The Role of Cognitive and Non-cognitive Skills for Investment Behavior*

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June 28, 2018

Abstract

We match Swedish military enlistment data on cognitive and non-cognitive skills onto detailed information about individuals financial holdings outside as well as inside the government-mandated defined contribution (DC) pension plan which was launched in 2000. We find that at the time of the launch, non-cognitive skills rather than cognitive skill were a strong predictor of opting out from the default fund. Cognitive skills, on the other hand, foster activity, in terms of re-allocation between funds, conditional on having opted out. As a consequence, the return loss associated with a one-standard deviation increase in non-cognitive skills is estimated to 0.08 percent per year while cognitive skills are unrelated to returns in the pension accounts. The driver of the return loss associated with non-cognitive skill is the peculiar circumstances at the time of the launch – only pension investors who entered the plan in 2000 suffer a return loss. We argue that the correlation between non-cognitive skills and opting out from the default fund at the time of the launch is explained by the response to the intense information and advertising campaigns that took place, a circumstance that Cronqvist and Thaler (2004) have labelled as a "pro choice" culture. Outside the pension system we find positive effects of both skills on stock market participation but only cognitive skills contribute to higher returns.

Keywords: Cognitive and non-cognitive skills, portfolio choice, default choice.

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Reform of developed countries' pension systems is at the top of the political agenda. Reform most often implies a shift away from pay-as-you-go systems and Defined Benefit (DB) pension plans to Defined Contribution (DC) plans in order to make the system in its entirety better funded.

Apart from the fiscal aspect, a distinguishing feature of DC plans is that they give individuals the freedom to manage their savings themselves. The argument for giving this responsibility to workers hinge critically on the assumption that people are, in general, able to make sound financial choices. If, in contrast, a substantial fraction of workers lack knowledge about financial products, are unable to understand key concepts (such as risk), or simply lack the interest or foresight to make adequate decisions, then a pension system that does not take this into account runs the risk of exposing plan participants to excessive risks and low returns, ultimately reducing pensions. Moreover, if the ability to make sound investment choices is positively correlated with earnings potential in the labor market, then pension reform may increase income inequality over the life-cycle. For these reasons, the choice architecture, a term used by Thaler and Sunstein (2008), surrounding DC pension plans ought to be designed wisely. If the pension plan is mandatory and imposed by the government these arguments become even more important since many individuals will lack previous experience from investing.

In this paper, we investigate the consequences of the Swedish pension reform in 2000 from the point of view that investors are endowed with heterogeneous skills and consequently differ in their ability to accomodate the reform. As part of the reform, all Swedes born after 1937 were required to choose how the contributions into their individual DC pension account[1] should be managed. The DC plan is paternalistic in the sense that it provides a sensible default fund: a low-cost fund exposed to global equities. Consequently, "just" opting out of the default fund – without carefully choosing an alternative set of mutual funds and thereafter monitoring one's account performance – may very well lead to worse outcomes than the default option. Yet the Swedish government gives little guidance on how to choose among funds and there are few restrictions on how an individual can allocate his or her savings, a feature of the Swedish pension system that has been criticized by e.g. Cronqvist and Thaler (2004) and Thaler and Sunstein (2008).

Our primary focus is on the study of how investment behavior in the new DC pension plan correlates with individuals' cognitive and non-cognitive skills. We find it fruitful to employ a "before and after" perspective since immediately after the launch of the DC plan in 2000 the tendency to opt out from the default fund fell dramatically, from 74 percent among plan entrants in 2000 to 28 percent among plan entrants in 2001. In subsequent years the tendency to opt out among plan entrants has fallen further – in 2006 it was 12 percent. We study the effects of cognitive and non-cognitive skills on the decision to opt out, the differential effect over time of those skills, and how our measures of skills influence returns.

To this end we tailor a representative registry-based data set comprising seven percent of the Swedish population. We start from LINDA, an off-the-shelf data register on socioeconomic

[1] In Sweden, the term "premium pension account" is often used.

characteristics that is frequently used among academic economists. Onto LINDA we match three additional data components. First, we match on detailed information on financial holdings outside the pension system (previously used in e.g. Calvet, Campbell, and Sodini, 2007, 2008; Vestman, 2012). Second, we match on detailed information on fund holdings in the mandatory pension plan. Finally, we match on test scores from the Swedish military enlistment and use those as measures of cognitive and non-cognitive skills, as in Lindqvist and Vestman (2011).

Our first finding is that opting out from the default fund is strongly positively correlated with non-cognitive skills at the time of the launch of the pension system but not thereafter. At the time of the launch in 2000, a one standard deviation increase in non-cognitive skills predicts a 4.9 percentage point decrease in the probability of choosing the default fund, a 12-percent effect relative to the baseline probability. In subsequent years, the effect quickly fades away. In contrast, cognitive skills are slightly positively correlated with choosing the default fund in 2000 and slightly negative in subsequent years.

Our second finding is that conditional on having opted out, cognitive skills rather than non-cognitive skills foster activity. A one-standard deviation increase in cognitive skills increases the likelihood that the portfolio was overhauled after entry into the plan by 4.3 percentage points, whereas the same increase in non-cognitive skill just implies an increase by 1.5 percentage points.

Taking these two findings together, it is not surprising that those endowed with a lot of non-cognitive skills earn lower returns, which is our third finding. Among those who entered the plan in 2000, a one-standard deviation increase in non-cognitive skills predicts a 0.85 percentage point lower cumulative return from the launch until 2008. There are two reasons for this. First, non-cognitive skills are associated with a lower probability of choosing the default fund – which did quite well. Second, even conditional on having opted out, high non-cognitive skills are associated with worse returns. Cognitive skills are positively associated with returns since – conditional on opting out – men with high cognitive skills had higher returns. Notably, there is no effect of non-cognitive skills on returns among those that entered after 2001(!).

In sum, our results suggest that cognitive and non-cognitive skills have very different effects on investment behavior in the Swedish pension system. While the finding that cognitive skills is positively correlated with sensible choices is intuitive and fits well with the previous literature on financial literacy (see e.g. Lusardi and Mitchell, 2014), the finding that men with high non-cognitive skills do worse is unexpected. In a sense, by refraining from attempting to make active choices, men with low non-cognitive skills are shielded from their own mistakes. In contrast, men with intermediate or high non-cognitive skills but low cognitive skills make active but poor choices.

An expanding literature has documented that non-cognitive skills is a strong predictor of good outcomes in many domains of life (Heckman et al., 2006; Lindqvist and Vestman, 2011). Why is this not the case in this context? We argue that the explanation lies in the way that the pension reform was communicated to the citizens. While the default fund is a sensible option, the government ran an extensive advertisement campaign in several different media before the implementation of

the reform which stressed the case for active choices. Strikingly, while the campaign stressed the necessity of making an active choice, it was silent on what kinds of investment strategies were sensible. The media coverage about the reform similarly pushed for active choices with little focus on actually guiding citizens to make sensible choices. Several media outlets actively argued against choosing the default fund. We complement the previous arguments by Cronqvist and Thaler (2004) and Cronqvist (2006) that there was a "pro choice" culture by collecting some additional media statistics throughout the period 1996 to 2007. In 2000, the number of news articles on the topic of the premium pension system appearing in the two leading Swedish news papers were more than 400 compared to less than 200 in all years between 2002 and 2007.

We argue that effects of skill that we see in the data reflect how different types of people react to this kind of information campaign. In the face of campaigns saying that they risk losing out on future pension income if they fail to make an active choice, people with high non-cognitive skills are likely to follow this advice. The kind of paternalism of the Swedish fund system a sensible default fund coupled with the advice to make active choices and few restrictions thus has differential effects for different types of people in the population.

Finally, we contrast these findings to the observed effects of both skill measurers on investment behavior *outside* the pension system. We find that the likelihood that an individual stocks (either directly or indirectly through equity funds) is increasing in both cognitive and non-cognitive skills. Omitting non-cognitive skills from the estimation implies an upward bias on the effect of cognitive skills. We thus confirm, but also qualify, the result of Grinblatt et al. (2011). Further, we find some evidence of higher returns among high cognitive skill investors, but not for investors with high non-cognitive skills, which can be interpreted as support for the findings in Grinblatt et al. (2012b).

Taking into account investors' behavior inside and and outside the pension system, a major take-away from this paper is that while cognitive skills seem to be benign in either investment domain, non-cognitive skills are not. Whether non-cognitive skills are rewarded in investment decisions, or not, depends on the specific context and decision environment. In a "pro choice" culture, those endowed with non-cognitive skills may be inclined or inspired to assume too much responsibility for their asset allocation decisions.

Our paper is related to an emerging literature on how people make financial choices. This line of research has shown that individuals display tremendous heterogeneity along most dimensions of investment behavior (e.g. Odean, 1999; Calvet et al., 2007, 2008). Recently, the literature has tied this variation in behavior to cognitive ability (Grinblatt et al., 2011, 2012b,a) and Gyllenram et al. (2013) ties stock market participation to cognitive as well as non-cognitive skills. Cole et al. (2014) exploit exogenous variation in state compulsory schooling laws in both standard and two-sample instrumental variable strategies, and show that education increases financial market participation, measured by investment income and equities ownership, while dramatically reducing the probability that an individual declares bankruptcy, experiences a foreclosure, or loan delinquencies.

Our paper differs from this previous literature primarily in that we focus on partially paternalistic policy – the Swedish pension reform – affected people depending on their cognitive and non-cognitive skills. A major advantage of studying behavior in a mandatory pension plan is that skills do not affect selection into the sample. Further, our data include information on investment behavior both in- and outside of the pension system, giving us a more complete view of on how skills affect investment outcomes.

The paper is organized as follows. We outline the key features of the Swedish pension reform in the next section and describe our data in Section 2 and the empirical strategy in Section 3. The results are presented in Section 4. Section 5 concludes the paper.

1 The Swedish pension reform

After years of debate in the 1990's, Sweden profoundly reformed its pension system in 1999 through a broad parliamentary agreement. From the perspective of a taxpayer in the labor force, it meant that (s)he was given two accounts, a notional account and a premium pension account. The balance on these two accounts, and forecasts of pension income, are reported at annual intervals through what is commonly known as the orange envelope". For each worker, labor income during the past year determines the installments into each account through two simple rules. The first rule is that the installment into the notional account equals 16 percent of earnings, though the earnings that contribute to installments are capped at 7.5 income basis amounts (in 2013 this corresponds to SEK 424,500, or approximately USD 65,000). The money on this account then earns interest equal to the growth rate of aggregate earnings. For the purpose of determining the interest rate, an official "income index" has been constructed. These funds are notional in the sense that they are not reserved for the individual but are instead used to fund current pension payments as in a traditional pay-as-you-go system. The second rule is that the installment into the premium pension account equals 2.5 percent of earnings. In contrast to the notional account, this account is a traditional defined contribution account in the sense that the funds are used to finance the future pension income of the individual. Each individual can choose to allocate these funds in up to five mutual funds from a menu of several hundreds of funds, of which most are also available outside the pension system (sometimes referred to as the retail segment). For clarity, we will henceforth refer to the premium pension account as the DC account. The small DC component of the system is meant to boost pension income while at the same time maintaining the overall risk exposure at a tolerable level. At the time of retirement, the two accounts are transformed to life-long annuities that are actuarially fair. The annuity divisors are specific to each birth cohort. If the pension income is too low, the pensioner receives a substitute such that total income out of the notional account reaches a guarantied floor that in 2013 was equal to SEK 94,800 (USD 14,600) for singles. In addition to these two forms of accounts, the system in its entirety has an asset buffer which roughly equals ten percent of the aggregate liabilities.

Four buffer funds were in 1999 mandated to manage these assets in such a way that they can counter demographical effects (ageing) and maintain the solvency of the system. In practice, the funds hold well-diversified portfolios of Swedish and international equities and government bonds. Relative to most other systems around the world, and relative to the previous Swedish system, the current system has several benefits. From a political economy perspective, it is advantageous because it has been carved out as a separate entity with its own budget and balance sheet. From a pedagogical perspective, each individual can monitor his/her accounts and the forecasts for his/her retirement income. From an actuarial perspective it is advantageous because the balance sheet is at any point only a function of past events. Account balances (the liability side of the balance sheet) are a function only of past earnings. Last but not the least, the system is sustainable up to the point of major demographical changes since the notional accounts grow at the same rate as aggregate labor income which in turn correlates perfectly with ninety percent of the asset side of the system's balance sheet. As alluded to already in our introduction, economists have identified one major risk factor associated with the new system, namely that inequality in pension incomes may become large. The source for such dispersion over and above the dispersion arising from income inequality during working life is the dispersion in returns on the DC accounts.

1.1 Media attention at the time of the reform

It is well-known that the launch of the mandatory DC plan was surrounded by intense information from the responsible governmental agency and marketing campaigns from banks and fund companies. Cronqvist and Thaler (2004) argue that the launch was surrounded by a pro choice culture and that participants were actively encouraged to choose their own portfolios via an extensive advertising campaign.

Figure 1 provides additional evidence of this phenomenon. The blue histogram (corresponding to the left vertical axis) depicts the number of news articles on the topic of premium pension that was published in the two leading national newspapers between 1996 (when the parliamentary decision took place) and 2007 (the end of our data period). In 2000, 418 articles on the topic were published, which corresponds to nearly one article every day in each paper. In contrast, there were less than 200 articles in every year before 2000 and in every year after 2001. The distribution within 2000 is also striking 323 of the 418 articles were published between August 1st and December 31st. To put 323 articles in perspective, we searched the same two newspapers for articles related to the 2000 Olympic Games which took place in Sydney, Australia. During the same five months of 2000, 759 such articles were published. In contrast, a scandal at that time which involved the Swedish minister for legal affairs (she chose to resigne on September 21st, 2000) produced 134 news articles during those same five months.

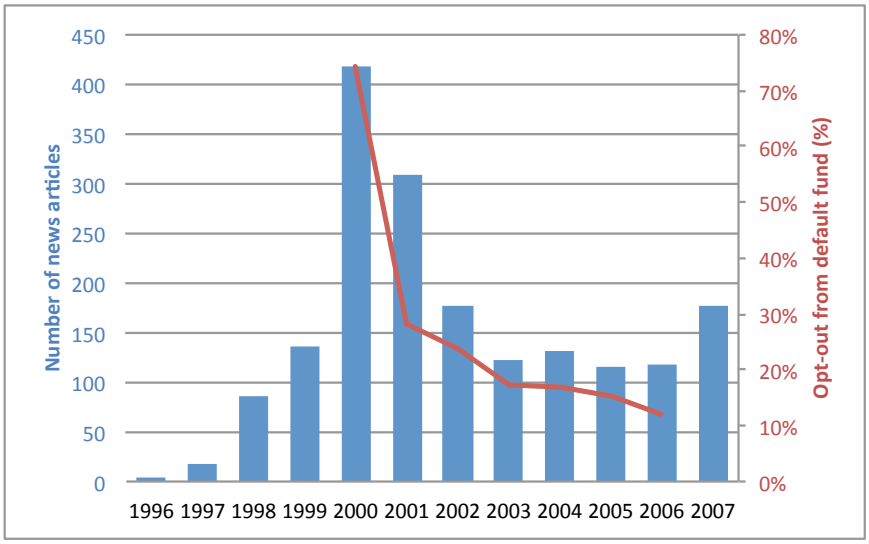
One striking example of journalistic failure is the supplemental weekend magazine that Swedens largest newspaper (Dagens Nyheter) published on September 12th 2000 to guide readers on the

upcoming launch of the DC plan. Over the magazines nine pages, there are interviews with politicians responsible for the reform, with financial practitioners, and with regular people on the street. Overall, informed choice is equated with the decision to opt out from the default fund. The default fund is given a small column on a half-page at the very last page.

We argue that the striking tendency to opt out from the default fund in 2000 to a large extent is the result of the intense buzz. The red line in Figure 1 depicts the fraction of plan entrants in our data set (LINDA) who opt out from the default fund. In 2000, 76 percent of the entrants opt out. Already in 2001, only 28 percent do so. The fraction of entrants that opt out from the default fund then steadily decreases throughout our sample period.

Figure 1: Media exposure and opt-outs from the default fund

The vertical axis to the right denotes the fraction of entering investors who opt out from the default fund. The vertical axis to the left denotes the number of news articles on the premium pension system (the mandatory DC plan) published in Dagens Nyheter and Svenska Dagbladet. Source: TNS-Sifo and our data set.



2 Data

With assistance from the Swedish Pensions Agency and Statistics Sweden we tailor a registry-based data set to our specific needs. The foundation of it is a representative panel data set called LINDA (Longitudinal INdividual DAta for Sweden) which consists of more than 300,000 households and their members. The total number of individuals in LINDA exceeds 700,000. LINDA is produced in annual waves and we use the eight waves between 2000 and 2007. This data set is compiled by Statistics Sweden and contains socioeconomic information such as age, education, household composition, civil status, etc. To LINDA we match on three additional data sources, one that contains detailed information about individuals' financial holdings outside of the pension

system, and one that contains information about the fund holdings in the DC accounts within the government pension system. The third and final data source is military enlistment data from 1968 to 2003.

2.1 Financial holdings inside and outside the pension system

First, we match on KURU to LINDA. KURU contains detailed registry-based information on each individual's non-pension financial wealth. It is a tax-based source for information about financial security holdings outside of the pension system. Specifically, tax form 31 in KURU allows us to compute the value of the holdings of each and every bond, stock and mutual fund that an individual holds on December 31st of each year. Two exceptions to these detailed tax reporting rules are the holdings of financial assets within private pension accounts, for which we only observe additions and withdrawals, and "capital insurance accounts", for which we observe the account balance but not the detailed holdings in it. The reason is that taxes on those two types of accounts depend merely on the account balances and not on the actual capital gains. There is also a tax on real estate, which allows for an accurate measurement of the value of owner-occupied single-family houses and second homes (cabins). Apartment (co-op) values are also available, though less accurately measured.

Second, we asked the Swedish Pensions Agency to deliver information to Statistics Sweden on each LINDA individual's year of entry into the pension system and information on which mutual funds the individual held on his/her DC account at the end of each year between 2000 and 2007 and the values of those. The mutual funds are identified by their ISIN. Statistics Sweden then matched on these data to LINDA and KURU.

In previous studies, KURU and records from the Swedish Pensions Agency have only been used by themselves. Calvet, Campbell, Sodini (2007, 2008), Vestman (2012), Koijen et al. (2013) use KURU to answer questions about investor diversification, portfolio rebalancing and consumption expenses. Dahlquist et al. (2013a) use DC account information similar to ours from the Pensions Agency to analyze how performance is related to activity. For a detailed description of either KURU or the Pensions Agency data, the reader is referred to these studies.

2.2 Enlistment data

Third, we match on the Swedish military enlistment data which is discussed at length in Lindqvist and Vestman (2011) and Grönqvist and Lindqvist (2013). Here, we provide a summary of the key variables in this data source.

The military enlistment usually takes place the year a Swedish man turns 18 or 19. The enlistment procedure spans two days involving tests of medical status, physical fitness, cognitive ability, and an interview with a psychologist. For the period we consider, almost all men who were not given a low health rating were enlisted to the military service. Importantly, it was not possible

to avoid the military service by obtaining a low score on cognitive or non-cognitive skills, though test scores predict the precise type of service to which conscripts were enlisted.

The majority of enlisted men start their military service upon graduation from secondary school. The duration of the military service time varies between 7 and 18 months depending on type of service. The far majority of men leave the military after the mandatory military service.

2.2.1 Measure of cognitive skills

The Swedish military has conducted tests of conscripts' cognitive skills since the mid 1940's. These tests have changed several times over the years, in 1980, 1994 and 2000 but general cognitive ability also ranging from 1 to 9. This variable follows a Stantine scale that approximates a normal distribution. We normalize the 1-9 measure of general cognitive ability to a distribution with zero mean and unit variance.

2.2.2 Measure of non-cognitive skills

All the men in our data had their psychological profiles evaluated according to a procedure that was adopted in 1972 and kept unchanged up to 1995 when it was subject to minor revisions. This procedure implies that conscripts are interviewed by a certified psychologist for about 25 minutes. As a basis for the interview, the psychologist has information about the conscript's results on the test of cognitive ability, physical endurance, muscular strength, grades from school and the answers to questions about friends, family and hobbies, etc. The interview is semi-structured in the sense that the psychologist has to follow a manual that states certain topics to be discussed, though specific questions are not decided beforehand.

The objective of the interview is to assess the conscript's ability to cope with the psychological requirements of the military service and, in the extreme case, war. The psychologists assign each conscript's military aptitude a score from 1 to 9, which follows the same Stanine distribution as the final test score for cognitive ability. In addition, leadership skills are estimated for those who score 5 or higher on the test of cognitive ability. In practice, the assessment of ability to cope with war stress and leadership skills are highly correlated in the data and we therefore restrict attention to military aptitude. As for cognitive skills, we normalize the 1-9 score to a distribution with mean zero and unit variance.

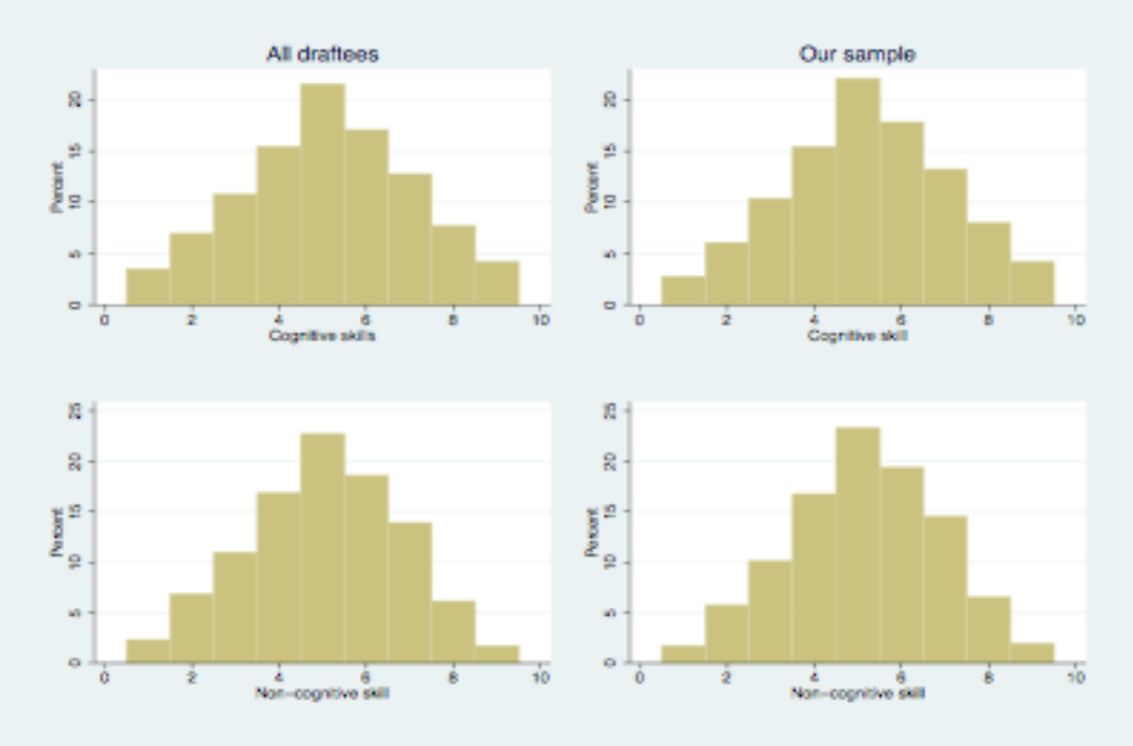
What character traits and abilities give a high score at the enlistment interview? According to the Swedish National Service Administration (SNSA), a high ability to function in the military requires willingness to assume responsibility; independence; outgoing character; persistence; emotional stability, and power of initiative (Lindqvist, 2004). Another important aspect is the conscript's ability to adjust to the specific requirements of life in the armed forces, like loss of personal freedom. Motivation for doing the military service is not among the set of characteristics that are considered beneficial for functioning in the military (Lindqvist, 2004).

Social skills are also considered important. Citing previous research in psychology, Andersson and Carlstedt (2003, p. 9) argue that group cohesion is the single most important factor that influence soldiers' ability to cope with war stress. Soldiers overcome their anxiety and continue to fight not because of strong feelings of hostility toward the enemy but because they don't want to abandon their friends.

Figure 2 shows the distribution of both skills measures. The two histograms to the left show the distribution in the full population of draftees between 1968 and 2003 (1.85 million Swedes). The two histograms to the right show the distribution in our sample of 168,835 DC plan investors. As can be seen our sample is representative of the entire population. This is a distinct advantage of studying investment behavior in a mandatory plan there is no selection bias into it and behavior is observed for a representative sample of the underlying skill distribution. In Figure A.1 in the Appendix we display the distribution of skills in our sample relative the sample of stock market participants outside the pension system.

Figure 2: Distribution of test scores

The panels to the left display the distributions for all draftees between 1968 and 2003 (1.85 million Swedes). The two histograms to the right show the distribution in our sample of 168,835 DC plan investors.



2.3 Sample restrictions

We impose as few sample restrictions as possible in our analysis. Starting with the LINDA waves from 2000 to 2007, there are 6,356,832 individual-year observations. Of those, there are 1,180,197 individual-year observations for those that were enlisted between 1968 and 2003. Twelve percent of those have either a missing test score on cognitive or non-cognitive skills and yet for one additional percentage point of the sample there is no educational information available. We arrive at a sample of 1,032,465 individual-year observations from LINDA with available test scores and information on education. Once we match on the pension account data, there are 957,291 individual-year observations. The loss in that matching stage mainly concerns young people who not yet have qualified into the DC plan.

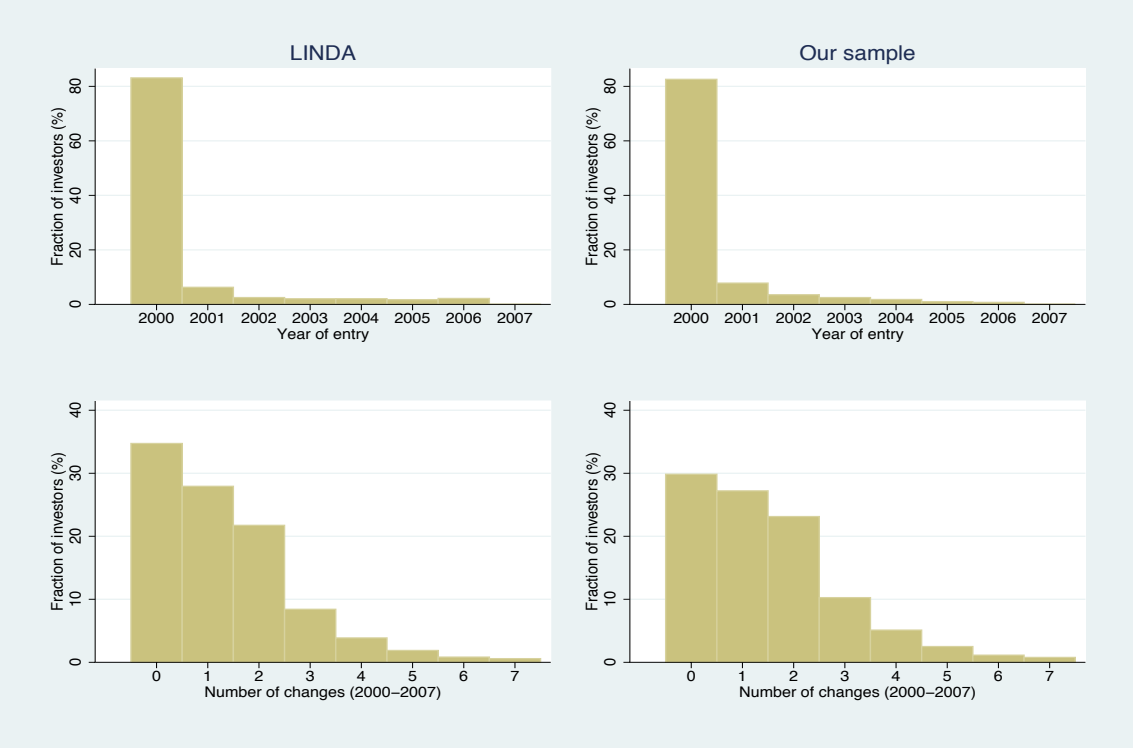
Figure 3 displays two features of the DC plan; year of entry in the top panels and activity in the bottom panels. Since all people in the labor force born in 1937 or later qualified for the DC plan at the time of its launch, entry is concentrated to year 2000. In subsequent years, entry is substantially lower. After 2002 it is below 3 percent of the full sample and continues to fall, most likely due to an infrequent adjustments of the LINDA sample frame. Year 2001 is an intermediate year in which entry if fairly high (7 percent) which is due to a slight revision of the eligibility criteria. The bottom panels depict the number of changes of funds during the 2000-2007 period among those that entered in 2000. No changes (0) means that the individual has remained in the default fund through out the period. One change means that the individual has opted out from the default fund at the time of entry and that the investor has kept that portfolio of funds ever since. Two to seven changes correspond to activity after entry. We see that relative to the full LINDA sample, our sample is slightly more active but not distinctively so. Overall, the pattern on fund changes is consistent with Dahlquist et al. (2013a). They document that over the 2000-2010 period 27 percent of the pension investors have been in the default fund throughout whereas 34 percent have initially opted out from the default fund but have since then not made any changes to their allocation. Consequently, in their sample 39 percent of the pension investors have made at least one fund change since the time of entry. This fact emphasizes the strong inertia among most DC plan investors. The presence of inertia means that even though contribution rates are fairly small (2.5 percent of annual labor income) a poor fund decision tends to stick, meaning that new inflows are also allocated poorly. We investigate the role of skills for activity, and lack thereof, in Section 5.2.

3 Method

We structure our discussion of methodological issues depending on the type of outcome considered. We begin with activity within the DC plan.

Figure 3: Year of entry and activity

The two top panels display the distribution of year of entry into the DC pension plan in LINDA and in our sample. The bottom panel displays the distribution of fund changes in the 2000-2007 period.



3.1 The decision to opt out from the default fund

We begin by analyzing activity at the time of the entry into the DC plan. The most basic distinction is between making an active choice or entering the default fund. We estimate regressions of the form

$$Default_{i0} = \beta_0 + \beta_c c_i + \beta_n n_i + X_{i0}\gamma + Z_i\delta + \varepsilon_{i0} \tag{1}$$

where $Default_{i0}$ is a dummy equal to 1 in case person i choose the default fund when first required to make a choice (i.e., $t = 0$), c_i is (standardized) cognitive skills, n_i is (standardized) non-cognitive skills, X_{i0} is a vector of time-varying characteristics and Z_i is a vector of time-invariant characteristics.

There are a number of issues to consider in the estimation of a regression with cognitive and non-cognitive skills like (1) which we discuss at length in Lindqvist and Vestman (2011).

First, in order to estimate the effect of skills on investment behavior, we want to control for factors which are correlated with skills and which can be presumed to have an independent effect on participation in financial markets. However, including variables which are partly determined

by cognitive and non-cognitive skills implies that we run into a problem of bad controls (Angrist and Pischke, 2008). In particular, since high cognitive skills predict higher educational attainment, cognitive skill within educational groups will be correlated with the error term. In order to get a sense of the sensitivity of our estimates, we estimate regression (1) both including and excluding educational controls.

Second, the functional form of (1) hinges upon the distributional assumptions of skills. As it turns out, a linear specification works quite well in combination with our assumption of normally distributed skills.

Third, it is not obvious how to think about the moderate positive correlation (0.38) between cognitive and non-cognitive skills. Based on previous research there are a priori reasons both for why cognitive skills can affect non-cognitive skills, as well as the other way around. We take an agnostic view in this paper and estimate (1) with both skill measures jointly and with each measure separately.

Fourth, both cognitive and non-cognitive skills are measured with error. Using data from twins, Lindqvist and Vestman (2011) estimate a reliability ratio of 0.87 for cognitive skills and 0.70 for non-cognitive skills. The lower reliability ratio of non-cognitive skills represents the additional measurement error due to by the fact that conscripts are interviewed by different psychologists. We will show results without the coefficients being adjusted for measurement error in skills but would like to note that the obtained estimate for non-cognitive skills is likely to be somewhat biased towards zero.

A final issue, specific to the context we study, is the interaction between skills and the year of entry into the pension system. As explained in the previous section, the launch of the pension reform was accompanied by an extensive campaign to induce people to make an active choice. If people with different combinations of skill react differently to this campaign, the estimated effect of skills on activity may change over time. For this reason, we estimate (1) separately for two different samples. Our first sample consists of all workers who made their first choice when the reform was launched, in 2000. The second sample consists of i) cohorts that entered the pension system after 2000 and ii) cohorts that entered in 2000 and would not have been eligible to enter the DC plan had it been introduced earlier. By comparing the results for adjacent cohorts who entered the system in 2000 or thereafter, we are able to get a sense of how people with different combinations of skills reacted to the campaign at the time of the launch of the reform. Yet since factors beside the campaign may also give rise to differences across cohorts, we stress that this analysis is merely suggestive.

Conditional on opting out at t=0, we distinguish between two types of investors: active and passive. Active investors change their allocation of funds in the DC plan at least once up until year 2007 while passive investors are those who stick to their initial choice. We estimate regressions of the form

$$Active_i = \beta_0 + \beta_c c_i + \beta_n n_i + X_{it}\gamma + Z_i\delta + \varepsilon_i \tag{2}$$

for the subsample of investors who did not opt for the default fund at $t = 0$. Here, $Active_i$ is a dummy variable equal to 1 in case an investor made at least one change to the allocation of funds some time between entry into the DC plan and 2007.

The same estimation issues regarding the choice of control variables, functional form, measurement errors and cohort effects that we discussed in the case of regression (1) pertains also to regression (2), and we do not discuss these issues further here. There is also an additional issue since regression (2) is estimated on a selected sample, i.e., people who made an active choice at $t = 0$. Because, as we will see, non-cognitive skills is positively correlated with making an active choice at $t = 0$, we expect a downward bias on β_n in regression (2). For now, we report the results from regressions with $Active_i$ as the dependent variable estimated on the whole sample, i.e., including men who are in the default fund.

3.2 Returns

Our final analysis of the DC plans concerns the realized returns on pension savings. We estimate regressions of the form

$$R_{it,t+k} = \beta_0 + \beta_c c_i + \beta_n n_i + X_{it}\gamma + Z_i\delta + \varepsilon_{it,t+k} \tag{3}$$

where $R_{it,t+k}$ is the realized return of individual is account between year t and $t + k$. We consider both annual returns and returns over the entire period between entry and 2007.

Because people who refrain from making an active choice all end up with the same fund, they all share the same values of the dependent variables in regression (3). We therefore report standard errors both with and without clustering at the largest chosen fund. The clustered and non-clustered standard errors answer different questions. The non-clustered standard errors tells us the degree of certainty by which we could say that cognitive and non-cognitive skills correlate with realized returns in this particular period. The clustered standard errors tell us whether we can generalize these results to other periods. Since the results may be sensitive to our largest cluster the default fund we also estimate regression (3) restricting the sample to workers who opted out of the default fund. The interpretation is then somewhat different since we then measure the effect of skills among those that have opted out.

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4 Results

Table I shows summary statistics for the different samples we consider in the analysis. The upper panel shows the characteristics of the full sample of men who entered in 2000-2004. Men who entered in 2000 are much older on average (37.2) compared to men who entered in 2001 (23.3) and 2002 or later (between 21.3 and 21.6). The reason is due to the way the pension reform was launched with all citizens born after 1937, who had at least one year of qualifying labor income in their work history, being eligible in 2000. The minimum qualifying labor income was in 2000 around SEK 18,000 (USD 2,600) and grows every year with the consumer price index. The second stark difference between cohorts is the share of workers who chose the default fund going from 28.7% in 2000 to 79.8% in 2001 to around 90% in 2003 and 2004. Panel B reports summary statistics for a restricted sample. To make the sample of entrants in 2000 more similar to the entrants in subsequent years we restrict attention to those individuals who have earned the qualifying labor income for less than five years prior to entry. Further, we impose the restriction that entrants in 2000 must be less than 29 years old. The statistics in panel B show that the sharp increase in the popularity of the default fund cannot be explained by the differences in demographics between the different cohorts. Imposing restrictions that give us reasonably similar groups of workers in 2000 and 2001-2004, we still see the share of workers who stay with the default fund double between 2000 and 2001.

4.1 Choosing the default fund at the time of entry

Table II shows the results from different versions of regression (1) where the dependent variable is equal to 1 in case an investor chose the default fund at the time of entry into the DC plan. Column 1 shows that, for full sample of individuals who chose the default fund in year 2000, cognitive skills does not predict opting out of the default fund. In contrast, a one standard deviation increase in non-cognitive skills predict a 3.5 percentage point decrease in the probability of opting out. Going from the low (-2 s.d.) to the high (+2 s.d.) end of the non-cognitive skill distribution thus predicts a 14 percentage point lower probability of choosing the default fund. Given that less than 30 percent of the 2000 cohort refrained from opting out of the default fund, this must be considered a very large effect.

The second column of Table II shows the results when we control for stock market participation prior to the launch of the reform, and allow for interaction effects between stock market participation and skills. As expected, men who participated in the stock market outside the pension system prior to the reform are much more likely to make an active choice (the effect is similar to the effect of going from the low to the high end of non-cognitive skills). Remarkably, the effect is negative in this group too. In contrast, cognitive skills matter much less for the decision to opt out. A one standard deviation increase implies a shift in the likelihood by just 1.4 percentage points.

The third column of Table II shows the results when we restrict the sample to men below the age of 29 and who has earned a qualifying income for at most five years. The purpose of imposing this restriction is to obtain a sample which is roughly comparable to men who entered the pension system between 2001 and 2004, i.e., in the years after the launch of the reform (we drop the age restriction for these groups). Column 3 shows that the effect of non-cognitive skills on opting out of the default fund is somewhat stronger for the restricted sample than for the full sample who entered in 2000. However, columns 5 and 7 show the correlation between non-cognitive skills and choice of the default fund is weaker for the cohort who entered in 2001 and does not exist for the cohorts that entered in 2002-2004. Controlling for, and interacting with, stock market participation in columns 4, 6 and 8 does not change this picture.

In untabulated regressions, we have included dummy variables for education. This does not change our findings on non-cognitive skills. With regards to cognitive skills, such a specification shifts the coefficients on cognitive skills upward somewhat but not by much.

Figure 4 depicts a version of the results in Table II. Each dot represents a point estimate (and its 95% confidence interval) for a particular sub-sample. For the period 1996-1999 we try to single out those investors who would have entered the DC plan at that time, had the new pension system been in place. To do so, we single out those who have 2 qualifying years of labor income and are less than 30 years old (1999), those who have 3 years of qualifying income and are less than 31 years olds (1998) and so forth up to 5 qualifying years and less than 34 years old (1996). For the year 2000, we focus on those investors who have a labor income corresponding to 0 or 1 qualifying years and are less than 29 years old. For the period 2001-2004 we use the restrictions of Panel B in Table I. The estimates in the figure suggest that the effect of non-cognitive skills is uniform over the five groups in the 1996-2000 sample. In 2001, the effect is on the border of being statistically significant and in the years thereafter the point estimates are essentially zero. The effect of cognitive skills, on the other hand, shows more of a downward trend though the effects are not statistically significant (the exception is 2003).

4.2 Activity and number of funds in the portfolio

Based on the number of fund changes over the 2000-2007 period, depicted in Figure 3, we classify individuals into three categories as previously done in Dahlquist et al. (2013b):

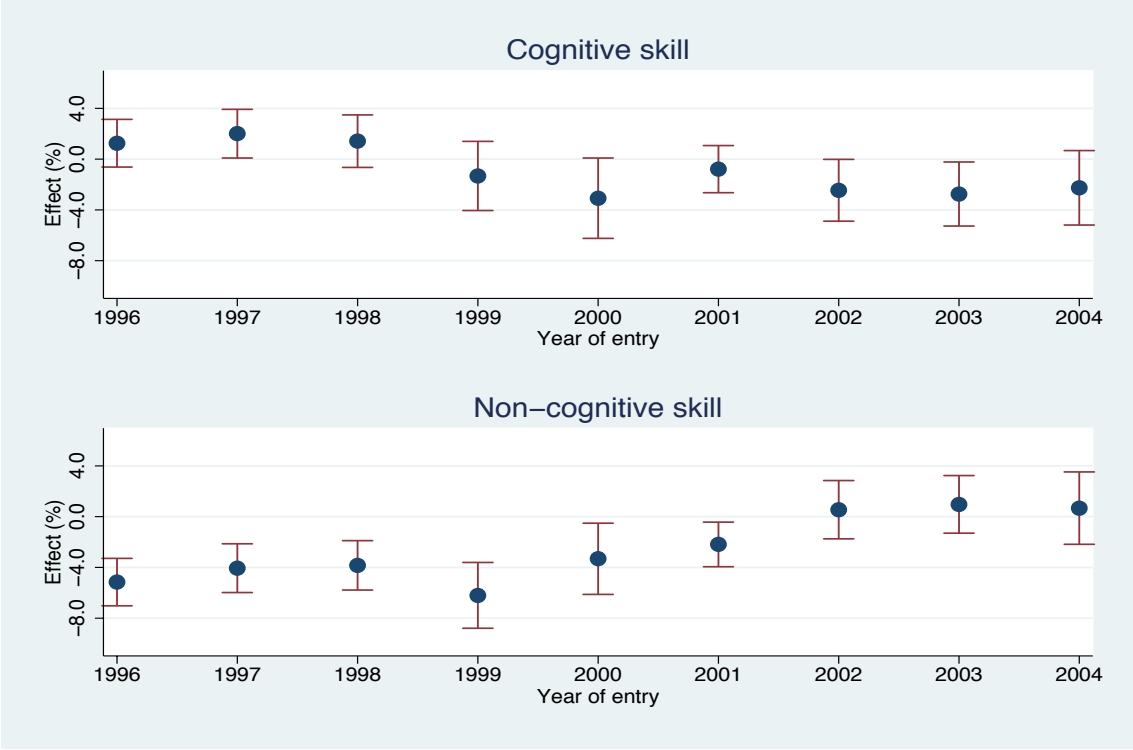
1. *Default investors.* A default investor has had its DC deposits allocated to the default fund ever since entry into the pension system.

2. *Passive investors.* A passive investor opted out of the default fund at the time of his entry into the pension system but since then he never made a change to his fund allocation.

3. *Active investors.* An active investor is someone who has made at least one change to her/his fund allocation after the entry into the pension system. Thus, this type consists both of

Figure 4: Effects at launch and thereafter

The top panel displays the estimated effects of a one-standard deviation increase in cognitive skills on the likelihood of default fund choice at the time of entry into the DC pension plan, along with their 95%-confidence intervals. For the years 1996 to 1999 we single out those individuals who would have entered in those years, had the pension plan been in place at that time. The bottom panel displays the analogous effects for non-cognitive skills. The regressions are similar to those reported in Table II.



individuals who have opted out of the default fund after entry into the pension system and individuals who have made repeated fund allocation decisions.

These categories constitute 30, 27 and 43 percent of our sample, respectively. Thus the classification divides our sample into three equal large parts, roughly speaking. Table III reports the effects of skills on the likelihood of belonging to the active (third) category, conditional on having opted out from the default fund, i.e. the dependent variable in those regression specifications is a dummy variable Active that takes on value one if the individual belongs to the third category above. The sample consists of individuals in the second and third category

Column 1 to 4 of Table III report how skills predict activity among those that entered the DC plan in 2000 (at the time of its launch). For those that entered in 2000 and opted out, both skill types predict an increasing amount of activity. However, cognitive skills have a much greater effect (4.3 percentage points versus 1.5 percentage points in column 1). There is no interaction effect with stock market participation outside the pension system, though participation by itself spurs activity (column 2). If the sample is restricted to those with limited work experience (column 3

and 4) the difference in effects between cognitive and non-cognitive skills is even greater – cognitive skills foster activity while non-cognitive skills do not. Taken together, with the results reported earlier in Table II, this is bad news for those who entered in 2000 and who are endowed with a lot of non-cognitive skills – the likelihood that they opted out from the default fund initially is large but the likelihood of maintaining activity thereafter is not very big. This is different from those endowed with cognitive skills – the likelihood of opting out is smaller but the likelihood of maintaining activity conditional on having opted out is greater.

Column 5 to 8 report effects on activity for those that entered the DC plan in 2001 to 2004 and opted out from the default fund. Here, we see no effect of cognitive skills but an effect of non-cognitive skills, though we are careful to interpret that results since the interaction effect with stock market participation is so large.

4.3 Returns in the DC pension plan

We now turn to the question whether skills predict realized return in the pension system. In essence, realized returns measures the combined effect of the decision to opt out from the default fund, the decision to be active and the decision to diversify decisions that we studied up to this point.

Table IV and V report returns for each pension investors. We include investors who opted for the default fund at the time of entry in Table IV while we exclude them in Table V. Thus, the interpretation of our estimates is that in Table IV we estimate the effect of skills unconditional on activity whereas in Table V we estimate the effect of skills conditional on having opted out from the default fund at the time of entry. We consider both annual returns (column 1 to 4) and compounded returns over many years (column 5 to 8). Throughout, we cluster standard errors at the fund ID which has the biggest portfolio weight in the individuals account in the beginning of the period.

Starting with column 1 of Table IV, we consider the annual returns of all pension investors. We see that a one standard deviation increase in non-cognitive skills predicts an eight basis points lower annual return ($p < 0.1$). In contrast there is no statistically significant effect of cognitive skill. Adding educational controls (column 2), the point estimates remain essentially the same but the level of statistical significance improves. Most importantly, cognitive skills now predict a higher return seven basis points per year per standard deviation of skill. Interestingly, we see in column 3 and 4 that these results rely heavily on the investors that entered the DC plan at the time of the launch in 2000. Focusing on the sample of entrants in subsequent years implies that statistical significance cannot be established and that the point estimates for non-cognitive skill is miniscule.

In column 5 and 6 we study the returns of those that entered in 2000 more closely. We focus on compounded returns for the eight-year period covering the beginning of 2001 to the end of 2008.

The estimated effect of a one standard deviation increase in non-cognitive skills is 85 basis points over eight years. This translates into ten basis points per year and is essentially in line with the results for annual returns in column 1 and 2. The effect for cognitive skills is however estimated to be statistically insignificant. In column 7 and 8 we focus on the effect of skills for those who entered in 2000 with those who entered in 2001. We focus on compounded returns from 2002 to 2008 (seven years). The overall effect of non-cognitive skills for both of these groups is estimated to 95 basis points, or 13 basis points per year. The aggregation of the two groups does however mask an important difference between them, as can be seen in column 8. In that specification, we include interaction terms for entry in 2001. We then see that entrants in 2001 over all have had 3.42 percent higher return than entrants in 2000 over the 2002-2008 period. Further, among entrants in 2000 a one standard deviation increase in non-cognitive skills implied a negative effect on returns equal to 1.02 percent. In contrast, the effect of non-cognitive skill was close to zero for entrants in 2001. Overall, the results in Table IV show that non-cognitive skills had a detrimental effect at the time of the launch of the pension system.

Table V reports effects on returns for those investors who have displayed some activity since 2000 (i.e., they are either active or passive investors). Column 1 and 2 show that the effect of non-cognitive skills is even greater among this group of investors. This is evidence that the tendency to opt out from the default fund in 2000 is not the only reason for the negative effect. More markedly is however the different impact of cognitive skills among entrants after 2000 column 3 and 4 show that among entrants after 2000, a one standard deviation increase in cognitive skill predicts a 32 basis points higher return. Column 5 and 6 report results for compounded returns for entrants in 2000. These results are in line with the ones in column 1 and 2 (though cognitive skills turn statistically insignificant). In column 7 and 8 we also see a strong negative effect of non-cognitive skills among entrants in 2000 and 2001. However, among those that opted out at the time of entry (the sample considered in Table V), there is no differential effect among entrants in 2000 and 2001. This suggests that non-cognitive skills had a particularly detrimental effect in 2000 because of the environment surrounding the launch and the high incidence of opting out from the default fund at that time. In untabulated results, we have employed the additional sample restrictions with respect to labor income history and age. Focusing on this sample leads to qualitatively the same estimates, though for the most part statistically insignificant.

To summarize, Table IV and V show that men with higher non-cognitive skills had lower returns than men with high cognitive skills.

4.4 Investment behavior outside the pension system

In this section we investigate the effect of cognitive and non-cognitive skills for investment behavior outside the pension system for the time period 2000 to 2007. This is valuable because it enables us to benchmark observed behavior just after the time of the launch pension system to more regular

investment domains, studied in e.g. Grinblatt et al. (2011, 2012b,a).

4.4.1 Stock market participation

Table VI reports regressions with a dummy variable that indicates stock market participation, either through direct stock holdings or through equity funds. Column 1 includes just year fixed effects and cognitive skills. A one-standard deviation increase in cognitive skills predicts a 9.5 percentage points increase in the likelihood of being a participant. The second column reports the analogous effect for non-cognitive skills which is estimated to 8.4 percentage points. The third column then includes both skill measures. Since the measures are positively correlated, both of the estimates become smaller. Importantly, the effect of cognitive skills decreases to 7.4 percentage points, suggesting that when non-cognitive skills are ignored, the role of cognitive skills or IQ tend to be overestimated. At the same time, there are reasons to believe that the relative importance of the two skill measures are mismeasured unless one corrects for the greater measurement error in non-cognitive skills. (Lindqvist and Vestman, 2011) report a reliability ratio of cognitive skills and non-cognitive skills equal to 86.8% and 70.3%, respectively. In the fourth column we correct for this, which implies that the effect of cognitive skills remains essentially unchanged while the effect of non-cognitive skills increases by 2.3 percentage points. This adjustment reverses the relative importance of the skills measures - the effect of non-cognitive skills is greater than that of cognitive skills. Finally, we add rich set of covariates to the regression in the fifth column. The covariates include dummy variables for education, a piecewise linear spline in age, dummy variables for geography and a dummy variable for marriage and cohabitation interacted with ranking the ranking position in the net worth and labor income distributions. The covariates are similar to those included by Grinblatt et al. (2011). The effect decreases to around three percentage points and the relative magnitude of non-cognitive skills remains greater than that of cognitive skills.

4.4.2 Returns

We also investigate the role of either skills measure for returns on stocks and equity funds. We report the estimated effects in Table VII. The first four columns show a consistent pattern; cognitive skills affect returns positively. A one-standard deviation increase in cognitive skills predicts an increase in portfolio returns of around forty basis points per year. In contrast, there is no effect of non-cognitive skills. Including a rich set of controls (in the fifth column), reduces the estimated effect to twenty-five basis points for a one-standard deviation increase.

5 Conclusion

The Swedish pension reform provides a unique opportunity to study investment behavior for a representative sample of the population. In this paper, we have shown that investment behavior differ markedly across people with different levels of cognitive and non-cognitive skills. In particular, men with high non-cognitive skills were much more likely to opt out of the default fund and make an active choice. As a result, non-cognitive skill is negatively correlated with realized returns.

We argue that the particular form of paternalism at the launch of the Swedish pension system – a sensible default fund but a strong emphasis that active choices are desirable – offers a plausible explanation for this pattern in the data. In other words, the kind of character traits associated with high non-cognitive skills – dependability, ambition and conscientiousness – which are critical for success in the labor market (Lindqvist and Vestman, 2011), also make people follow the bad financial advice given by the government. In this sense, our results indicate that pension reform need to take into account both the existence of inactive investors who refrain from making active choices even if exposed to an aggressive information campaign, and investors who make active choices if pursuaded to do so, but who lack the knowledge and expertise to choose sound investments. In our view, policy makers in other countries who launch a new pension system should take note of the Swedish experience.

A second take-away from our analysis of investment behavior in- and outside the pension system is that while cognitive skills seem to be benign in either investment domain, non-cognitive skills are not. Whether non-cognitive skills are rewarded in investment decisions, or not, depends on the specific context and decision environment. In a "pro choice" culture, those endowed with non-cognitive skills may be inclined or inspired to assume too much responsibility for their asset allocation decisions.

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A Skill distributions inside and outside the pension system

Figure 5: Skill distributions among pension investors and among stock market participants

The panels to the left display the distribution of cognitive and non-cognitive skills in the sample of pension investors. The panels to the right display the corresponding skill distributions among those individuals who hold stocks or equity mutual funds outside the pension system.

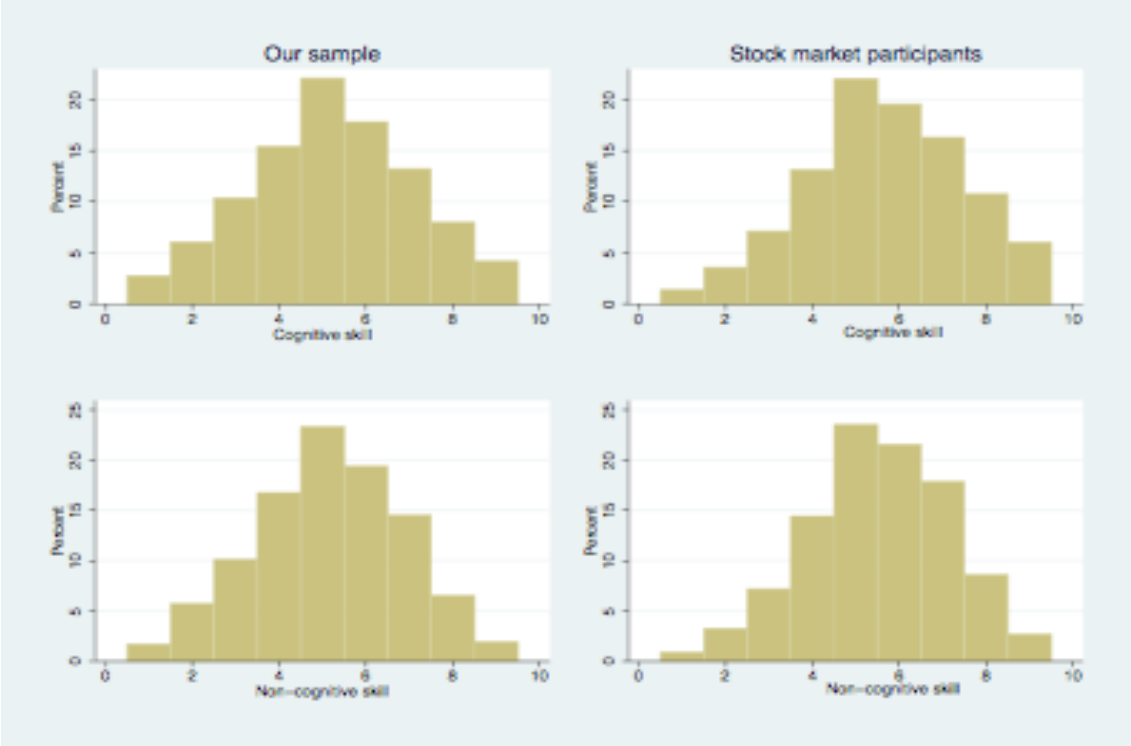

Table I: Averages of variables by year of entry

Panel A: Full sample

	2000	2001	2002	2003	2004
Default fund	28.7%	79.8%	82.7%	90.2%	88.2%
Cognitive skills (c_i)	0.017	0.052	0.057	0.047	0.070
Non-cognitive skils (n_i)	0.033	-0.094	-0.134	-0.083	-0.159
Age	37.2	23.3	21.6	21.3	21.5
Years of eligibility	7.64	2.86	2.30	2.21	2.23
Labor income	261,340	97,273	86,594	77,521	84,403
Account balance	16,460	1,060	753	1,110	972
Stock market participation	60.2%	56.1%	52.9%	53.7%	51.9%
Observations	104,689	9,899	4,496	3,179	2,286

Panel B: Restricted sample

	2000	2001	2002	2003	2004
Default fund	40.4%	80.2%	82.8%	90.3%	88.3%
Cognitive skills (c_i)	-0.155	0.004	0.050	0.045	0.071
Non-cognitive skills (n_i)	-0.139	-0.109	-0.138	-0.084	-0.162
Age	24.3	22.9	21.4	21.1	21.3
Years of eligibility	3.34	2.62	2.21	2.15	2.20
Labor income	149,400	93,300	83,600	76,000	82,400
Account balance	5,900	1,020	730	1,090	950
Stock market participation	53.1%	55.8%	52.8%	53.7%	51.9%
Observations	9,023	9,369	4,407	3,143	2,268

The table presents average of variables by year of entry into the pension plan at the year of entry. Panel A reports the full sample and Panel B for the sub-sample of individuals who have a history of five or fewer years of qualifying income for the pension system and who at most are 28 years old in 2000. All values have been deflated to 2005 prices.

Table II: Choice of the default fund at the time of entry into the DC pension plan

	I	II	III	IV	V	VI	VII	VIII
Cognitive skills (c_i)	0.000	0.014***	0.011*	0.025***	-0.014***	-0.010*	-0.015***	-0.003
	(0.002)	(0.003)	(0.006)	(0.008)	(0.005)	(0.006)	(0.004)	(0.005)
Non-cognitive skills (n_i)	-0.035***	-0.039***	-0.049***	-0.056***	-0.020***	-0.019***	-0.003	-0.003
	(0.002)	(0.003)	(0.005)	(0.008)	(0.004)	(0.006)	(0.004)	(0.005)
Stock market partic.		-0.132***		-0.143***		-0.089***		-0.042***
		(0.003)		(0.011)		(0.008)		(0.007)
Cognitive skills (c_i) x Stock market partic.		-0.009***		-0.006		0.003		-0.016**
		(0.003)		(0.011)		(0.009)		(0.008)
Non-cognitive skills (n_i) x Stock market partic.		0.017***		0.030***		0.007		0.005
		(0.003)		(0.011)		(0.008)		(0.007)
Year of entry	2000	2000	2000	2000	2001	2001	2002-04	2002-04
Age $\leq$ 28 years	No	No	Yes	Yes	No	No	No	No
Eligibility $\leq$ 5 years	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	No	No	No	No	No	No	Yes	Yes
R-squared	0.040	0.059	0.037	0.058	0.015	0.027	0.017	0.021
Observations	104,689	104,689	9,023	9,023	9,369	9,369	9,818	9,818

The table presents the results of regressions with dummy variable for the choice of the default fund at the time of entry into the DC pension plan. All regressions include cohort fixed effects, controls for work experience (count of years of work experience from 0 to 10 or more years), and a spline in the balance on pension account. Standard errors, robust to conditional heteroscedasticity, are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Table III: Activity in the DC pension plan among opt-outs from the default fund

	I	II	III	IV	V	VI	VII	VIII
Cognitive skills (c_i)	0.043***	0.040***	0.052***	0.056***	0.002	0.008	0.010	0.023
	(0.002)	(0.004)	(0.009)	(0.014)	(0.010)	(0.016)	(0.011)	(0.018)
Non-cognitive skills (n_i)	0.015***	0.014***	0.008	0.007	0.003	0.040***	0.0005	0.038**
	(0.002)	(0.004)	(0.009)	(0.013)	(0.009)	(0.015)	(0.011)	(0.017)
Stock market partic.		0.071***		0.071***		-0.000		-0.008
		(0.004)		(0.017)		(0.019)		(0.020)
Cognitive skills (c_i) x Stock market partic.		-0.003		-0.017		-0.012		-0.020
		(0.005)		(0.019)		(0.020)		(0.023)
Non-cognitive skills (n_i) x Stock market partic.		-0.002		-0.003		-0.061***		-0.061***
		(0.005)		(0.018)		(0.020)		(0.022)
Year of entry	2000	2000	2000	2000	2001-04	2001-04	2001-04	2001-04
Age $\leq$ 28 years	No	No	Yes	Yes	No	No	Yes	Yes
Eligibility $\leq$ 5 years	No	No	Yes	Yes	No	No	Yes	Yes
Year fixed effects	No	No	No	No	Yes	Yes	Yes	Yes
R-squared	0.012	0.016	0.023	0.029	0.033	0.038	0.017	0.023
Observations	104,689	63,536	3,653	3,653	2,831	2,831	2,421	2,421

The table presents the results of regressions with dummy variable for the choice of the default fund at the time of entry into the DC pension plan. All regressions include cohort fixed effects, controls for work experience (count of years of work experience from 0 to 10 or more years), and a spline in the balance on pension account. Standard errors, robust to conditional heteroscedasticity, are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Table IV: Performance regressions on the DC account, including default fund investors

	I	II	III	IV	V	VI	VII	VIII
Dependent variable:	Annual ret.	Annual ret.	Annual ret.	Annual ret.	Comp. ret. 2001-08	Comp. ret. 2001-08	Comp. ret. 2002-08	Comp. ret. 2002-08
Cognitive skills (c_i)	0.09	0.07*	0.13	0.08	-0.08	-0.08	-0.33	-0.38
	(0.05)	(0.04)	(0.09)	(0.07)	(0.32)	(0.32)	(0.32)	(0.33)
Non-cognitive skills (n_i)	-0.08**	-0.09**	0.008	-0.002	-0.85***	-0.85***	-0.95***	-1.02***
	(0.04)	(0.04)	(0.03)	(0.02)	(0.28)	(0.28)	(0.33)	(0.31)
Entry in 2001						-		3.42
								(2.46)
Cognitive skills (c_i) x Entry in 2001								0.55
								(0.39)
Non-cognitive skills (n_i) x Entry in 2001								0.86***
								(0.26)
Year of entry	2000-07	2000-07	2001-07	2001-07	2000	2000	2000-01	2000-01
Dummy vars. for educ.	No	Yes	No	Yes	No	Yes	No	No
Year fixed effects	Yes	Yes	Yes	Yes	No	No	No	No
R-squared	0.902	0.902	0.926	0.926	0.0085	0.0085	0.023	0.024
Number of clusters	776	776	518	518	291	291	350	350
Observations	689,464	689,464	67,611	67,611	63,458	63,458	68,992	68,992

The table presents performance regressions on the DC acocunt, including default fund investors. The dependent variable in column 1 to 4 is the annual return for each year. The dependent variable in column 5 to 8 is the compounded return from 2001 to 2008 and from 2002 to 2008. All specifications include cohort fixed effects, controls for work experience at beginning of the period (dummy variables from 0 to 10) and a spline in the balance for the pension account at the beginning of the period. Standard errors are clustered on the fund ID with the largest portfolio weight in the account. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Table V: Performance regressions on the DC account, excluding default fund investors

	I	II	III	IV	V	VI	VII	VIII
Dependent variable:	Annual ret.	Annual ret.	Annual ret.	Annual ret.	Comp. ret. 2001-08	Comp. ret. 2001-08	Comp. ret. 2002-08	Comp. ret. 2002-08
Cognitive skills (c_i)	0.11*	0.09*	0.35***	0.32***	-0.18	-0.18	-0.56	-0.59
	(0.06)	(0.05)	(0.11)	(0.11)	(0.44)	(0.44)	(0.39)	(0.39)
Non-cognitive skills (n_i)	-0.13***	-0.14***	-0.13	-0.13	-1.13***	-1.13***	-1.35***	-1.34***
	(0.03)	(0.02)	(0.11)	(0.10)	(0.20)	(0.20)	(0.18)	(0.18)
Entry in 2001						-		9.18***
								(2.65)
Cognitive skills (c_i) x Entry in 2001								1.05
								(0.77)
Non-cognitive skills (n_i) x Entry in 2001								-0.02
								(0.62)
Year of entry	2000-07	2000-07	2001-07	2001-07	2000	2000	2000-01	2000-01
Dummy vars. for educ.	No	Yes	No	Yes	No	Yes	No	No
Year fixed effects	Yes	Yes	Yes	Yes	No	No	No	No
R-squared	0.881	0.881	0.804	0.804	0.012	0.012	0.031	0.033
Number of clusters	776	776	518	518	291	291	350	350
Observations	486,074	486,074	17,529	17,529	44,298	44,298	46,246	46,246

The table presents performance regressions on the DC acocunt, excluding default fund investors. The dependent variable in column 1 to 4 is the annual return for each year. The dependent variable in column 5 to 8 is the compounded return from 2001 to 2008 and from 2002 to 2008. All specifications include cohort fixed effects, controls for work experience at beginning of the period (dummy variables from 0 to 10) and a spline in the balance for the pension account at the beginning of the period. Standard errors are clustered on the fund ID with the largest portfolio weight in the account. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Table VI: Stock market participation outside the pension system

	I	II	III	IV	V
Cognitive skills (c_i)	0.095*** (0.001)		0.074*** (0.001)	0.075*** (0.001)	0.029*** (0.001)
Non-cognitive skills (n_i)		0.084*** (0.001)	0.056*** (0.001)	0.079*** (0.001)	0.031*** (0.001)
Measurement error adj.	No	No	No	Yes	No
Dummy vars. for educ.	No	No	No	No	Yes
Spline for age	No	No	No	No	Yes
Dummy var. for married	No	No	No	No	Yes
Cohabitation x Net worth	No	No	No	No	Yes
Cohabitation x Labor income	No	No	No	No	Yes
Dummy variables for geography	No	No	No	No	Yes
R-squared	0.038	0.030	0.049	0.058	0.151
Observations	888,877	888,877	888,877	888,877	888,877

The table presents the results of regressions with a dummy variable for stock market participation as dependent variable. All regressions include year fixed effects. Standard errors, robust to conditional heteroscedasticity and clustered at the individual level, are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Table VII: Performance of equity investments outside the pension system

	I	II	III	IV	V
Cognitive skills (c_i)	0.41***		0.39***	0.46***	0.25***
	(0.03)		(0.04)	(0.04)	(0.04)
Non-cognitive skills (n_i)		0.18***	0.05	0.03	-0.02
		(0.07)	(0.04)	(0.05)	(0.04)
Measurement error adj.	No	No	No	Yes	No
Dummy vars. for educ.	No	No	No	No	Yes
Spline for age	No	No	No	No	Yes
Dummy var. for married	No	No	No	No	Yes
Cohabitation x Net worth	No	No	No	No	Yes
Cohabitation x Labor income	No	No	No	No	Yes
Dummy variables for geography	No	No	No	No	Yes
R-squared	0.621	0.621	0.621	0.621	0.622
Observations	327,224	327,224	327,224	327,224	327,224

The table presents the results of regressions with annual returns as dependent variable. All regressions include year fixed effects. Standard errors, robust to conditional heteroscedasticity and clustered at the individual level, are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.