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ORIGINAL PAPER

Ability, Educational Attainment, and Household Financial Distress

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Abstract
Using register data on the Finnish population, we show that both ability (measured with comprehensive school GPA) and educational attainment are relevant predictors of financial distress, even after accounting for childhood family environment. Low GPA is an especially useful predictor of financial distress years later for those who attain a secondary-level education at most. Our results suggest that any societal interventions to mitigate financial distress should particularly focus on low GPA individuals, and especially those unlikely to continue their studies after completing comprehensive school.

Keywords Financial distress · Cognitive ability · Noncognitive ability · Educational attainment

Recent literature suggests noncognitive and cognitive abilities help to avoid financial distress. High emotional stability, conscientiousness (Parise & Peijnenburg, 2019), self-efficacy, and patience (Kuhnen & Melzer, 2018) are negatively related with financial distress. Individuals who score high in arithmetic and mathematics have lower interest payments on personal debt (Agarwal & Mazumder, 2013).

In this paper, we use the grade point average (GPA) from the final grade of compulsory school, at about 15 years of age, as an overall measure of individual ability. The GPA conveniently captures both cognitive and, even more so, noncognitive abilities (Duckworth & Seligman, 2005). In contrast to measures based on individual questionnaires or tests, the grades reflect performance evaluated by teachers over the final year at comprehensive school. Hence, the GPA is perhaps the most robust measure of adolescent ability available. While it is less accurate in scope than the measures typically used in the literature, including IQ, patience, and conscientiousness, it is much more commonly observable, and often registered, as in the case of Finland, for entire birth cohorts and populations.

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Noncognitive abilities related to time preferences contribute to higher grades. Duckworth and Seligman (2005) report that while cognitive ability, as measured by IQ, is important for the school grades of adolescents, noncognitive ability matters even more. In their study among eighth-graders, self-discipline explains more than twice as much variance in final grades compared to IQ. Similarly, Castillo et al. (2011) show patience to be related with school grades. Golsteyn et al. (2013) demonstrate that adolescents who are more patient tend to perform better in compulsory school and attain a higher level of education.

Better grades are associated with a lower likelihood of negative economic outcomes in adulthood. Agarwal and Mazumder (2013) find that a measure of patience in the National Longitudinal Survey of Youth (NLSY) is strongly associated with the mathematical skills score in the Armed Forces Qualifying Test (AFQT), but not with the AFQT-scores related to other skills. At the same time, they show that it is particularly mathematical skills, rather than, e.g., verbal ones, that predict sound financial decisions. Kuhnen and Melzer (2018) find noncognitive ability to be a more relevant predictor of debt behaviour than cognitive ability. Broadly, it seems that the noncognitive skill of being patient may improve one's likelihood to both do well in school and make good financial decisions, rather than school grades directly causing better financial decisions.

The abilities and outcomes of children are significantly influenced by their environment, perhaps most importantly by their parents' socioeconomic status. As discussed by Heckman et al. (2006), engaging parents can significantly contribute to their children's cognitive and noncognitive abilities, and the more resources the parents have, the more able they are to engage. The importance of one's childhood environment is highlighted by the fact that cognitive and noncognitive abilities are shaped early in life, making differences persistent. Indeed, results from Falk et al. (2021) indicate that children from families with high socioeconomic status (SES) are more intelligent, patient, and risk averse compared to children from low-SES families. A regression of financial outcomes on GPA not accounting for the largely unobserved childhood environment factors would thus produce coefficients not purely reflecting intrinsic ability, but instead confounded by the observable socioeconomic status of parents and unobservable factors. To account for these factors in our main analysis, we focus on between-sibling differences. We hence capture all the observed and unobserved childhood environment characteristics to the extent that they are shared between siblings, not just the commonly observed characteristics such as parental education and income.

We use register data covering the entire population of Finland and define financial distress as having an entry in the national payment default register. Until recently, most studies on financial distress have resorted on self-reported data from surveys (e.g., Taylor et al., 2011), proprietary data provided by a financial institution (e.g., Agarwal et al., 2011), or court filings (e.g., Zhu, 2011). The lack of comprehensive register data also applies to the earlier literature on ability and financial distress (Agarwal & Mazumder, 2013; Kuhnen & Melzer, 2018; Parise & Peijnenburg, 2019).

Only a handful of studies to date have had access to national data registers. Using Finnish data, previous research has shown the probability of being in debt enforcement to correlate positively with being male, low socioeconomic status, and low education (Oksanen et al., 2015). Debt-related district court judgements are particularly common among young males with an educational attainment below the secondary level, and among the divorced (Majamaa et al., 2019).

These findings are complemented by three studies using Danish register data. Hohnen and Hansen (2021) report that the middle-aged and older, the employed, and couples with children are particularly likely to have risky debt positions due to large bank loans. In a quasi-random assignment setting, Hvidberg (2021) shows those who end up studying business and economics to have a lower default probability, and that the difference is not explained by the income channel. Kreiner et al. (2020) highlight the importance of intergenerational transmission in financial decision-making. Their results also indicate that the income channel should not be overemphasized when studying financial distress.

We find that the probability of financial distress monotonically decreases with compulsory school GPA, even after accounting for mother fixed effects and educational attainment. The lower one's educational attainment, the more her probability of financial distress decreases with GPA. Especially among individuals without a post-secondary degree, the effects are economically sizable. For instance, consider two siblings who have only completed compulsory education, one with a GPA in the first quintile and the other in the third quintile. The latter one's estimated financial distress probability is nine percentage points lower. This estimate controls for between-sibling differences in income, gender, and age. Relative to the mean distress propensity of 43% in this educational attainment group, the estimate translates into a difference of more than one-fifth. The effect of GPA can be traced over lifetime, even among those aged 50–65.

The only group where our main specification does not indicate a negative relation between GPA and distress are those with the highest educational attainment, i.e., a master's degree or higher. In this group, however, financial distress is effectively non-existent, with a mean propensity of 0.7%. Similarly, among those with a lower-level university degree (B.Sc. or equivalent), the propensity is only 2.2%. These educational attainment groups should clearly not be prioritized in potential efforts to mitigate financial distress.

The main contribution of this paper is to assess how the importance of ability in avoiding financial distress varies by educational attainment. While previous studies (Agarwal & Mazumder, 2013; Kreiner et al., 2020; Kuhnen & Melzer, 2018; Parise & Peijnenburg, 2019) examine ability and educational attainment separately, we study the different combinations of these two factors to identify the groups most likely to fall into financial distress: those with low ability, those with low education, or those with both.

From a policy perspective, our results imply that any efforts to mitigate household overindebtedness should be made early and targeted to those performing poorly in comprehensive school. Prior literature agrees. Interventions on increasing mathematics, financial literacy, or economics education in the high-school curriculum have resulted in economically modest impacts on the debt behaviour of young adults in the USA (Brown et al., 2016; Kaiser et al., 2022). For instance, an additional required year of mathematics decreased the probability of having debt in collections by 0.6 percentage points (compared to a mean of 40%), while a mandatory financial literacy course had zero impact on this outcome. In contrast, traits like patience, predicting a high GPA and positive future outcomes, have proven malleable at least up to the fourth grade (Alan & Ertac 2018). Our findings corroborate the notion that interventions conducted well before secondary-level education, such as the Perry Preschool Program in the USA, are far more likely to reach the most vulnerable groups of individuals. Furthermore, according to Heckman et al. (2013), the success of the Perry programme in improving economic outcomes is not attributable to improvements in cognitive ability (as measured by IQ), but rather to boosting the noncognitive personality skills of the participating children.

The next section describes our population-level register data. The "Regression Results" section presents our results, and the "Concluding Remarks" section concludes.

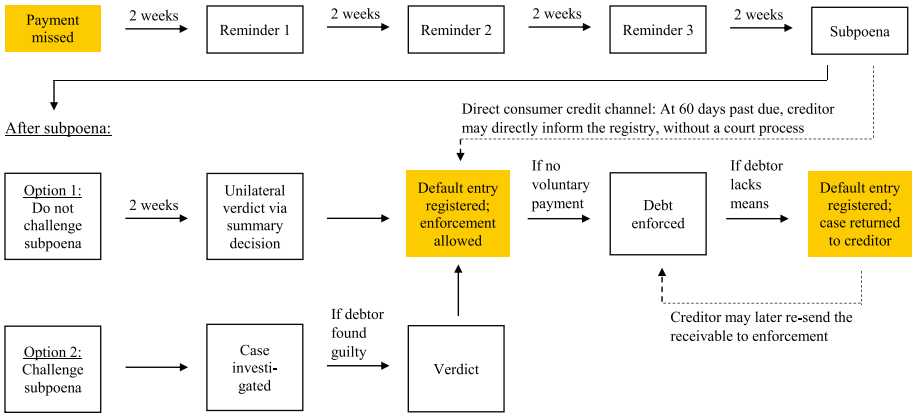

Fig. 1 The process between a missed payment and a payment default entry in Finland. In our sample, 21% have at least one entry through the direct consumer credit channel, and 86% have at least one entry through the district court channel (Options 1 and 2 combined). Of the latter, Option 1 accounts for 99%

Data

Our cross-section of population data originates from two sources. First, we obtain the complete Finnish payment default register from Suomen Asiakastieto Oy. Second, we obtain data on educational performance and background information from Statistics Finland.

Our estimation sample is restricted to individuals aged 30–65. The lower limit of 30 is applied to effectively exclude individuals who have yet to complete their final level of education. The upper limit of 65 corresponds to the median retirement age. Furthermore, our sample includes only those whose parents are also found in Statistics Finland data, and for whom data on all the variables of interest are available.[1] In total, these restrictions leave us with an initial sample of 1,141,334 individuals. We compare siblings with each other and the final sample restricted to individuals with at least one sibling has 758,076 observations.

Payment Default Entries

Individual payment defaults are registered by two private companies in Finland. We have a population snapshot of effective payment default entries on November 11, 2020, from Suomen Asiakastieto Oy. In total, 368,192 individuals (8.3% of the adult population) have at least one entry on this date. Our outcome variable is an indicator for these individuals.

Next, we explain how an individual ends up with an entry in the payment default register, and how long the entries remain valid.

From the day a payment (e.g., a consumer loan, phone bill, rent, or an instalment on a car) first misses its due date, it typically takes four to six months until an eventual payment

[1] Information on parents is missing for those born abroad to parents never registered in Finland. Accordingly, the share of, e.g., foreign nationals is low in our sample compared to population statistics (0.2 vs. 5.2%). Another variable not available for the entire population is annual taxable income for those in the age group 30–65 and is missing for 20,214 individuals. Most likely reason is that they were not Finnish residents in 2018 when we measure taxable income.

default entry is registered. The process is illustrated in Fig. 1.[2] First, once the due date passes and no payment is received, the creditor must send the debtor at least three reminders with intervals of no less than two weeks. Once at least two weeks have passed since the due date of the third reminder, the creditor may file a subpoena to a district court. As a result, the legal minimum time between missing the first due date and the subpoena is eight weeks.

Of the payment default entries resulting from district court verdicts in our data, 99% come from summary civil cases. These undisputed debt collection cases require less background information from creditors than normal civil cases. If the debtor does not challenge the case in two weeks, the court decides it in a summary procedure. The average time taken by district courts to handle summary civil cases in, e.g., 2019, was 2.7 months.[3] In the remaining one percent of the cases, the payment default entry results from the normal civil procedure, where the charges are disputed and both parties heard to reach a verdict.[4]

After the verdict, the district court notifies the register (our data source), who registers a payment default entry for the debtor. At this point, if the debtor does not pay voluntarily, the creditor can submit an enforcement application to the national enforcement authority. If necessary, the enforcement authority will then attempt to seize the debtor's income (e.g., earnings, pension, or business income) through wage garnishment or asset repossession to cover the debt. If the debtor lacks the means to comply with the enforcement, another payment default entry will be registered, and the enforcement authority returns the matter to the creditor. This is not uncommon: of the 124,348 individuals with at least one payment default entry in our sample, 79% have at least one entry for impeded enforcement due to a lack of means. The creditor has the right to send the receivable back to the enforcement authority later. A single receivable can thus result in several payment default entries if the debtor repeatedly lacks the income or assets to repay.

Not all payment default entries result from the process described in Fig. 1. Taxes due and certain insurance bills, for instance, are directly enforceable by the creditor without a court verdict. Also, in the case of consumer credit, the creditor may directly inform the register directly about a payment default once a debt payment is at least 60 days overdue, provided that the debtor has been appropriately informed.

In our sample, 21% of the individuals with a payment default entry have at least one registered through the direct consumer credit channel. 86% have at least one entry through the district court channel. Our measure of financial distress thus captures individuals who are typically deep underwater, typically unable, or in some rare cases unwilling to pay their bills. They have accumulated on average 29.1 (median 20) payment default entries.

The time a payment default entry remains valid varies. An individual's first entry remains valid for two years, provided that during these two years the debt is paid in full, and no new default entries are registered. If the debt has not been fully repaid after two years, the validity is lengthened to three years. Importantly, every time a new entry is filed

[2] On the process details, our information sources are the Ministry of Justice (www.oikeus.fi/en/) and the National Enforcement Authority (www.ulosottolaitos.fi/en/).

[3] Source: Publication 2020:4 of the Ministry of Justice (available [in Finnish] at https://julkaisut.valtioneuvosto.fi/bitstream/handle/10024/162138/OM_2020_4_th.pdf?sequence=4&isAllowed=y.

[4] The expenses of the district court fall on the creditor. As of January 2022, they amount to 65 euros for not challenged summary civil cases, 270 euros for summary challenged civil cases, and 530 euros for a normal civil procedure. Majamaa et al. (2016) examined a randomly selected sample of 2000 debt-related summary decisions given by district courts between 2012 and 2014, the median amount owed by the debtors was 253 euros.

while an existing one is still effective, previous payment default entries are prolonged for an additional four years.

GPA and Educational Attainment

Information on comprehensive school GPA is available from 1985 onwards. In Finland, the compulsory education lasts nine years. Entry to comprehensive school occurs in the calendar year one turns seven years of age, and the final, 9th grade of comprehensive school ends in the calendar year one turns 16. Our GPA data is from the 9th grade. The oldest full cohort in our sample, whose GPA data are from 1985, is hence born in 1969.

On 11 November 2020, the oldest full cohort is 51 years old. As it is possible to complete compulsory education within a longer time span, or to retake subjects later in life to improve GPA, there are also individuals between ages 52 and 65 in the sample. In total, there are 106,078 such individuals.

The GPA is based on integer grades between four and 10 for each school subject. There are 20 subjects in total, with 14 academic subjects and six other subjects including physical education, visual arts, music, and crafts. The GPA is the equally weighted average of these 20 grades.

We use GPA as a composite measure of ability. GPA has been shown to correlate with personality, especially with self-control, conscientiousness, and performance self-efficacy (e.g., Duckworth & Seligman, 2005; McAbee & Oswald, 2013; Richardson et al., 2012), IQ (Duckworth & Seligman, 2005); verbal and mathematical SAT-scores (Hackett et al., 1992) and to a small extent the socio-economic status of parents (Zwick & Green, 2007). We do not claim GPA to exclusively capture a single dimension of individual aptitude, such as patience or mathematical ability. In contrast, we employ GPA as a holistic measure of adolescent ability measured consistently for an entire cohort of individuals, and distinct from educational attainment, which is more often observable.

Final-year GPA is especially important, as it is used for applying to secondary-level institutions of either general (high school) or vocational education, from which it typically takes three years to graduate. After compulsory school, one may also decide not to pursue further schooling.

Degrees from universities of applied sciences are mainly bachelor's level. Most students who enrol to a university obtain study rights to both bachelor's and master's degree and most they eventually graduate with a master's degree from the same institution they initially enrol at.

Overall, Finnish society values education highly and educational attainment of students is high. Comprehensive school performance is significantly higher based on PISA-tests than on average in OECD-countries. The fraction of individuals with at least secondary-level education is higher, and the fraction of individuals with a B.Sc. degree or higher is on par with OECD averages (OECD, 2020). The external validity of our results is highest when compared with countries with similar educational and credit recourse systems.[5] Based on the similarity of educational systems, Finland would best compare with other Nordic countries (Denmark, Norway, and Sweden). Based on the similarity of credit

[5] Finland has no personal bankruptcy and debt resettlement can be applied only in exceptional circumstances, such as significant unforeseen medical issues.

recourse law allowing creditor to eventually access any income or assets, our results would be most comparable with the Netherlands and Portugal (Walter & Krenchel, 2021).

Control Variables

We control for basic demographics available in the Statistics Finland data. These include age, a binary gender classification, and an indicator for being a Finnish citizen. The citizenship control is included because non-Finnish citizens are overrepresented in the payment default register.

We also control for annual taxable income. Including income as an independent variable would ex ante lead to the bad control problem: there may be a causal relation between ability and financial distress through income. To alleviate this concern, we refer to earlier literature (e.g., Cole et al., 2014; Kreiner et al., 2020) whose results indicate the income channel not to be a very relevant contributor to financial distress. Also in our results, the coefficient estimates for GPA hardly change at all after including income decile dummies in the regression.

Including income as a control variable may also induce a reverse causality issue. According to Bos et al. (2018), negative credit information causes lower future earnings through an increased likelihood of unemployment. Given that our coefficient estimates change very little after the inclusion of income decile dummies (as shown below), this is unlikely to qualitatively change the conclusions drawn from our results.

Descriptive Statistics

Table 1 summarizes the data in our estimation sample. Because our regression specifications examine differences between maternal siblings, thus leaving the 383,258 individuals without siblings out of the analysis, we show the descriptive statistics separately for those with at least one sibling. Those with siblings very much resemble the general population but have, on average, a slightly higher GPA, educational attainment, and annual income.

The payment default propensity is just below 11% in the estimation sample and 8.3% in the full adult population. The difference stems from the fact that cohorts aged 66 or above, where default propensity is low, are excluded from our analysis.

The mean GPA in the estimation sample is 7.74. For ease of interpretation in the regression analysis, we use GPA quintiles. Quintile 2 to 5 lower boundaries (inclusive) are 6.9, 7.4, 7.9, and 8.5.

In Table 2, we report the distribution of educational attainment for each GPA quintile in the sibling sample. In the bottom GPA quintile, 89.8% attain up to a secondary level of education, and 1.1% reach a master's level degree. In the top quintile, 54.4% complete a master's degree, and 0.6% attain no degree beyond comprehensive schooling. The pattern is consistent with NLSY data from the USA reported by Heckman and Vytlacil (2001), who demonstrate the strong sorting of ability by schooling. Similarly, Heckman et al. (2006) compare distributions of cognitive and noncognitive skills by schooling level, showing college graduates to have the most favourable distribution of skills and high school dropouts the least favourable distribution.

The patterns in Table 2 also appear consistent with Cunha et al. (2010), who find that cognitive and noncognitive capabilities explain a third of the variation in educational attainment among a sample of 2207 children of the 1979 NLSY respondents. Cunha et al. (2010) further estimate that measured parental investments, which should also positively

Table 1 Summary statistics

	All ($N=1{,}141{,}334$)		Siblings > 0 ($N=758{,}076$)	
	Mean	SD	Mean	SD
Payment default indicator	0.109	0.312	0.108	0.311
Education level indicators:				
Comprehensive school	0.081	0.272	0.079	0.270
Secondary, vocational	0.417	0.493	0.412	0.492
Secondary, general	0.061	0.240	0.059	0.235
B.Sc. or equivalent	0.244	0.429	0.250	0.433
M.Sc. or higher	0.197	0.397	0.200	0.400
Ninth grade GPA	7.720	0.916	7.737	0.924
GPA level indicators (vis-á-vis full population):				
Bottom quintile	0.202	0.402	0.201	0.401
2nd quintile	0.176	0.381	0.170	0.376
3rd quintile	0.194	0.396	0.190	0.392
4th quintile	0.201	0.401	0.203	0.402
Top quintile	0.226	0.418	0.236	0.424
Number of siblings	1.049	1.180	1.579	1.122
Male indicator	0.490	0.500	0.498	0.500
Age	40.58	7.533	39.46	6.438
Foreign national indicator	0.002	0.041	0.002	0.038
Annual taxable income (euros)	36,389	22,912	36,518	22,737

Table 2 Percent of highest education level completed by GPA quintile ($N=758{,}076$)

Highest education level completed	GPA quintile				
	1	2	3	4	5
Compulsory	21.9	9.8	6.0	2.6	0.6
Secondary, voc	67.9	64.7	48.7	26.7	7.7
Secondary, gen	2.0	4.1	7.2	9.0	6.7
B.Sc. or equiv	7.0	17.8	29.0	38.8	30.5
M.Sc. or higher	1.1	3.7	9.1	22.9	54.4

contribute to GPA according to, e.g., Falk et al. (2021), account for another 15% of this variation. This highlights the importance of controlling for family socioeconomic status in an empirical specification, which we do by including mother fixed effects.

Figure 2 shows the association of financial distress propensity with educational attainment and age in the full population of Finns aged 19 to 85 at the end of 2020. The age cohorts we analyse in Tables 3 and 4 (from 30 to 65 years) are highlighted by the dotted line area on the graph in both panels. Educational attainment has a clear association with the probability of distress throughout the age distribution. Only after 75 years of age do the distress propensities converge among the different education levels.

Distress propensity peak age varies substantially with educational attainment. For males who complete comprehensive school only, the peak of 42.0% is at age 27. For females with the same educational attainment, the peak of 35.3% is at age 26. Given the severity and

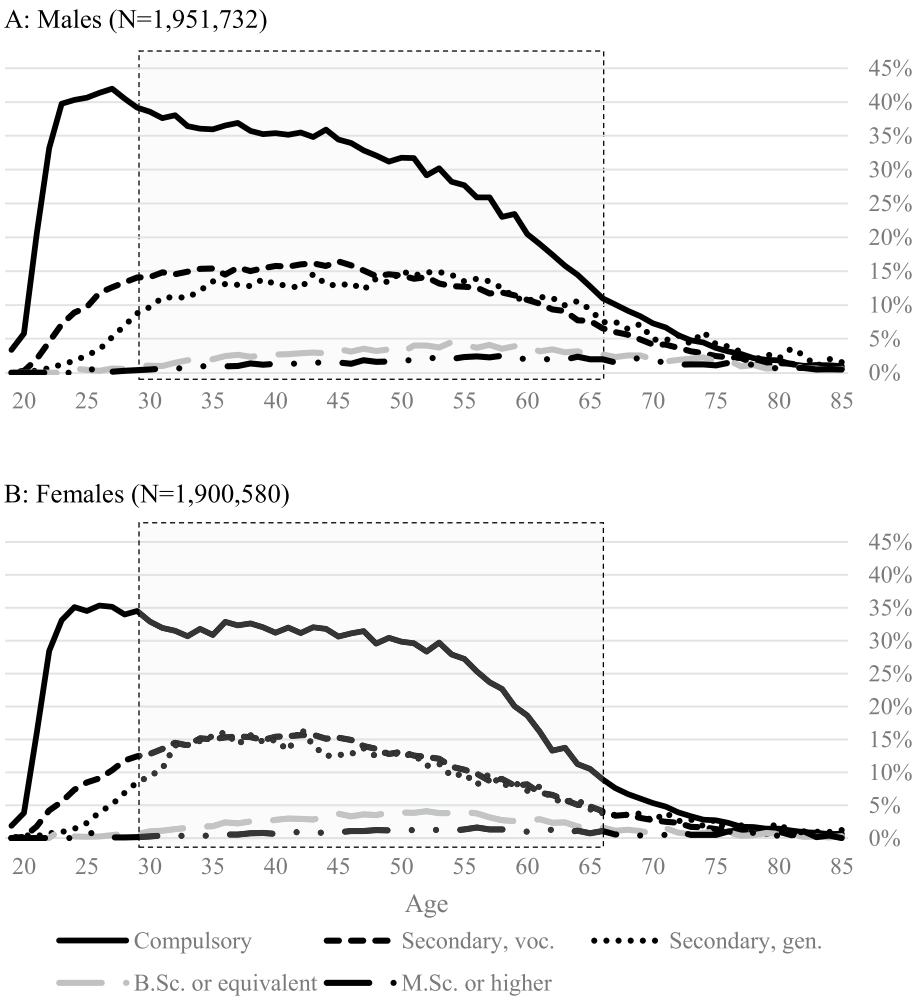

Fig. 2 Full-population payment default propensity by age and education level. On each graph, the area indicated by the dotted line highlights the age cohorts we use to estimate results in Tables 3 and 4

persistence of our distress measure, these propensities can be considered extremely high. Also, the contrast with the highly educated is stark. Among those with a master's degree or higher, the peak is 2.5% (58 years of age) for males and 1.6% for females (56 years).

In Panel A of Fig. 3, we add GPA into the analysis. Again, we analyse those individuals who have at least one sibling and who are 30 to 65 years of age. Panel A shows that the mean probability of distress monotonously decreases with GPA when holding educational attainment constant. Of the 33,452 individuals whose GPA is in the bottom quintile and whose educational attainment remains at comprehensive school, approximately one-half experience financial distress.

In Panel B of Fig. 3, we replace distress propensity with mean income. Variation in financial distress propensity by GPA quintile is not associated with income differences within an educational attainment bracket. Trends are monotonously increasing only for the

general track of secondary education, and master's degree or higher. On the other levels of educational attainment, higher ability does not lead to higher pay. A potential explanation, at least for those with compulsory or vocational secondary education, could be that in jobs requiring a low level of formal education, the qualities expected of a preferred worker are different from those valued by comprehensive-school teachers. Heckman et al. (2006) provide some insight regarding the ability-pay pattern. They state that according to a large literature summarized by Bowles et al. (2001), employers in low-skill labour markets value noncognitive traits like docility, dependability, and persistence more than cognitive ability or independent thought. Silliman and Virtanen (2022) find similar differences between the GPA-pay relations of the two tracks. Their results, like ours, suggest that vocational education may be particularly beneficial for people whose strengths lie outside of academics before the secondary level, while those strong in academic skills may benefit from general education.

Comparisons between the vocational and general tracks of secondary schooling in Fig. 3 yield also other interesting insights. The intersection of the bottom GPA quintile and the vocational track is associated with the highest distress propensity within individuals who have completed a secondary degree. But the distress propensity is lower for the vocational than the general track in all other GPA quintiles in Panel B of Fig. 3. If income was an important driver of financial distress, we would expect the vocational track to be associated with a higher mean taxable income than the general track in GPA quintiles 2 to 5. However, when we compare mean taxable income between individuals of the different tracks, we see this is not the case. The higher the GPA, the larger the difference in mean taxable income, in favour of those who completed the general track. This pattern is consistent with the non-prominent role of the income channel found earlier (e.g., Kreiner et al., 2020) and highlights the fact that to understand the variation in financial distress propensity, we must study factors beyond taxable income.

Regression Results

Table 3 presents our results from regressing the financial distress indicator (having a payment default entry in the register on November 11, 2020) on the compulsory school GPA quintile indicators and control variables. All the coefficients presented indicate between-sibling differences. We first run three specifications using the full sample, adding explanatory variables step by step. Then, we run our full specification in cohort subsamples (age 30–34 and 50–65). In all specifications, the omitted educational attainment category is compulsory schooling, and the omitted GPA category is the bottom quintile.

It is important to notice that individuals seldom make credit decisions completely independently. To capture the true effect of an individual's own GPA, an empirical model would ideally also include the GPA's of all relevant family members. In the absence of such comprehensive data (we have data on cohorts between 30 and 65 years of age), we should interpret GPA coefficients in Table 3 as upper bound estimates, and unbiased in case credit decisions are independent from familial influence. To give perspective on the magnitude of familial influence in the context of security choice (also a financial decision) in the same population, Knüpfer, Rantapuska, and Sarvimäki (2022) estimate a child's coefficient estimates to drop about one-fifth when both parents' choices are in the regression compared to when just one parent's choice is included.

Table 3 Coefficients from OLS regressions where the dependent variable is the payment default indicator. Omitted category for education is compulsory schooling and bottom quintile for GPA

	Full sample			Age 30–34	Age 50–65
	(1)	(2)	(3)	(4)	(5)
Education level indicators:					
Secondary, vocational	−0.206***	−0.206***	−0.168***	−0.225***	−0.074***
	(−57.96)	(−57.79)	(−49.13)	(−23.53)	(−4.24)
Secondary, general	−0.215***	−0.215***	−0.192***	−0.198***	−0.081**
	(−24.44)	(−24.43)	(−22.68)	(−7.94)	(−2.56)
B.Sc. or equivalent	−0.332***	−0.333***	−0.268***	−0.336***	−0.138***
	(−72.68)	(−72.70)	(−60.40)	(−27.41)	(−6.47)
M.Sc. or higher	−0.353***	−0.355***	−0.282***	−0.320***	−0.182***
	(−42.79)	(−43.07)	(−35.36)	(−7.61)	(−6.37)
GPA level indicators:					
2nd quintile GPA	−0.053***	−0.053***	−0.049***	−0.047***	−0.049*
	(−9.16)	(−9.20)	(−8.82)	(−3.11)	(−1.86)
3rd quintile GPA	−0.101***	−0.101***	−0.092***	−0.092***	−0.051*
	(−15.59)	(−15.65)	(−14.83)	(−5.39)	(−1.73)
4th quintile GPA	−0.134***	−0.135***	−0.125***	−0.159***	−0.045
	(−15.42)	(−15.49)	(−14.98)	(−6.88)	(−1.12)
Top quintile GPA	−0.168***	−0.170***	−0.162***	−0.173***	−0.210***
	(−10.99)	(−11.08)	(−10.85)	(−3.88)	(−3.72)
Secondary, vocational x					
2nd quintile GPA	0.004	0.004	0.004	−0.009	0.022
	(0.63)	(0.67)	(0.64)	(−0.58)	(0.79)
3rd quintile GPA	0.031***	0.032***	0.028***	0.02	0.009
	(4.64)	(4.66)	(4.29)	(1.11)	(0.31)
4th quintile GPA	0.048***	0.048***	0.043***	0.067***	−0.014
	(5.31)	(5.31)	(4.98)	(2.81)	(−0.34)
Top quintile GPA	0.064***	0.064***	0.060***	0.056	0.139**
	(4.07)	(4.10)	(3.97)	(1.24)	(2.41)
Secondary, general x					
2nd quintile GPA	0.045***	0.046***	0.045***	−0.039	0.079*
	(3.87)	(3.93)	(4.01)	(−1.25)	(1.80)
3rd quintile GPA	0.065***	0.066***	0.066***	−0.008	0.032
	(5.90)	(5.96)	(6.15)	(−0.27)	(0.70)
4th quintile GPA	0.090***	0.091***	0.091***	0.057*	0.010
	(7.31)	(7.37)	(7.70)	(1.71)	(0.19)
Top quintile GPA	0.094***	0.094***	0.095***	0.033	0.180**
	(5.31)	(5.34)	(5.56)	(0.65)	(2.57)
B.Sc. or equivalent x					
2nd quintile GPA	0.046***	0.046***	0.044***	0.036**	0.079**
	(6.73)	(6.77)	(6.71)	(1.98)	(2.55)
3rd quintile GPA	0.091***	0.092***	0.087***	0.076***	0.049
	(12.53)	(12.61)	(12.39)	(3.97)	(1.48)
4th quintile GPA	0.122***	0.122***	0.118***	0.149***	0.052

Table 3 (continued)

	Full sample			Age 30–34	Age 50–65
	(1)	(2)	(3)	(4)	(5)
	(13.12)	(13.19)	(13.18)	(6.03)	(1.21)
Top quintile GPA	0.153***	0.154***	0.150***	0.160***	0.205***
	(9.77)	(9.84)	(9.87)	(3.53)	(3.50)
M.Sc. or higher x					
2nd quintile GPA	0.057***	0.058***	0.055***	0.020	0.094***
	(5.68)	(5.72)	(5.64)	(0.43)	(2.58)
3rd quintile GPA	0.100***	0.101***	0.098***	0.066	0.102***
	(9.91)	(9.97)	(10.03)	(1.46)	(2.65)
4th quintile GPA	0.134***	0.135***	0.137***	0.141***	0.093**
	(11.66)	(11.73)	(12.28)	(3.00)	(1.98)
Top quintile GPA	0.168***	0.169***	0.179***	0.161***	0.264***
	(9.84)	(9.89)	(10.77)	(2.66)	(4.30)
Income level indicators:					
Second decile			−0.060***	−0.052***	−0.086***
			(−25.09)	(−9.77)	(−6.94)
Third decile			−0.140***	−0.115***	−0.174***
			(−60.29)	(−21.91)	(−14.41)
Fourth decile			−0.174***	−0.131***	−0.210***
			(−76.21)	(−25.15)	(−17.98)
Fifth decile			−0.191***	−0.143***	−0.210***
			(−84.60)	(−27.54)	(−18.66)
Sixth decile			−0.200***	−0.158***	−0.222***
			(−89.49)	(−30.20)	(−19.48)
Seventh decile			−0.211***	−0.161***	−0.233***
			(−95.85)	(−31.54)	(−19.82)
Eighth decile			−0.215***	−0.164***	−0.240***
			(−99.19)	(−31.92)	(−20.90)
Ninth decile			−0.220***	−0.168***	−0.246***
			(−101.62)	(−31.27)	(−21.47)
Top decile			−0.225***	−0.170***	−0.267***
			(−102.71)	(−29.38)	(−22.55)
Mother fixed effects	Yes	Yes	Yes	Yes	Yes
Demographic controls	No	Yes	Yes	Yes	Yes
R-squared	0.570	0.570	0.593	0.662	0.582
N	758,076	758,076	758,076	108,112	33,082

Below the coefficients, t-statistics are presented in parentheses. The symbols ***, **, and * stand for statistical significance in a two-sided test at the 1%, 5%, and 10% confidence levels, respectively

The differences between the specifications are summarized at the bottom of the table. In Column 1, the explanatory variables are the GPA and educational attainment indicators together with mother fixed effects, i.e., an explanatory variable whose value is the same for individuals who have the same mother. The fixed effect captures childhood environmental

Table 4 Implied estimated effect sizes (in percentage points) of the variables of interest, calculated from the coefficients reported in Table 3

	Effect of completing:	Effect of being in GPA quintile no.:			
		2	3	4	5
Column 3 (baseline):					
Compulsory	–	−4.90	−9.20	−12.50	−16.20
Secondary, vocational	−16.8	−4.50	−6.40	−8.20	−10.20
Secondary, general	−19.2	−0.40	−2.60	−3.40	−6.70
B.Sc. or equivalent	−26.8	−0.50	−0.50	−0.70	−1.20
M.Sc. or higher	−28.2	0.60	0.60	1.20	1.70
Column 4 (age 30–34):					
Compulsory	–	−4.70	−9.23	−15.93	−17.30
Secondary, vocational	−22.5	−5.63	−7.24	−9.26	−11.73
Secondary, general	−19.8	−8.63	−10.03	−10.20	−14.02
B.Sc. or equivalent	−33.6	−1.11	−1.59	−1.05	−1.29
M.Sc. or higher	−32.0	−2.72	−2.67	−1.86	−1.22
Column 5 (age 50–65):					
Compulsory	–	−4.90	−5.10	−4.50	−21.00
Secondary, vocational	−7.4	−2.70	−4.20	−5.90	−7.10
Secondary, general	−8.1	3.00	−1.90	−3.50	−3.00
B.Sc. or equivalent	−13.8	3.00	−0.20	0.70	−0.50
M.Sc. or higher	−18.2	4.50	5.10	4.80	5.40

factors, such as family socioeconomic status and shared childhood experiences, to the extent that they are shared between maternal siblings. In Column 2, we add age, gender, and an indicator for Finnish citizenship as control variables. Age is particularly relevant due to the life-cycle patterns of payment default propensity shown earlier in Fig. 2: While the peak age depends on educational attainment, the propensity tends to decline towards older age. In Column 3, we add individual income decile indicators to capture income effects orthogonal to ability and education. Finally, in Columns 4 and 5, we further analyse the impact of age on our results by limiting the analysis to the opposite ends of the sample's age distribution: those aged 30–34, and those aged 50 to 65 years. Columns 4 and 5 aim to capture a dosage effect working in two directions: Older individuals have been exposed more to credit during their lives, but they also have had the opportunity to escape financial distress through repayment of debt.

Columns 1 through 3 in Table 3 show that the additional control variables have a relatively limited impact on the estimated coefficients of educational attainment and GPA. Moving from Column 1 to Column 2, i.e., adding demographic controls, both the coefficients and the *R*-squared are effectively unchanged. In Column 3, where we also condition on income decile, most of the coefficients slightly decrease while the *R*-squared increases from 0.57 to 0.59.[6] The qualitative interpretations of the results remain the same after inclusion of demographic and income controls.

[6] In an unreported specification replicating Column 1 without mother fixed effects, the *R*-squared is only 0.14. Compared with Column 1's *R*-squared of 0.57, this shows that the mother fixed effects explain a substantial share of the variation in the financial distress indicator, consistent with the notion that financial distress is intergenerationally transmitted (Kreiner et al., 2020).

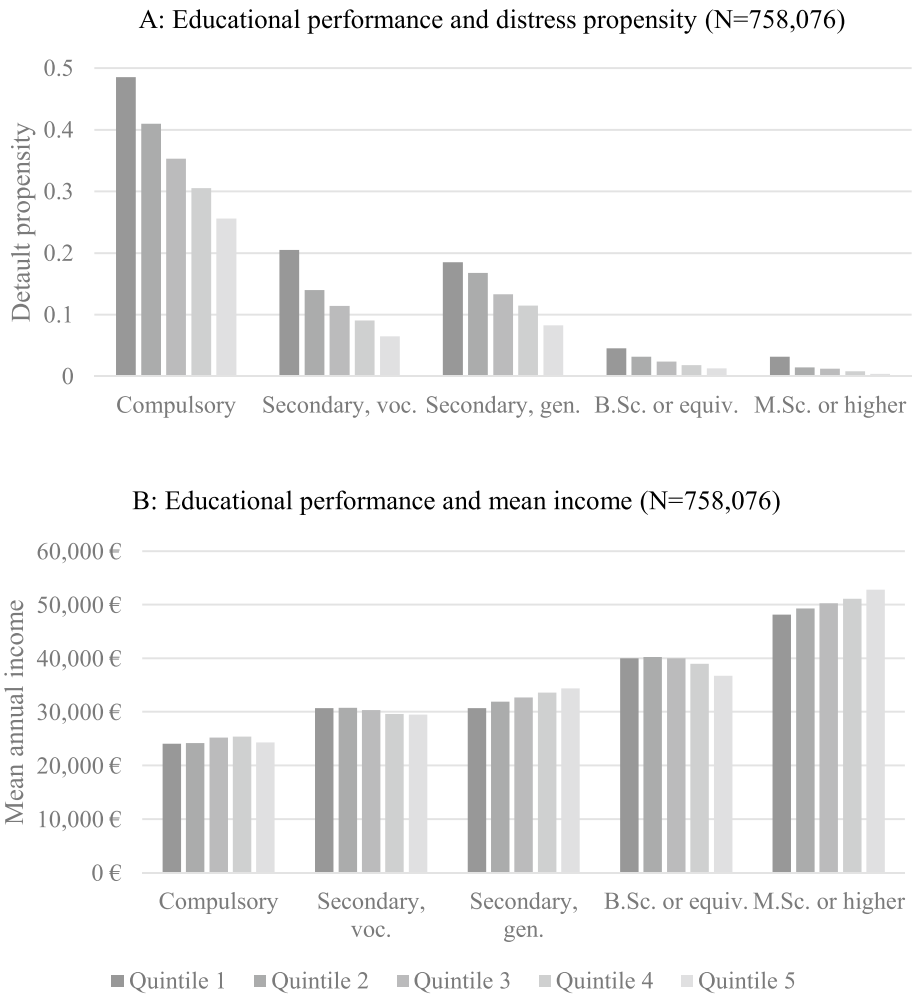

Fig. 3 Propensity of financial distress (Panel A) and mean annual income (Panel B) by highest educational degree completed and GPA quintile

Age measures the time one has been exposed to available credit and to the risk of defaulting on a payment. It is also plausible that as one gets older, the impact of GPA and educational attainment would gradually diminish because of learning. To explore this claim, we split the sample into two cohort-based subsamples: 30–34 and 50–65 years of age. We include 16 cohorts in the second subsample as the number of observations declines with age due to missing GPA information as we describe in the "GPA and Educational Attainment" section. For brevity, we do not report results for other cohort-based subsamples.

We find that, by and large, the predictive power of GPA is strong across cohorts, except for those closer to retirement age. Compared to the full-sample estimates, the coefficients tend to be similar or larger in the cohort-based subsample aged 30–34 (Column 4). In this subsample, we find in unreported results that each additional year of age is also associated with a higher distress probability. In contrast, in the subsample aged 50–65, the predicted

effects of GPA are mainly smaller than in the full sample. At least partly due to the reduced sample size, these estimates are also less often statistically significant. However, the general conclusion is qualitatively same: even among those aged 50 and above (for whom it has been 34 years or more since they finished compulsory education at age 16), a higher GPA is associated with a lower distress probability, particularly on the lower levels of educational attainment.

The effect magnitude of GPA at a particular level of education attainment requires some calculation. Table 4 provides the estimated effect magnitudes calculated from the coefficients in columns 3, 4, and 5 of Table 3. Consider siblings A and B with an education of the type "Secondary, general." Suppose A has a GPA in the second quintile and B in the fourth. According to our baseline estimates in Column 3, the stand-alone impact of having this type of education is − 19.2 percentage points compared to someone with primary-level education only. For A (GPA in the 2nd quintile), the predicted probability differs by $100*(-0.049+0.045)=-0.4$ percentage points from the one predicted for someone with the same educational attainment, but a first-quintile GPA. For B (4th quintile), this difference equals $100*(-0.125+0.091)=-3.4$ percentage points. Thus, the predicted probability of financial distress is 3.0 percentage points lower for B than for A.

Parise and Peijnenburg (2019) report that a one-standard-deviation increase in emotional stability (conscientiousness) leads to 0.65-percentage-point (0.74) decrease in the probability of financial distress, corresponding to about a fifth of the baseline rate of 0.036 in their sample. Kuhnen and Melzer (2018) find that a one-standard-deviation increase in self-efficacy corresponds to a 1.9-percentage-point-decrease in the probability of loan default, corresponding to 11% of the sample average. The standard deviation of our ability measure, GPA, is 0.92. In terms of quintiles, a change of 0.92 in GPA roughly translates into moving two quintiles up or down. The effect sizes outlined above, along with the bottom panel of Table 4, show that although our ability measure is broader in scope, our estimated effect sizes are comparable to those of the earlier studies on non-cognitive ability. In comparison with randomized control trials, the taxonomy of Kraft (2020) would describe our GPA effects as "large." Considering the different mean propensities between educational attainment groups, Table 4 also highlights the fact that the importance of GPA varies by educational attainment group. Hence, controlling for educational attainment without a measure for ability is not sufficient to fully understand who likely ends up in financial distress.

Overall, the association between GPA and financial distress propensity remains strong up to a bachelor's level educational attainment but disappears for those with a master's degree or higher. It may be that ability and education are, to some degree, substitutes. Payment defaults are rare among individuals with post-secondary education. Of those with a bachelor's degree, only 2.1% are in financial distress, broadly in line with the propensity in the Parise and Peijnenburg (2019) sample. Still, if one sibling of this education level has a GPA in the third quintile and another in the fifth, our estimates predict a between-sibling difference of 0.7 percentage points in the probability of financial distress. This corresponds to a third of the baseline propensity. Of those with a master's degree and at least one sibling, only 0.6% are in financial distress. In this group, GPA is not associated with the probability of being in default.

Finally, we see that the estimated coefficients of the educational attainment indicators decrease in Column 3 relative to Column 2. Some of the between-sibling variation in financial distress attributed to the educational attainment indicators in Column 2 is captured by the income decile indicators in Column 3. Depending on the post-compulsory education level, the decrease in estimated effect magnitudes varies between two and seven percentage

points. Still, the coefficient estimates in Column 3 remain statistically and economically significant. Compared to a sibling with compulsory education, one with a secondary-level education has an estimated distress probability that is 16.8 (vocational track) to 19.2 (general track) percentage points lower. For bachelor's and master's level education, the corresponding estimates are 26.8 and 28.2 percentage points, respectively. The mean of the distress measure is 0.43 among those with compulsory education only. Relative to this base level, the estimated decrease in distress probability due to more education translates into 39 to 45% for secondary education, and 62 to 66% for post-secondary education. Hence, educational attainment is associated with lower financial distress, even after accounting for shared childhood environment (mother fixed effects) and ability (GPA).

Concluding Remarks

We find a strong association between ability measured in adolescence and the probability of financial distress later in life. Unlike prior literature (Agarwal & Mazumder, 2013; Kreiner et al., 2020; Kuhnen & Melzer, 2018; Parise & Peijnenburg, 2019), we also demonstrate that this association significantly varies by educational attainment. Our results can be summarized as follows: In the lower educational attainment groups in which financial distress is common, compulsory school GPA works very well as an early predictor.

It is important to note that in addition to educational attainment and income, our main results control for childhood shared environment through mother fixed effects, making the comparison between siblings. Without mother fixed effects, we would see larger estimated effects for GPA on all levels of educational attainment, and GPA would consistently predict financial distress also among those with the highest educational attainment. In those estimates, a fraction of the variation explained by family environment would be falsely attributed to school performance. By focusing on siblings, we eliminate this upward bias from our estimates.

The estimated impacts of GPA are large and economically important. For instance, among those with a secondary-level vocational education (40% of the adult population), the mean propensity of financial distress is 14%. In this educational attainment group, an individual with a first-quintile GPA will have a 6.4 percentage points higher estimated distress probability than her sibling with a third-quintile GPA. This corresponds to 44% of the mean distress propensity.

A practical question raised by our findings is whether lenders should, or could, use GPA as a measure of consumer credit risk. Using self-reported GPA would suffice as it is almost perfectly correlated with true GPA (Bacon & Bean, 2006). While our results do suggest this might improve assessments of default risk, the answer is not straightforward. Bartlett et al. (2021, 2022) highlight the fact that data inputs improving business decisions may sometimes lead to discrimination. While GPA, for instance, likely correlates with creditworthiness, its residual variation that is not correlated with creditworthiness may associate with factors like gender or ethnic minority status. If this is the case, including GPA in a credit risk model would inadvertently lead to discriminatory lending. In Finland, regulation allows lenders to collect "non-traditional" information if it is relevant and if they have their client's explicit consent. Due to discrimination and privacy concerns, however, GPA is currently not used by lenders.

Instead of business applications, we consider our main practical contribution to relate to public policy. Indeed, the results we present have an important implication: any efforts

to curb financial distress should be targeted to those performing poorly in comprehensive school. Our findings corroborate the notion that additional education in, e.g., mathematics or financial literacy, particularly after the secondary level, is not likely to be fruitful, as the base rates for financial distress are low among those pursuing a degree in higher education.

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Declarations

Conflict of Interest The authors declare no competing interests.

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