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Abstract:

Using a sample of high-school students from North Rhine-Westphalia, I find evidence that noncognitive skills significantly increase performance in school and success in professional life as well as happiness at age forty-three. Since test scores for cognitive skills are available for the students in the sample, I can disentangle the effect of cognitive and noncognitive skills.
The analysis shows that a high degree of self-regulation increases success in school as well as income, occupational prestige and happiness significantly. However, there are differences between males and females. Furthermore, different attribution and motivation strategies also influence performance in professional life. A straightforward conclusion of the analysis is that parents’ investment in the noncognitive skills of their children is worthwhile and the costs of doing so are rather modest.

JEL Klassifikation : J24, J31, C13
Schlüsselwörter : Noncognitive Skills, Self-Regulation, Motivation, School Performance, Wage, Occupational

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NONCOGNITIVE SKILLS AND SUCCESS IN LIFE: THE IMPORTANCE OF MOTIVATION AND SELF-REGULATION

Michael Rauber*

This Draft: August 2007

- Preliminary and Incomplete-

Abstract

Using a sample of high-school students from North Rhine-Westphalia, I find evidence that noncognitive skills significantly increase performance in school and success in professional life as well as happiness at age forty-three. Since test scores for cognitive skills are available for the students in the sample, I can disentangle the effect of cognitive and noncognitive skills.
The analysis shows that a high degree of self-regulation increases success in school as well as income, occupational prestige and happiness significantly. However, there are differences between males and females. Furthermore, different attribution and motivation strategies also influence performance in professional life. A straightforward conclusion of the analysis is that parents' investment in the noncognitive skills of their children is worthwhile and the costs of doing so are rather modest.

JEL Classification: J24, J31, C13
Keywords: noncognitive skills; self-regulation; motivation; school performance; wage; occupational prestige

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1. Introduction

Recent econometric literature focuses on the importance of so called noncognitive skills on labour market outcomes and success (e.g. Heckman and Rubinstein, 2001; Heckman, Stixrud and Urzua, 2006; Flossmann, Piatek and Wichert, 2006).

Although no general definition of the term noncognitive skills exists in psychology, motivational psychology offers two important concepts that seem to build up a large part of what economists describe as noncognitive skills: motivation and self-regulation or volition (Achtziger and Gollwitzer, 2006). Motivation is responsible for goal setting whereas self-regulation is important for goal striving. Goal setting and goal striving are governed by different psychological processes and are both necessary for performance and achievement (Heckhausen and Gollwitzer, 1987).

Research is still preliminary but first results support the hypothesis that noncognitive skills play an important role for achievement and success in life. However, many studies dealing with this topic are hampered by identification problems. Most datasets available do not include measures of noncognitive skills; those that do usually miss information on the cognitive skills of individuals. For example, the 1999 wave of the German Social Economic Survey (GSOEP), a longitudinal household survey conducted since 1984, includes questions on Rotter's (1966) locus of control but no measure for cognitive skills. However, without simultaneous data on cognitive and noncognitive abilities identification has to rely on strong assumptions. Such assumptions are usually not testable and what is measured therefore remains somewhat unclear.

Furthermore, even if data are available causality may not be clear. If an individual is interviewed about noncognitive skills at age forty, it is obvious that the answer is partly determined by experience and success in life until then. To overcome this reverse causality one has to use instrumental variable estimation. However, even in longitudinal datasets there are often no or only weakly correlated instruments available.[1]

Finally, since psychologists have dealt with noncognitive skills for many years, it seems to be advisable to base the analysis of noncognitive skills on their well-developed theories and concepts. Only by doing this it is possible to give these skills a deeper meaning and interdisciplinary interpretation.

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[1] Although the GSOEP includes a large number of questions on private and professional development it is quite difficult to find useful instruments for Rotter's (1966) locus of control (Göggel, 2007).

In this paper, the effects of motivation, self-regulation and social skills on various outcomes in life will be analysed with respect to the issues mentioned above. Performance in school, achievement in professional life and happiness will be used as the three well defined indicators for success. Having data on both cognitive and noncognitive skills at the time of adolescence and early adulthood, the panel structure of the dataset will allow the explicit taking of timing and causality into account.

The results of the analysis indicate that self-regulation and attribution are important for success in all three areas. However, the effect differs between females and males and within different fields. Social skills do not prove to have a significant impact on success. Overall it seems fair to conclude that both cognitive and noncognitive skills, developed in early childhood, shape the individual path through life. A straightforward conclusion of the analysis is that parents' investment in the noncognitive skills of their children is worthwhile and the costs of doing so are rather modest.

The rest of this paper unfolds as follows: Section 2 briefly describes the dataset used for the analysis. Section 3 introduces several important psychological concepts. Section 4 is devoted to a discussion of cognitive skills and the interaction of both types of skills. The results are presented in section 5. Section 6 focuses on sample section and section 7 finally concludes.

2. The Data

Data was used from a longitudinal panel study of 3240 10^{th} grade students attending 121 classes at 68 "Gymnasien" in North Rhine-Westphalia (Central Archive for Empirical Social Research, 2007; Meulemann, 2007). The testing and interviews were conducted at three different points in time: during the 10^{th} grade (1970), at age 30 (1984) and at age 43 (1997). The study was restricted to North Rhine-Westphalia and the high-school students were selected by a two-stage clustered sampling procedure.

The 10^{th} grade students were asked questions concerning their habits, success in school and also family related topics. They also participated in a psychometric test (Intelligence Structure Test, IST; Amthauer, 1953). Furthermore, parents and teachers were asked to answer questionnaires. For the present study only the parent and student questionnaires were evaluated, because the teacher questionnaire focused on the whole class and included no additional information on individual students. About ten years after the first interview the students' grades were collected from the schools and also recorded. Follow-up interviews were conducted 1984 and 1997. Questions concerning the professional and

academic career as well as private development were asked. Overall, the sample size was reduced to about 1600 participating individuals at age 43, which is about 50 percent of the initial sample size. Panel attrition is a common problem in longitudinal studies and I will deal explicitly with this issue in section 6.[2]

Finally, note that the sample consists only of students from grammar schools (the highest level of German school education), which helps to avoid confounding effects of education and social origin. In fact, by focusing on this group of students the initial conditions in the sample are much more homogenous and, therefore, it is less probable that the estimates suffer from any omitted variable bias.

3. Noncognitive skills

This section briefly reviews some important concepts from motivational psychology. Since motivation induces volition and self-regulative behavior, the initial discussion concerns the relationship between attribution and motivation and thereafter the concepts of self-regulation and volition (Heckhausen and Gollwitzer, 1987).

Motivation and Attribution: Weiner et al. (1971, 1972) developed a model of attribution and showed that success and failure are attributed by individuals to internal or external factors. Individuals can follow an internal attribution strategy by attributing success to effort and ability. External attribution factors are, for example, family and luck. The level of time for stability of attribution can also be considered (Weiner, 1971; Bierbrauer, 1996). Individuals can attribute success to unstable and task specific factors or to stable factors such as the family. A scheme of attribution can be found in the following Figure:

[2] Note that the degree of attrition seems not to be exceptionally high, given that over a time horizon of 20 years the SOEP lost about the same percentage of its initial participants. The SOEP-West started initially in the year 1984 with 12290 participants. In the year 2004 only 6811 individuals that participated in the first wave were still in the sample (SOEP 2007).

	INTERNAL	EXTERNAL
STABLE	**ABILITY**	**FAMILY**
UNSTABLE	**EFFORT**	**LUCK**

Figure 1: Attribution schemes , Source : Weiner et al. (1971). Note that Weiner et al. (1971) refer to "Task difficulty" in the upper right corner. Since family is time stable and external I include this factor.

The students in the sample were asked in the 10th grade how important they thought that ability, effort, luck and support by the family were for success in school. These questions refer to the attribution scheme introduced by Weiner et al. (1971) and therefore proxy the attribution of success. The answer possibilities were always on a scale from 0, implying not important, to 5 which denoted very important. Similar questions were also asked at both follow-up interviews. The questions at that time were slightly modified, dealing more generally with individual success in life. In the analysis the answers from the 10th grade and the first follow-up interview were focused upon to avoid reverse causality. An aggregation of the attribution factors with respect to both dimensions internal vs. external and stable vs. unstable was made since both attribution styles might have important motivational consequences. The resulting variables range between 0 and 10, a higher score indicates a stronger success attribution to the respective factor.

There are several psychological studies that document how the attribution style is linked to motivation. Weiner and Kukla (1970) formulate the hypothesis that attribution, locus of control (Rotter, 1966) and motivation are closely connected:

> *"In summary, an interaction is expected between locus of control, success and failure, and the resultant achievement motivation [need for achievement minus*

> *anxiety of failure]. The prototypic high-achievement-oriented individual is conceptualized as one who assumes responsibility for success, but relatively denies his liability for failure. On the other hand, the individual low in resultant achievement concerns is believed to assume the blame for failure, while denying himself the luxury of personal praise for success."* Weiner and Kukla (1970: p.9).

After a series of experiments they came to the conclusion that "…individuals classified as high in resultant achievement [need for achievement minus anxiety of failure] tend to attribute success to themselves more than individuals low in resultant achievement motivation." (Weiner and Kukla, 1970, p.12). Several studies from developmental psychology confirm this observation: The attribution style is formed during early childhood and a positive or depressing attribution style is fully developed at an age of 11 years (Heckhausen and Heckhausen, 2006, p.:431, Heckhausen, 1984). During adolescence both attribution styles lead to a different development of children (Heckhausen and Heckhausen, 2006, p.:431). Furthermore, there is evidence that self-esteem is also closely connected to attribution: Individuals with a high degree of self-esteem tend to frequently attribute success as being internal.[3]

However, the time stability of attribution can also have important motivational consequences as it influences success expectations: Meyer (1973) confronted individuals in an experiment with a series of failure experiences and divided the participants into two groups. One group was comprised of individuals that revealed an attribution pattern to time stable factors. Interestingly, this group significantly reduced their expectations of future success in each round of the experiment, whereas the other group had roughly constant success expectations over time. Abramson et al. (1989, p. 361) further confirm the importance of time stability of attribution with their research on hopelessness. Bad events can lead to a destruction of self-esteem if attribution is stable and global. Finally attribution to stable factors like family or ability might potentially lead to less task specific effort.

Self-regulation: The concept of self-regulation has a long history in psychological literature. Even William James (1890) named a chapter in Volume 2 of his "Principles of Psychology" *Will*. He therein discusses, among other things, why sometimes a certain action is not

[3] See Stiensmeier-Pelster and Heckhausen (2006), p. 378 on this issue.

undertaken although there might be a motivation for it (obstructed will) and why at other times actions not intended are undertaken (explosive will). A recent definition of self-regulation is given by Peterson and Seligman (2004):

> *"Self-regulation refers to how a person exerts control over his or her own responses so as to pursue goals and live up to standards. These responses include thoughts, emotions, impulses, performances, and other behaviors. The standards include ideals, moral injunctions, norms, performance targets, and the expectations of other people."* Peterson and Seligman (2004, p.: 500).

In motivational psychology the term volition describes such self-regulatory capacities in the context of goal striving. Since the introduced definition of noncognitive skills is derived from motivational psychology, it seems to be useful to explain the concept of volition in some detail. Volition is closely connected to the Rubicon-model of action phases (Heckhausen and Gollwitzer, 1987). The name Rubicon-model derives from a tiny river in Northern Italy: Crossing the Rubicon-River and entering Italy with a standing army was forbidden by an ancient Roman law and any general that did so was a traitor. This tiny stream therefore revealed Caesar's intentions and marked the point of no return (Achtziger and Gollwitzer, 2006). According to the Rubicon-model (Heckhausen and Gollwitzer, 1987) every action includes such a point of no return at which the individual moves from goal setting to goal striving:

> *"Once subjects move from planning and goal-setting to the implementation of plans, they cross a metaphorical Rubicon. That is, their goals are typically protected and fostered by self-regulatory activity rather than reconsidered or changed, often even when challenged."* Corno, (1993, p.:15).

Whereas motivational factors determine goal setting, the primary role of volition is the implementation of existing goals and therefore goal striving (Corno, 1993). Since self-regulation is the more general concept reference will be made to self-regulation in what follows but volition is, of course, a part it.

Self-regulation is scored by using parents' judgments on a scale of 1 (very gifted) to 3 (not gifted) of their child's ability to assert itself and to deal with difficult situations. Since this measure is from the parents' questionnaire at the time of adolescence, it is reasonably

exogenous to events later in life. Furthermore, parents are probably in the best position to judge on this ability of their offspring.[4]

Social skills: Social skills and especially friendships seem to be important for a child's developmental process. Observations in child care centers show that even among infants a considerable differentiation in social interaction exists (Hartup, 1992). Friendships support the child's developmental process within several dimensions:

> *"1.These relationships are contexts in which basic social skills are acquired or elaborated (e.g. social communication, cooperation, and group entry skills);*
> *2. They are information sources for acquiring self-knowledge, knowledge about others, and knowledge about the world;*
> *3. They are emotional and cognitive resources (both for "having fun" and adapting to stress); and*
> *4. They are forerunners of subsequent relationships (modeling the mutual regulation and intimacy that most close relationships require)."*
> Hartup, (1992), p. 184.

However, there is also evidence for negative peer group effects in the literature: Urberg, Degirmencioglu and Pilgrim (1997) found that close friends and friendship groups had a significant influence on the use of cigarettes and alcohol among adolescents.[5]

Social skills were evaluated here by using parents' answers on a scale from one (very gifted) to three (not gifted) on how talented their child was in getting new friends. Because of the possibly negative influences during adolescence the direction of the effect seems to be ex ante unclear.

4. Cognitive skills

Cognitive skills are measured by well developed standardized tests of mathematical and language capabilities. The results of such a standard psychometric test (Intelligence Structure Test, IST; Amthauer, 1953) are available for the high-school students in the sample because the students participated in class room tests during the 10th grade. The IST

[4] Note that parents' judgement might not always be comparable. Therefore this variable is almost certainly measured with some noise.
[5] Close friends and friendship groups e.g. both independently contributed to the prediction of drinking to intoxication (Urberg, Degirmencioglu and Pilgrim, 1997).

is multidimensional and consists of nine separate tests. However, only a short version of the IST with four subtests was carried out.[6] The distribution of the number of correctly solved questions is depicted in the Appendix Figure 3. The average number of correctly solved questions is 40.5. Because all students attended the same school track, differences in the test performance should reflect underlying differences in intelligence and not different educational attainment.[7]

There is some evidence in the psychological literature which shows that cognitive skills and motivation are roughly uncorrelated (Gagné and St. Père, 2002).[8] Furthermore, Corno (1993, p.15) reports that "Conative (motivational and volitional) aptitudes are considered by most theorists to be conceptually and empirically distinct from general or specialized intellectual abilities". Nevertheless it seems important to include a measure of pure cognitive skills into the analysis to disentangle the effect of both types of skills.

To test for the correlation between the measures of cognitive and noncognitive skills, simple bivariate correlation coefficients between the variables using the answers from the 10th grade questionnaire were calculated. The results are reported in Table 2. Interestingly, both types of skills are roughly uncorrelated which confirms the already mentioned psychological evidence. A similar result was also reported by Heckman, Stixrud and Urzua (2006, p.9) for their sample of NLSY pupils.

5. Results

In this section an analysis of whether motivation, self-regulation and social skills formed during childhood have an impact on outcomes later in life is made. Three different measures of success will be used: Performance in school, professional achievement and happiness.

5.1 School performance

The first question addressed is how noncognitive skills affect academic performance. In Germany, the school leaving grades directly influence later academic career opportunities because universities do not select their students on the basis of admission tests. The

[6] The tests carried out were Wortauswahltest, Analogietest, Zahlenreihentest and Würfeltest. I decided to include the number of correctly solved questions into the regression because all pupils attend the same track and class and are therefore comparable. Furthermore, mean age in the 10th grade is 15.4 years with a standard deviation of 0.88, so two thirds of all pupils are between 14.5 and 16.2 years old which is also reasonably close. Finally, I was advised to use the raw scores by HOGREFE (publisher of the IST).

[7] Note that there might be differences with respect to schools and teachers. However, every federal state has a standardized curriculum and therefore these differences should be of minor importance.

[8] Also creativity seems to be uncorrelated with cognitive skills, see Sen and Hagtvet (1993).

permission to study several popular subjects like medicine or psychology depends solely upon the grades.

Grades for the 13th class are available for most pupils in the sample that stayed in school until then.[9] These grades were collected directly from the schools for the majority of students so there was essentially no possibility of misreporting. A natural starting point for the analysis is therefore to disentangle the effect of cognitive and noncognitive skills on success in school. The regression results are presented in Table 3: In columns 1, 2, 5 and 6 the dependent variable is the average grade and in column 3 and 4 the two subjects mathematics and German are analyzed separately.

There seems to be no significant difference between the school performance of boys and girls in the sample (FEMALE). The psychometric test score (IST) is highly significant with a negative sign in all regressions, implying that higher cognitive ability improves (lowers) the grade. Note, that the t-values are the highest among all included variables. The variable IST is bounded between 12 and 70 correctly solved questions; this translates into a difference of the average grade of roughly -0.72.

Self-regulation shows up significantly in the regression for the average grade (columns 1 and 2) and increases achievement in school: Students with a high self-regulatory capacity (SELFREG_H) are about one-eighth grade better than the students in the lowest category. The students in the middle category (SELFREG_M) still have a one-twelfth better average grade. There is no significant difference between a stable and unstable attribution style (column 1). However, individuals who rank high in internal attribution (ATTR.INTERNAL) and low in external attribution (ATTR.EXTERNAL) have better grades as can be seen by inspection of column 2. This result is in line with Heckhausen and Heckhausen (2006) and confirms that attribution styles formed during childhood have a significant impact on performance. Finally, the variable measuring social skills (FRIEND) is insignificant in all regressions.

Generally, the results show that noncognitive skills are nearly as important as cognitive skills for performance in school. Although the effect does not seem to outperform the effect of cognitive skills, as in Duckworth and Seligman (2005), it is nevertheless quite substantial.[10]

[9] Note that some students left school before the Abitur.

[10] Ranking highest in internal attribution and having a high self-regulatory capacity improves the grade by -0.37 as compared to -0.72 for cognitive skills.

Of course one has to be cautious because of potential reverse causality. However, the explanatory variables seem to be reasonably exogenous because the grades were collected in the 13th class which was 3 years after the initial interview. Furthermore, the information on social skills and self-regulation was from the parents' questionnaire and therefore probably relates to the whole development of the child.

The variable REPEAT is a dummy variable which is coded one for students that repeated an academic year at least once. It is highly significant and has a positive sign, which indicates that students that repeated performed worse even though they had more time to deal with the same curriculum. The educational attainment of the mother (MOTHER EDU) is significant at the 1 percent level and shows the expected sign.[11] As can be seen in column 1, the mother's educational attainment is also by far more important than that of the father (FATHER EDU).[12] Interestingly, the educational achievement of the mother is highly significant for the average and the German grade but not for the mathematical performance.

Mathematics and German (columns 3 and 4 of Table 3) both arguably differ a lot in their requirement profile. Cognitive skills are probably more important for mathematics whereas e.g. debating skills should contribute more to the German grade. This hypothesis is easily confirmed by comparing the coefficient of the psychometric test (IST) in columns 3 and 4: The point estimate and t-statistic is larger for mathematics than for German. The noncognitive skills variables also reflect these differences impressively: Self-regulation (SELFREG_H) is highly significant in the regression for the German grade but insignificant for the mathematics grade. This confirms the hypothesis outlined above because German requires class room discussions and therefore verbal performance is an integral part of the teacher's evaluation. Obviously, a high degree of willpower is helpful for that kind of task.

For mathematics (column 3) things are quite different: an internal attribution style improves grades whereas self-regulation has no significant impact on achievement. Therefore, motivation seems to be much more important for the mathematics performance. Because mathematics requires sedulous learning and practice, it seems to be plausible that individuals who attribute success to effort and ability are more motivated than those that attribute success to luck or family. Some anecdotal evidence for this hypothesis is given by Stiensmayer-Pelster and Heckhausen (2006), who refer in an (hypothetical) example exactly

[11] Whether this effect is indeed due to a higher educational attainment of the mother or due to genetic reasons is not important for the present study. See e.g. Plug (2004) for a discussion. Note that the educational attainment is coded from 1 (elementary school without further training) to 13 (university degree) in the dataset. I also used several different scales and a full set of dummy variables to check for the robustness of the results.
[12] The correlation coefficient between the father's and the mother's educational attainment is 0.62.

to this situation. All this supports the insight that different noncognitive skills beneficially unfold in different subjects.

As is well known, boys and girls differ in their development during adolescence. Therefore the effect of self-regulation was estimated separately for boys and girls: With respect to the German grade, self-regulation significantly improves the performance of boys and girls but the effect is larger for girls. For the average grade a positive effect of self-regulation can only be identified for girls.[13] This result might be due to the development edge of girls over boys during adolescence.

Finally to check for the robustness of the results several robustness tests were performed. To test for omitted variable bias the number of evenings spent at home was additionally included and also a residential school dummy as explanatory variable (column 5). As can be seen, EVENINGS has a negative coefficient and is significant at the 10 percent level, indicating that the more evenings spent at home during the 10^{th} grade improved the average grade three years later significantly. With respect to the measures of noncognitive skills nothing changed very much. Furthermore, the baseline regression with classroom fixed effects was estimated because there might have been differences between teachers and schools in grading. This even increased the t-values of self-regulation slightly as can be seen in column 6.

5.2 Professional career

5.2.1 Wage and Income

To investigate the impact of noncognitive skills on the professional career several wage and earnings equations were estimated and included in the measures for cognitive and noncognitive skills. The logarithm of net hourly wage at the time of the second follow-up interview was used as a dependent variable in the baseline regressions. It was computed by dividing net monthly income by the average hours worked per month.[14] The distribution of the wage variable is depicted in Appendix, Figure 2 and the results are shown in Table 4. Dummy variables for the highest school degree, successful completed studies and occupation as a civil servant are included in the baseline specification in column 1.

[13] German grade: SELFREG_H: girls: -0.33 (t-value: 2.57); boys: -0.22 (1.83); Average grade: SELFREG_H: girls: -0.17 (1.98); boys: -0.08 (0.98).

[14] Gross monthly income is not available in the dataset. Note that average hours worked is measured by actual and not by contractual specified hours. Average hours worked per month is calculated as weekly hours times four.

Work experience (EXPERIENCE), measured in years and calculated as the sum of all actual periods of employment, is highly significant and has a positive coefficient as can be seen by inspection of column 1. The female dummy is negative and insignificant. Given that we have a sample of high-school graduates and control for hours worked and a large number of cognitive and noncognitive skills, this is not surprising.

The psychometric test score (IST) has the expected positive coefficient and is significant at the 10 percent level, indicating that a higher level of cognitive skills increases the wage, even when controlled for the highest school degree obtained.

The measures for noncognitive skills show up remarkably in the baseline regression: Self-regulation is highly significant for males and has a positive coefficient (SELFREG MALE). Interestingly, for women the effect of self-regulation is not statistically different from zero. A possible explanation for this will be discussed later. Finally, the coefficients of stable and unstable attribution styles taken from the teenager's questionnaire have the right sign but are insignificant in the baseline regression. The same is true for internal and external attribution (not shown).[15]

The second column presents the estimates of a reduced form where most control variables are not included. Since many career choices during life are probably directly and indirectly influenced by cognitive and noncognitive skills, this regression better identifies the total effect on the wage. As expected, the psychometric test score (IST) now becomes highly significant. Also, the importance of self-regulation increases and the variables are now significant at the 1 percent level for males.

In column 3 instrumental variable estimation is used for the attribution style (ATTR. STABLE and ATTR.UNSTABLE). The reason is that in the 10th grade interview the students were only asked about attribution of success at school. These questions might therefore not be appropriate when dealing with overall personal development. More precise questions concerning personal success in life were asked at both follow-up interviews and therefore instrumental variable regression seems to be suitable for the analysis.[16]

A two-stage least squares regression was used for estimation of the wage equation. The instruments were the attribution scores from the 10th grade and first follow-up interview. A twelve year time lag between the first and the second follow-up ensures

[15] Note that 4 individuals reported a very high hourly wage above 600 DM. If these observations are excluded, stable and unstable attribution becomes significant at the 5 percent level.

[16] Furthermore, the attribution variable was taken from the teenager's questionnaire. I therefore suspect that this variable is measured less precisely than the other variables on noncognitive skills which were collected from the parents' questionnaire.

validity of the instruments (Hansen J-statistic p-value 0.46). The first stage partial R^2 of 0.09 and 0.08 for both endogenous variables were remarkably high and allow precise identification.[17] The results are presented in column 3. Most strikingly, unstable attribution has a much larger impact on wages; the coefficient is positive and significant at the 1 percent level.[18] Stable attribution has a negative but insignificant coefficient. Individuals who attribute success task specific are probably more successful because unstable attribution increases task specific effort. However, as Meyer (1973) pointed out, a reduction of future success expectations due to stable attribution after a series of failures could also lead to this result. Finally, stable attribution can lead to hopelessness and resignation (Abramson et al., 1989).

In column 4 the same exercise is undertaken with respect to internal and external attribution. Internal attribution has a positive coefficient and is borderline significant at the 10 percent level whereas external attribution is insignificant. This verifies the result from our previous analysis of school performance, but some caution seems to be appropriate because of the low significance level. However, combining this result with that from column 3, internal and unstable attribution seems to be a preferable strategy for success in the job market.

Column 5 presents an instrumental variable regression as previously shown, however the independent variable here is the natural logarithm of income. As can be seen, the female dummy variable is now highly significant and has a negative coefficient because the hours worked are not controlled for. Female volition (SELFREG_H FEMALE) now has a positive and significant effect on income. Combining this result with the one from column 1 leads to the conclusion that the effect of self-regulation seems to work for women mainly due to the labor supply decision. Women on average work less hours than males but those with a high degree of goal striving decide to participate more actively in the labor market and therefore earn a higher income. Probably because of their high degree of self-regulation they can deal with the burden of housework, child care and employment more effectively. However, conditional on hours worked there is no additional effect of self-regulation.

The final hypothesis to be addressed is whether the significant influence of noncognitive skills is entirely due to the already identified effect of the high-school leaving

[17] Using only the teenager's attribution style as instrument leads to a weak instrument problem (e.g. first stage F-value for unstable attribution: 1.01)

[18] I also estimated the reduced form equation presented in column 2 using two-stages least squares as a robustness check. This increases, as we should expect, the coefficients and t-values of the cognitive and noncognitive skills variables somewhat.

grades. As already mentioned, the grades have a strong influence on later career opportunities in Germany because universities select students on the basis of grades. Furthermore, grades are also used by employers to select the best candidates for vocational training. I therefore condition on the average grade in the regression presented in column 6 of Table 4. As can be seen, this reduces the sample size to nearly one half of the initial observations. Most variables including the average grade become insignificant. However, the measure for self-regulation (SELFREG_H MALE) remains as significant at the 5 percent level as unstable attribution does. Motivation and self-regulation developed in early childhood and adolescence therefore seem to influence wages not only through their initial effect on grades.

5.2.2 Occupational Prestige

The wage is only one possible measure for professional success. Another factor, more often used in sociology, is occupational prestige. Treiman (1977) developed an occupational prestige scale using data from about 60 countries. The scale ranges between 18 for unskilled workers and 78.9 for physicians and professors. The Treiman (1977) prestige score was used as a dependent variable to analyze the effect of motivation and self-regulation on occupational prestige. The distribution of the Treiman (1977) score in the present sample of individuals is depicted in the Appendix. Note that the relatively high mean of about 55 is due to the fact that the sample consists of former high-school students.

The results of the analysis are shown in Table 5. Strikingly, self-regulation has a highly significant impact on occupation prestige for men *and* women. The effect is about 3.6 additional prestige points for males with a high level of goal striving and therefore nearly as large as the influence of the cognitive skills (IST), which lead to a maximum of 3.9 additional scale points.[19]

Stable and unstable (column 3) as well as internal vs. external attribution (column 4) also show up significantly in the instrumental variable regressions with the same pattern as in the prior wage regressions. Self-regulation and motivation seem to lead to the selection of professions with relatively high occupational prestige for both men and women.

Finally, it remains to be tested whether the wage differences identified previously are only due to this selection effect of more prestigious jobs. Therefore the Treiman (1977) score was included in the baseline OLS wage regression. The results are depicted in column

[19] 0.0666*[70-12] since 70 was the maximum and 12 the minimum number of correctly solved questions.

5. As can be seen, Treiman's (1977) prestige score is highly significant in the wage regression. However, the self-regulation variables still remain significant for males, indicating that the higher wage is not only due to the selection of more prestigious jobs. Note, however, as should be expected, that the coefficients of the noncognitive skill variables are reduced and therefore indicate that indeed part of the effect on wages is due to selection.[20]

5.3 Happiness

Professional success is only one area where one would expect noncognitive skills to be of importance. This section undertakes an analysis of happiness. Using the same sample of individuals, Meulemann (2001) finds that success evaluation at age 43 is more important than objective success for happiness and that more recent successes have larger impacts on satisfaction than past ones.

However, whereas Meulemann (2001) looks backward from age 43, this analysis includes the measures of noncognitive skills from the students' questionnaire and analyzes happiness later in life. Happiness in private and professional life was ranked by the individuals answer on a scale from zero (not satisfied) to ten (maximum satisfaction) of how happy they were with their private and professional development at the time of the second follow-up interview. Since private and professional happiness were separately coded both answers were analysed separately. The results are shown in Table 5. Because of obvious causality problems, instrumental variable estimation was used for the attribution style as previously explained.

Women seem to evaluate their private life more positively than men, as can be seen in column 2. The psychometric test score (IST) only influences happiness in private life significantly. Furthermore, a high degree of self-regulation (SELFREG MALE) increases happiness with private development significantly for males.[21]

Internal attribution increases happiness at work significantly (column 1). This is consistent with the previous results, where internal attribution also increased the wage and occupational status. Interestingly, for private happiness external attribution seems to be a

[20] A further estimation was made of the instrumental variable wage regression (Table 4, column 3) including Treiman's (1977) prestige score. The results of this exercise show that unstable attribution remains highly significant and therefore confirm the conclusion drawn above.

[21] To test whether this effect is due to stable personal characteristics I additionally controlled for the answers in the first follow-up interview. The coefficients remained significant.

better strategy of coping. However, the variable is only at the 10 percent level significant and therefore this result should be interpreted with some caution.[22]

The level of the educational attainment of the father decreases the happiness with one's own professional life. This effect could be due to a status effect. Having a father with a high educational status probably devaluates the personal achievement and increases the aspiration level.

Finally, completed studies also increases satisfaction in private as well as professional life. Whereas there is a direct link between income and completed studies, the private satisfaction could increase e.g. because of better mating possibilities.

6. Selection

There was a substantial decline in the number of participants especially during the first follow-up interview at the age of thirty. This decline in sample size is a common methodological issue in studies with a longitudinal design.[23] Meulemann, Wieken-Mayser and Wiese (1987) analysed the sample composition of the dataset and compared the 10th grade sample with the participants of the first follow-up interview. They found no differences in composition with respect to gender, age, religion and only small differences for socioeconomic background and residence. However, individuals without "Abitur" are significantly underrepresented in the sample. The reason for this might be the early experience of failure and therefore the reluctance to admit this by participating in the study again (Meulemann, Wieken-Mayser, Wiese, 1987). Since the selection mechanism is observable and a large number of background characteristics can be controlled, including cognitive skills, the use of inverse probability weighting is appropriate (Wooldridge 2002). Further details on inverse probability weighting and possible improvements can be found in Flossmann (2006).[24]

A further estimation was made of the reduced form wage and prestige regressions as seen earlier (Table 4 and 5, columns 2). A dummy variable on whether "Abitur" grades are available in the dataset is included in the selection equation. The reason is the fore-

[22] Meulemann (2001) includes contemporaneous attribution into the happiness regressions and finds also significant effects.
[23] Even the LAU, a longitudinal study of high school students in Hamburg officially supported by the ministry lost a large number of its initial participants after two years. LAU 5 started 1996 with more than 12000 students but due to movements, class repetitions etc. only about 9800 could be interviewed again in 1998 (LAU, 2007).
[24] I profited strongly from a discussion with Anton Flossmann on this issue.

mentioned selection mechanism.[25] The results are depicted in Table 7. As can be seen, nothing much changes. Especially the effects of the variables measuring noncognitive skills remain almost unchanged and the t-statistics even increase.

7. Conclusion

The analysis confirms recent insights that noncognitive skills formed during childhood have a significant and lasting impact on success in life and influence performance in school, professional career and happiness.

Several basic concepts from motivational psychology were focused upon. Attribution, self-regulation and social skills were the three dimensions of noncognitive skills built into the analysis. Motivation and self-regulation are important for performance in school. The identified effect of self-regulation is larger for girls than for boys, which is probably due to their early development during adolescence.

The analysis of the labour market shows that for males, wages, income and occupational prestige increase with the level of self-regulation. The effect on wages is partly due to selection into more prestigious jobs. For women it can be observed that a high degree of self-regulation leads to more active participation in the labour market (more hours worked) and therefore a higher income. Probably coping with family stress and employment pressure is easier with sound self-regulatory capacities. Women with a high degree of volition also work in more prestigious jobs, but an additional effect on wages cannot be identified. Finally, individuals that attribute success to internal and unstable factors seem to be more successful than others. As discussed, these results are in accordance with several other motivational theories.

Since self-regulation and motivation are important for success, a crucial question is how the development of these skills can be supported and fostered. Several psychological studies stress the importance of the relationship between the parents and child within the first years of life: Branson (2000) discusses beneficial parental interventions that support the development of self-regulation within several development phases (e.g. 0-3 months, 4-12 months, 12-36 months): Young infants need predictable interactions and rhythms for development and the presence of trusted persons give them some control over new situations. Preschool and Kindergarten children should be given reasons for existing rules

[25] Furthermore, in some rare cases, the schools were not cooperative and did not pass the exam results and student files to the researchers, which also lower the probability of location and therefore participation in the follow-up interview.

and the parental focus should not be on punishment but rather on problem solving and the explanation of appropriate behaviour (Branson, 2000). Furthermore, children confronted with excessive demands by their mothers seem to develop often a pronounced fear of failure later on (Heckhausen and Heckhausen, 2006, p.: 417). To summarize the evidence so far, there is the possibility for parents to facilitate the development of noncognitive skills especially in early childhood, thereby increasing the success of their children later in life.

Tables and Figures

Table1: Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
FEMALE	3385	0.4715	0.4993	0	1
IST	3191	40.479	8.9614	12	70
SELFREG_H MALE	2608	.10429	.30570	0	1
SELFREG_M MALE	2608	.35621	.47897	0	1
SELFREG_L MALE	2608	.07131	.25740	0	1
SELFREG_H FEM	2608	.13573	.34257	0	1
SELFREG_M FEM	2608	.26955	.44381	0	1
SELFREG_L FEM	2608	.06288	.24279	0	1
UNSTABLE_S	3222	6.3386	1.9332	0	10
STABLE_S	3222	5.6245	2.0122	0	10
UNSTABLE_FI	1969	6.6166	1.8653	0	10
STABLE_FI	1962	6.3028	1.9541	0	10
UNSTABLE_SI	1591	6.8228	1.5654	0	10
STABLE_SI	1590	6.3572	1.6178	1	10
INTERNAL_S	3224	7.6421	1.5601	0	10
EXTERNAL_S	3222	4.3246	2.4258	0	10
INTERNAL_FI	1964	6.9287	1.672	0	10
EXTERNAL_FI	1966	5.998	2.2112	0	10
INTERNAL_SI	1589	7.0755	1.3171	1	10
EXTERNAL_SI	1591	6.0987	1.8709	0	10
FRIEND	2616	1.8341	0.6264	1	3
AV GRADE	1783	2.9682	0.5396	1.0833	4.1
AGE	3286	15.418	0.8879	13	19
EDUC FATHER	3223	5.8787	4.2744	1	13
EDUC MOTHER	3245	4.2148	3.537	1	13
LN WAGE	1748	3.1083	0.6072	0.0202	6.6924
EXPERIENCE	1861	13.002	5.9471	0	26.417
EXPERIENCE2	1861	204.4	148.68	0	697.84
STUDY	1801	0.6824	0.4657	0	1
CIV_SERVANT	1853	0.4614	0.4986	0	1
MITTLERE REIFE	1987	0.1741	0.3793	0	1
FACHOBERSCHULE	1987	0.1007	0.3009	0	1
ABITUR	1987	0.7121	0.4529	0	1
TREIMAN SCORE	1841	55.1189	11.6635	18	78.9
REPEAT	3182	0.3654	0.4816	0	1

Notes: The descriptive statistics are calculated for the total sample. Of the 3385 students 145 were not present at the first interview and therefore the net sample size is 3240.

Table 2: Correlations between variables

	IST	M1	M2	M3	F1	F2	F3	IA	EA	SA	UA	FR
IST	1.00											
M1	0.12	1.00										
M2	0.13	-0.26	1.00									
M3	0.04	-0.09	-0.21	1.00								
F1	-0.08	-0.14	-0.30	-0.11	1.00							
F2	-0.14	-0.21	-0.45	-0.16	-0.24	1.00						
F3	-0.10	-0.09	-0.19	-0.07	-0.10	-0.16	1.00					
IA	-0.04	0.01	-0.09	-0.03	0.06	0.06	0.01	1.00				
EA	-0.10	-0.02	-0.07	-0.05	0.05	0.08	0.00	0.20	1.00			
SA	-0.07	-0.02	-0.08	-0.05	0.05	0.08	0.01	0.57	0.67	1.00		
UA	-0.08	0.00	-0.08	-0.04	0.06	0.07	-0.01	0.46	0.72	0.26	1.00	
FR	0.06	-0.15	0.06	0.15	-0.18	0.02	0.13	-0.02	-0.06	-0.02	-0.06	1.00

IST: psychometric test score; M1-M3: Self-regulation male (1-high); F1-F3: Self-regulation female (1-high); IA/EA: internal/ external attribution; SA/UA: stable/ unstable attribution; FR: Social Skills (Friendship)

Table 3: School performance

	1 Average Grade	2 Grade	3 Math	4 German	5 Av. Grade	6 Av. Grade
FEMALE	0.0107	0.0127	-0.0415	-0.0800	0.0149	-0.0464
	(0.27)	(0.33)	(0.62)	(1.17)	(0.38)	(0.85)
IST	-0.0124***	-0.0121***	-0.0362***	-0.0179***	-0.0122***	-0.0118***
	(7.08)	(6.90)	(11.87)	(6.11)	(6.95)	(6.97)
SELFREG_H	-0.1260**	-0.1245**	0.0842	-0.2696***	-0.1257**	-0.1371**
	(2.11)	(2.09)	(0.80)	(2.95)	(2.14)	(2.28)
SELFREG_M	-0.0841	-0.0869*	-0.0288	-0.0654	-0.0880*	-0.0945*
	(1.61)	(1.67)	(0.33)	(0.81)	(1.70)	(1.82)
ATTR. INTERNAL		-0.0249***	-0.0372**	-0.0049	-0.0238**	-0.0203**
		(2.71)	(1.99)	(0.36)	(2.57)	(2.22)
ATTR. EXTERNAL		0.0070	0.0291**	-0.0050	0.0071	0.0104*
		(1.14)	(2.52)	(0.56)	(1.15)	(1.66)
FRIEND	0.0099	0.0116	-0.0763	-0.0108	0.0171	0.0155
	(0.36)	(0.42)	(1.43)	(0.22)	(0.60)	(0.51)
REPEAT	0.2243***	0.2176***	0.4975***	0.2828***	0.2050***	0.1679***
	(6.27)	(6.02)	(7.20)	(4.98)	(5.46)	(4.88)
FATHER EDU	-0.0057	-0.0057	-0.0065	0.0072	-0.0053	-0.0027
	(1.54)	(1.53)	(0.87)	(0.97)	(1.42)	(0.66)
MOTHER EDU	-0.0175***	-0.0190***	-0.0075	-0.0345***	-0.0186***	-0.0181***
	(3.29)	(3.57)	(0.76)	(3.89)	(3.45)	(3.34)
CONSTANT	3.6431***	3.7518***	5.2438***	4.3376***	3.845***	3.7047***
	(30.55)	(28.12)	(20.75)	(21.66)	(27.30)	(27.29)
ATTR_UNSTABLE	-0.0037					
	(0.46)					
ATTR_STABLE	-0.0033					
	(0.40)					
EVENINGS					-0.0208*	
					(1.83)	
RES_SCHOOL					-0.1063	
					(1.06)	
Method	OLS	OLS	OLS	OLS	OLS	FE
Observations	1385	1385	1383	1384	1384	1385
R^2	0.10	0.11	0.14	0.09	0.11	0.25

Notes: * denotes significance at the 10 percent, ** at the 5 percent and *** at the 1 percent level, respectively. The t-values are based upon a clustering robust covariance-matrix on class level. Dependent variables are untransformed grades. The average grade was calculated as arithmetic mean of all available grades.

Table 4: Professional career: Wage

	1 ln(wage)	2 ln(wage)	3 ln(wage)	4 ln(wage)	5 ln(income)	6 ln(wage)
EXPERIENCE	0.0492*** (3.32)		0.0537*** (3.33)	0.0507*** (3.39)	0.0623** (3.05)	0.0595*** (2.96)
EXPERIENCE_2	-0.0007 (1.29)		-0.0010* (1.76)	-0.0008 (1.52)	-0.0008 (1.19)	-0.0013* (1.67)
FEMALE	-0.0348 (0.49)	-0.0730 (0.94)	-0.0613 (0.72)	-0.0673 (0.88)	-0.4994*** (6.65)	-0.1015 (1.10)
IST	0.0027* (1.82)	0.0041*** (2.72)	0.0040*** (2.58)	0.0034** (2.30)	0.0022 (1.33)	0.0039* (1.91)
SELFREG_H MALE	0.2015** (3.06)	0.2261*** (3.21)	0.2013*** (2.69)	0.1891*** (2.71)	0.2507*** (3.40)	0.2031** (1.97)
SELFREG_M MALE	0.1369*** (3.25)	0.1628*** (3.45)	0.0945* (1.93)	0.1156** (2.53)	0.1647*** (3.35)	0.0132 (0.23)
SELFREG_H FEMALE	-0.0174 (0.21)	-0.0045 (0.05)	-0.0446 (0.51)	-0.0504 (0.62)	0.1859** (2.44)	-0.0241 (0.24)
SELFREG_M FEMALE	-0.0109 (0.15)	0.0249 (0.33)	0.0086 (0.11)	0.0149 (0.21)	0.0591 (0.84)	0.0170 (0.19)
ATTR. STABLE	-0.0109 (1.50)	-0.0090 (1.16)	-0.0262 (0.78)		-0.0204 (0.57)	-0.0413 (0.87)
ATTR. UNSTABLE	0.0133 (1.59)	0.0127 (1.45)	0.1132*** (3.13)		0.0959** (2.37)	0.1032** (2.34)
FRIEND	-0.0319 (1.19)	-0.0210 (0.73)	-0.0216 (0.78)	-0.0313 (1.14)	-0.0199 (0.70)	0.0151 (0.45)
CONSTANT	2.1928*** (11.47)	3.0644*** (26.89)	1.6219*** (3.92)	1.6312*** (4.13)	6.463*** (13.90)	1.9922*** (3.35)
ATTR. INTERNAL				0.0598* (1.72)		
ATTR. EXTERNAL				0.0270 (0.95)		
ABITUR GRADE						-0.0179 (0.43)
Control Dummies						
School Degree	✓	-	✓	✓	✓	✓
CIVIL SERVANT	✓	-	✓	✓	✓	✓
STUDY	✓	-	✓	✓	✓	✓
Method	OLS	OLS	TSLS	TSLS	TSLS	TSLS
Observations	1048	1051	1033	1033	1036	640
R^2	0.19	0.06	0.10	0.17	0.39	0.04
Hansen Stat. / p-value			1.54 (0.46)	0.44 (0.80)	0.93 (0.63)	2.95 (0.23)

Notes:* denotes significance at the 10 percent, ** at the 5 percent and *** at the 1 percent level respectively. The t-values are based on a heteroscedasticity robust covariance-matrix.

Table 5: Professional career: Treiman (1977) Occupational Prestige

	1 Treiman Score	2 Treiman Score	3 Treiman Score	4 Treiman Score	5 ln (wage)
EXPERIENCE	0.3337		0.3700	0.4214	0.0466***
	(1.03)		(1.07)	(1.22)	(3.23)
EXPERIENCE_2	-0.0108		-0.0139	-0.0149	-0.0006
	(0.95)		(1.15)	(1.23)	(1.16)
FEMALE	-1.0755	-0.8100	-1.5175	-1.3224	-0.0287
	(0.72)	(0.44)	(0.97)	(0.83)	(0.41)
IST	0.0666**	0.1227***	0.0788**	0.0726**	0.0017
	(1.98)	(3.09)	(2.23)	(2.06)	(1.15)
SELFREG_H MALE	3.579**	5.2710***	3.5738**	3.3580**	0.1629**
	(2.33)	(2.92)	(2.31)	(2.12)	(2.48)
SELFREG_M MALE	2.470**	3.9583***	1.8827	1.8723	0.1219***
	(2.03)	(2.78)	(1.51)	(1.48)	(2.93)
SELFREG_H FEMALE	2.9008**	3.7700**	2.7577**	2.6318*	-0.0345
	(2.26)	(2.33)	(2.05)	(1.90)	(0.42)
SELFREG_M FEMALE	2.254**	3.2503**	2.193*	2.1402*	-0.0087
	(1.98)	(2.20)	(1.87)	(1.78)	(0.12)
ATTR. STABLE	0.0030	0.0136	-0.1978		-0.0106
	(0.02)	(0.08)	(0.35)		(1.45)
ATTR. UNSTABLE	0.0256	-0.0123	1.2834*		0.0131
	(0.17)	(0.07)	(1.83)		(1.56)
FRIEND	-0.1519	0.5805	0.0650	-0.1006	-0.0309
	(0.29)	(0.96)	(0.12)	(0.18)	(1.17)
CONSTANT	40.1937	47.4366	32.993***	29.54***	1.9134
	(10.33)	(16.79)	(4.52)	(3.81)	(9.09)
ATTR. INTERNAL				1.5302**	
				(2.17)	
ATTR. EXTERNAL				-0.1346	
				(0.25)	
TREIMAN SCORE					0.0075***
					(4.80)
Control Dummies					
School Degree	✓	-	✓	✓	✓
CIVIL SERVANT	✓	-	✓	✓	✓
STUDY	✓	-	✓	✓	✓
Method	OLS	OLS	TSLS	TSLS	OLS
Observations	1106	1108	1091	1091	1038
R^2	0.30	0.03	0.29	0.27	0.21
Hansen Stat. / p-value			0.25/ 0.88	2.09/ 0.35	

Notes: * denotes significance at the 10 percent, ** at the 5 percent and *** at the 1 percent level, respectively. The t-values based on a heteroscedasticity robust covariance-matrix. The dependent variables (column 1-4) are the untransformed Treiman (1977) scores.

Table 6: Happiness

	1 Happiness work	2 Happiness private
FEMALE	-0.1970	0.7318**
	(0.69)	(2.48)
IST	0.0076	0.0132**
	(1.32)	(2.44)
SELFREG_H MALE	-0.0439	0.5542*
	(0.18)	(1.93)
SELFREG_M MALE	-0.0733	0.4961**
	(0.36)	(2.17)
SELFREG_H FEMALE	0.0562	0.1007
	(0.20)	(0.41)
SELFREG_M FEMALE	-0.1378	-0.0488
	(0.56)	(0.22)
ATTR. INTERNAL	0.2705**	0.0871
	(2.33)	(0.80)
ATTR. EXTERNAL	0.1471	0.1781*
	(1.41)	(1.82)
FRIEND	-0.2332**	0.0132
	(2.42)	(0.14)
FATHER EDU	-0.0381**	-0.0249
	(2.24)	(1.50)
MOTHER EDU	0.0100	-0.0096
	(0.46)	(0.46)
MITREIFE	0.3624	1.2162
	(0.85)	(2.39)**
FACHOB	0.6121	1.3272
	(1.38)	(2.53)**
ABITUR	0.3272	1.0775
	(0.77)	(2.13)**
STUDY	0.3801***	0.2502*
	(2.61)	(1.74)
CONSTANT	4.0426***	3.8039***
	(3.16)	(3.14)
Method	TSLS	TSLS
Observations	1238	1242
R2	0.07	0.05

Notes: * denotes significance at the 10 percent, ** at the 5 percent and *** at the 1 percent level, respectively. The t-values are based on a heteroscedasticity robust covariance-matrix.

Table 7: Selection effects

	1 ln(wage)	2 Treiman Score
FEMALE	-0.0674	-1.0998
	(0.80)	(0.62)
IST	0.0050***	0.1230**
	(3.28)	(2.73)
SELFREG HIGH MALE	0.2301***	5.6619***
	(3.30)	(3.11)
SELFREG MED MALE	0.1730***	4.2444***
	(3.54)	(3.11)
SELFREG HIGH FEM.	-0.0146	4.0898**
	(0.16)	(2.87)
SELFREG MED FEM.	0.0189	3.6897**
	(0.22)	(2.44)
ATTR. STABLE	-0.0089	0.0813
	(1.14)	(0.50)
ATTR. UNSTABLE	0.0118	-0.0479
	(1.43)	(0.27)
FRIEND	-0.0201	0.7968
	(0.05)	(1.17)
CONSTANT	3.0232***	46.4672***
	(25.07)	(16.29)
Method	IPW	IPW
Observations	2468	2468

Notes: * denotes significance at the 10 percent, ** at the 5 percent and *** at the 1 percent level, respectively. Mother's education level, father's education level, a dummy variable whether the Abitur grade is available, self-regulation, friendship, female and IST are included in the selection equation. All standard errors are bootstrapped (100 replications).

Appendix

Definitions

FEMALE: Dummy variable which is one for women and zero otherwise.

IST: Number of correctly solved questions in the Intelligence Structure Test (IST; Amthauer, 1953). The tests carried out were Wortauswahltest, Analogietest, Zahlenreihentest and Würfeltest.

SELFREG: Self-regulation is taken from the parents' questionnaire and measures on a scale from 1 (very gifted) to 3 (not gifted) the child's ability to assert themselves and to deal with difficult situations. Self-regulation enters the regressions as a set of dummy variables.

UNSTABLE ATTRIBUTION: Unstable attribution is constructed as sum of attribution to EFFORT and LUCK. It ranges between zero and ten and higher scores indicate stronger attribution to unstable factors.

STABLE ATTRIBUTION: Stable attribution is constructed as sum of attribution to ABILITY and FAMILY. It ranges between zero and ten and higher scores indicate stronger attribution to stable factors.

INTERNAL ATTRIBUTION: Internal attribution is constructed as sum of attribution to ABILITY and EFFORT. It ranges between zero and ten and higher scores indicate stronger attribution to internal factors.

EXTERNAL ATTRIBUTION: External attribution is constructed as sum of attribution to FAMILY and LUCK. It ranges between zero and ten and higher scores indicate stronger attribution to external factors.

FRIEND: Friend is taken from the parents' questionnaire and measures on a scale from 1 (very gifted) to 3 (not gifted) the child's ability to get new friends.

AVERAGE GRADE: Average over all available grades (13^{th} class).

EDUC FATHER / EDUC MOTHER: The educational attainment is coded from 1 (elementary school without further training) to 13 (university degree) in the dataset (Central Archive for Empirical Social Research, 2007). I use the original variable for the analysis.

LN (WAGE): Is the natural logarithm of the wage. Wage is computed as net monthly income divided by average hours worked per month for all individuals that worked at the time of the second follow-up. Note that average hours worked is measured by actual and not by contractual specified hours. Average hours worked per month is calculated as weekly hours times four.

EXPERIENCE: Sum of all actual periods of employment (measured in years).

STUDY: Dummy variable for successful completed studies.

CIVIL SERVANT: Dummy variable for occupation as civil servant.

REPEAT: Dummy variable for students that at least once repeated a class.

TREIMAN SCORE: Treiman's (1977) occupational prestige score.

Figure 2: Distribution of net hourly wage

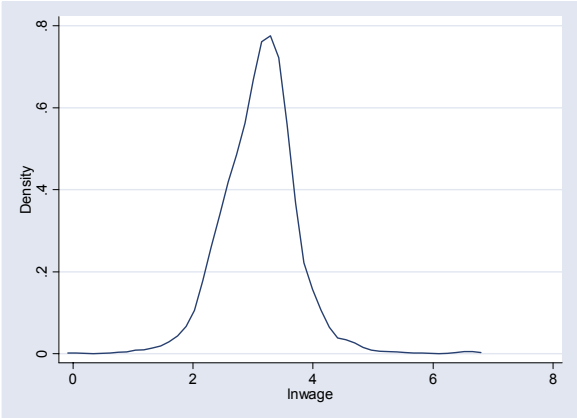


Figure 3: Distribution of IST

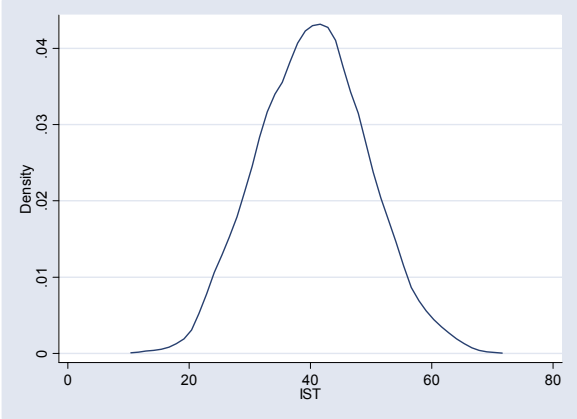
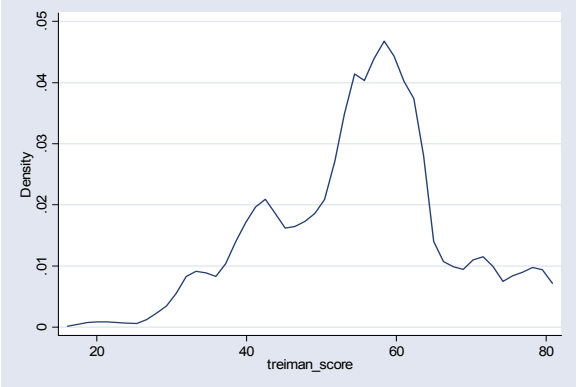


Figure 4: Distribution of Treiman's (1977) Occupational Prestige



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