

Changes over Time in the Returns to Creativity, Communication, and Other Socio-Emotional Abilities

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April 20, 2018

This is a preliminary draft

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Abstract

Although many would agree that creativity, communication, and other socio-emotional abilities should matter on the labor market, a lack of data has limited research on how these abilities affect wages over time. Using a novel Danish survey, I analyze changes over time in the returns to a multidimensional set of abilities, including, among others, creativity and communication. The findings show that employees use every ability for work, only to different extents. The abilities examined play an important role in determining wages, but some abilities affect wages more than others in the time period examined, 2003 to 2010. For example, the estimated return to communication ability tends to be the highest over time, with approximately the same levels, close to 8.3 percent, and the estimated return to creativity tends to be low and statistically insignificant over time. The estimated returns are surprisingly stable over time, with the exception of one year. In 2008, the estimated returns are relatively low to several abilities, including communication ability. This finding is likely caused by the economic crisis which started that year.

Keywords: Returns to education, socio-emotional abilities, noncognitive abilities, human capital, factor analysis.

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Introduction

Many would agree that a multidimensional set of socio-emotional abilities should matter on the labor market. Individuals must be creative and innovative in their work and must communicate knowledge, interact with others, work independently, and use other socio-emotional abilities – in addition to using cognitive abilities such as reading and math ability. To the extent that a broad range of socio-emotional abilities are associated with performing work tasks, they affect wages.² However, although such abilities are important, a lack of data has limited research on how they affect wages over time.

Using a novel Danish cross-sectional survey linked to administrative data over time, I analyze changes over time in the returns to a multidimensional set of socio-emotional and cognitive abilities that include forms that are not normally measured or included in standard data sets, such as creative and innovative ability. Specifically, the socio-emotional abilities cover creative and innovative ability, communication ability, social competency, self-management ability, civic competency, health awareness, environmental awareness, and intercultural awareness. The cognitive abilities include reading and math ability and learning ability (a standard human capital variable).

The paper extends the empirical research in labor economics not only with respect to including a broad range of socio-emotional abilities but also with respect to understanding the degree to which individuals actually supply these abilities at work. The Danish survey measures the actual supply in work, for example, the survey measures the actual individual supply of creative and innovative ability at work. By comparison, previous literature by far and large covers either innate levels of abilities or the average person's use of skills in an occupation based on the nature of the data. For example, socio-emotional abilities such as personality traits are pinpointed with standardized test scores and thereby measure innate levels of abilities (e.g., Heckman, Stixrud, and Urzua, 2006; Mueller and Plug, 2006; Semykina and Linz, 2007; Mohanty, 2009; Heineck and Anger, 2010; Silles, 2010; Almlund,

² Socio-emotional abilities or skills are often called non-cognitive skills or soft skills.

Duckworth, Heckman, and Kautz, 2011; Furnham and Cheng, 2013). The innate levels may not reflect the actual use in work, but rather the potential use in work. The information on the use of skills from the Dictionary of Occupational Titles (DOT) measures the average person's use of different skills in an occupation, but these data do not consider that individual use may vary within an occupation (e.g., Lucas, 1974; Hartog, 1977, 1981; Brown, 1980; Autor, Levy, and Murnane, 2003; Ingram and Neumann, 2006).

The results in this paper show that each employee uses every type of the measured abilities at work. For example, everyone uses his or her creative and innovative ability at work. Nonetheless, because workers vary in the extent to which they use a single ability, some workers use more creative and innovative ability than others. Those who use a high level of creative and innovative ability tend to use a high level of other abilities, but those who use the highest level of the creative and innovative ability may not use the highest level of the other abilities. In general, the use is positively correlated, but those who use the highest level of one ability may not use the highest level of another ability.

Having established that individuals actually use creativity, communication, and the other measured abilities at work, the paper turns to the question of how these abilities affect wages over time. The wage regressions build on a standard log-linear wage equation involving abilities, thereby following Ingram and Neumann (2006). A key assumption in the analysis is that the supply of abilities is constant over time. This assumption follows from the fact that supply of abilities is measured in one year only (2003). My assumption is in line with previous analyses on socio-emotional abilities which meet the same problem in terms of personality traits (e.g., Cuesta and Budría 2012; Mohanty 2010). Nevertheless, the assumption may be strong because the supply of abilities can react to changes

in the returns, especially in the long run. Thus, for precaution, I limit the time period for the wage regressions from 2003 to 2010.³

Regarding the impact on wage for workers, the combined set of the abilities helps explain the variance in wages over time. Individually, the estimated return to communication ability is the highest from 2003 to 2010, with approximately the same levels for each year, close to 8.3 percent. Thus, an employed worker who uses his or her communication ability at a level one standard deviation above the mean in the sample obtains a wage that is 8.3 percent higher than that of a worker who employs his or her communication ability at the mean level, which corresponds to approximately two years of schooling. The estimated return to reading and math ability is second highest over time, at around 7.0 percent. However, the estimated return to creative and innovative ability is low and statistically insignificant in every year examined.

The findings contribute to discussions regarding education policy. By showing that not only reading and math ability (a cognitive ability) but also socio-emotional abilities are important in the labor market, this study stresses the importance of educating young people to be strong not only at reading and math but also at other aspects, such as communicating knowledge.

This introduction ends with a notion on the vocabulary. I use the terms “ability” and “competency” interchangeably throughout this paper. The Danish survey aims at measuring competencies, and in general, definitions of the term competency build on the term ability. By contrast, I abstain from using the term “skill” which the literature in labor economics often addresses as there is a tendency towards understanding that a competency is more than a skill and that the terms competency and skills are not synonymous (OECD, 2005).

³ The specific year, 2010 – rather than, for example, 2009 or 2011 – is chosen because a data break appears in the variable for wage in the administrative data in 2010.

1. Data

I use a cross-sectional Danish survey of a multidimensional set of abilities linked to administrative data. The following describes the survey, the administrative data, the sample, and the index construction.

A. Description of the Survey

A Danish project called The National Competence Account measures 10 abilities: creative and innovative ability, communication ability, reading and math ability, social competency, self-management ability, learning ability, civic competency, health awareness, environmental awareness, and intercultural awareness (Department of Education, 2005; Klynge, 2008).

The survey covers abilities that are considered key competencies for a successful life and a well-functioning society in a knowledge-based economy. The areas are selected and defined theoretically by the Organisation for Economic Co-operation and Development (OECD) in the project Definition and Selection of Key Competencies: Theoretical and Conceptual Foundations, which was undertaken by the OECD in 1997–2003 (OECD, 2003, 2005; Rychen and Salganik, 2003).

The National Competence Account project, which was conducted from 2001 to 2005, developed the questions and measured the abilities empirically. The project was undertaken as a joint operation among the Ministry of Education, the Ministry of Employment, the Ministry of Economic and Business Affairs, and the Ministry of Science, Technology, and Innovation.

Statistics Denmark collected the data in the winter of 2003–2004 from a representative sample of 7,953 individuals aged 20 to 64 who were living in Denmark on November 1st, 2003. The survey was conducted by telephone interviews in two rounds. Every person was contacted by telephone at least six times, including via cell-phone (if available).

Description of Abilities

The ten abilities are defined as follows.

Creative and Innovative Ability. This ability involves creating new products or services. In particular, it involves the ability to create new applications of existing technology, new concepts, new problem solutions and new knowledge that differs from what previously existed.

Communication Ability. This ability involves arguing one's own opinion and understanding others. In particular, it involves the ability to manage appropriate communication methods and tools for sharing information with other people.

Reading and Math Ability. This ability pertains to reading and math comprehension. Reading comprehension consists of the ability to understand, interpret, and reflect upon written materials. Math comprehension requires the capacity to identify, understand, and engage in mathematics.

Social Competency. This ability involves interacting with others and concerns being able to form mutually rewarding and constructive relationships with other people.

Self-Management Ability. This ability involves undertaking tasks independently. Managing oneself requires the ability to make decisions, organize, and perform tasks independently and through one's own initiative so that traditional management in the sense of detailed instruction, monitoring, and control is rendered superfluous.

Learning Ability. This ability involves acquiring new knowledge and concerns the extent to which an individual is open to learning, is aware of his or her own learning process, searches for situations that may lead to learning, and transfers new knowledge into valuable action.

Civic Competency. This ability involves participating in democratic decisions and concerns an individual's involvement and participation in the sustainability and development of democratic life.

Health Awareness. This ability involves assuming responsibility for one's own body and health and concerns obtaining, maintaining, and improving one's physical and mental health.

Environmental Awareness. This ability involves contributing to environmental responsibility. This awareness requires knowledge about reducing environmental strain and involves integrating this knowledge into attitudes and actions.

Intercultural Awareness. This ability involves complying with the complexity of foreign cultures. The ability is about being able to decode, understand, and act upon the differences that may arise when encountering people, values, and norms from another country.

Selection of Variables

The variables in the survey measure the usage of the abilities in work and in leisure, the motivation for using the abilities, the working conditions for using the abilities, and the educational conditions for using the abilities; see Klyng (2008). For the analysis, I select the variables that measure the use of the abilities in work because my focus is on the returns to these abilities in work. A total of 33 variables are selected for the analysis. Table 1.1 lists the selected variables.

Response Scales

The responses offered to the questions are categorical. The responses offered for the questions on creative and innovative ability, self-management ability, and health awareness are the following: “not at all”, “to a lesser degree”, “to some degree”, “to a large degree”, and “to a very large degree”. The responses offered for the questions on communication ability and reading and math ability are “never”, “every month”, “every week”, and “every day”. The responses offered for the remaining five abilities are the following: “yes” and “no”.⁴ I code the responses such that more is better: every variable starts out as zero and increases with one unit across the categories of responses.

⁴ One exception is the responses offered for the question “participate in meetings to influence general conditions at work” in civic competency. This question builds on two questions. The first one is: Can you influence decisions regarding general conditions at your workplace, such as organisational changes, safety matters or smoking policy? The responses offered for this question are “yes” and “no”. Those who answer yes are asked the second question: Have you

Additionally, the respondents were able to answer “don’t know” or “refuse to answer” to each question but were not told up front about this option. For precaution, I give these responses a value of zero. Some questions have the category “no need/not possible” or (the question) “may not relate to the respondent”. I also assign these categories a value of zero because they appear when a respondent does not use the aspect of the ability and because the value of zero corresponds to that case. The focus of this paper is how much an individual uses a given aspect of an ability rather than the reason for why he or she may not use the aspect. One exception is the responses related to intercultural awareness. These questions were not asked to immigrants. I assign immigrants the highest score on every response based on the assumption that they use the highest level.

B. Administrative Data

The administrative data provide information on each individual’s wage, education, labor market experience, and gender. Wage measures the hourly average wage. Education and labor market experience are measured in years. Data for all administrative variables are from 2003 to 2010. A personal identifier code enables me to link the administrative data to the survey data for each individual.

C. Sample

Of the initial representative sample size of 7,953, a total of 5,170 individuals responded to both rounds of the survey (a response rate of 65 percent). In all, 3,311 of the 5,170 individuals (or 64 percent) are employed workers and earn a reliable wage in the administrative data in 2003. These 3,311

participated in meetings or other such activities at your place of work within the last three months with the purpose of influencing general conditions? The responses offered for this question is “no”, “yes, have participated once or twice”, and “yes, have participated more than twice”. As the second question is strictly conditional on the first one, I combine the two questions into one.

individuals are the starting point for the analysis, hence called the baseline sample. See Appendix A for details on the sample distribution in 2003.

D. Index Construction

I create one index for each type of ability. Six indices are constructed using factor analysis, as they are each measured with three or more underlying variables. The six indices are as follows: creative and innovative ability, communication ability, self-management, learning ability, environmental awareness, and intercultural awareness. See Jöreskog and Sörbom (1979) and Borghans, Duckworth, Heckman, and Weel (2008) for an introduction to factor analysis. To account for the fact that the survey data are categorical, I use polychoric correlations in the factor analysis. The factors have means equal to zero for the investigated sample. See Appendix B for a validation of the six indices created by factor analysis.

Four indices are based on simple indices because they are determined by two underlying variables each. The four indices are reading and math ability, social competency, civic competency, and health awareness. I standardize the underlying variables such that they have means equal to zero and variances equal to one for the baseline sample of 3,311 individuals. The simple index provides equal weight to each variable.

E. Discussion

The index construction builds on the following key assumptions:

A.1 The ten abilities exist and one meaningful index can be created for every ability used at work. For example, an ability such as creative and innovative ability does exist, and one meaningful index can be created for the supply in work of this ability.

A.2 The variables underlying a single ability measure and pinpoint the relevant aspects of the ability used at work. For example, the variables underlying creative and innovative ability measure and pinpoint each relevant aspect of the ability used at work.

A.3 The stronger the worker's use of a given aspect of an ability, the stronger the ability is used at work. For example, a worker who develops new products or services "to a very large degree" uses a higher level of his or her creative and innovative ability at work than if he or she develops new products or services "to a lesser degree".

A.4 The answers are comparable across individuals. For example, two workers who develop new products or services "to a very large degree" use the same level of that aspect of his or her creative and innovative ability.

Assumptions A.1 and A.2 allow one index to be created for the supply of every ability at work. The method builds on theory in the sense that the ten indices represent the ten key competencies selected and defined by the DeSeCo, and that one index is created for every ability used at work based on the variables the National Competence Account define to pinpoint and measure the given ability. The factor analysis validates this method empirically for six of the abilities: creative and innovative ability, communication ability, self-management, learning ability, environmental awareness, and intercultural awareness. The fact that multiple abilities exist rather than one single ability is consistent with the broad understanding in the literature; see, e.g., Heckman, Stixrud, and Urzua (2006), Borghans, Duckworth, Heckman, and Weel (2008), and Gardner (1999).

Assumptions A.2 to A.4 imply that the frequency of use of every ability is measured as precisely as possible. Obviously, a single ability may be complex and difficult to delimit, but several routes are taken to meet this aim.

Each ability is captured from several angles such that several variables underlie each ability. The strategy of measuring and pinpointing each ability from several angles rather than from only one angle increases the likelihood of obtaining precise measures.

Two strategies in the survey design help obtain measures that are as precise as possible. One strategy is that the survey was implemented over two rounds with a few months in-between, and every respondent in the baseline sample answered the questions in both rounds. The second strategy is that the categories of responses vary across the questions. For example, sometimes the individual chooses among the following categories of responses: “not at all”, “to a lesser degree”, “to some degree”, “to a large degree”, and “to a very large degree”. At other times, the categories of responses cover “yes” and “no”; or “never”, “every month”, “every week”, and “every day”. Both strategies help minimizing potential systematic misreporting from each respondent.

In addition, the paper obtains measures that are as precise as possible because the variables focus on the action taken rather than on self-assessments of the ability. For example, a variable in creative and innovative ability asks the respondent “to what extent have you developed new products and services at work within the last three months” rather than “to what extent are you creative and innovative in your work”.

The factor analysis handles random measurement error in the variables, such as when a respondent misreports some aspects of a given ability. The factor analysis is applied to the six abilities, which are measured with three or more underlying variables.

Some measurement error may remain in the frequency of use despite the several routes taken. For example, the factor analysis is unable to handle systematic measurement error, which arises when the individual systematically misreports the use of all aspects. Four indices are based on equal weights because they have two underlying variables each. The simple weights are unable to handle random measurement error in addition to the systematic measurement error.

Nevertheless, the largest contribution to any potential measurement error left may stem from the fact that the variables mainly focus on the frequency of use (i.e., the quantity) and disregard the qualitative differences in use. For example, a qualitative difference may exist between two respondents who develop new products or services to a very large degree: one respondent may develop new products or services at a higher quality than is the case for the other respondent. Assumptions A.3 and A.4 imply that the possibility is disregarded (for now) for tractability reasons, but it would be informative to address this aspect in future studies and data collections.

2. The Individual Supply of Abilities at Work

To determine whether individuals actually use creativity, communication, and the other socio-emotional and cognitive abilities at work, Figure 2.1 presents histograms of the supply of each ability for the baseline sample of 3,311 employees in 2003. The unit of measurement for the supply of a given ability is one standard deviation.

The histograms show that each individual does indeed supply every ability at work. For example, every worker uses his or her creative and innovative ability. The figure also illustrates that the workers vary in the extent to which they use a single ability. For example, some workers use more creative and innovative ability than others. It is expected that workers use many of the abilities but that everybody uses so many of the abilities – including creative and innovative ability – may be a surprise. A variation in the use of an ability across workers would be expected, given that they use the ability.

The distributions for reading and math ability, social competency, civic competency, and the health awareness differ somewhat from the other six abilities. The four distributions are discrete rather than continuous, indicating that several workers use the minimum or maximum level possible of these

four abilities. Methodological limitations lead to these results, as the four abilities are based on simple indices with two variables.⁵

To glimpse at how the uses of the abilities are correlated with one another, Table 2.1 demonstrates the pair-wise correlations among the supply of the abilities. The correlations are positive, but clearly imperfect. For example, the correlation between creative and innovative ability and communication ability is equal to 0.634. Those workers who use a high level of creative and innovative ability tend to use a high level of communication ability. However, those who use the highest level of creative and innovative ability may not use the highest level of the communication ability. The correlations are stronger between some abilities than others. For example, creative and innovative ability is correlated to a greater extent with communication ability (with a level equal to 0.634) than with reading and math ability (with a level equal to 0.340).

Although the abilities are positively correlated with one another, no ability can be fully explained by the remaining abilities. The R^2 -levels in Table 2.1 test for multicollinearity by regressing one ability on the nine remaining abilities. None of the R^2 -levels are close to 100%. Creative and innovative ability is the ability that is explained to the greatest extent, 64.3%, by the remaining variables.

3. Changes over Time in the Returns to the Abilities

The findings above show that each individual uses his or her creativity, communication, and the other measured abilities at work. This section investigates whether these abilities also play an important role in the wage over time.

⁵ The distribution for social competency is less dispersed than those of reading and math ability, civic competency and health awareness because the two variables underlying social competency have fewer categories of response than the two variables underlying reading and math ability, civic competency and health awareness. The categories of responses for the questions underlying the social competency are “yes” and “no”, whereas, for example, the categories of responses for the questions underlying the reading and math ability are “every day”, “every week”, “every month”, and “never”.

The wage regressions build on a standard log-linear wage equation involving abilities, following Ingram and Neumann (2006). As noted in the introduction, a key assumption in the analysis is that the supply of abilities is constant over time as the supply of abilities is measured in one year only (2003). Although my assumption follows previous analyses on socio-emotional abilities in terms of personality traits, the assumption may be strong in the long run for the supply of abilities. Thus, I limit the time period for the wage regressions from 2003 to 2010.⁶

The return is the price or payoff to the ability. The meaning of “return” follows common usage. Heckman, Lochner, and Todd (2006) specify the conditions under which price is in fact the rate of return in terms of schooling. The difference from previous studies is that here, the return is the “the return to the supply of ability” rather than “the return to innate ability”. The return to the supply of ability equals the return to innate ability only when workers use their entire innate ability for work.

Technically, I estimate the wage regressions simultaneously with the factor model parameters for the abilities within a given year (Bollen, 1989; Browne and Arminger, 1995). The estimator is a weighted least square estimator because I use polychoric correlations in the factor model.

The sample for a given year consists of those among the baseline sample of 3,311 individuals who are employed workers and earn a reliable wage that year. For example, among the baseline sample of 3,311 individuals, 3,055 individuals are employed workers and earn a reliable wage in 2004. One could also limit the sample to those among the baseline sample who are employed workers with a reliable wage in every year from 2003 to 2010, but the current approach seems as a natural starting point.

Tables 3.1 to 3.3 present the results. In Table 3.1, the log of hourly wage is regressed on the abilities. In Table 3.2, the log of hourly wage is regressed on education, labour market experience, and gender, which are standard explanatory variables in a wage regression based on the Mincer (1974)

⁶ As noted earlier, the specific year, 2010 – rather than, for example, 2011 – is chosen because a data break appears in the wage in the administrative data in 2010.

model. Table 3.3 combines the regressions from Tables 3.1 and 3.2 in that the log of hourly wage is regressed on the abilities and the standard explanatory variables. The results of all three models are relevant when assessing the effect of the abilities on wages over time, but Table 3.3 generates preferred estimates, and Figure 3.1 illustrates the results from this table.

The results in the three tables demonstrate that the abilities significantly contribute to explaining the variance in individual wages over time both with and without controlling for the standard explanatory variables. For example, in 2003, the abilities explain 24.1 percent of the variance in the wage according to the R^2 -level in Table 3.1. The abilities and the standard explanatory variables in a wage regression altogether explain 41.0 per cent of the wage variance in 2003 in Table 3.3. That level is substantially higher than the level explained by the standard explanatory variables in Table 3.2, at 30.1 percent. The abilities are jointly statistically significant at the 1 per cent level in a Wald test in Table 3.3 ($p < 0.001$) in 2003. This significance adds to the result that abilities play an important role in the wage.

Taken as a whole, the variance in the individual wage explained by the ten abilities with and without the standard explanatory variables is remarkably stable over time. Nonetheless, one year stands out. In 2008, the ten abilities and the standard explanatory variables explain only 34.8 percent of the variance in the wage. Additionally, the ten abilities jointly explain only 22.1 percent of the variance of the wage by themselves that year. This finding is likely caused by the economic crisis which started that year.

Regarding the return to each ability, Table 3.3 and Figure 3.1 show that some abilities affect wages more than others over time.⁷ The estimated return to communication ability is the highest over time, with approximately the same levels for each year, close to 8.3 percent. Thus, a worker who uses communication ability at a level one standard deviation above the mean in the sample obtains around

⁷ As noted earlier, Table 3.3 generates preferred estimates and for the sake of brevity, I focus on the estimates on the ten abilities and the standard explanatory variables from this table.

an 8.3 percent higher wage than a worker who supplies communication ability at the mean level in any of the years. The two exceptions are 2008 and 2009, with coefficients at 7.6 percent and 7.4 percent, respectively. The estimated return to reading and math ability is second highest across the years, at around 7.0 percent. The estimated returns to the two abilities are statistically significant in every year.

This result is followed by the returns to self-management ability, learning ability, social competency, civic competency, and intercultural awareness: the estimated return to self-management ability is close to 2.5 percent in every year, the estimated return to learning ability is close to 2.0 percent, and the estimated returns to social competency, civic competency, and intercultural awareness are close to 1.5 percent in every year. The estimates are statistically significant in almost every year. One exception is 2008. In that year, the returns to self-management ability, social competency, and civic competency have relatively low levels, at 1.7 percent, 1.1 percent, and 0.6 percent, respectively. Additionally, the levels for social competency and civic competency are statistically insignificant in 2008.

By contrast, the estimated return to creative and innovative ability is close to zero and is statistically insignificant in all years. A worker who uses creative and innovative ability at a level one standard deviation above the mean in the sample does not obtain a higher wage than a worker who supplies the ability at the mean level in any year.

Finally, the estimated returns to health awareness and environmental awareness are negative in all years, with levels close to -1.4 percent. A worker who uses any of these abilities at a level one standard deviation above the mean in the sample obtains a lower wage than a worker who uses these abilities at the mean level in any year. The estimated returns are statistically significant in all years, but 2008.

Regarding the returns over time, the estimated returns to each ability are surprisingly stable from 2003 to 2010. One could have expected that for example, skilled biased technical change or globalization had influenced the levels, but it does not seem to be the case (although obviously not a proof). Nonetheless, one year stands out. In 2008, the estimated returns are relatively low for six of the abilities: communication ability, self-management ability, social competency, civic competency, health awareness, and environmental awareness. Additionally, the estimates are statistically insignificant for the last four-mentioned abilities. These findings go hand in hand with the result that the ten abilities jointly explain a lower variance of the wage that year with and without controlling for the standard explanatory variables. The findings are, as noted earlier, likely caused by the economic crisis that started that year.

As for the estimated returns within a given year, explaining the findings is not entirely self-evident. A plausible explanation for the positive returns to communication ability, reading and math, self-management ability, social competency, learning ability, civic competency, and intercultural awareness is that they are productive when carrying out a task at work. This explanation follows from human capital theory (Schultz, 1961; Becker, 1967). For example, the more strongly an employee uses his or her communication ability, the more productive he or she is and the higher the wage over time.

The estimated return to creative and innovative ability is close to zero and is statistically insignificant in every year. Nonetheless, workers use the ability at work, according to the histogram, which may seem to be a paradox, but the theory of compensating wage differentials might justify the finding (Rosen, 1986). This theory states that individuals are willing to give up wage and accept jobs with a lower wage to gain desirable job features. In other words, workers may be willing to use a high level of creative and innovative ability, although they receive approximately the same wage as if they

had used a low level of this ability because they find it desirable to be creative and innovative. The same explanation can be applied to environmental awareness, and health awareness.

The results within a year may also reflect a combination of the two theories. For example, human capital theory may explain some part of the estimate on a given ability, and the theory of compensating wage differential may explain another part. Such mechanisms may reinforce one another, or they may counteract one another. See Brown (1980) for an additional discussion of explanations of the signs and significance levels of worker and job characteristics.⁸

With regard to the standard explanatory variables, they still significantly contribute to explaining the variance in the individual wage over time in a regression with the multidimensional set of socio-emotional and cognitive abilities. For example, in Table 3.2, education, labor market experience, and gender explain 30.1 percent of the variance in the wage in 2003. Combined with the abilities in Table 3.3, the variance explained in 2003, 41.0 percent, is higher than the level explained by the abilities themselves, at 24.1 percent. Each standard explanatory variable is also significant in every year in Table 3.3. The exceptions cover experience-squared which is statistically insignificant in 2008 and 2009.

Regarding the coefficients, one more year of education increases the wage by around 4.5 percent from 2003 to 2008 and by around 5 percent in 2009 and 2010. The estimate for years of experience is positive and the estimate for experience-squared is negative across all years. More-experienced workers receive a higher wage, but the effect of additional experience diminishes as more experience is acquired. A male worker with the same level of experience, education and supply of

⁸ It may be natural to consider whether there are valuable interactions among abilities. For example, a strong supply of creative and innovative ability may increase the value of a strong supply of communication ability within a year. One method of looking into this possibility is to create a dummy variable that equals one if the worker uses every ability above the average level (Hartog, 1981). Because only 60 workers meet the criterion, I do not undertake that procedure. Another procedure is to allow factors to be interacted in the wage regressions. I do not utilize that procedure because four abilities have indices based on a simple index rather than on factor analysis.

abilities as a female worker is predicted to earn approximately 20 percent more from 2003 to 2008 and around 19 percent more in 2009 and 2010.

The coefficients on the standard explanatory variables are very stable over time, only do a small shift appear after 2008. Again, this is likely caused by the economic crisis starting in 2008. As for the results within a year, the variables behave in the typical way in the wage regressions. Nonetheless, the coefficient of years of education does not measure the true return to education, as education itself may be required to produce the abilities. Thus, rather than measuring the true returns, the coefficients on the education can be thought of as reflecting the productive effects of past human capital investment not related to the abilities being measured. For example, in his or her current job, a worker may use technical knowledge and insight obtained through education. The same caveat applies to the coefficient on experience.

This section ends with a comment. The wage regressions build on the assumption that all important variables are included in the wage regressions and thus ignore not only potential omitted variable bias, but also potential sample selection bias from omitted variables (Heckman 1976, 1979). Evidently, the sample of employed workers with a reliable wage vary across time in Tables 3.1 to 3.3. A high share drops out from year to year because individuals are not employees, but instead, for example, unemployed, self-employed, or retired persons that year. Although the choice of being an employed worker rather than, for example, unemployed or a retired person, is an interesting feature, I leave this to be explored in future research.

4. Conclusion

Overall, this study's findings show that socio-emotional abilities play an important role in the labor market over time in addition to cognitive abilities. The analysis covers a broader range of abilities, including others, such as creative and innovative ability, which is not normally included in standard

data sets. Additionally, the analysis addresses the actual individual supply of the abilities rather than the potential or average supply within the occupation, which also distinguishes this study from the previous literature.

The findings show that every ability is used by all workers in the sample in 2003 but that the workers vary in the extent to which they use any particular ability. For example, everyone uses his or her creative and innovative ability at work, but some workers use more creative and innovative ability than others. Additionally, those who use the highest level of one ability may not use the highest level of another ability, although such use is positively correlated.

The socio-emotional and cognitive abilities play an important role in explaining the variance in wages from 2003 to 2010. Taken individually, some abilities are more important than others over time. Communication ability tends to have the highest estimated return in all the years. Reading and math ability has the second-highest positive estimated return in every year, while the estimated return to creative and innovative ability is low and statistically insignificant in the time period examined. The estimated returns to each ability are very stable over time, with the exception of one year. In 2008, the estimated returns are relatively low to several abilities, including communication ability. This finding is likely caused by the economic crisis which started that year.

Appendix A: Sample Selection

Table A.1 shows how the sample is distributed from the initial sample of 7,953 individuals to the sample of 3,311 individuals which is the baseline sample for the analysis.

The reasons for not participating in both rounds of the survey cover a broad range of aspects. In the first round, telephone numbers were not obtainable for 812 people because they might have had an unlisted number. Moreover, 406 persons were not able to be reached, that is, they did not answer the phone, the phone was busy, they asked to be called another day, but they did not answer

the phone that day. In all, 273 had moved and there was no possibility of contacting them at their new residence.

A total of 159 persons disappeared in the first round, that is, they were unable to participate or they undertook the survey only partly due to illness, a handicap, difficulties with the language, or having to leave the home during the survey. In all, 799 persons refused to participate in the first round. A total of 334 responded to the questions in the first round of the survey but not the second. They were not able to be reached on the phone, were unable to participate in the second round, or refused to participate in the second round.

Among the 5,170 individuals who participated in both rounds of the survey, 1,673 individuals were not employees in 2003. They were either self-employed, assisting spouses, students, unemployed, or retired persons. A total of 186 employed workers earned an unreliable wage in 2003 such that Statistics Denmark assessed their wage to be unreliable or their hourly wage was less than 60 DKK (approximately 10 USD), which leads to the final sample of 3,311 individuals.

The table shows the final sample relates well to the initial and representative samples in terms of gender. The share of males and females in the final sample compared to that in the initial sample is 42.6 percent and 40.7 percent, respectively. The final sample relates less well to the initial sample in terms of age: only 16.6 percent of the individuals aged 60-65 years and 27.3 percent of the individuals aged 20-29 years from the initial sample appear in the final sample. A high share of these age groups drops out because individuals are not employees, but instead, for example, retired persons or students.

The sample selection in terms of being employed naturally raises the concern of a bias. For example, a sample selection bias can arise from the choice of being employed rather than unemployed. However, it would be difficult to control for this sample selection bias here because my analysis addresses the abilities supplied at work rather than workers' innate ability levels. Controlling

for this type of sample selection bias requires information on the abilities supplied at work for everyone in 2003. Due to the nature of the data, abilities supplied at work are observed for only the employed and not for the unemployed. Thus, the required type of information is not available for everyone in 2003. To address this type of sample selection bias would be informative in future research. Previous research does not meet these challenges regarding partially observed abilities because it addresses innate abilities that are always measured and observed.

Appendix B: Index Validation

The following validates the six indices created by factor analysis. The six indices are as follows: creative and innovative ability, communication ability, self-management, learning ability, environmental awareness, and intercultural awareness. These indices are measured by 25 variables.

Figure A.1 shows the scree plot, which graphs the eigenvalues of all the factors for the sample correlation matrix on the 25 observed variables. According to the scree test (Cattell, 1978), six factors should be retained as the curve starts to levels off at factor 7. Factors beyond factor 6 contribute little to the solution. This judgement is consistent with the Kaiser criterion (Kaiser, 1960), as six factors have an eigenvalue greater than 1.00. Specifically, factors 1, 2, 3, 4, 5, and 6 have eigenvalues of 6.303, 3.234, 2.675, 1.809, 1.626, and 1.073. Factors 7 to 25 are below the cutoff point, with values from 0.810 to 0.107.

Table A.1 presents the results for the exploratory factor analysis (with goemin rotation) restricted to six factors. The first column contains labels for the 25 observed variables. The next six columns show the results for the factor loadings, and the last column shows the results for the communalities. The factor loadings and communalities in bold are those which match that, by rule of thumb, loadings should have a value greater than 0.32 for the observed variables to represent a

particular factor and communalities should have a value greater than 0.4 for the factors to explain a great deal of the variance in the observed variable (Costello and Osborne, 2005).

The observed variables tend to make a meaningful and useful contribution to the six factors. The variables that load on the same factor make sense together, and the variables that load on different factors measure something different because the observed variables tend to load on the a priori defined six factors. In addition, all factors have at least three observed variables with high factor loadings, which is the ideal case. Finally, the six factors explain much of the variance in most observed variables because the communalities are above 0.4 in all cases but six. Still, the six exceptions are above 0.2, and thus beyond the cutoff point for potential elimination from the analysis (Child, 2006).

For models fits, the root mean square error of approximation (RMSEA) value is equal to 0.026, the comparative fit index (CFI) value if equal to 0.991 and the standardized root mean square residual (SRMR) value is equal to 0.019. Each of these in indicative of acceptable model fit (Hu and Bentler, 1999). Altogether, the six-factor solution appears to be a good fit for the indices created by factor analysis.

References

- Almlund, M., Duckworth, A. L., Heckman, J., and Kautz, T. (2011), Personality Psychology and Economics, in E. A. Hanushek, Machin, S. J., and Woessmann, L. (eds.), *Handbook of the Economics of Education 4(E)*, Elsevier, Amsterdam, 1-181.
- Autor, D. H., Levy, F., and Murnane, R. J. (2003), The Skill Content of Recent Technological Change: An Empirical Exploration, *The Quarterly Journal of Economics*, 118, 1279- 1333.
- Becker, G. (1967), *Human Capital and the Personal Distribution of Income: an Analytical Approach*, University of Michigan Press, Ann Arbor.

- Bollen, K. A. (1989), *Structural Equations with Latent Variables*, John Wiley & Sons, New York.
- Borghans, L., Duckworth, A. L., Heckman, J. J., and Weel B. T. (2008), The Economics and Psychology of Personality Traits, *Journal of Human Resources* 43, 972-1059.
- Brown, C. (1980), Equalizing Differences in the Labor Market, *The Quarterly Journal of Economics* 94, 113-134.
- Browne, M. W. and Arminger, G. (1995), Specification and Estimation of Mean- and Covariance-Structure Models, in G. Arminger, Clogg, C. C., and Sobel, M. E. (eds.), *Handbook of Statistical Modeling for the Social and Behavioral Sciences*, Plenum Press, New York, 311-359.
- Cattell, R. B. (1978), *The Scientific Use of Factor Analysis in Behavioral and Life Sciences*, New York, NY: Plenum Press.
- Child, D. (2006), *The Essentials of Factor Analysis* (3rd ed.), New York, NY: Continuum International Publishing Group.
- Costello, Anna B. and Jason W. Osborne (2005), Best Practices in Exploratory Factor Analysis: Four Recommendations for Getting the Most from Your Analysis, *Practical Assessment, Research & Evaluation* 10 (7): 1-9.
- Cuesta, Maite B. and Santiago Budría (2012), Unemployment Persistence: How Important are Non-Cognitive Skills?, *IZA Discussion Paper No. 6654*.
- Department of Education (2005), The National Competence Account – Main Report [Det Nationale Kompetenceregnskab – Hovedrapport], *Undervisningsministeriet, Copenhagen*, December.
- Furnham, A. and Cheng, H. (2013), Factors Influencing Adult Earnings: Findings from a Nationally Representative Sample, *Journal of Socio-Economics* 44, 120-125.
- Gardner, H. (1999), *Intelligence Reframed: Multiple Intelligences for the 21st Century*, Basic Books, New York.

- Hartog, J. (1977), On the Multicapability Theory of Income Distribution, *European Economic Review* 10, 157-171.
- Hartog, J. (1981), *Personal Income Distribution: A. Multicapability Theory*, Martinus Nijhoff Publishing, Boston.
- Heckman, J. J. (1976), The Common Structure of Statistical Models of Truncation, Sample Selection and Limited Dependent Variables and a Simple Estimator for Such Models, *Annals of Economic and Social Measurement* 5, 120-137.
- Heckman, J. J. (1979), Sample Selection Bias as a Specification Error, *Econometrica* 47, 153-161.
- Heckman, J. J., Lochner, L. J., and Todd, P. (2006), Earnings Functions, Rates of Return and Treatment Effects: the Mincer Equation and Beyond, in E. A. Hanushek and Welch, F. (eds.), *Handbook of the Economics of Education*, Amsterdam; London, North-Holland, 307-458.
- Heckman, J., Stixrud, J., and Urzua, S. (2006), The Effects of Cognitive and Noncognitive Abilities on Labor Market Outcomes and Social Behavior, *Journal of Labor Economics* 24, 411-482.
- Heineck, G. and Anger, S. (2010), The Returns to Cognitive Abilities and Personality Traits in Germany, *Labour Economics* 17, 535-546.
- Hu, L., and P. M. Bentler (1999), Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives, *Structural Equation Modeling* 6 (1), 1-55.
- Ingram, B. F. and Neumann, G. R. (2006), The Returns to Skill, *Labour Economics* 13, 35-59.
- Jöreskog, K. G. and Sörbom, D. (1979), *Advances in Factor Analysis and Structural Equation Models*, Abt Books, Cambridge, MA.
- Kaiser, Henry F. (1960), The Application of Electronic Computers to Factor Analysis, *Educational and Psychological Measurement* 20, 141-151.
- Klynge, A. H. (2008), The Data Set on the Multiple Abilities, *Working Paper* (available online at www.sfi.dk/klynge).

- Lucas, R. E. B. (1974), The Distribution of Job Characteristics, *The Review of Economics and Statistics* 56, 530-540.
- Mincer, J. A. (1974), *Schooling, Experience, and Earnings*, Columbia University, Press.
- Mohanty, M. S. (2009), Effects of Positive Attitude on Happiness and Wage: Evidence from the US Data, *Journal of Economic Psychology* 30, 884-897.
- Mohanty, Madhu S. (2010), Effects of Positive Attitude and Optimism on Employment: Evidence from the US data, *Journal of Socio-Economics* 39(2), 258-270.
- Mueller, G. and Plug, E. (2006), Estimating the Effect of Personality on Male-Female Earnings, *Industrial and Labor Reviews* 60, 3-22.
- Organisation for Economic Co-operation and Development (OECD) (2003), *Definition and Selection of Competencies: Theoretical and Conceptual Foundations (DeSeCo). Summary of the Final Report*, Organisation for Economic Co-operation and Development, November 11, 2003.
- Organisation for Economic Co-operation and Development (OECD) (2005), *Definition and Selection of Key Competencies: Executive Summary*, Organisation for Economic Co-operation and Development, June, 30, (Available online at www.oecd.org/dataoecd/47/61/35070367.pdf).
- Rosen, S. (1986), The Theory of Equalizing Differences, Chapter 12, in O. C. Ashenfelter and R. Layard (eds.), *The Handbook of Labor Economics*, Vol. 1, Amsterdam; New York: North-Holland, 641-692.
- Rychen, D. S. and Salganik, L. H. (eds.) (2003), *Key Competencies for a Successful Life and a Well-Functioning Society*, Hogrefe & Huber Publishers, Göttingen.
- Schultz, T. W. (1961), Investment in Human Capital, *American Economic Review* 1, 1-17.
- Semykina, A. and Linz, S. J. (2007), Gender Differences in Personality and Earnings: Evidence from Russia, *Journal of Economic Psychology* 28, 387-410.
- Silles, M. A. (2010), Personality, Education and Earnings, *Education Economics* 18, 131-151.

Table 1.1: The Variables Underlying the Supply of Abilities in Work

Creative and Innovative Ability

Develop new products or services at work, test new methods of working, job requires innovative thinking.

Communication Ability

Address cases through writing at work, use an ordinary phone at work, use a computer at work, search for information on the Internet at work, write letters/e-mails at work.

Reading and Math Ability

Read at work, use math at work.

Social Competency

Help colleagues with work, ask colleagues for help with work.

Self-Management Ability

Structure own working day, decide how to carry out work, decide who to work with, influence what to do at work.

Learning ability

New professional challenges at work, work in new teams or groups, change job function at same place of work, change job at same place of work to learn something new, participate in job-rotation or exchange job functions that require learning new skills.

Civic Competency

Participate in meetings to influence general conditions at work, hold a position of trust at work.

Health Awareness

Prevent work-related physical pain, prevent work from causing stress.

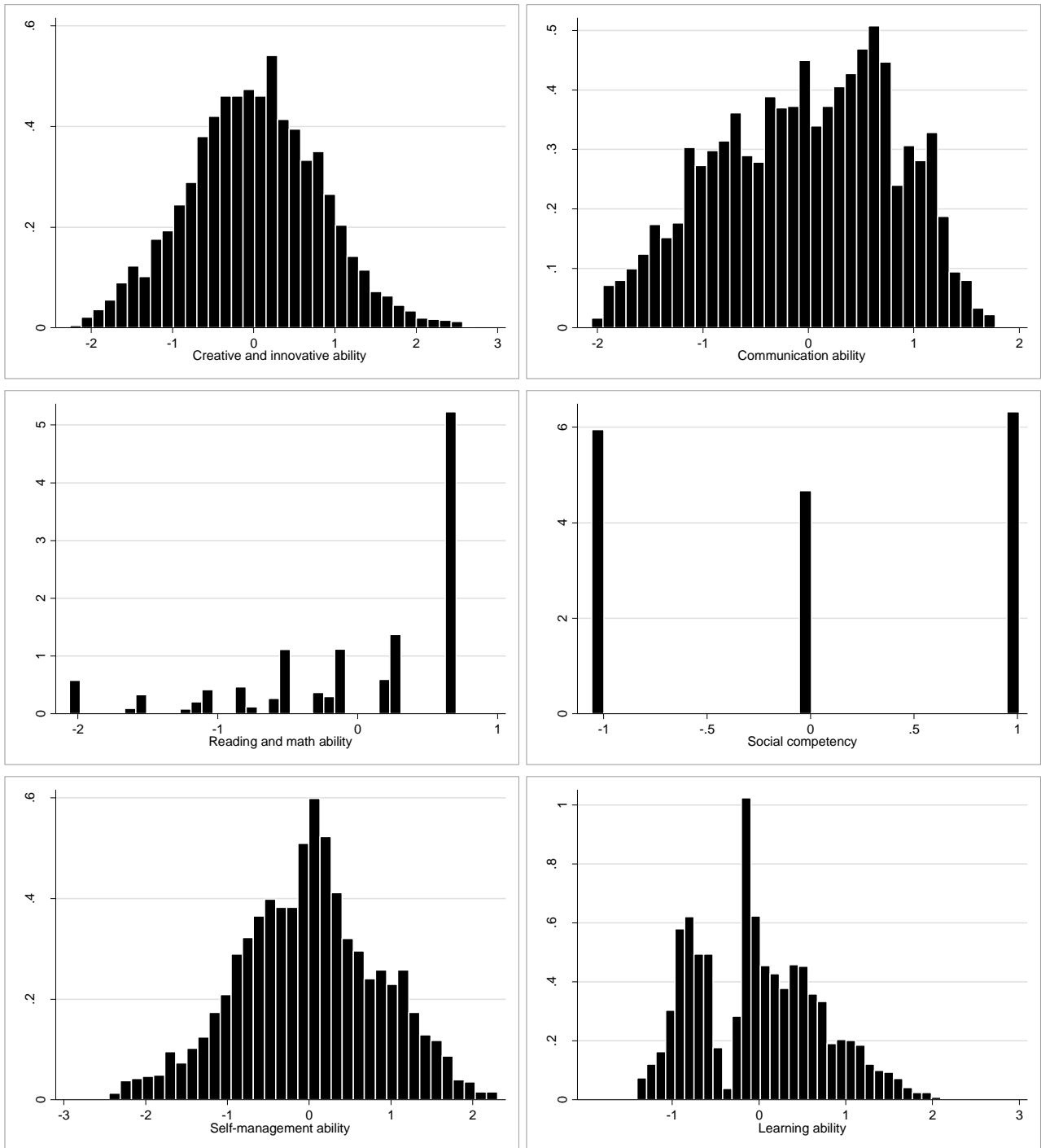
Environmental Awareness

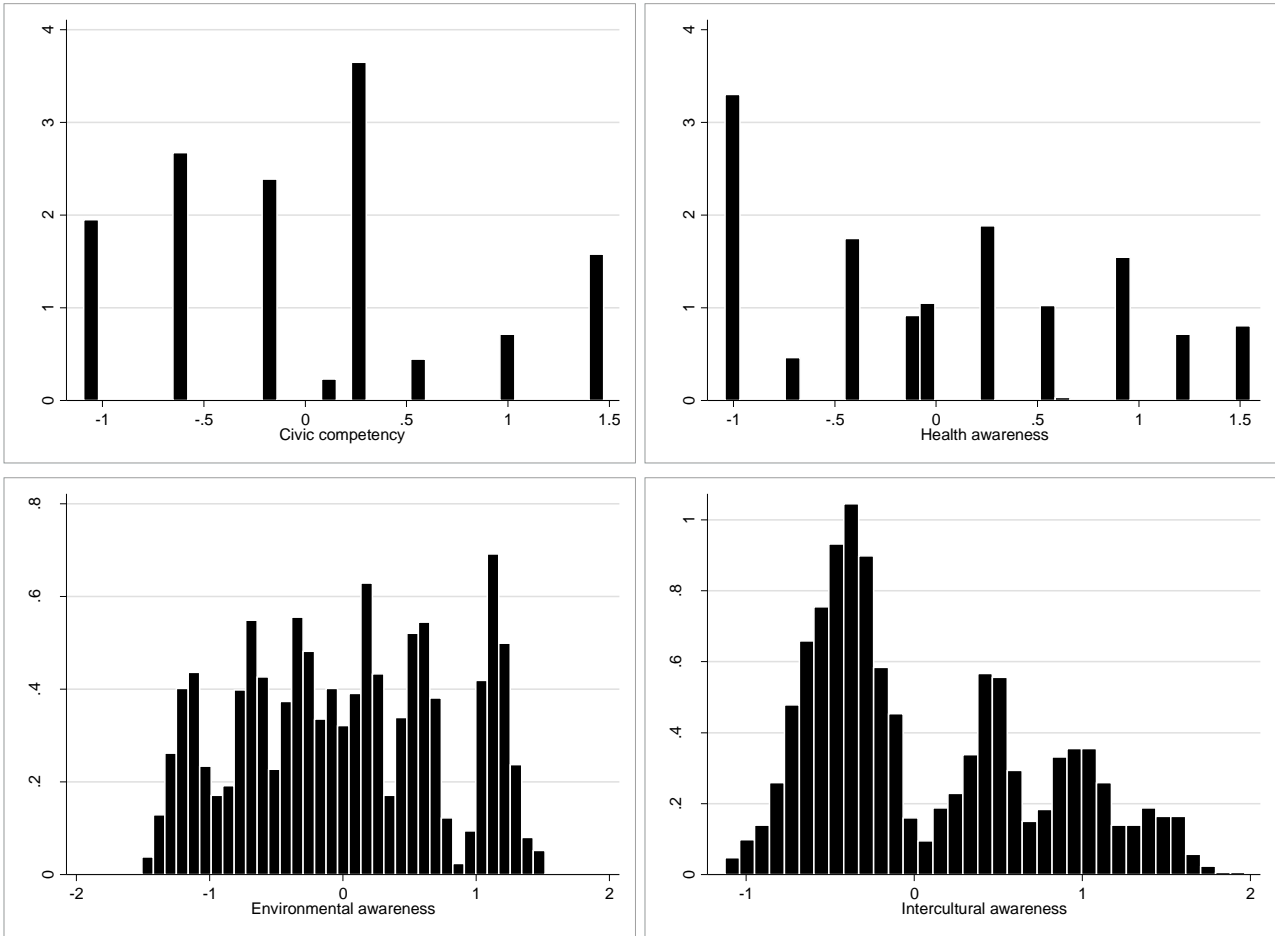
Save on materials and/or energy and/or water at work, use less environmentally damaging materials and products at work, propose environmentally friendly measures at work, implement environmentally friendly measures at work, plan the work of others so that they can be environmentally responsible.

Intercultural Awareness

Use knowledge from education on foreign cultures at work, use knowledge on foreign cultures from postgraduate education at work, use knowledge from previous time abroad at work.

Figure 2.1: Histograms for Supply of Abilities in Work





Note: The number of observations is 3,311. The histograms illustrate the index scores for each ability. The unit for a single ability is one standard deviation. The indices for creative and innovative ability, communication ability, self-management ability, learning ability, environmental awareness, and intercultural awareness are constructed using factor analysis, while the indices for reading and math ability, social competency, civic competency, and health awareness are based on a simple index, measured with two underlying variables each.

Table 2.1: Correlations between Supply of Socio-Emotional and Cognitive Abilities in Work

	1 Creative and innovative ability	2 Communication ability	3 Reading and math ability	4 Social competency	5 Self- management ability	6 Learning ability	7 Civic competency	8 Health awareness	9 Environmental awareness	10 Intercultural awareness
1 Creative and innovative ability	1.000									
2 Communication ability	0.634 ***	1.000								
3 Reading and math ability	0.340 ***	0.464 ***	1.000							
4 Social competency	0.278 ***	0.258 ***	0.211 ***	1.000						
5 Self-management ability	0.666 ***	0.536 ***	0.269 ***	0.150 ***	1.000					
6 Learning ability	0.713 ***	0.478 ***	0.264 ***	0.261 ***	0.264 ***	1.000				
7 Civic competency	0.368 ***	0.232 ***	0.133 ***	0.139 ***	0.256 ***	0.251 ***	1.000			
8 Health awareness	0.142 ***	0.026	0.016	0.082 ***	0.037 **	0.126 ***	0.119 ***	1.000		
9 Environmental awareness	0.467 ***	0.119 ***	0.130 ***	0.096 ***	0.269 ***	0.251 ***	0.322 ***	0.169 ***	1.000	
10 Intercultural awareness	0.578 ***	0.434 ***	0.185 ***	0.179 ***	0.272 ***	0.521 ***	0.287 ***	0.125 ***	0.326 ***	1.000
R-squared	64.30 %	46.90 %	27.30 %	12.60 %	38.90 %	39.10 %	20.70 %	6.10 %	23.00 %	25.40 %

Note: The number of observations is 3,311. The correlations use the index scores for the abilities. The R-squared for a given ability stems from regressing that specific ability on the nine remaining abilities. Correlations significant at a 1% level are denoted via ***.

Year	2003		2004		2005		2006		2007		2008		2009		2010	
	β	SE	β	SE	β	SE	β	SE	β	SE	β	SE	β	SE	β	SE
Abilities																
Creative and innovative ability	0.010	0.013	-0.002	0.013	0.010	0.013	0.011	0.013	0.001	0.014	0.008	0.015	0.005	0.014	-0.001	0.016
Communication ability	0.093 ***	0.007	0.096 ***	0.007	0.095 ***	0.007	0.092 ***	0.007	0.094 ***	0.008	0.088 ***	0.008	0.088 ***	0.008	0.103 ***	0.008
Reading and math ability	0.119 ***	0.010	0.113 ***	0.010	0.121 ***	0.010	0.126 ***	0.010	0.126 ***	0.011	0.125 ***	0.011	0.116 ***	0.012	0.126 ***	0.012
Social competency	0.026 ***	0.006	0.031 ***	0.006	0.031 ***	0.007	0.030 ***	0.007	0.036 ***	0.007	0.028 ***	0.007	0.027 ***	0.007	0.035 ***	0.008
Self-management ability	0.031 ***	0.009	0.039 ***	0.009	0.034 ***	0.009	0.037 ***	0.009	0.043 ***	0.009	0.025 **	0.011	0.033 ***	0.010	0.039 ***	0.011
Learning ability	-0.002	0.009	0.008	0.009	0.002	0.009	0.007	0.009	0.016 *	0.009	0.017	0.010	0.016 *	0.010	0.023 **	0.010
Civic competency	0.049 ***	0.007	0.050 ***	0.007	0.054 ***	0.007	0.055 ***	0.008	0.044 ***	0.008	0.038 ***	0.008	0.057 ***	0.008	0.048 ***	0.008
Health awareness	-0.037 ***	0.007	-0.044 ***	0.007	-0.048 ***	0.007	-0.036 ***	0.007	-0.038 ***	0.008	-0.030 ***	0.008	-0.035 ***	0.008	-0.036 ***	0.008
Environmental awareness	-0.004	0.007	-0.006	0.007	-0.010	0.007	-0.013 *	0.007	-0.009	0.008	-0.005	0.008	-0.014 *	0.008	-0.020 **	0.009
Intercultural awareness	0.019 **	0.008	0.038 ***	0.008	0.029 ***	0.008	0.021 **	0.008	0.032 ***	0.009	0.035 ***	0.009	0.042 ***	0.009	0.041 ***	0.009
Constant	5.152 ***	0.008	5.161 ***	0.008	5.208 ***	0.008	5.247 ***	0.008	5.292 ***	0.009	5.319 ***	0.009	5.347 ***	0.009	5.371 ***	0.010
R-squared	24.1%		26.7%		27.0%		26.4%		25.7%		22.1%		26.3%		27.7%	
Number of observations	3,311		3,055		2,971		2,910		2,810		2,598		2,529		2,521	

Note: The unit of measurement for the supply of a given ability is one standard deviation. The sample within a given year are those among the 3,311 individuals in 2003 who are employed workers and have a reliable wage that year. ***, **, and * indicate estimates significant at the 1%, 5%, and 10% levels, respectively.

Table 3.2: Results of Wage Regressions Controlling for Education, Labor Market Experience, and Gender

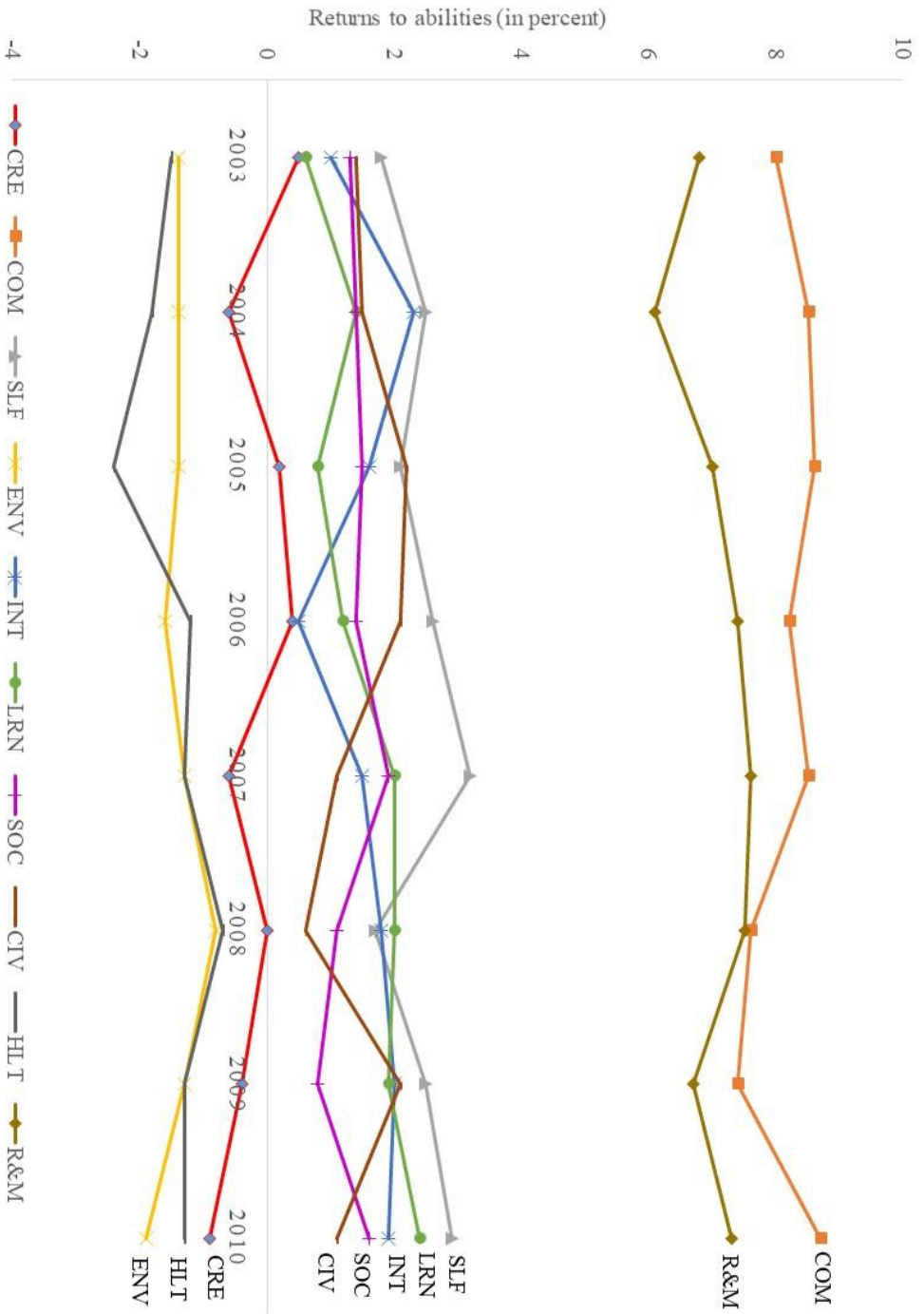
Year	2003		2004		2005		2006		2007		2008		2009		2010	
	β	SE	β	SE	β	SE	β	SE	β	SE	β	SE	β	SE	β	SE
Education	0.049 ***	0.002	0.052 ***	0.002	0.050 ***	0.002	0.051 ***	0.002	0.051 ***	0.002	0.051 ***	0.002	0.054 ***	0.002	0.057 ***	0.002
Labor market experience	0.015 ***	0.002	0.012 ***	0.002	0.009 ***	0.002	0.009 ***	0.002	0.011 ***	0.003	0.007 **	0.003	0.007 **	0.003	0.009 ***	0.003
Experience-squared	-0.025 ***	0.004	-0.018 ***	0.005	-0.012 **	0.005	-0.014 ***	0.005	-0.017 ***	0.006	-0.008	0.006	-0.008	0.006	-0.012 *	0.006
Male	0.232 ***	0.009	0.229 ***	0.010	0.225 ***	0.010	0.228 ***	0.010	0.228 ***	0.011	0.222 ***	0.012	0.204 ***	0.011	0.212 ***	0.012
Constant	4.316 ***	0.029	4.318 ***	0.03	4.416 ***	0.034	4.448 ***	0.037	4.464 ***	0.041	4.531 ***	0.046	4.515 ***	0.045	4.482 ***	0.049
R-squared	30.1%		30.1%		28.4%		28.4%		26.5%		25.1%		28.4%		27.2%	
Number of observations	3,311		3,055		2,971		2,910		2,810		2,598		2,529		2,521	

Note: The unit for education and labor market experience is one year. Experience squared is normed by 100. The sample within a given year are those among the 3,311 individuals in 2003 who are employed workers and have a reliable wage that year. ***, **, and * indicate estimates significant at the 1%, 5%, and 10% levels, respectively.

Year	2003		2004		2005		2006		2007		2008		2009		2010	
	β	SE	β	SE	β	SE	β	SE	β	SE	β	SE	β	SE	β	SE
Abilities																
Creative and innovative ability	0.005	0.010	-0.006	0.011	0.002	0.011	0.004	0.011	-0.006	0.011	0.000	0.013	-0.004	0.012	-0.009	0.013
Communication ability	0.080 ***	0.006	0.085 ***	0.006	0.086 ***	0.006	0.082 ***	0.006	0.085 ***	0.007	0.076 ***	0.007	0.074 ***	0.007	0.087 ***	0.007
Reading and math ability	0.068 ***	0.008	0.061 ***	0.009	0.070 ***	0.009	0.074 ***	0.009	0.076 ***	0.010	0.075 ***	0.010	0.067 ***	0.010	0.073 ***	0.011
Social competency	0.013 **	0.005	0.014 *	0.006	0.015 **	0.006	0.014 **	0.006	0.019 ***	0.006	0.011	0.007	0.008	0.006	0.016 **	0.007
Self-management ability	0.018 **	0.008	0.025 ***	0.008	0.021 ***	0.008	0.026 ***	0.008	0.032 ***	0.008	0.017 *	0.010	0.025 ***	0.009	0.029 ***	0.009
Learning ability	0.006	0.008	0.014 *	0.007	0.008	0.008	0.012	0.008	0.020 **	0.008	0.020 **	0.009	0.019 **	0.009	0.024 ***	0.009
Civic competency	0.014 **	0.006	0.015 **	0.006	0.022 ***	0.006	0.021 ***	0.007	0.011	0.007	0.006	0.007	0.021 ***	0.007	0.011	0.008
Health awareness	-0.015 ***	0.006	-0.018 ***	0.006	-0.024 ***	0.006	-0.012 *	0.006	-0.013 *	0.007	-0.007	0.007	-0.013 *	0.007	-0.013 *	0.007
Environmental awareness	-0.014 **	0.006	-0.014 **	0.006	-0.014 **	0.007	-0.016 ***	0.007	-0.013 *	0.007	-0.008	0.008	-0.013 *	0.007	-0.019 **	0.008
Intercultural awareness	0.010	0.007	0.023 ***	0.007	0.016 **	0.007	0.005	0.007	0.015 *	0.008	0.018 **	0.008	0.020 **	0.008	0.019 **	0.009
Controls																
Education	0.044 ***	0.002	0.047 ***	0.002	0.045 ***	0.002	0.045 ***	0.002	0.046 ***	0.002	0.046 ***	0.002	0.050 ***	0.002	0.053 ***	0.002
Labor market experience	0.014 ***	0.002	0.011 ***	0.002	0.008 ***	0.002	0.008 ***	0.002	0.010 ***	0.002	0.006 **	0.003	0.007 **	0.003	0.008 ***	0.003
Experience-squared	-0.023 ***	0.004	-0.016 ***	0.004	-0.011 **	0.004	-0.011 ***	0.004	-0.014 ***	0.005	-0.006	0.006	-0.007	0.006	-0.012 **	0.006
Male	0.213 ***	0.010	0.210 ***	0.010	0.202 ***	0.011	0.207 ***	0.011	0.209 ***	0.011	0.205 ***	0.012	0.187 ***	0.011	0.193 ***	0.013
Constant	4.371 ***	0.028	4.368 ***	0.031	4.474 ***	0.032	4.509 ***	0.032	4.522 ***	0.037	4.580 ***	0.045	4.563 ***	0.042	4.532 ***	0.044
R-squared	41.0%		42.2%		41.0%		40.7%		38.9%		34.8%		39.1%		39.3%	
Number of observations	3,311		3,055		2,971		2,910		2,810		2,598		2,529		2,521	

Note: The unit of measurement for the supply of a given ability is one standard deviation. The unit for education and labor market experience is one year. Experience squared is normed by 100. The sample within a given year are those among the 3,311 individuals in 2003 who are employed workers and have a reliable wage that year. ***, **, and * indicate estimates significant at the 1%, 5%, and 10% levels, respectively.

Figure 3.1 : Results of Returns to Socio-Emotional and Cognitive Abilities

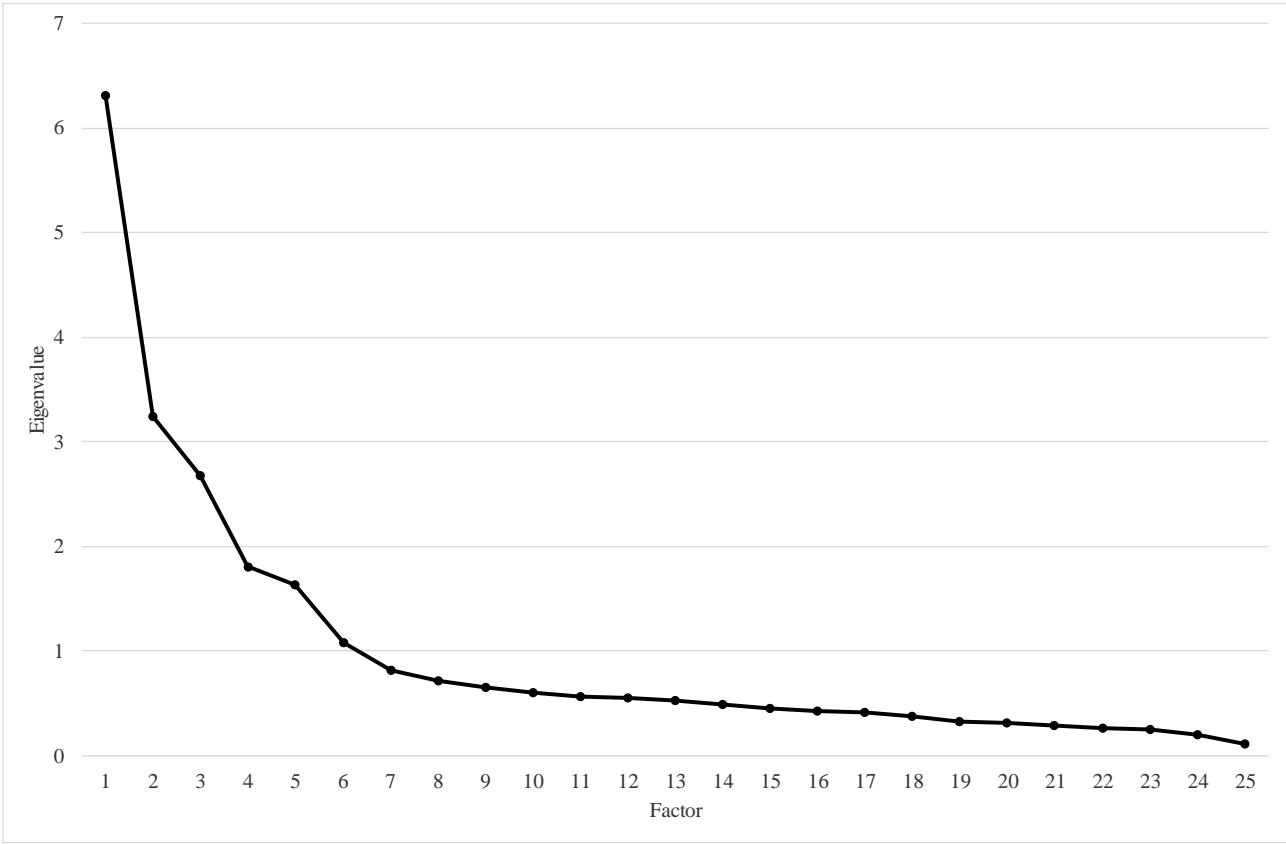


Note: Please print in colors if possible. The figure illustrates the estimated returns from Table 3.3. COM is short for communication ability, R&D is reading and math ability, SLF is self-management ability, LRN is learning ability, INT is intercultural awareness, SOC is social competency, CIV is civic competency, CRE is creative and innovative ability, HLT is health awareness, and ENV is short for environmental awareness.

Table A.1: Sample Distribution

	Initial sample in 2003	Number not found	Not reached	Moved	Disappear	Refuse	Respond to survey only in round 1	Respond to survey in rounds 1 and 2	Not an employee in 2003	Unreliable wage in 2003	Final sample in 2003
	No. Pct.	No. Pct.	No. Pct.	No. Pct.	No. Pct.	No. Pct.	No. Pct.	No. Pct.	No. Pct.	No. Pct.	No. Pct.
Gender											
Male	3,936 100.0	419 10.6	202 5.1	156 4.0	77 2.0	377 9.6	167 4.2	2,538 64.5	784 19.9	77 2.0	1,677 42.6
Female	4,017 100.0	393 9.8	204 5.1	117 2.9	82 2.0	422 10.5	167 4.2	2,632 65.5	889 22.1	109 2.7	1,634 40.7
Age group											
20 - 29 years	1,331 100.0	213 16.0	97 7.3	85 6.4	37 2.8	57 4.3	63 4.7	779 58.5	362 27.2	54 4.1	363 27.3
30 - 39 years	1,940 100.0	207 10.7	87 4.5	79 4.1	34 1.8	162 8.4	83 4.3	1,288 66.4	281 14.5	43 2.2	964 49.7
40 - 49 years	1,895 100.0	170 9.0	97 5.1	56 3.0	36 1.9	191 10.1	68 3.6	1,277 67.4	267 14.1	46 2.4	964 50.9
50 - 59 years	1,862 100.0	161 8.6	85 4.6	44 2.4	36 1.9	243 13.1	76 4.1	1,217 65.4	315 16.9	36 1.9	866 46.5
60 - 65 years	925 100.0	61 6.6	40 4.3	9 1.0	16 1.7	146 15.8	44 4.8	609 65.8	448 48.4	7 0.8	154 16.6
Individuals	7,953 100.0	812 10.2	406 5.1	273 1.9	159 2.0	799 10.0	334 4.2	5,170 65.0	1,673 21.0	186 2.3	3,311 41.6

Figure B.1: Scree Plot



Note: Number of observations: 3,311.

Table B.1: Results for Exploratory Factor Analysis

	Geomin Rotated Loadings						Communalities
	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	
Develop new products or services at work	.135	.003	.096	.000	.568	.000	.447
Job requires innovative thinking	.042	-.004	.186	.003	.563	.067	.465
Test new methods of working	-.033	.165	-.009	.053	.599	-.037	.433
Write letters/e-mails at work	.930	-.006	.045	-.032	.034	-.027	.903
Use an ordinary phone at work	.703	-.027	.027	.088	-.026	-.009	.498
Search for information on the Internet at work	.819	-.037	.009	.007	.034	.027	.708
Use a computer at work	.946	.032	-.102	-.005	-.025	-.007	.828
Address cases through writing at work	.589	.025	.040	.002	.147	.023	.473
Structure own working day	.186	.005	.749	.024	-.009	-.036	.680
Decide how to carry out work	-.017	.023	.833	-.027	-.001	-.023	.674
Decide who to work with	.032	-.040	.391	.027	.187	.034	.252
Influence what to do at work	-.039	.000	.551	.020	.263	.037	.445
New professional challenges at work	.277	.434	.003	.003	.294	.092	.573
Work in new teams or groups	.104	.447	-.046	-.010	.290	.125	.462
Change job function at same place of work	-.026	.803	.017	-.041	-.002	.022	.641
Change job at same place of work to learn something new	.010	.938	.060	-.002	-.166	-.023	.810
Participate in job-rotation or exchange job functions	-.123	.518	-.149	.064	.140	-.104	.347
Save on materials, energy or water at work	.112	.060	-.024	.660	-.114	.092	.444
Use less environmentally damaging materials and products at work	-.067	-.001	.059	.742	-.108	.081	.548
Propose environmentally friendly measures at work	-.026	-.035	-.033	.778	.080	-.041	.626
Implement environmentally friendly measures at work	.009	-.008	-.011	.874	.043	-.069	.234
Plan the work of others so that they can be environmentally responsible	.024	.004	.042	.704	.151	.005	.391
Use knowledge from previous time abroad at work	.015	.061	-.004	-.020	.061	.598	.592
Use knowledge on foreign cultures from education at work	.018	.012	-.019	.023	-.009	.836	.289
Use knowledge on foreign cultures from postgraduate education at work	-.032	-.037	.024	.021	.024	.822	.323

Note: Geomin rotated loadings and communalities from exploratory factor analysis with six factors. Number of observations: 3,311.