	-.01 **	.00	-.04 **	.04 **
Black ethnicity	0.11	0.31	0	1	-.04 **	-.05 **	-.05 **	.02 **	-.01 **	-.13 **	.00	-.06 **	.24 **
Academic ability	0.06	0.84	-2.69	1.46	.22 **	.13 **	.50 **	.05 **	-.01 **	.06 **	-.04 **	-.06 **	-.18 **

Entrepreneurs	Mean	SD	Min.	Max.	Hrinc	LoC	Edu	Age	Sex	Mar	Heal	City	South
Hrincome	14.38	26.72	1	1000									
LoC	54.01	27.80	0.11	97.59	.06 **								
Education	12.97	2.45	4	20	.11 **	.23 **							
Age	30.28	5.31	16	43	.19 **	.07 **	.17 **						
Sex	0.64	0.48	0	1	.10 **	-.01	-.11 **	-.06 **					
Marital status	0.63	0.48	0	1	.02	.05 **	.08 **	.19 **	-.19 **				
Health	0.04	0.19	0	1	-.03 **	-.03 **	-.05 **	.03 **	-.04 **	.00			
City residence	0.21	0.41	0	1	-.06 **	-.01	-.09 **	-.10 **	.05 **	.05 **	.01		
Southern region	0.26	0.44	0	1	.01	-.05 **	-.06 **	-.02	.04 **	-.04 **	.04 **	-.01	
Hispanic ethnicity	0.05	0.22	0	1	.01	-.05 **	-.02	.00	.05 **	-.07 **	-.01	-.05 **	.07 **
Black ethnicity	0.05	0.21	0	1	-.02	-.01	-.07 **	.04 **	.05 **	-.14 **	.01	-.05 **	.11 **
Academic ability	0.08	0.90	-2.69	1.42	.19 **	.07 **	.43 **	.04 **	-.03 *	.06 **	-.02	-.01	-.04 **

Table 2: Regression Results for Employees

Employees (Hrincome)	Random-effects benchmark Model 1		Random-effects IV- Model 2		Random-effects IV- Model 3	
Variables	Coefficient	s.e.	Coefficient	s.e.	Coefficient	s.e.
Educationhat			0.103 ***	0.007	0.066 ***	0.007
LoC			0.001 ***	0.000	-0.009 ***	0.000
LoC * Education					0.001 ***	0.000
Academic abilities	0.163 ***	0.006	0.008	0.011	0.004	0.010
Sex	0.227 ***	0.010	0.256 ***	0.010	0.257 ***	0.010
Marital status	0.058 ***	0.004	0.059 ***	0.004	0.058 ***	0.004
Health	-0.051 ***	0.010	-0.050 ***	0.011	-0.049 ***	0.011
City residence	-0.077 ***	0.006	-0.064 ***	0.006	-0.062 ***	0.006
Southern region	-0.084 ***	0.011	-0.066 ***	0.012	-0.073 ***	0.011
Hispanic ethnicity	-0.011	0.023	0.022	0.026	0.009	0.025
Black ethnicity	-0.067 ***	0.016	-0.108 ***	0.019	-0.107 ***	0.018
Constant	0.937 ***	0.087	-0.451 ***	0.131	0.027	0.134
R^2 within	0.522		0.527		0.530	
R^2 between	0.391		0.428		0.467	
R^2 overall	0.455		0.474		0.494	
N	56212		47152		47040	
F-statistic compared with			850.14		1875.33	
previous model			0.000		0.000	

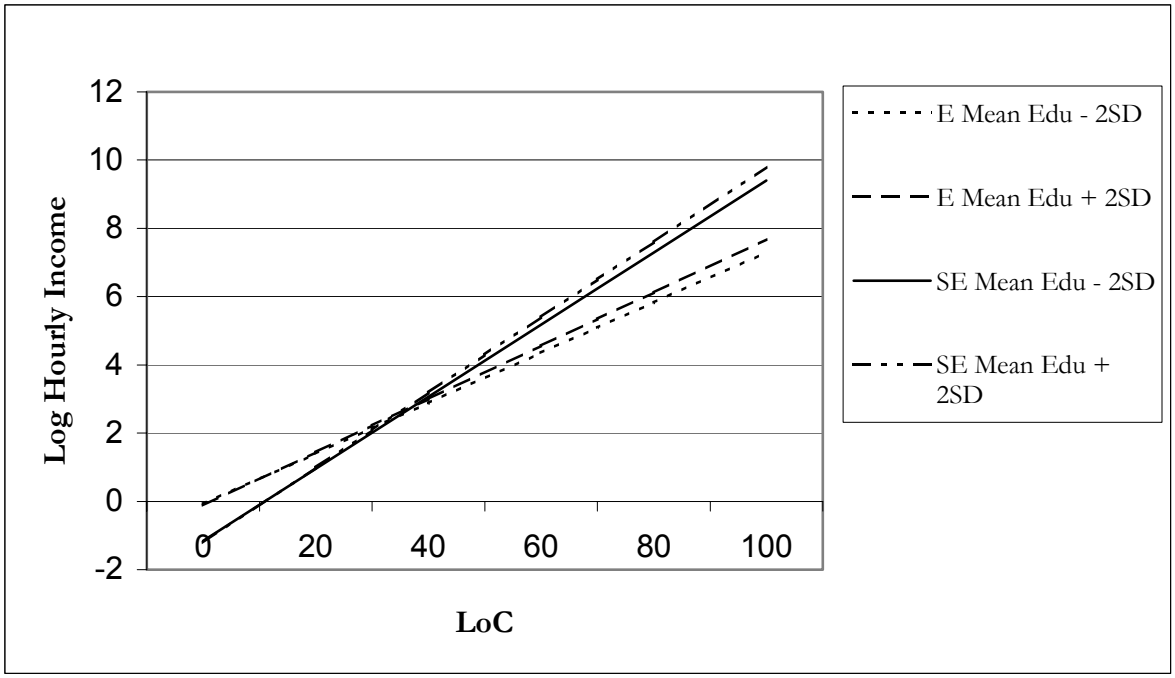
All models include a set of age, year and birth year dummies to control for age, cohort and macroeconomic effects.
*** $p < 0.01$, **$p < 0.05$, and *$p < 0.1$.
Instruments used in the IV estimations are presented in the Appendix.

Table 3: Regression Results for Entrepreneurs

Entrepreneurs (Hrincome)	Random-effects benchmark Model 4		Random-effects IV-Model 5		Random-effects IV-Model 6	
Variables	Coefficient	s.e.	Coefficient	s.e.	Coefficient	s.e.
Educationhat			0.139***	0.025	0.098***	0.026
LoC			0.002**	0.001	-0.008***	0.002
LoC * Education					0.001***	0.000
Academic abilities	0.139***	0.026	-0.073	0.044	-0.072	0.044
Sex	0.662***	0.045	0.661***	0.048	0.660***	0.048
Marital status	0.046	0.032	0.026	0.036	0.019	0.036
Health	-0.099	0.071	-0.061	0.079	-0.058	0.079
City residence	-0.141***	0.042	-0.150***	0.045	-0.139***	0.045
Southern region	0.010	0.049	0.045	0.054	0.040	0.053
Hispanic ethnicity	-0.115	0.120	-0.088	0.132	-0.106	0.131
Black ethnicity	-0.182***	0.092	-0.241***	0.114	-0.235***	0.114
Constant	-0.027	0.862	-1.592	0.876	-1.083	0.878
R^2 within	0.185		0.191		0.190	
R^2 between	0.291		0.321		0.336	
R^2 overall	0.248		0.273		0.283	
N	3566		2952		2950	
F-statistic compared with			50.48		39.85	
previous model			0.000		0.000	

All models include a set of age, year and birth year dummies to control for age, cohort and macroeconomic effects.
***$p < 0.01$, **$p < 0.05$, and *$p < 0.1$.
Instruments used in the IV estimations are presented in the Appendix.

Figure 1: The Education * Locus-of-Control Interaction Effect



SE denotes Entrepreneur and E denotes Employee

Appendix: Codebook and IVs

	Codebook
Education	Total education completed (in years)
LoC	Locus-of-control score, a high value indicating internality
LoC * Education	Interaction term of locus-of-control score and education years
Hrincome	Natural log of earnings per hour (in dollars)
Entrepreneurship	A dummy with value 1 if the person is an entrepreneur, and 0 otherwise
Marital status	A dummy with value 1 if the person is married, and 0 otherwise
Black ethnicity	A dummy with value 1 if the person is of Afro-American ethnicity, and 0 otherwise
White ethnicity	A dummy with value 1 if the person is of white ethnicity, and 0 otherwise
Hispanic ethnicity	A dummy with value 1 if the person is of Hispanic ethnicity, and 0 otherwise
Health	A dummy with value 1 if the person feels that her or his health negatively influences the amount of work she or he can do
Southern region	A dummy with value 1 if the person lives in the south of the U.S., and 0 otherwise
Sex	A dummy with value 1 if the person is male, and 0 otherwise
Age	Age in years
Age squared	Age squared
Academic Ability	ASVAB score, standardized for age
City residence	A dummy with value 1 if the person lives outside a city, and 0 otherwise

Instruments used	**Entrepreneurs**	**Employees**
A dummy with value 1 if there were magazines in the household at the age of 14	X	
A dummy with value 1 if there was a library card in the home at the age of 14		X
A dummy with value 1 if there was no father figure in the household at the age of 14		X
Education of the mother (years completed)	X	
Education of the father (years completed)	X	X
Number of siblings in the household	X	X
Number of older siblings in the household	X	X
A dummy with value 1 if a foreign language is spoken in the household	X	X
A dummy with value 1 if the father and mother were present in the household at the age of 14	X	X