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# Advancing the Measurement of Non-Cognitive Skills: Evidence from Chicago Public Schools

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# I. EXECUTIVE SUMMARY

Non-cognitive skills, such as persistence and social awareness, are important determinants of life outcomes and can be shaped through education and interventions. For this reason, schools and districts have started to measure non-cognitive skills, primarily relying on self-reports in which students assess their own skills. However, recent research suggests that these self-reports might suffer from biases. To address these biases, researchers have developed innovative measurement techniques, including advanced survey-based measures and measures based on more objective academic indicators (for example, absences and credits earned). However, no studies have directly compared the properties of standard self-reports, advanced survey-based measures, and measures based on academic indicators.

We fill this gap by (1) examining the relationships among these three approaches; (2) calculating their predictive power for later outcomes; and (3) exploring their susceptibility to biases. Our findings suggest that standard self-reported measures of non-cognitive skills suffer from substantive biases, but that innovative measurement approaches can address these biases and yield predictive measures of non-cognitive skills.

## Background and research questions

A growing body of evidence has shown that *non-cognitive* skills are just as important as cognitive skills in determining life outcomes, including educational attainment. Cognitive tests—like IQ and achievement tests—do not capture important non-cognitive skills that matter for success in life and that can be shaped through interventions.[1] Until recently, these skills have largely been disregarded in evaluations of social interventions and educational systems (Heckman and Kautz 2014). These skills include conscientiousness, emotional stability, persistence, self-management, patience, risk taking, altruism, social awareness, self-efficacy, risk aversion, and mindfulness. For many important life outcomes, such as educational attainment, health, earnings, and employment, the predictive power of non-cognitive skills rivals that of cognitive skills (Almlund et al. 2011, Roberts et al. 2007). Non-cognitive skills are also malleable and can be shaped through interventions and education (Heckman et al. 2013, Jackson 2018, Kautz et al. 2014, Roberts et al. 2008).

Based on this evidence, policymakers and researchers are increasingly interested in measuring non-cognitive skills in schools (Duckworth and Yeager 2015, West et al. 2016). Progress has been slow, however, in part because of a pervasive view that non-cognitive skills are difficult to measure in a reliable way. As yet, research has not provided a concrete answer—there is no agreement on a "best" system across, or even within, disciplines.

Although different disciplines conceptualize non-cognitive skills in different ways, most researchers adopt measures based on self-reports. For example, personality psychologists have

[1] In this study, we use the term "non-cognitive skills" but do not intend to draw a sharp distinction between this term and similar terms used to describe these skills in the literature, such as socioemotional skills, character, personality, soft skills, and preferences.

settled on a relatively well-accepted taxonomy of personality traits known as the Big Five: (1) Openness to Experience (curiosity); (2) Conscientiousness (hard-working, organized); (3) Extraversion (outgoing, sociable); (4) Agreeableness (kind, trusting); and (5) Emotional Stability (stable, calm).[2] In education, researchers often conceptualize non-cognitive skills as social and emotional skills or competencies, such as Self-Management. Economists typically consider preferences, such as willingness to save (Patience) and willingness to take financial risks (Risk Taking). Across these disciplines, researchers often measure non-cognitive skills using self-reports in which respondents rate themselves on subjective scales.

At present, most practitioners also rely on self-reported measures. For example, a group of school districts in California developed self-reported measures of non-cognitive skills to use in their accountability and continuous improvement system (West et al. 2018). Other school districts, such as the District of Columbia Public Schools, are using self-reported measures of non-cognitive skills to track progress toward achieving districtwide goals (District of Columbia Public Schools 2018). Many evaluations of educational programs or other social interventions use self-reported measures of non-cognitive skills as key outcomes (Duckworth and Yeager 2015, Tuttle et al. 2013).

At the same time, researchers have warned about relying on self-reported surveys of non-cognitive skills because of potential biases (Duckworth and Yeager 2015). These biases include "reference bias," which arises when respondents rate themselves relative to different reference points, such as their peers (Kyllonen and Bertling 2013). Reference bias is of particular concern when comparing skills across different types of schools and can reduce the predictive power of measures (Kyllonen and Bertling 2013, West et al. 2016).

These potential biases point to a fundamental challenge in measuring any skill or psychological trait. Measures of skill could depend not only on the skills themselves, but also on incentives or other aspects of a person's situation (Heckman and Kautz 2012). By situation, we mean the wide range of external factors that affect *measures* of a student's skills that do not reflect underlying skills. The situation could include the conditions in which a student takes a test or completes a survey, peer groups, the incentives for performing well at school, and school climate. These types of situations could cause biases when measuring non-cognitive skills. For example, reference bias might arise because students compare themselves to their peer group, which is one aspect of their situation. Similarly, if students at one school face incentives for their responses on a questionnaire, then they might appear to have different levels of skills compared to students who do not face such incentives.

To address these biases, researchers are developing new approaches to measuring non-cognitive skills. In this report, we examine two such approaches: (1) advanced survey-based measures; and (2) the use of objective forms of behavior that can proxy non-cognitive skills (here, we use academic indicators).

[2] We adopt the convention of capitalizing specific psychological constructs.

1. **Advanced survey-based measures.** Researchers have developed advanced survey measures of non-cognitive skills, such as anchoring vignettes and situational judgment tests (SJTs), that purport to address these biases by accounting for aspects of respondents' situations (Kyllonen and Bertling 2013, Primi et al. 2016). Anchoring vignettes provide a direct measure of a respondent's reference point that can be used to adjust that respondent's responses on a survey. SJTs ask respondents how they would behave in particular situations, thereby helping standardize respondents' situations.
2. **Objective behaviors based on academic indicators.** Recent research suggests that high school students' school records—such as grades, absences, credits earned, and disciplinary infractions—provide a promising way for schools to assess key non-cognitive skills. These records are correlated with some self-reported assessments of non-cognitive skills (Borghans et al. 2016, Duckworth et al. 2007, Poropat 2009, West et al. 2018). They also are highly predictive of long-term academic outcomes, such as high school graduation and college persistence (Allensworth and Easton 2005, Allensworth and Easton 2007, Borghans et al. 2016, Bowen et al. 2009, Jackson 2018, Kautz and Zanoni 2019).[3] These measures also are appealing because schools and districts already collect them, so they do not introduce additional burden.

Although promising, these innovative measures have not been compared to each other in the school context. This study compares three alternate approaches to measuring non-cognitive skills: (1) standard survey-based measures of non-cognitive skills, (2) advanced survey-based measures, and (3) measures based on academic indicators that schools already collect (Table 1). We include two prototypical survey-based measures: (1) the Big Five Inventory-2 (Soto and John 2017) of personality traits; and (2) the Global Preferences Survey (Falk et al. 2018). We also developed advanced survey-based measures of the Big Five, including anchoring vignettes and an SJT. Finally, we consider measures based on a range of academic indicators.

**Table 1. Summary of measurement approaches examined in the study**

| Constructs and measures |
|---|
| **1. Standard self-reported measures** |
| **Personality (Big Five)** |
| Constructs: *Openness* to Experience (curiosity), *Conscientiousness* (hard-working, organized), *Extraversion* (outgoing), *Agreeableness* (kind, trusting), *Emotional Stability* (stable, calm) |
| Measures used: Big Five Inventory-2 (Soto and John 2017) |
| **Preferences** |
| Constructs: *Patience* (willingness to forgo payments today for higher future payments), *Risk Taking* (preference for a lottery with uncertain payouts compared to an assured payout), *Positive Reciprocity* (tendency to respond to positive actions with positive actions), *Negative Reciprocity* (tendency to respond to negative actions with negative actions), *Altruism* (tendency to gratuitously share with others), *Cognitive Reflection* (deliberate decision making) |
| Measures used: Global Preferences Survey (Falk et al. 2016), Cognitive Reflection Test (Frederick 2005) |

[3] For example, in a cohort of students in Chicago Public Schools (CPS), 9th-grade absences, grade point average (GPA), and credits earned explained 20 to 35 percent of the variation in high school graduation, whereas 9th-grade achievement test scores explained roughly 10 percent (Kautz and Zanoni 2019).

**Constructs and measures**

**2. Advanced self-reported measures**

**Personality (Big Five) adjusted using anchoring vignettes**

Constructs: *Openness* to Experience (curiosity), *Conscientiousness* (hard-working, organized), *Extraversion* (outgoing), *Agreeableness* (kind, trusting), *Emotional Stability* (stable, calm)

Measures used: Big Five Inventory-2 (Soto and John 2017) adjusted using study-developed anchoring vignettes. The anchoring vignettes provide a way to measure respondents' reference points for each of the Big Five by asking respondents the extent to which hypothetical behaviors reflect aspects of the Big Five. Respondents' self-reports on the Big Five are adjusted to account for these reference points.

**Situational judgment test of Conscientiousness**

Constructs: *Conscientiousness* (hard-working, organized).

Measures used: A study-developed situational judgment test in which respondents describe how much effort they would exert on a homework assignment in different situations. The situations vary in the degree to which they hinder students' effort.

**3. Objective behaviors**

**Academic indicators**

Constructs: *Achievement* (performance on achievement tests), *School Behavior*

Measures used: Achievement test score (PSAT score), grade point average (GPA), credits earned, fraction of days absent, misconduct offenses

In particular, we address three key research questions:

### 1. How do contemporaneous measures of non-cognitive skills relate to each other?

Currently, there are many possible measures of non-cognitive skills coming from different disciplines (psychology, economics, and education),[4] making it difficult for school districts and policymakers to decide which measure to use to assess students, teachers, and schools. This study quantifies the relationship between and among a variety of measures, shedding light on the extent to which they capture distinct skills.

### 2. To what extent do various measures of cognitive and non-cognitive skills predict later outcomes?

For many practical applications in education, measures of non-cognitive skills are most useful if they predict longer-term outcomes, such as grade progression or graduation. However, the predictive power of many non-cognitive measures has not been established in the school context. In this study, we compare the predictive power of a range of non-cognitive measures from each of the three measurement approaches that we consider. We also explore the incremental predictive power of the measures—that is, the extent to which one measure predicts outcomes above and beyond another measure when both are included as predictors at the same time. Importantly, we consider whether survey-based measures offer additional predictive power beyond what schools already collect.

[4] The relationships between these sources is still largely unknown (Almlund et al. 2011). Most existing studies find little empirical relationships between measures of economic preferences and measures of personality traits (Becker et al. 2012, Dohmen et al. 2010). A recent study suggests that the low correlations are due to measurement error (Jagelka 2019).

### 3. To what extent do students' measures of non-cognitive skills depend *directly* on aspects of a students' situation, including their reference (peer) group and incentives?

A student's situation—broadly defined—can influence their performance on psychological measures, which in turn can confound measurement and bias comparisons across groups of students. In education, two aspects of a student's situation are especially important:

1. **Reference groups that students compare themselves to when completing self-reports.** In schools, a major concern is "reference bias," which arises when respondents rate themselves relative to their immediate peers, rather than to the whole population. We examine the extent to which self-reported measures suffer from reference bias and test several methods designed to address reference bias, including anchoring vignettes and SJTs (Kyllonen and Bertling 2013).

2. **Incentives for providing certain responses on self-reports.** Measures of non-cognitive skills are increasingly being used in higher-stakes settings, such as for accountability in schools. For example, a group of districts in California are using measures of non-cognitive skills for accountability and school improvement (West et al. 2018). In such applications, it is plausible that teachers or school administrators might seek to improve their school's scores by providing students with incentives for their reports on measures of non-cognitive skills. To explore this possibility, we conducted an experiment to estimate the extent to which incentives—another part of a students' situation—can affect how students respond on non-cognitive skill questionnaires.

To address these research questions, we collected detailed survey data and school administrative records from students in Chicago Public Schools (CPS). In particular, we administered surveys to approximately 650 9th-grade students in six schools in CPS. The surveys collected information on standard self-reported measures of non-cognitive skills from personality psychology (the Big Five) and economics (preferences), advanced survey measures designed to address specific biases, and student background information. We linked the survey data to school student records that included information on course grades, achievement test scores, credits earned, absences, misconduct, basic demographic information, and enrollment status. The administrative records contain information through the first semester of eleventh grade. These data allowed us to explore (1) the relationships among standard survey-based measures, advanced survey-based measures, and measures based on academic indicators; (2) the predictive power of 9th-grade academic measures; and (3) the extent to which measures depend on students' situations, such as their peer group and incentives.

## Summary of main findings

Using these data, we reached several conclusions:

### 1. How do contemporaneous measures of non-cognitive skills relate to each other?

Overall, our analyses suggest that the three measurement approaches capture distinct, but related, types of non-cognitive skills. In particular, we find that:

- The Big Five and the measures of preferences are relatively uncorrelated with each other. The highest correlation is 0.36, but most are much smaller.
- Each of the advanced survey-based measures of the Big Five is highly correlated with the corresponding standard survey-based measures. For example, our anchoring vignette version of Conscientiousness has a correlation with the standard measure of Conscientiousness of 0.71. The correlations are similar for other dimensions.
- Most of the academic indicators are highly correlated with each other, but some are more related to cognitive skills, whereas others capture non-cognitive skills.
  - Measures such as absences and credits earned primarily reflect non-cognitive skills, such as Conscientiousness and Agreeableness with correlations ranging from 0.19 to 0.31.
  - In contrast, GPA is correlated with measures of both cognitive skill and non-cognitive skills.

### 2. To what extent do various cognitive and non-cognitive measures predict later outcomes?

We find that academic indicators are the best predictors of future outcomes, including later test scores, grades, credits earned, and successful grade progression. Both standard and advanced survey-based measures add no predictive power above and beyond the academic indicators. Survey-based measures vary in their predictive power. In particular, we find that:

- Compared to survey-based measures, academic indicators are better predictors of later outcomes, particularly those more related to non-cognitive skills.
  - As a group, academic indicators are about two to three times more predictive than survey-based measures.
  - Survey-based measures add no predictive power above and beyond the academic indicators.
  - Among the academic indicators, the number of credits earned is the single best predictor of whether a student completes subsequent years of schooling.
  - Compared to other academic indicators, achievement test scores are relatively poor predictors of later educational outcomes (except for later test scores).
- Survey-based measures vary in the extent to which they predict outcomes.
  - As a group, the Big Five and preferences are similarly predictive of most educational outcomes.
- Combining the Big Five and preferences adds to the predictive power over using only one or the other, because they capture different attributes.

### 3. To what extent do students' measures of non-cognitive skills depend on aspects of their situation, including their reference (peer) group and incentives?

We find evidence that standard survey-based measures depend on reference groups and incentives, suggesting the potential for bias when measuring them. Some of the advanced survey-based measures are less susceptible to these biases.

- Standard survey-based measures of non-cognitive skills exhibit reference bias across schools.
  - We find that students' reference points differ across schools when assessing most non-cognitive skills.
  - Adjusting for anchoring vignettes appears to reduce some, but not most, of the reference bias. However, the performance of anchoring vignettes depends on apparently arbitrary decisions about how to adjust for reference bias.
  - The SJT of Conscientiousness appears to suffer less from reference bias than other measures of personality.
- Incentives can affect student reports on survey-based measures of non-cognitive skills, suggesting the need to account for incentives when measuring non-cognitive skills, especially in high-stakes settings.
  - Our experiment suggests that even relatively small incentives ($5 gift cards) can affect students' responses on non-cognitive measures by up to 0.10 standard deviations.
  - These impacts are around a third of the impacts often found in interventions designed to promote non-cognitive skills, suggesting that incentives are substantively important.

## Discussion

Overall, our findings suggest that both standard and advanced survey-based measures of non-cognitive skills offer few benefits over using academic indicators that schools already collect. The survey-based measures offer no predictive power above and beyond academic indicators. Although our outcomes are limited to relatively short-term educational outcomes, other recent studies suggest that our basic conclusions about predictive power would not change with access to a broader set of longer-term outcomes.[5] This evidence suggests that, compared to survey-based measures, academic indicators provide a better way to identify students at risk of dropping out because they lack non-cognitive skills.

Our findings also suggest that standard self-reported non-cognitive measures might not be suitable for high-stakes purposes in which schools are compared with each other, such as for school accountability. We find evidence that such measures are subject to reference bias and also can depend on incentives for reporting. These concerns are especially relevant because some

[5] For example, similar non-cognitive measures based on academic indicators are highly predictive of longer-term outcomes such as high school graduation, college enrollment, college persistence, arrests, employment, and income (Jackson 2018, Kautz and Zanoni 2019). For these outcomes, the predictive power of measures based on academic indicators is typically greater than that found for survey-based measures in other studies (Almlund et al. 2011, Barrick and Mount 1991, Roberts et al. 2007).

school districts are using self-reported measures of non-cognitive skills (West et al. 2018). In such settings, teachers or principals might provide incentives or coach students to give favorable responses on non-cognitive skills surveys. Even if students attempted to give the most accurate responses, however, reference bias might render those responses incomparable across schools.

Our results also allow educational agencies to better understand which non-cognitive skills are captured by academic indicators. On the surface, measures of academic indicators might not appeal to schools, districts, or policymakers because they seemingly lack a connection to existing classifications of non-cognitive skills. Many educational agencies have adopted "frameworks" that identify key social and emotional (non-cognitive) skills and suggest how they can be developed.[6] Previously, it has been challenging to map academic indicators to such frameworks. This study shows that academic indicators relate to dimensions of the Big Five (Conscientiousness and Agreeableness), which have also been linked to other frameworks (Soto and John 2017).

Including other types of more objective measures in evaluations or accountability systems could help mitigate the risks of some of these biases. Alternative measures include measures based on academic indicators, third-party reports, and task-based measures, such as the Academic Diligence Task (Galla et al. 2014). Because such alternative measures might suffer from other forms of bias (Duckworth and Yeager 2015), the best approach might be to include measures from different sources.

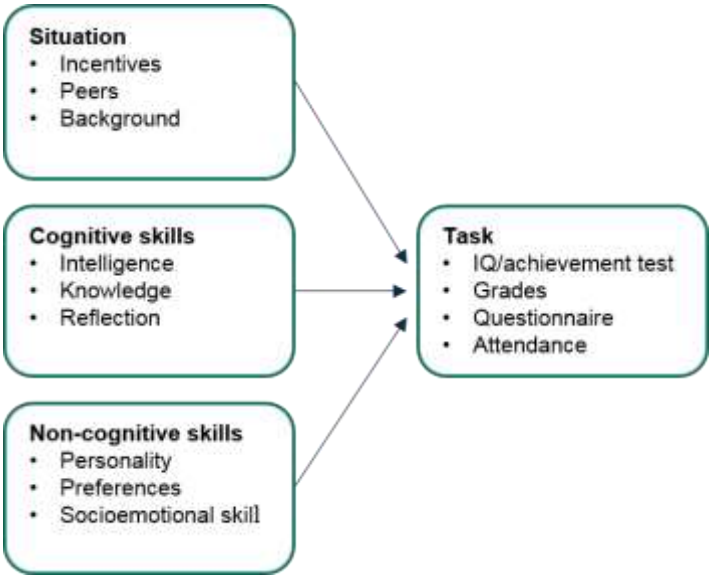
[6] For example, see the Collaborative for Academic, Social, and Emotional Learning (CASEL) framework (Axelrod 2010). The CASEL framework divides skills or competencies into five categories: (1) Self-Awareness, (2) Self-Management, (3) Social Awareness, (4) Relationship Skills, and (5) Responsible Decision-Making.

# II. MEASUREMENT FRAMEWORK

To guide our analyses, we adopt a framework that recognizes that any psychological measure can be viewed as performance on a task, which could depend on multiple skills and incentives (Almlund et al. 2011, Borghans et al. 2008, Heckman and Kautz 2012). In psychology, typical tasks include tests, responses to interviews, and self-reports. However, a task also could be performance in a game (Andrews et al. 2017, LaMar 2017, Mislevy 2011), a structured activity in a laboratory, or a "real-life" task (Falk et al. 2013). In this conceptualization, a task could be, for example: (1) taking an IQ or achievement test, (2) taking a personality test, (3) attending school, (4) graduating from high school, or (5) interacting with students at school.

The challenge in measuring a particular non-cognitive skill—or any psychological characteristic—is that performance on a task used to measure it can depend on other skills, as well as the situation broadly defined (Figure 1).[7] The standard practice in many psychological measurement schemes is to equate performance on a particular task with a skill associated with that task. A prime example is using IQ test scores to measure intelligence. Such scores typically do not adjust for effort on the task, the context in which the tasks are being performed, or other skills that affect task performance. For example, on an IQ test, a student higher in Conscientiousness might answer questions more accurately than an equally intelligent with less Conscientiousness.

**Figure 1. Measurement framework**




These issues are empirically relevant. For example, famous studies show that providing incentives of candy or money to children taking IQ tests can increase scores by half of a standard deviation, or about 8 points on a standard 100-point scale (Almlund et al. 2011, Ayllon and Kelly 1972, Breuning and Zella 1978, Clingman and Fowler 1976, Edlund 1972, Holt and Hobbs 1979,

[7] It is also possible that the skills and incentives could interact with each other. For example, students with different skills might be more responsive to certain types of incentives.

Larson et al. 1994, Zigler and Butterfield 1968). Other studies show that measures often assumed to capture cognitive skills—including IQ tests, achievement tests, and course grades—also reflect non-cognitive skills to varying degrees (Borghans et al. 2011a, Borghans et al. 2016).

Similar issues could apply to standard survey-based measures of non-cognitive skills in at least two distinct ways. First, completing a survey is a behavior that could be influenced by aspects of the situation, including incentives to respond in a particular way or survey administration conditions. Second, many questionnaires require respondents to reflect on past behavior, which could in turn depend on the situation or incentives faced at the time. For example, one commonly used Big Five item asks respondents the extent to which they agree with the statement "I see myself as someone who tends to be lazy" (Soto and John 2017). Their response might depend on the incentives they faced to work hard. If they had been in a situation with greater incentives, they might have worked harder.

This framework also highlights the insight that, if a behavior or task depends on a skill, then the behavior is also a valid measure of that skill after adjusting for the situation and other skills. This insight justifies the recent approach of measuring non-cognitive skills by isolating a common factor that drives grades, absences, misconduct incidents, and credits earned. These measures are valid because they depend on skills beyond raw intelligence. For example, earning course credits requires performing tasks that reveal skills, such as showing up for class and completing assignments.[8]

Some psychologists argue that this approach is circular because it uses behavior to predict future behaviors (Benda 2005, Pratt and Cullen 2000). Others rebut this view by pointing out that *any* measure of a psychological trait or skill is ultimately derived from a form of behavior (Heckman and Kautz 2012, Kautz et al. 2014). Psychological assessments are no exception. To extract a measure of skill from a behavior requires standardizing for other factors that affect the behavior but do not reflect the skills, such as incentives (Borghans et al. 2008).

We introduce this framework to help motivate our analyses and guide interpretation of the results. We provide new evidence on the extent to which various measures depend on students' situations and several types of skills.

[8] This idea is not new. Ralph Tyler, one of the creators of the original achievement tests, suggested that test scores should be supplemented with a broader class of behaviors (Tyler 1940).

# III. DATA

To address our three research questions, we collected detailed survey and administrative data from students in CPS. In this section, we describe our data collection procedures, the measures we used, and the characteristics of the students in the sample.[9]

## Recruitment and survey administration

### School and student recruitment

We aimed to recruit at least 650 students from six schools with varying levels of performance. To do so, we identified a candidate set of public high schools in CPS that each served at least 150 students in the 9th grade. We then stratified those schools by their five-year graduation rates and targeted our recruitment to schools with different graduation rates. This approach resulted in a sample of six high schools, three of which had five-year high school graduation rates less than the median among candidate schools and three of which had five-year high school graduation rates above the median. The five-year graduation rate ranged from 58.7 to 91.4 percent.

After recruiting schools, we recruited students in those schools by obtaining active consent to participate in the study from students and their parents. To encourage students to return their consent forms, we offered them $5 gift cards, whether or not they decided to participate in the study. We recruited 672 students to take the survey, meeting our goal of obtaining a sample of at least 650 students. This sample represented 45 percent of students eligible to take the survey in participating schools.

### Survey administration

We collected the survey data through a paper-and-pencil questionnaire administered during spring of the 2016–2017 school year. The survey consisted of two parts (Part A and B), each of which was designed to take approximately 30 minutes to complete. We trained classroom teachers to administer the survey during class time. Teachers administered Part B approximately two weeks after administering Part A. As described in more detail in Section VII, as part of an experiment, we randomly assigned students to one of two versions of Part B. The two versions differed in their instructions to students on one section of the survey. In particular, one set of instructions incentivized students' reports on one measure of non-cognitive skills (Big Five Conscientiousness), whereas the others did not.

## Descriptions of measures

### The Big Five

To measure personality, we focus on one commonly used taxonomy known as the Big Five, sometimes referred to as the "latitude and longitude" of personality (Costa and McCrae 1992).

[9] See Appendix Section A.3 for additional details on the construction of variables, as well as the survey instruments used in this study.

The Big Five are five constructs: (1) Openness to Experience (Openness), which relates to curiosity and intellectual pursuits; (2) Conscientiousness, which is the extent to which people are organized and hardworking; (3) Extraversion, which is the extent to which people are outgoing and sociable; (4) Agreeableness, which relates to unselfishness and friendliness; and (5) Emotional Stability (or Neuroticism), which relates to consistency in emotional reactions (American Psychological Association 2007).

To measure the Big Five, we use the Big Five Inventory-2 (Soto and John 2017), a recently updated, 60-item version of the original 44-item Big Five Inventory (John et al. 1991). The inventory asks respondents the extent to which they agree with a series of statements. For example, one item that measures Conscientiousness is "I see myself as someone who tends to be disorganized," which has five response categories that range from "Disagree strongly" to "Agree strongly." We modified the questionnaire slightly after pre-testing it among students similar to those in our sample.

To reduce measurement error in the Big Five constructs, we estimate a factor model separately for each construct. We use this model to calculate regression factor scores for each student, which can be interpreted as averages of the underlying items, weighted by the extent to which the items contain information on the latent factors so that items with more measurement error receive lower weights. This approach reduces measurement error relative to using a simple mean. We convert the scores into standard deviation units by subtracting the mean and dividing by the standard deviation in our sample.

**Anchoring vignettes**

We complement the standard measures of the Big Five with anchoring vignettes, which are supplemental survey questions designed to address reference bias. Reference bias arises when people have different reference points when responding to survey questions and might arise if students compare themselves to their peers, rather than to the population as a whole. It is most likely to occur with questions in which response categories are subjective, such as those used for the Big Five (such as "Disagree" or "Disagree a little"). An individual's interpretation of whether they "Disagree" might depend on their own reference point. For example, one item from the Big Five Inventory-2 asks respondents the extent to which they agree with the statement "I see myself as someone who tends to be disorganized" (Soto and John 2017). The way students respond to this question might depend on the extent to which their peers tend to be organized.

Anchoring vignettes provide a way to adjust self-reported measures for reference bias by "anchoring" the items of interest using the respondents' assessment of a hypothetical situation (Kyllonen and Bertling 2013, Primi et al. 2016). For example, Table 2 displays a vignette that we developed to adjust self-reported items that measure Conscientiousness. The instructions ask students to rate the behaviors of three hypothetical people in terms of their organizational skills, using the same response categories that we used to assess the Big Five. The three vignettes exemplify people with varying degrees of Conscientiousness, which we label as "Low," "Mid," and "High." Students' responses provide a way to contextualize responses like "Disagree a little."

**Table 2. Example anchoring vignettes**

| Level | Description | | | | |
|---|---|---|---|---|---|
| 1. Low | When Taylor is given a school assignment, Taylor does not usually start the assignment until right before the deadline and frequently does not meet deadlines. Taylor does not arrange materials in the school locker and places all of the papers in a backpack without using a folder.<br><br>How much do you agree or disagree that Taylor is someone who is organized? | | | | |
| | 1 = Disagree strongly | 2 = Disagree a little | 3 = Neither agree nor disagree | 4 = Agree a little | 5 = Agree strongly |
| 2. Mid | When Robin is given a school assignment, Robin usually remembers deadlines but sometimes will turn assignments in late. When in a hurry, Robin might leave a school locker messy. Robin uses a folder for school papers and homework.<br><br>How much do you agree or disagree that Robin is someone who is organized? | | | | |
| | 1 = Disagree strongly | 2 = Disagree a little | 3 = Neither agree nor disagree | 4 = Agree a little | 5 = Agree strongly |
| 3. High | When Jesse is given a school assignment, Jesse starts the assignment right away, works on it until the assignment is completed, and double-checks the answers. Jesse organizes books in the locker and keeps all of the school papers in separate folders for each subject.<br><br>How much do you agree or disagree that Jesse is someone who is organized? | | | | |
| | 1 = Disagree strongly | 2 = Disagree a little | 3 = Neither agree nor disagree | 4 = Agree a little | 5 = Agree strongly |

We then use the anchoring vignettes to adjust the scores assigned to students' responses. For each dimension of the Big Five, we developed vignettes similar to those displayed in Table 2. We followed standard rules for scoring responses to the Big Five, as well as adjusting those scores using the responses to the vignettes (Table 3). The adjustment involves assigning each student a score based on how they rated themselves compared to how they rated the hypothetical people in the vignettes.

To understand the adjustment, consider the following example. When rating themselves, two students (Mark and Sarah) report that they "Agree strongly" that they tend to be organized. However, they differ in their responses to the anchoring vignettes, suggesting that they have different reference points. Mark selects "Agree strongly" in the "High" vignette that Jesse is "organized," whereas Sarah selects "Agree a little" (Table 2). These responses suggest that Mark is just as organized as Jesse, whereas Sarah is more organized than Jesse, implying that Sarah is also more organized than Mark. Therefore, Sarah would be classified as having a higher level of Conscientiousness than Mark, even though they both rated themselves the same. In this example, Mark would receive a score of 6 and Sarah would receive a score of 7. To refer to these adjusted measures, we add the abbreviation AV (Anchoring Vignette) after the name of the Big Five dimensions (for example, Conscientiousness-AV).

We consider several approaches for handling cases in which students fill out the anchoring vignettes inconsistently. Inconsistent responses can arise in two ways. First, students might rate

two vignettes the same way for a given dimensions of the Big Five. For example, they might select "Disagree a little" for both the Low and Mid vignettes for Conscientiousness. Alternatively, they might rate the vignettes "incorrectly"—for example, by rating the Low vignette higher than the High vignette. The standard approach in the literature has been to calculate all possible scores for respondents and assign respondents the lowest score that they could have achieved (Kyllonen and Bertling 2014, Primi et al. 2016, Weiss and Roberts 2018). This approach has been favored because earlier studies found that it led to a higher reliability in the scales (Kyllonen and Bertling 2014).

We find, however, that our results are highly sensitive to the approach for handling inconsistencies. For that reason, we conduct our analyses using three ways of handling inconsistencies: (1) assigning the lowest possible value, (2) assigning the highest value, and (3) assigning the average of the lowest and highest possible values. We adopt the third approach for our main analyses, because it is more balanced. We present results for the other approaches in the Appendix.

**Table 3. Scoring rules for standard Big Five and anchoring-adjusted Big Five**

| Self-rating/self-rating relative to anchor | Score |
|---|---|
| **Standard scoring** | |
| Self-rating = Disagree strongly | 1 |
| Self-rating = Disagree a little | 2 |
| Self-rating = Neither agree nor disagree | 3 |
| Self-rating = Agree a little | 4 |
| Self-rating = Agree strongly | 5 |
| **Anchor-adjusted scoring** | |
| **Self-rating** < Low vignette rating | 1 |
| **Self-rating** = Low vignette rating | 2 |
| Low vignette rating < **Self-rating** < Mid vignette rating | 3 |
| **Self-rating** = Mid vignette rating | 4 |
| Mid vignette rating < **Self-rating** < High vignette rating | 5 |
| **Self-rating** = High vignette rating | 6 |
| High vignette rating < **Self-rating** | 7 |

### Situational judgment test for Conscientiousness

Situational judgement tests (SJTs) are another approach designed to explicitly account for situations that could confound measurement (Kyllonen and Bertling 2013). SJTs work in a complementary way to anchoring vignettes in that they ask how respondents would act in a particular situation. For this study, we developed an SJT to measure Conscientiousness in which respondents describe how much effort they would exert on a homework assignment in different situations (Table 4). Due to limitations in survey space, we focused on Conscientiousness, because it is the most relevant for educational outcomes. We designed the situations so that students would be increasingly more likely to stop working on their homework assignment. To summarize the measure, we estimated a factor model in which the responses depend on a single

latent factor.[10] As with the standard Big Five, we calculated regression factor scores for each student. We refer to this measure as Conscientiousness-SJT.

**Table 4. Situational judgment test for Conscientiousness**

| Description from survey | | | |
|---|---|---|---|
| **Hypothetical situations** | | | |
| Imagine that you are at home working on homework that is due tomorrow morning. You thought it would take you 1 hour, but you have already spent 1 hour on it and think it will take you 1 more hour to do a good job. Keeping this in mind, consider the following three situations.<br><br>Situation 1: It is 5:00 p.m. and you have no other plans for the evening. What would you do?<br>Situation 2: It is 5:00 p.m. and you have plans with a friend starting in 15 minutes. What would you do?<br>Situation 3: It is midnight and you have school in the morning. What would you do? | | | |
| **Response options** | | | |
| 1 = Stop working on the assignment | 2 = Work a little bit longer but leave part of it unfinished | 3 = Rush to finish the assignment, knowing I might make some mistakes | 4 = Finish the assignment and double-check it to make sure there are no mistakes |

## Economic preferences

To measure economic preferences, we adapted items from the Global Preferences Survey (Falk et al. 2016, Falk et al. 2018). Table 5 defines these measures, which can be separated into standard economic preferences (Patience and Risk Taking) and social preferences (Altruism, Positive Reciprocity, and Negative Reciprocity). The items elicit preferences in two distinct ways: (1) by asking respondents what choices they would make in hypothetical situations, and (2) by asking respondents to provide subjective ratings of themselves. For example, the measure of Patience is based in part on a sequence of questions that ask respondents whether they would prefer receiving $500 dollars today or some other amount (such as $650) in 12 months. The lower the amount they are willing to receive in 12 months, the higher their Patience. The measure of Patience is also based on an item that asks respondents the extent to which the following statement describes them: "I do not spend money today so that I would be able to afford more tomorrow" (0 = Does not describe me at all, 1, 2, 3…10 = Describes me perfectly). These survey-based measures have been validated using experimental measures in which respondents face real incentives when making decisions (Falk et al. 2016).

We combine items for each preference using the method derived in the original validation studies (Falk et al. 2018). This method weights each item based on how predictive the measure was when compared to an experimental measure. The measures are standardized to have a mean of zero and standard deviation of one.

[10] In particular, we estimated a non-linear factor model in which we modeled the responses to each item as an ordered probit.

**Table 5. Measures of economic preferences**

| Preference | Description |
|---|---|
| **Traditional measures of preferences** | |
| Patience (Time Preference) | The extent to which students are willing to forgo payments today in order to receive higher payments in the future. |
| Risk Taking | The extent to which students prefer an assured payment relative to a lottery. |
| **Social preferences** | |
| Altruism | The extent to which students are willing to share resources with others without seeking repayment. |
| Negative Reciprocity | The extent to which students would respond to a negative action of other people with a negative action. |
| Positive Reciprocity | The extent to which students would respond to a positive action of other people with a positive action. |

## Cognitive Reflection

Cognitive Reflection is a measure of a person's ability to make deliberate and thoughtful decisions by inhibiting initial reactions. We include it in this study because past studies have found that Cognitive Reflection relates to decision making, as well as economic preferences such as Patience and Risk Taking (Frederick 2005, Oechssler et al. 2009). We measured cognitive reflection using the Cognitive Reflection Test, a standard three-item measure (Frederick 2005), which we detail in Table 6. We estimate a factor model in which we model the probability that a respondent answers a question correctly as a function of their underlying Cognitive Reflection. We then calculate regression factor scores for each student. Although Cognitive Reflection and preferences are distinct, we group them together for some analyses, because they both relate to economic decision making.

**Table 6. Measures of cognitive reflection**

| Item | Description |
|---|---|
| #1 | A bat and a ball cost $1.10 in total. The bat costs $1.00 more than the ball. How much does the ball cost? |
| #2 | If it takes 5 machines 5 minutes to make 5 widgets, how long would it take 100 machines to make 100 widgets? |
| #3 | In a lake, there is a patch of lily pads. Every day, the patch doubles in size. If it takes 48 days for the patch to cover the entire lake, how long would it take for the patch to cover half of the lake? |

## School administrative records

We complement these survey-based measures with detailed administrative data from CPS on GPAs, absences, disciplinary infractions, 9th- and 10th-grade achievement test scores on the PSAT, grade progression, race, gender, and age (Table 7). These measure are collected by the district and follow standard definitions across schools.

These administrative measures serve dual purposes in the study. First, the 10th- and 11th-grade measures serve as important outcomes that we use to explore the predictive power of the 9th-grade measures that we collect. Because most students in our sample do not drop out during the study, a key outcome is an on-track indicator, which summarizes whether students successfully progressed through grades as expected. The 10th-grade indicator is whether they progressed from 9th to 10th grade in one year, and the 11th-grade indicator is whether they progressed from 9th to 11th grade in two years.

Second, we explore the extent to which the 9th-grade administrative measures (course grades, credits earned, absences, PSAT scores) can be used to proxy non-cognitive skills. We examine correlations between each of these measures and our other measures of non-cognitive skills. In addition, because the administrative measures are highly correlated with each other, we use statistical methods to distill them into an underlying non-cognitive factor. A key challenge is that such records capture cognitive skills in addition to non-cognitive skills. Following several recent studies, we use a factor model to remove cognitive skill from the common component of other academic indicators (grades, absences, credits earned, and disciplinary infractions), leaving behind a measure of non-cognitive skill (Jackson 2018, Kautz and Zanoni 2019). This approach results in an "Achievement factor" that represents cognitive skills and "Behavioral factor" that we hypothesize represents non-cognitive skills.[11]

This approach implicitly defines the Achievement factor as performance on the PSAT score. The Behavioral factor is the portion of the remaining measures (course grades, credits earned, absences, scores) that does not depend on cognitive skills. The underlying logic is based on our measurement framework (Figure 1)—because measures like grades depend on key non-cognitive skills, such records also serve as a proxy for non-cognitive skills (after accounting for their dependence on cognitive skill).

**Table 7. Key measures from administrative records**

| Measure | Description |
|---|---|
| PSAT score | A student's total score on the PSAT |
| GPA | Grade point average, measured on a four-point scale, where points are assigned as follows: A = 4; B = 3; C = 2; D =1; F = 0. The grades for each course are weighted by the number of credits. |
| GPA (adjusted) | Grade point average, measured on a six-point scale, where advanced classes count as an extra point relative to a standard course. |
| Credits earned | The number of credits earned. |
| Fraction days absent | The fraction of days that a student is absent out of the number of days enrolled. |
| Misconduct offenses | The number of any misconduct offenses. |
| Achievement factor | A regression factor score that represents a student's ability to perform on an achievement test. |
| Behavioral factor | A regression factor score that represents the common component of GPA, credits earned, fraction of days absent, and misconduct offenses after controlling for achievement. |
| On-track indicator | Indicator for whether or not a student has progressed as expected in a given year compared to grade level upon study enrollment. |

## Description of the sample

Descriptive statistics suggest that we achieved our goal of recruiting a sample of students with a variety of levels of academic performance (Table 8). The students in the full sample were predominantly Black/African American or Hispanic/Latino, and tended to be eligible for free or reduced-price lunch. The survey respondents differed significantly from nonrespondents on a number of dimensions, including gender and most academic indicators. Compared to nonrespondents, the survey respondents tended to perform better in school.

Despite these differences, the standard deviations of the academic indicators in the respondent sample are relatively large, suggesting that the sample exhibits enough variation in

[11] See Appendix Section A.3 for a formal description of the model.

student performance for the purposes of our study. For example, in a nationally representative sample, the average PSAT score is 889 with a standard deviation of 154 (College Board 2019). In our respondent sample, the mean is 856 and the standard deviation is 144.

**Table 8. Baseline characteristics, 2016–2017 school year**

| | Full sample | | Respondents | | Nonrespondents | | |
|---|---|---|---|---|---|---|---|
| Variable | Mean | S.D. | Mean | S.D. | Mean | S.D. | *p*-value for difference |
| **Demographics** | | | | | | | |
| Female | 0.50 | 0.50 | 0.63 | 0.48 | 0.40 | 0.49 | 0.00 |
| Primary language at home | | | | | | | |
| English | 0.55 | 0.50 | 0.53 | 0.50 | 0.56 | 0.50 | 0.41 |
| Spanish | 0.36 | 0.48 | 0.37 | 0.48 | 0.35 | 0.48 | 0.38 |
| Other | 0.10 | 0.29 | 0.10 | 0.29 | 0.10 | 0.29 | 0.97 |
| Student services received | | | | | | | |
| Free or reduced-price lunch | 0.87 | 0.34 | 0.88 | 0.32 | 0.85 | 0.35 | 0.09 |
| Special Education | 0.14 | 0.35 | 0.11 | 0.31 | 0.17 | 0.38 | 0.00 |
| ESL | 0.06 | 0.25 | 0.05 | 0.21 | 0.08 | 0.27 | 0.01 |
| Student race/ethnicity | | | | | | | |
| Black, non-Hispanic | 0.40 | 0.49 | 0.41 | 0.49 | 0.40 | 0.49 | 0.94 |
| Hispanic | 0.47 | 0.50 | 0.47 | 0.50 | 0.46 | 0.50 | 0.61 |
| White, non-Hispanic | 0.07 | 0.25 | 0.06 | 0.24 | 0.07 | 0.26 | 0.47 |
| Other | 0.06 | 0.24 | 0.06 | 0.23 | 0.06 | 0.24 | 0.64 |
| **9th-grade academic indicators** | | | | | | | |
| PSAT score | 837.17 | 140.65 | 855.99 | 143.81 | 821.27 | 136.00 | 0.00 |
| GPA | 2.62 | 0.84 | 2.86 | 0.75 | 2.44 | 0.86 | 0.00 |
| GPA (adjusted) | 3.04 | 1.03 | 3.37 | 0.93 | 2.78 | 1.04 | 0.00 |
| Credits earned | 6.61 | 1.13 | 6.80 | 0.71 | 6.45 | 1.36 | 0.00 |
| Fraction days absent | 0.09 | 0.11 | 0.07 | 0.08 | 0.11 | 0.14 | 0.00 |
| Misconduct offenses | 1.03 | 3.50 | 0.92 | 3.27 | 1.11 | 3.67 | 0.29 |
| **Sample sizes** | **1,433–1,520** | | **656–673** | | **656–673** | | |

Sources: Chicago Public Schools administrative data, 2016–2017 school year.

S.D. = Standard deviation of the variable.

Because the main goal of this study is to compare the properties of a set of cognitive and non-cognitive skill measures, we restrict our remaining analyses to a sample that has non-missing values for our key measures. These measures include the standard Big Five, the Big Five-AV, Conscientiousness-SJT, economic preferences, Cognitive Reflection, and the key 9th-grade academic indicators (PSAT score, GPA, credits earned, fraction days absent, and misconduct offenses). This additional restriction reduces our sample of survey respondents from 673 to 620, which represents 92 percent of the survey sample.

# IV. RELATIONSHIPS AMONG MEASURES OF SKILLS

In this section, we examine the relationships among various 9th-grade measures of cognitive and non-cognitive skills to better understand the extent to which they capture distinct constructs. This analysis helps map out the relationships in our measurement framework (Figure 1), especially the possibility that measures (tasks) could capture multiple skills. To summarize the relationships, we present tables that show the correlations between measures. On the tables, a darker shade of green represents a larger correlation in absolute value terms. See Appendix Tables A3–A32 for results by subgroup.

## Correlations among standard measures of non-cognitive skills

In general, the correlations among our standard measures of non-cognitive skills are consistent with past studies (Table 9). Although each of the Big Five and economic preference measures is correlated with each other, the correlations are relatively low, suggesting that each captures a different underlying construct.

**Correlations among the Big Five.** The correlations among distinct Big Five characteristics are similar to the initial validation study of the Big Five-2 (Soto and John 2017). As in the original validation study, the correlations between Openness and Emotional Stability and between Agreeableness and Extraversion are the lowest. Similarly, Agreeableness and Conscientiousness have the highest correlation, although the correlation we find is somewhat higher than in the original study (0.45 versus 0.28). In general, the correlations we found are somewhat larger in absolute value, which might have arisen because we use a factor model to calculate the values for each Big Five dimension, which tends to reduce measurement error compared to using simple averages as in the original study.

**Correlations among economic preferences.** The correlations among economic preferences in our data are also similar to those in the original study that used the Global Preferences Survey (Falk et al. 2018). For example, the highest correlation in the original study was between Altruism and Positive Reciprocity (0.33), which is similar to that in our study (0.24). Other correlations show a similar pattern.

**Correlations among the Big Five, economic preferences, and Cognitive Reflection.** Much like in earlier studies, we find relatively low correlations between the Big Five and economic preference parameters, even when the measures are conceptually similar. For example, Patience and Conscientiousness are conceptually similar, but the correlation is small, as found in earlier studies (Becker et al. 2012). Also, as in an earlier study, Agreeableness is the Big Five dimension that is most closely linked with social preferences (Altruism, Positive Reciprocity, and Negative Reciprocity). Similarly, Cognitive Reflection is positively related to Patience and Risk Taking, as in the original study on Cognitive Reflection (Frederick 2005). Likewise, Patience and Risk Taking have been linked to other measures of cognitive skills (Becker et al. 2012). A new finding is that Conscientiousness and Cognitive Reflection are negatively related, which might arise because students high in Conscientiousness focus on completing tasks quickly so might not take time to reflect on their responses.

**Table 9. Correlation among standard measures of personality, preferences, and cognitive skills**

| Measure | Openness | Conscientiousness | Extraversion | Agreeableness | Emotional Stability | Patience | Risk Taking | Positive Reciprocity | Negative Reciprocity | Altruism | Cognitive Reflection |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Openness | 1.00 | | | | | | | | | | |
| Conscientiousness | 0.32*** | 1.00 | | | | | | | | | |
| Extraversion | 0.34*** | 0.18*** | 1.00 | | | | | | | | |
| Agreeableness | 0.27*** | 0.45*** | 0.06 | 1.00 | | | | | | | |
| Emotional Stability | 0.01 | 0.29*** | 0.20*** | 0.30*** | 1.00 | | | | | | |
| Patience | 0.09** | 0.14*** | -0.04 | 0.14*** | 0.07* | 1.00 | | | | | |
| Risk Taking | 0.16*** | -0.02 | 0.25*** | -0.08** | 0.05 | -0.02 | 1.00 | | | | |
| Positive Reciprocity | 0.21*** | 0.11*** | 0.10** | 0.23*** | 0.05 | 0.16*** | 0.02 | 1.00 | | | |
| Negative Reciprocity | -0.04 | -0.26*** | 0.08** | -0.36*** | -0.06 | 0.00 | 0.13*** | 0.09** | 1.00 | | |
| Altruism | 0.16*** | 0.20*** | 0.05 | 0.32*** | 0.04 | 0.15*** | 0.08** | 0.24*** | -0.07* | 1.00 | |
| Cognitive Reflection | 0.06 | -0.14*** | -0.05 | 0.00 | 0.04 | 0.08** | 0.09** | 0.06 | 0.00 | -0.01 | 1.00 |

Sources: Chicago Public Schools administrative data, 2016–2017 school year. Student survey, 2016–2017 school year.

Note: Openness, Conscientiousness, Extraversion, Agreeableness, and Emotional Stability are measured using regression factor scores based on the Big Five Inventory-2 (Soto and John 2017). Patience, Risk Taking, Positive Reciprocity, Negative Reciprocity, and Altruism are measured using items from the Global Preferences Survey (Falk et al. 2016). Cognitive Reflection is measured using regression factor scores based on the Cognitive Reflection Test (Frederick 2005).

* Significantly different from zero at the .10 level, two-tailed test.

** Significantly different from zero at the .05 level, two-tailed test.

*** Significantly different from zero at the .01 level, two-tailed test.

## Correlations between advanced survey-based measures of non-cognitive skills and traditional measures of non-cognitive skills

**Correlations among advanced survey-based measures of non-cognitive skills.** The correlations among the advanced survey-based measures of the Big Five show a pattern similar to the standard measures of the Big Five (Table 10). As with the original measures, the highest correlation is between Agreeableness-AV and Conscientiousness-AV. Notably, Conscientiousness-SJT is most correlated with Conscientiousness-AV, suggesting that they capture a similar construct. In general, the absolute value of the correlations among these advanced measures is lower than that of the standard measures. This pattern might arise because the advanced measures address reference bias. If reference bias affects each measure of the Big Five in a similar way, part of the correlation among measures could be due to the fact that the reference points are correlated, rather than the underlying skills.

**Table 10. Correlation among advanced survey-based measures**

| Measure | Openness-AV | Conscientiousness-AV | Extraversion-AV | Agreeableness-AV | Emotional Stability-AV | Conscientiousness-SJT |
|---|---|---|---|---|---|---|
| Openness-AV | 1.00 | | | | | |
| Conscientiousness-AV | 0.17*** | 1.00 | | | | |
| Extraversion-AV | 0.21*** | 0.13*** | 1.00 | | | |
| Agreeableness-AV | 0.05 | 0.35*** | 0.02 | 1.00 | | |
| Emotional Stability-AV | -0.04 | 0.17*** | 0.18*** | 0.19*** | 1.00 | |
| Conscientiousness-SJT | 0.16*** | 0.27*** | 0.09** | 0.21*** | 0.09** | 1.00 |

Sources: Chicago Public Schools administrative data, 2016–2017 school year. Student survey, 2016–2017 school year.

Note: Openness-AV, Conscientiousness-AV, Extraversion-AV, Agreeableness-AV, and Emotional Stability-AV are measured using regression factor scores based on an anchor-adjusted version of the Big Five Inventory-2 (Soto and John 2017). Conscientiousness-SJT is based on a study-developed situational judgement test designed to measure Conscientiousness.

* Significantly different from zero at the .10 level, two-tailed test.
** Significantly different from zero at the .05 level, two-tailed test.
*** Significantly different from zero at the .01 level, two-tailed test.

**Correlations between standard measures and advanced survey-based measures.** The correlations between the advanced survey-based measures of the Big Five and standard non-cognitive measures also follow a similar pattern (Table 11). Each of the advanced measures of the Big Five is most correlated with the corresponding standard measure of the Big Five. Notably, the SJT and anchor-adjusted versions of Conscientiousness display nearly identical correlation patterns.

**Table 11. Correlations between standard and advanced survey-based measures**

| Measure | Openness-AV | Conscientiousness-AV | Extraversion-AV | Agreeableness-AV | Emotional Stability-AV | Conscientiousness-SJT |
|---|---|---|---|---|---|---|
| Openness | 0.60*** | 0.21*** | 0.20*** | 0.08** | -0.01 | 0.19*** |
| Conscientiousness | 0.19*** | 0.71*** | 0.12*** | 0.34*** | 0.22*** | 0.36*** |
| Extraversion | 0.20*** | 0.05 | 0.72*** | -0.04 | 0.19*** | 0.08** |
| Agreeableness | 0.09** | 0.38*** | 0.02 | 0.66*** | 0.23*** | 0.31*** |
| Emotional Stability | 0.00 | 0.25*** | 0.20*** | 0.23*** | 0.76*** | 0.18*** |
| Patience | 0.05 | 0.17*** | -0.01 | 0.08** | 0.03 | 0.12*** |
| Risk Taking | 0.11*** | -0.06 | 0.17*** | -0.03 | 0.06 | -0.03 |
| Positive Reciprocity | 0.04 | 0.11*** | 0.04 | 0.12*** | 0.04 | 0.13*** |
| Negative Reciprocity | -0.01 | -0.18*** | 0.08* | -0.30*** | -0.03 | -0.20*** |
| Altruism | 0.07* | 0.14*** | 0.06 | 0.20*** | 0.05 | 0.18*** |
| Cognitive Reflection | 0.00 | -0.10** | -0.08* | -0.07* | 0.01 | 0.04 |

Sources: Chicago Public Schools administrative data, 2016–2017 school year. Student survey, 2016–2017 school year.

Note: Openness, Conscientiousness, Extraversion, Agreeableness, and Emotional Stability are measured using regression factor scores based on the Big Five Inventory-2 (Soto and John 2017). Patience, Risk Taking, Positive Reciprocity, Negative Reciprocity, and Altruism are measured using items from the Global Preferences Survey (Falk et al. 2016). Cognitive Reflection is measured using regression factor scores based on the Cognitive Reflection Test (Frederick 2005). Openness-AV, Conscientiousness-AV, Extraversion-AV, Agreeableness-AV, and Emotional Stability-AV are measured using regression factor scores based on an anchor-adjusted version of the Big Five Inventory-2 (Soto and John 2017). Conscientiousness-SJT is based on a study-developed situational judgement test designed to measure Conscientiousness.

* Significantly different from zero at the .10 level, two-tailed test.
** Significantly different from zero at the .05 level, two-tailed test.
*** Significantly different from zero at the .01 level, two-tailed test.

## Correlations among academic indicators and between academic indicators and survey-based measures of non-cognitive skills

**Correlations among academic indicators.** Compared to the survey-based measures, the correlations among the academic indicators tend to be much higher in absolute value (Table 12). However, the extent to which they are correlated varies greatly, and the pattern suggests that they could not be explained by a single underlying variable. For example, PSAT score and the measures of GPA are highly correlated ($r > 0.42$), suggesting that they are related to each other. The measures of GPA and credits earned are also highly correlated with each other ($r > 0.48$). However, credits earned and PSAT scores are comparatively uncorrelated ($r = 0.17$). Such a pattern is consistent with the presence of more than one underlying factor—if a single factor explained the data, we would expect PSAT scores and credits earned to be more highly correlated.

The correlations between the separate academic indicators and the summary factors further support the existence of multiple factors. The PSAT score is most correlated with the Achievement factor, and absences and credits earned are most correlated with the Behavioral factor. GPA has relatively high correlations with both. These findings provide empirical support to the measurement framework (Figure 1) by demonstrating how even similar types of tasks, such as the academic indicators, can depend on multiple skills, but to varying degrees.

**Table 12. Correlations among academic indicators and factors**

| Measure | PSAT score | GPA | GPA (adjusted) | Credits earned | Fraction days absent | Misconduct offenses | Achievement factor | Behavioral factor |
|---|---|---|---|---|---|---|---|---|
| PSAT score | 1.00 | | | | | | | |
| GPA | 0.42*** | 1.00 | | | | | | |
| GPA (adjusted) | 0.55*** | 0.93*** | 1.00 | | | | | |
| Credits earned | 0.17*** | 0.48*** | 0.49*** | 1.00 | | | | |
| Fraction days absent | -0.29*** | -0.55*** | -0.55*** | -0.41*** | 1.00 | | | |
| Misconduct offenses | -0.26*** | -0.25*** | -0.32*** | -0.09** | 0.45*** | 1.00 | | |
| Achievement factor | 0.98*** | 0.46*** | 0.58*** | 0.14*** | -0.31*** | -0.28*** | 1.00 | |
| Behavioral factor | 0.01 | 0.89*** | 0.78*** | 0.57*** | -0.58*** | -0.22*** | 0.04 | 1.00 |

Sources: Chicago Public Schools administrative data, 2016–2017 school year.

Note: The Achievement factor is a predicted regression factor score based on the components of the PSAT test. The Behavioral factor is a predicted regression factor score based on the fall and spring GPAs from ninth grade, the faction of days absent in the fall and spring of ninth grade, credits accumulated in the fall and spring of ninth grade, and total misconduct incidents in ninth grade.

* Significantly different from zero at the .10 level, two-tailed test.
** Significantly different from zero at the .05 level, two-tailed test.
*** Significantly different from zero at the .01 level, two-tailed test.

**Correlations between academic indicators and survey-based measures.** Correlations between the academic indicators and the survey-based measures shed light on how the academic indicators relate to standard non-cognitive skills (Table 13).

The correlations suggest that PSAT scores and the Achievement factor capture something that can be interpreted as cognitive skill. Both of these indicators are most strongly related to Openness to Experience, Patience, and Cognitive Reflection. Past studies show that, of the Big Five, Openness to Experience is the most related to other measures of cognitive skills, such as IQ and other achievement tests (Almlund et al. 2011). Cognitive Reflection itself is a measure of cognitive skill.

Consistent with our hypothesis, the remaining academic indicators can be interpreted as capturing some combination of cognitive skill and non-cognitive skill, but to varying degrees. The Behavioral factor—which represents the part of the indicators that is unrelated to achievement—best highlights this point. The Behavioral factor is relatively unrelated to measures that have been found to be correlated with cognitive skill, including Openness and Cognitive Reflection. It is, however, highly correlated with all three measures of Conscientiousness and both measures of Agreeableness. This finding is consistent with the notion that the Behavioral factor represents the extent to which students are hardworking and well behaved in school. It is also consistent with previous literature that shows that Agreeableness and Conscientiousness are related to juvenile delinquency (John et al. 1994) and that Conscientiousness—or related constructs—are associated with GPA (Borghans et al. 2011a, Borghans et al. 2016, Poropat 2009).

## Table 13. Correlation between survey-based measures and academic indicators from administrative data

| Measure | PSAT score | GPA | GPA (adjusted) | Credits earned | Fraction days absent | Misconduct offenses | Achievement factor | Behavioral factor |
|---|---|---|---|---|---|---|---|---|
| Openness | 0.15*** | 0.12*** | 0.13*** | 0.02 | 0.05 | -0.04 | 0.16*** | 0.04 |
| Conscientiousness | -0.09** | 0.31*** | 0.25*** | 0.11*** | -0.03 | -0.03 | -0.06 | 0.35*** |
| Extraversion | -0.04 | -0.06 | -0.04 | 0.05 | 0.03 | 0.06 | -0.07 | -0.02 |
| Agreeableness | 0.11*** | 0.30*** | 0.29*** | 0.15*** | -0.17*** | -0.18*** | 0.13*** | 0.28*** |
| Emotional Stability | 0.07* | 0.11*** | 0.14*** | 0.08** | -0.10** | -0.07* | 0.07* | 0.10** |
| Openness-AV | -0.06 | 0.00 | -0.03 | -0.03 | 0.09** | 0.08* | -0.05 | 0.00 |
| Conscientiousness-AV | -0.01 | 0.28*** | 0.24*** | 0.07* | -0.08* | -0.06 | 0.02 | 0.29*** |
| Extraversion-AV | -0.06 | -0.02 | -0.01 | 0.05 | 0.03 | 0.07* | -0.08* | 0.01 |
| Agreeableness-AV | -0.02 | 0.21*** | 0.19*** | 0.09** | -0.11*** | -0.14*** | -0.01 | 0.24*** |
| Emotional Stability-AV | 0.01 | 0.07 | 0.08* | 0.06 | -0.09** | -0.09** | 0.01 | 0.08* |
| Conscientiousness-SJT | 0.15*** | 0.28*** | 0.28*** | 0.11*** | -0.09** | -0.07 | 0.17*** | 0.21*** |
| Patience | 0.22*** | 0.18*** | 0.18*** | 0.00 | -0.05 | -0.10** | 0.23*** | 0.08* |
| Risk Taking | 0.06 | -0.04 | -0.03 | -0.04 | 0.02 | -0.02 | 0.04 | -0.07* |
| Positive Reciprocity | 0.16*** | 0.08* | 0.12*** | -0.03 | -0.01 | -0.11*** | 0.16*** | 0.00 |
| Negative Reciprocity | -0.01 | -0.22*** | -0.20*** | -0.13*** | 0.13*** | 0.10** | -0.01 | -0.25*** |
| Altruism | 0.07* | 0.07* | 0.06 | 0.06 | -0.04 | -0.06 | 0.08** | 0.04 |
| Cognitive Reflection | 0.35*** | 0.11*** | 0.14*** | -0.05 | -0.07* | -0.08* | 0.35*** | -0.05 |

Sources: Chicago Public Schools administrative data, 2016-2017 school year. Student survey, 2016-2017 school year.

Note: Openness, Conscientiousness, Extraversion, Agreeableness, and Emotional Stability are measured using regression factor scores based on the Big Five Inventory-2 (Soto and John 2017). Patience, Risk Taking, Positive Reciprocity, Negative Reciprocity, and Altruism are measured using items from the Global Preferences Survey (Falk et al. 2016). Cognitive Reflection is measured using regression factor scores based on the Cognitive Reflection Test (Frederick 2005). Openness-AV, Conscientiousness-AV, Extraversion-AV, Agreeableness-AV, and Emotional Stability-AV are measured using regression factor scores based on an anchor-adjusted version of the Big Five Inventory-2 (Soto and John 2017). Conscientiousness-SJT is based on a study-developed SJT designed to measure Conscientiousness. The Achievement factor is a predicted regression factor score based on the components of the PSAT test. The Behavioral factor is a predicted regression factor score based on the fall and spring GPAs from ninth grade, the faction of days absent in the fall and spring of ninth grade, credits accumulated in the fall and spring of ninth grade, and total misconduct incidents ninth grade.

* Significantly different from zero at the .10 level, two-tailed test.

** Significantly different from zero at the .05 level, two-tailed test.

*** Significantly different from zero at the .01 level, two-tailed test.

# V. PREDICTIVE POWER

In this section, we explore the predictive power of the measures in our data. We first consider the predictive power of each 9th-grade measure separately. We then consider the predictive power of groups of measures, as well as the incremental predictive power by estimating the extent to which one measure (or set of measures) adds to the predictive power of another set of measures. When analyzing one predictor at a time, we summarize the predictive power using a simple correlation ($r$).When analyzing multiple predictors, we summarize the predictive power using the square root of the adjusted $R$-squared statistic ($R$), which we estimate by regressing each outcome on one or more predictors. We use $R$, because it is the multivariate analogue to a correlation. As in Section IV, we present these results in tables with colors that indicate the relative magnitude of the relationships. See Appendix Tables A33–A51 for sensitivity tests and results by subgroup.

## Predictive power of individual measures

Table 14 presents the predictive power of each of the 9th-grade predictors for 10th- and 11th-grade outcomes. This table suggests several conclusions:

- The best predictor of later academic indicators (PSAT score, GPA, credits earned, and fraction of days absent) is previous values of the same variables.
- The best predictor of whether students are on-track in 10th and 11th grade is the 9th-grade academic indicators, especially credits earned. This finding likely arises because whether a student is on-track is, in part, a function of the number of credits earned.
- Of the academic indicators, PSAT scores have the least predictive power for outcomes (except for later PSAT scores).
- The Achievement and Behavioral factors are similarly predictive of outcomes as the academic indicators. For example, past GPA is the best predictor of future GPA, but the behavioral factor is a better predictor of future GPA than credits earned, fractions of days absent, or misconduct offenses.
- The standard measures of the Big Five have predictive power similar to that of the advanced measures of the Big Five. Conscientiousness and Agreeableness stand out as the most predictive.
- If we use the other approaches for handling inconsistencies in the anchoring vignettes, the conclusions change dramatically (see Appendix Table A33). For example, if we assign inconsistent respondents to the minimum score they could have received, the correlation between Conscientiousness-AV and 10th-grade PSAT score is positive and statistically significant ($r$ = 0.19***). On the other hand, if we assign inconsistent respondents to the maximum score they could have achieved, the correlation is statistically significant but negative ($r$= -0.21***). This finding might arise if inconsistency in reporting on the vignettes is related to lower levels of academic skills. In that case, by assigning inconsistent students to low levels of Big Five, the anchoring-adjusted Big Five will appear to be more highly correlated with academic indicators.

**Table 14. Predictive power (*r*) of individual 9th-grade measures for 10th- and 11th-grade outcomes**

| Measure | PSAT Score, 10th grade | GPA , 10th grade | GPA (adjusted), 10th grade | Credits earned, 10th grade | Fraction days absent, 10th grade | Misconduct offenses, 10th grade | On-track, 10th grade | On-track, 11th grade |
|---|---|---|---|---|---|---|---|---|
| Openness | 0.11*** | 0.07* | 0.09** | 0.02 | -0.01 | -0.12*** | 0.00 | 0.02 |
| Conscientiousness | -0.07 | 0.27*** | 0.25*** | 0.07* | -0.12*** | -0.03 | -0.02 | 0.02 |
| Extraversion | -0.11*** | -0.08* | -0.06 | 0.01 | 0.08* | 0.09** | 0.05 | 0.06 |
| Agreeableness | 0.10** | 0.24*** | 0.24*** | 0.12*** | -0.17*** | -0.15*** | -0.05 | 0.05 |
| Emotional Stability | 0.05 | 0.07* | 0.11*** | 0.08** | -0.09** | -0.02 | 0.01 | 0.05 |
| Openness-AV | -0.07* | -0.03 | -0.05 | -0.04 | 0.09** | 0.00 | -0.03 | -0.04 |
| Conscientiousness-AV | 0.02 | 0.28*** | 0.27*** | 0.08** | -0.16*** | -0.04 | 0.00 | 0.04 |
| Extraversion-AV | -0.11*** | -0.02 | -0.02 | 0.07* | 0.03 | 0.10** | 0.05 | 0.11*** |
| Agreeableness-AV | -0.01 | 0.16*** | 0.15*** | 0.07* | -0.12*** | -0.05 | 0.03 | 0.04 |
| Emotional Stability-AV | -0.04 | 0.04 | 0.06 | 0.11*** | -0.10** | -0.04 | 0.04 | 0.05 |
| Conscientiousness-SJT | 0.10** | 0.22*** | 0.24*** | 0.08** | -0.11** | -0.08* | -0.02 | 0.02 |
| Patience | 0.19*** | 0.17*** | 0.18*** | 0.04 | -0.10** | -0.08** | -0.01 | 0.02 |
| Risk Taking | 0.02 | -0.05 | -0.03 | 0.01 | 0.03 | 0.05 | -0.03 | 0.03 |
| Positive Reciprocity | 0.13*** | 0.00 | 0.05 | -0.04 | -0.06 | -0.03 | -0.08** | -0.05 |
| Negative Reciprocity | -0.01 | -0.18*** | -0.17*** | -0.07* | 0.15*** | 0.05 | -0.02 | -0.04 |
| Altruism | 0.04 | 0.02 | 0.03 | 0.05 | -0.05 | -0.03 | -0.06 | 0.04 |
| Cognitive Reflection | 0.37*** | 0.04 | 0.08** | -0.05 | -0.08* | -0.04 | -0.07* | -0.05 |
| PSAT score | 0.88*** | 0.36*** | 0.50*** | 0.18*** | -0.33*** | -0.24*** | 0.08** | 0.17*** |
| GPA | 0.45*** | 0.80*** | 0.80*** | 0.32*** | -0.53*** | -0.18*** | 0.11*** | 0.23*** |
| GPA (adjusted) | 0.59*** | 0.75*** | 0.85*** | 0.35*** | -0.57*** | -0.25*** | 0.14*** | 0.26*** |
| Credits earned | 0.10** | 0.38*** | 0.40*** | 0.48*** | -0.38*** | -0.03 | 0.26*** | 0.44*** |
| Fraction days absent | -0.30*** | -0.50*** | -0.53*** | -0.42*** | 0.77*** | 0.24*** | -0.22*** | -0.32*** |
| Misconduct offenses | -0.24*** | -0.19*** | -0.25*** | -0.24*** | 0.43*** | 0.54*** | -0.12*** | -0.16*** |
| Achievement factor | 0.86*** | 0.40*** | 0.53*** | 0.18*** | -0.35*** | -0.25*** | 0.05 | 0.13*** |
| Behavioral factor | 0.05 | 0.69*** | 0.64*** | 0.35*** | -0.50*** | -0.09** | 0.15*** | 0.26*** |

Sources: Chicago Public Schools administrative data, 2016-2017, 2017–2018, and 2018–2019 school years. Student survey, 2016-2017 school year.

Note: The table displays the correlation between the outcomes and the predictors indicated in the left column. Openness, Conscientiousness, Extraversion, Agreeableness, and Emotional Stability are measured using regression factor scores based on the Big Five Inventory-2 (Soto and John 2017). Patience, Risk Taking, Positive Reciprocity, Negative Reciprocity, and Altruism are measured using items from the Global Preferences Survey (Falk et al. 2016). Cognitive Reflection is measured using regression factor scores based on the Cognitive Reflection Test (Frederick 2005). Openness-AV, Conscientiousness-AV, Extraversion-AV, Agreeableness-AV, and Emotional Stability-AV are measured using regression factor scores based on an anchor-adjusted version of the Big Five Inventory-2 (Soto and John 2017). Conscientiousness-SJT is based on a study-developed situational judgement test designed to measure Conscientiousness. The Achievement factor is a predicted regression factor score based on the components of the PSAT test. The Behavioral factor is a predicted regression factor score based on the fall and spring GPAs from ninth grade, the faction of days absent in the fall and spring of ninth grade, credits accumulated in the fall and spring of ninth grade, and total misconduct incidents in ninth grade.

* Significantly different from zero at the .10 level, two-tailed test.

** Significantly different from zero at the .05 level, two-tailed test.

*** Significantly different from zero at the .01 level, two-tailed test.

## Predictive power of groups of measures and incremental predictive power

We also summarize the predictive power of groups of measures within each of the three measurement approaches (personality, preferences, and academic indicators), as well as the

incremental predictive power among those groups (Table 15). For example, we compare the predictive power of all the standard measures of the Big Five to all the advanced measures of the Big Five. To do so, we regress each outcome on various groups of measures and compare the differences. These analyses suggest several conclusions:

- The standard and advanced measures of the Big Five differ in which outcomes they best predict (compare Rows 1 and 2). For example, the standard measures are better at predicting PSAT scores, whereas the advanced measures are better at predicting credits earned and whether students are on-track.
- Combining the advanced Big Five measures and the standard Big Five measures improves the predictive power above and beyond using only one or the other (compare Rows 1 and 2 with Row 4). This finding suggests that these different approaches capture different information.
- Compared to social preferences (Altruism, Positive Reciprocity, and Negative Reciprocity), traditional preferences (Patience and Risk Taking) are better predictors of indicators that are more related to cognitive skill (such as PSAT score) but worse predictors of more behavioral outcomes (such as absences and whether students are on-track) (compare Rows 6 and 7).
- Combining the social preferences and traditional preferences improves the predictive power relative to including only one or the other (compare Rows 6 and 7 with Row 9).
- For most outcomes, the Achievement and Behavioral factors are nearly as predictive as including all the academic indicators on which they are based (compare Rows 9 and 10). However, the separate academic indicators are more predictive of credits earned and whether students are on-track.

**Table 15. Predictive power ($R$) of 9th-grade measures for 10th- and 11th-grade outcomes**

| # | 9th-grade predictors | PSAT Score, 10th grade | GPA , 10th grade | GPA (adjusted), 10th grade | Credits earned, 10th grade | Fraction days absent, 10th grade | Misconduct offenses, 10th grade | On-track, 10th grade | On-track, 11th grade |
|---|---|---|---|---|---|---|---|---|---|
| | **Standard and advanced Big Five measures** | | | | | | | | |
| 1 | Big Five | 0.25 | 0.32 | 0.30 | 0.09 | 0.19 | 0.20 | 0.00 | 0.00 |
| 2 | Big Five-AV | 0.10 | 0.29 | 0.29 | 0.12 | 0.20 | 0.09 | 0.00 | 0.11 |
| 3 | Conscientiousness-SJT | 0.09 | 0.22 | 0.24 | 0.07 | 0.10 | 0.07 | 0.00 | 0.00 |
| 4 | Big Five + Big Five-AV | 0.33 | 0.34 | 0.34 | 0.14 | 0.23 | 0.21 | 0.04 | 0.09 |
| 5 | Big Five + Big Five-AV + Conscientiousness-SJT | 0.35 | 0.36 | 0.37 | 0.14 | 0.23 | 0.21 | 0.00 | 0.08 |
| | **Preferences** | | | | | | | | |
| 6 | Traditional preferences | 0.19 | 0.16 | 0.18 | 0.00 | 0.08 | 0.08 | 0.00 | 0.00 |
| 7 | Social preferences | 0.11 | 0.17 | 0.17 | 0.07 | 0.16 | 0.00 | 0.06 | 0.04 |
| 8 | Cognitive Reflection | 0.36 | 0.00 | 0.07 | 0.02 | 0.07 | 0.00 | 0.05 | 0.03 |
| 9 | Traditional preferences + social preferences | 0.20 | 0.23 | 0.24 | 0.05 | 0.17 | 0.06 | 0.03 | 0.00 |
| 10 | Traditional preferences + social preferences + Cognitive Reflection | 0.40 | 0.23 | 0.24 | 0.06 | 0.18 | 0.05 | 0.05 | 0.02 |
| | **Measures based on academic indicators** | | | | | | | | |
| 11 | Academic indicators | 0.89 | 0.80 | 0.83 | 0.54 | 0.79 | 0.54 | 0.26 | 0.46 |
| 12 | Achievement and behavioral factors | 0.87 | 0.80 | 0.83 | 0.38 | 0.61 | 0.26 | 0.14 | 0.28 |
| 13 | Academic indicators + Achievement and Behavioral factors | 0.89 | 0.80 | 0.83 | 0.53 | 0.79 | 0.54 | 0.26 | 0.46 |

Sources: Chicago Public Schools administrative data, 2016-2017, 2017–2018, and 2018–2019 school years. Student survey, 2016-2017 school year.

Note: The table displays the square root of the adjusted *R*-squared from regressions of each outcome on the predictors indicated in the left column. Big Five includes Openness, Conscientiousness, Extraversion, Agreeableness, and Emotional Stability, which are measured using regression factor scores based on the Big Five Inventory-2 (Soto and John 2017). Big Five-AV includes Openness-AV, Conscientiousness-AV, Extraversion-AV, Agreeableness-AV, and Emotional Stability-AV, which are measured using regression factor scores based on an anchor-adjusted version of the Big Five Inventory-2 (Soto and John 2017). Conscientiousness-SJT is based on a study-developed situational judgement test designed to measure Conscientiousness. Traditional preference include Patience, Risk Taking, and social preferences include Positive Reciprocity, Negative Reciprocity, and Altruism. All preferences are measured using items from the Global Preferences Survey (Falk et al. 2016). Cognitive Reflection is measured using regression factor scores based on the Cognitive Reflection Test (Frederick 2005). Academic indicators include PSAT score, GPA, GPA (adjusted), credits earned, fraction of days absent, and misconduct offenses. The Achievement factor is a predicted regression factor score based on the components of the PSAT test. The Behavioral factor is a predicted regression factor score based on the fall and spring GPAs from ninth grade, the faction of days absent in the fall and spring of ninth grade, credits accumulated in the fall and spring of ninth grade, and total misconduct incidents in ninth grade.

We also summarize the predictive power across the three main measurement approaches (Table 16). Table 15 suggests that the academic indicators are the most predictive measures for all outcomes. However, it is still possible that some of the survey-based measures predict outcomes above and beyond the academic indicators. These analyses suggest two main conclusions:

1. The separate measures of the academic indicators are the most predictive of later outcomes, and adding any of the other measures does not improve the overall predictive power (compare Row 3 with Row 29, for example).

2. The Big Five (standard or advanced) and the economic preferences are similarly predictive of most outcomes. Combing the Big Five and economic preferences adds to the predictive power over using only one or the other.

**Table 16. Predictive power ($R$) of 9th grade measures (Big Five, preferences, and school records) for 10th- and 11th-grade outcomes**

| # | 9th-grade predictors | | | PSAT Score, 10th grade | GPA , 10th grade | GPA (adjusted), 10th grade | Credits earned, 10th grade | Fraction days absent, 10th grade | Misconduct offenses, 10th grade | On-track, 10th grade | On-track, 11th grade |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Standard Big Five, separate 9th-grade school records** | | | | | | | | | | | |
| 1 | Big Five | | | 0.25 | 0.32 | 0.30 | 0.09 | 0.19 | 0.20 | 0.00 | 0.00 |
| 2 | | Preferences | | 0.40 | 0.23 | 0.24 | 0.06 | 0.18 | 0.05 | 0.05 | 0.02 |
| 3 | | | Academic indicators | 0.89 | 0.80 | 0.83 | 0.54 | 0.79 | 0.54 | 0.26 | 0.46 |
| 4 | Big Five | Preferences | | 0.44 | 0.35 | 0.34 | 0.09 | 0.21 | 0.19 | 0.05 | 0.00 |
| 5 | Big Five | | Academic indicators | 0.89 | 0.80 | 0.83 | 0.53 | 0.79 | 0.55 | 0.26 | 0.45 |
| 6 | | Preferences | Academic indicators | 0.89 | 0.80 | 0.83 | 0.53 | 0.79 | 0.55 | 0.28 | 0.46 |
| 7 | Big Five | Preferences | Academic indicators | 0.89 | 0.80 | 0.83 | 0.53 | 0.79 | 0.56 | 0.27 | 0.45 |
| **Advanced Big Five, separate 9th-grade school records** | | | | | | | | | | | |
| 8 | Big Five (adv) | | | 0.16 | 0.33 | 0.34 | 0.13 | 0.21 | 0.10 | 0.00 | 0.10 |
| 9 | | Preferences | | 0.40 | 0.23 | 0.24 | 0.06 | 0.18 | 0.05 | 0.05 | 0.02 |
| 10 | | | Academic indicators | 0.89 | 0.80 | 0.83 | 0.54 | 0.79 | 0.54 | 0.26 | 0.46 |
| 11 | Big Five (adv) | Preferences | | 0.42 | 0.36 | 0.37 | 0.12 | 0.24 | 0.09 | 0.00 | 0.09 |
| 12 | Big Five (adv) | | Academic indicators | 0.89 | 0.80 | 0.83 | 0.53 | 0.79 | 0.54 | 0.25 | 0.46 |
| 13 | | Preferences | Academic indicators | 0.89 | 0.80 | 0.83 | 0.53 | 0.79 | 0.55 | 0.28 | 0.46 |
| 14 | Big Five (adv) | Preferences | Academic indicators | 0.89 | 0.80 | 0.83 | 0.53 | 0.79 | 0.55 | 0.27 | 0.46 |
| **Standard Big Five, separate 9th-grade Achievement and Behavioral factors** | | | | | | | | | | | |
| 15 | Big Five | | | 0.25 | 0.32 | 0.30 | 0.09 | 0.19 | 0.20 | 0.00 | 0.00 |
| 16 | | Preferences | | 0.40 | 0.23 | 0.24 | 0.06 | 0.18 | 0.05 | 0.05 | 0.02 |
| 17 | | | Academic factors | 0.87 | 0.80 | 0.83 | 0.38 | 0.61 | 0.26 | 0.14 | 0.28 |
| 18 | Big Five | Preferences | | 0.44 | 0.35 | 0.34 | 0.09 | 0.21 | 0.19 | 0.05 | 0.00 |
| 19 | Big Five | | Academic factors | 0.87 | 0.80 | 0.83 | 0.38 | 0.61 | 0.29 | 0.18 | 0.30 |
| 20 | | Preferences | Academic factors | 0.87 | 0.80 | 0.83 | 0.39 | 0.60 | 0.26 | 0.17 | 0.30 |
| 21 | Big Five | Preferences | Academic factors | 0.87 | 0.80 | 0.83 | 0.39 | 0.61 | 0.28 | 0.19 | 0.31 |
| **Advanced Big Five, separate 9th-grade Achievement and Behavioral factors** | | | | | | | | | | | |
| 22 | Big Five (adv) | | | 0.16 | 0.33 | 0.34 | 0.13 | 0.21 | 0.10 | 0.00 | 0.10 |
| 23 | | Preferences | | 0.40 | 0.23 | 0.24 | 0.06 | 0.18 | 0.05 | 0.05 | 0.02 |
| 24 | | | Academic factors | 0.87 | 0.80 | 0.83 | 0.38 | 0.61 | 0.26 | 0.14 | 0.28 |
| 25 | Big Five (adv) | Preferences | | 0.42 | 0.36 | 0.37 | 0.12 | 0.24 | 0.09 | 0.00 | 0.09 |
| 26 | Big Five (adv) | | Academic factors | 0.87 | 0.80 | 0.83 | 0.39 | 0.61 | 0.26 | 0.14 | 0.31 |
| 27 | | Preferences | Academic factors | 0.87 | 0.80 | 0.83 | 0.39 | 0.60 | 0.26 | 0.17 | 0.30 |
| 28 | Big Five (adv) | Preferences | Academic factors | 0.87 | 0.80 | 0.83 | 0.39 | 0.61 | 0.25 | 0.16 | 0.32 |
| **All 9th-grade measures** | | | | | | | | | | | |
| 29 | Big Five, Big Five (adv), preferences, academic indicators, academic factors | | | 0.89 | 0.80 | 0.83 | 0.53 | 0.79 | 0.56 | 0.27 | 0.56 |

Sources: Chicago Public Schools administrative data, 2016-2017, 2017–2018, and 2018–2019 school years. Student survey, 2016-2017 school year.

Note: The table displays the square root of the adjusted $R$-squared from regressions of each outcome on the predictors indicated in the left columns. Big Five includes Openness, Conscientiousness, Extraversion, Agreeableness, and Emotional Stability, which are measured using regression factor scores based on the Big Five Inventory-2 (Soto and John 2017). Big Five (adv) includes Big Five-AV and Conscientiousness-SJT. Big Five-AV includes Openness-AV, Conscientiousness-AV, Extraversion-AV, Agreeableness-AV, and Emotional Stability-AV, which are measured using regression factor scores based on an anchor-adjusted version of the Big Five Inventory-2 (Soto and John 2017). Conscientiousness-SJT is based on a study-developed situational judgement test designed to measure Conscientiousness. Preferences include Patience, Risk Taking, Positive Reciprocity, Negative Reciprocity, Altruism, which are measured using items from the Global Preferences Survey (Falk et al. 2016), as well as Cognitive Reflection, which is measured using regression factor scores based on the Cognitive Reflection Test (Frederick 2005). Academic indicators include PSAT score, GPA, GPA (adjusted), credits earned, fraction of days absent, and misconduct offenses. The

Achievement factor is a predicted regression factor score based on the components of the PSAT test. The Behavioral factor is a predicted regression factor score based on the fall and spring GPAs from ninth grade, the faction of days absent in the fall and spring of ninth grade, credits accumulated in the fall and spring of ninth grade, and total misconduct incidents in ninth grade.

# VI. ASSESSING AND ADDRESSING REFERENCE BIAS

In this section, we assess the extent to which reference bias might arise across the schools in our sample. As discussed earlier, recent evidence suggests that people respond to surveys based on their own reference points (Kyllonen and Bertling 2013, Primi et al. 2016). Reference bias could arise if non-cognitive skills differ systematically across schools or subgroups within schools, and students rate their own skills relative to their peers' skills. In this way, reference bias could also affect the average responses for one school compared to another, thereby biasing comparisons between schools.

Anchoring vignettes provide a way to improve the performance of surveys by addressing reference bias. For example, the PISA 2012—an instrument that assesses student achievement across countries—included a teacher support scale based on subjective student ratings of their teachers and corresponding anchoring vignettes. Before adjusting responses using vignettes, the correlation across countries of achievement and (positive) teacher support suggested a negative relationship between the two variables (Kyllonen and Bertling 2013). This result is surprising, because teacher support and achievement are typically positively related. After adjusting the scale using the vignettes, the correlation between the two variables increased and became positive—as would be expected. The unadjusted negative relationship was likely the misleading result of reference bias. In addition, anchoring vignettes improved internal consistency (reliability) for measures of non-cognitive skills (Primi et al. 2016).

We conduct two sets of analyses to explore reference bias across schools. First, we use responses on anchoring vignettes to characterize the extent to which students from different schools have different reference points. Second, we explore how adjusting students' self-reported non-cognitive skills changes the properties of those reports, including the distribution of non-cognitive skills across schools and the reliability of the measures. These issues are related to the possibility that self-reported measures can depend on aspects of students' situations (see Figure 1).

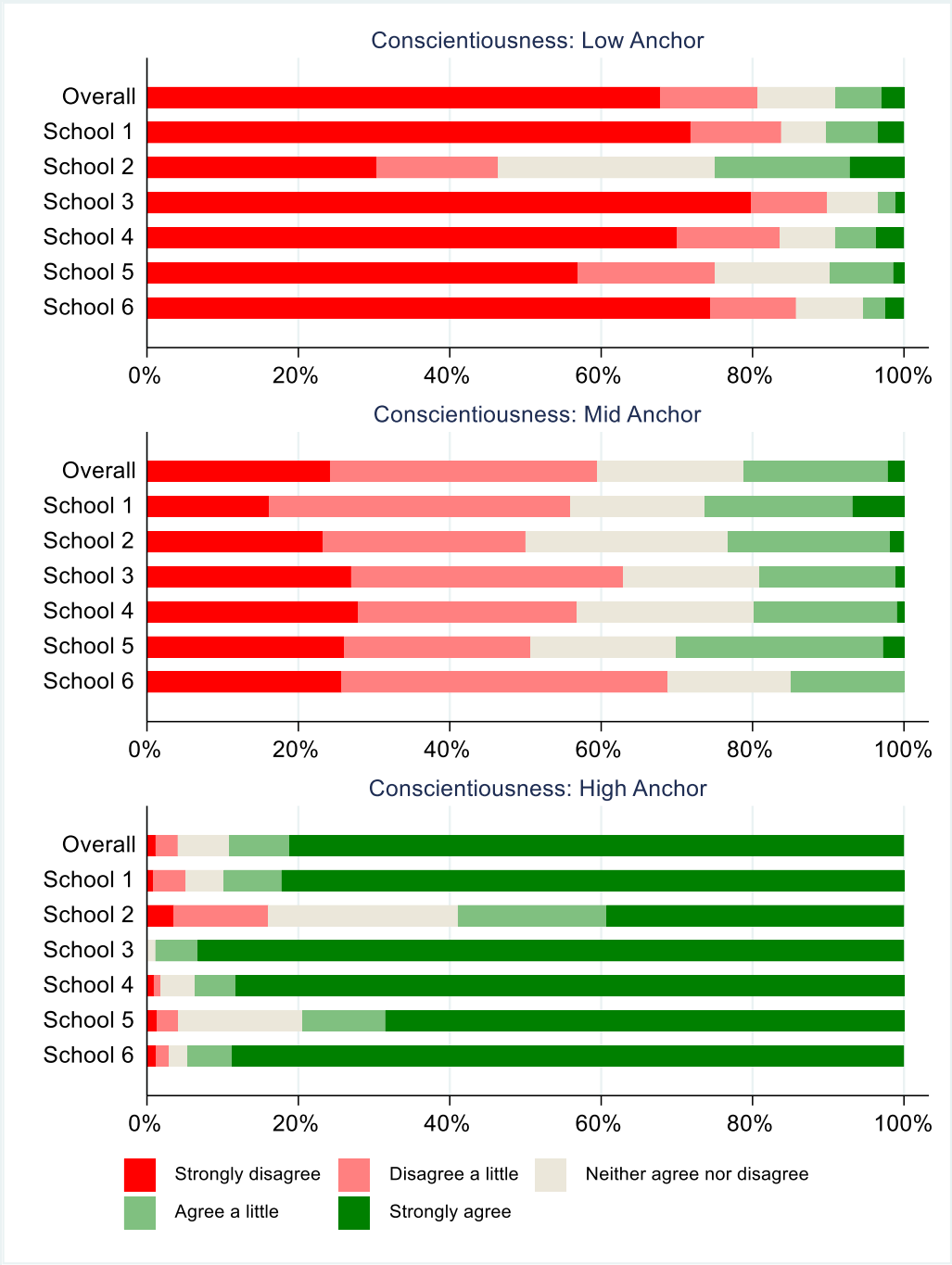
## Assessing reference bias

The anchoring vignettes described in Section III serve not only as a way to adjust students' responses, but also as a measure of how students' reference points differ across schools. In the vignettes, students are asked to rate the extent to which the behavior of a hypothetical person aligns with the students' notion of a particular skill. For example, one of the vignettes asks students to rate the extent to which they agree that a hypothetical person is organized. If students' responses to these items vary systematically across schools, then it suggests that students from different schools have different reference points.

To explore this possibility, we calculated the average response to each of the vignettes for each school. Figure 2 presents these results graphically for anchoring vignettes related to Conscientiousness (see Appendix Section A.6 for figures summarizing the other Big Five vignettes). The shading of the bars represents the percentage of students who select each of the five response options for each school, such that a greener shade indicates more agreement and a

redder shade indicates less agreement. For example, the first panel of Figure 2 displays average responses for the vignette that represents the hypothetical person who exhibits the least Conscientiousness. These results suggest that students differ systematically in their reference points. For example, only about 30 percent of students in School 2 "Strongly disagree" that the person in the Low vignette is organized, whereas nearly 80 percent of students in School 3 "Strongly disagree." The results are similar for other dimensions of the Big Five.

**Figure 2. Percentage of students selecting each response category for the Conscientiousness vignette, by school**




Sources: Chicago Public Schools administrative data, 2016-2017 school year. Student survey, 2016-2017 school year.

Note: The figure displays the percentage of students selecting each response category for the anchoring vignette by school.

Formal statistical tests help confirm that the reference points differ across schools. In particular, we conduct *Chi*-Square tests for whether the responses are equal across schools. Overall, the results suggest that average responses on the anchoring vignettes differ across schools, which suggests that the references points also differ across schools. The differences are

statically significant at the 5 percent level for 13 of the 15 tests and are statistically significant at the 10 percent level for the remaining two tests (Table 17).

**Table 17. Statistical tests of equality of responses on anchoring vignettes across schools**

| | *p*-values from *Chi*-square tests of equality of responses on anchoring vignettes across schools | | |
|---|---|---|---|
| Domain | Low | Mid | High |
| Openness | 0.00 | 0.00 | 0.00 |
| Conscientiousness | 0.00 | 0.01 | 0.00 |
| Extraversion | 0.00 | 0.01 | 0.00 |
| Agreeableness | 0.00 | 0.06 | 0.00 |
| Emotional Stability | 0.00 | 0.10 | 0.00 |

Sources: Chicago Public Schools administrative data, 2016-2017 school year. Student survey, 2016-2017 school year.

## Addressing reference bias

**Distribution of measures across schools.** We consider how adjusting for reference bias would affect comparisons across schools. These results are relevant because similar types of surveys are being used for school accountability and school improvement (West et al. 2018). Table 18 shows the average value of each measure for each school in our sample. The colors indicate the school's relative rank, with a greener shade indicating a more favorable rank and a redder shade indicating a less favorable rank. To facilitate comparisons, we order the schools from left to right based on their average PSAT score. The *p*-value is based on an *F*-test with the null hypothesis that all schools have the same mean for a given measure.

The results suggest that comparisons across schools would differ greatly depending on the exact measure used. Most of the academic indicators give a similar comparison across schools, with School 6 typically performing the best and School 2 performing the worst. The personality measures paint a different picture. For example, the rankings based on both the standard and anchor-adjusted measure of Conscientiousness do not align with the academic indicators, and the *F*-tests suggest that there are no differences across schools. At the same time, the SJT measure of Conscientiousness aligns more closely with the academic indicators, and the differences are statistically significant across schools. This finding is consistent with the possibility that the SJT helps address reference bias. The economic preferences and Cognitive Reflection tend to align most closely to the academic indicators, perhaps because they are based on more objective questions in which students report how they would behave in particular situations.

However, these results are highly sensitive to the approaches for handling inconsistencies in the anchoring vignettes (see Appendix Table A52). For example, if we assign inconsistent respondents to the minimum score they could have received, the average values across schools for the anchor-adjusted measures mirrors that of the academic indicators. On the other hand, if we assign inconsistent respondents to the maximum score they could have achieved, the pattern reverses. This finding supports the possibility that inconsistency in responses on the anchoring vignettes reflects lower levels of academic skills. Therefore, if students who report inconsistently are assigned lower levels of the Big Five, then the distribution of the Big Five will better match the distribution of the academic indicators.

**Table 18. Average value of 9th-grade measures across schools**

| Measure | School 6 | School 1 | School 3 | School 4 | School 5 | School 2 | *p*-value |
|---|---|---|---|---|---|---|---|
| PSAT score | 978.85 | 900.08 | 850.00 | 790.82 | 772.29 | 728.45 | 0.00 |
| GPA | 3.11 | 2.83 | 3.13 | 2.48 | 3.04 | 2.63 | 0.00 |
| GPA (adjusted) | 3.91 | 3.31 | 3.53 | 3.18 | 3.17 | 2.73 | 0.00 |
| Credits earned | 6.92 | 6.74 | 6.94 | 6.76 | 6.74 | 6.80 | 0.02 |
| Fraction days absent | 0.04 | 0.05 | 0.06 | 0.09 | 0.05 | 0.14 | 0.00 |
| Misconduct offenses | 0.04 | 0.21 | 0.20 | 0.31 | 0.56 | 6.83 | 0.00 |
| Openness | 0.03 | 0.16 | 0.06 | 0.06 | -0.31 | -0.15 | 0.02 |
| Openness-AV | -0.15 | 0.03 | 0.00 | 0.13 | -0.11 | 0.31 | 0.03 |
| Conscientiousness | -0.06 | -0.07 | 0.07 | 0.22 | -0.01 | 0.00 | 0.20 |
| Conscientiousness-AV | 0.03 | -0.07 | 0.05 | 0.06 | -0.12 | 0.03 | 0.81 |
| Conscientiousness-SJT | 0.25 | -0.03 | -0.09 | 0.00 | -0.17 | -0.13 | 0.01 |
| Extraversion | -0.02 | 0.06 | -0.23 | 0.16 | -0.15 | 0.11 | 0.04 |
| Extraversion-AV | 0.04 | -0.01 | -0.24 | 0.12 | -0.15 | 0.25 | 0.01 |
| Agreeableness | 0.12 | 0.09 | 0.16 | -0.06 | -0.04 | -0.36 | 0.02 |
| Agreeableness-AV | 0.04 | 0.02 | 0.17 | -0.07 | 0.02 | -0.30 | 0.15 |
| Emotional Stability | 0.08 | -0.07 | -0.33 | 0.25 | 0.02 | -0.03 | 0.00 |
| Emotional Stability-AV | 0.04 | -0.01 | -0.27 | 0.24 | -0.01 | -0.08 | 0.01 |
| Patience | 0.22 | 0.00 | 0.21 | -0.22 | -0.15 | -0.28 | 0.00 |
| Risk Taking | 0.06 | 0.02 | 0.04 | -0.11 | 0.11 | -0.18 | 0.18 |
| Positive Reciprocity | 0.17 | 0.14 | 0.22 | -0.02 | -0.39 | -0.38 | 0.00 |
| Negative Reciprocity | -0.02 | 0.05 | -0.18 | 0.12 | -0.06 | 0.06 | 0.13 |
| Altruism | 0.22 | -0.01 | 0.10 | -0.20 | -0.08 | -0.17 | 0.00 |
| Cognitive Reflection | 0.21 | 0.28 | 0.04 | -0.30 | -0.18 | -0.33 | 0.00 |

Sources: Chicago Public Schools administrative data, 2016-2017 school year. Student survey, 2016-2017 school year.

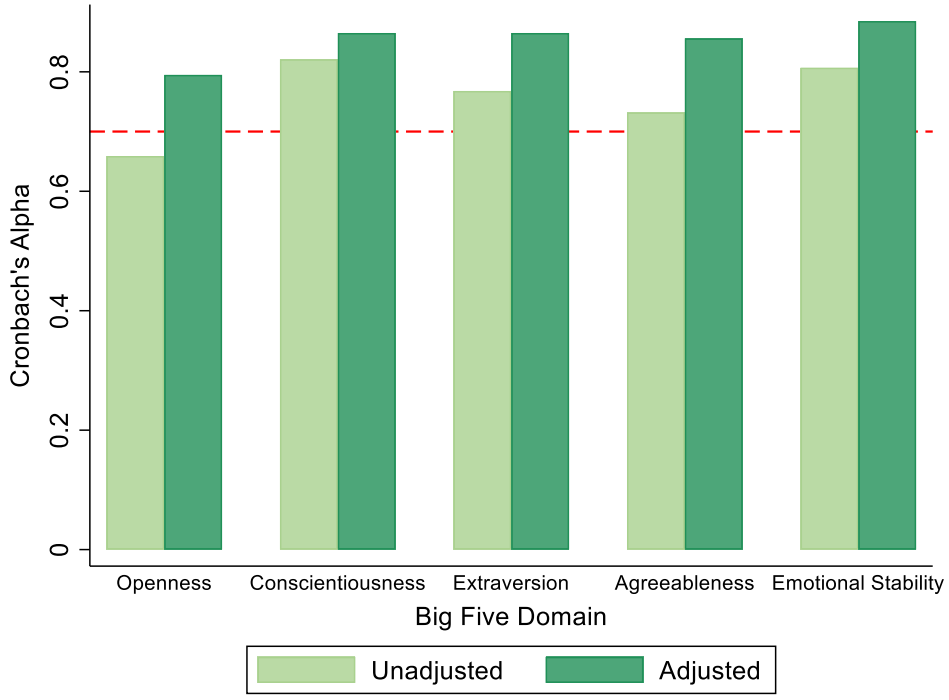
Notes: The table displays the average value of each measure in the left column for each school. The colors indicate the school's relative rank, with a greener shade indicating a more favorable rank and a redder shade indicating a less favorable rank. The *p*-value is based on an *F*-test with the null hypothesis that all schools have the same mean for a given measure. Openness, Conscientiousness, Extraversion, Agreeableness, and Emotional Stability are measured using regression factor scores based on the Big Five Inventory-2 (Soto and John 2017). Patience, Risk Taking, Positive Reciprocity, Negative Reciprocity, and Altruism are measured using items from the Global Preferences Survey (Falk et al. 2016). Cognitive Reflection is measured using regression factor scores based on the Cognitive Reflection Test (Frederick 2005). Openness-AV, Conscientiousness-AV, Extraversion-AV, Agreeableness-AV, and Emotional Stability-AV are measured using regression factor scores based on an anchor-adjusted version of the Big Five Inventory-2 (Soto and John 2017). Conscientiousness-SJT is based on a study-developed situational judgement test designed to measure Conscientiousness.

**Reliability.** In addition, we consider how adjusting the Big Five measures using the anchoring vignettes affects the reliability (internal consistency) as measured by Cronbach's alpha. We find that for all Big Five measures, the adjusted measures have a higher reliability than the unadjusted measures (Figure 3). For example, before adjusting, the reliability for Openness to Experience is less than 0.70, a standard rule of thumb for whether a measure is considered reliable (Bland and Altman 1997). This finding is consistent with previous studies (Primi et al. 2016).

One possibility—not previously explored in the literature—is that the anchoring vignettes might improve the reliability because the adjusted Big Five items vary in a more granular way than do the standard Big Five. In particular, the anchor-adjusted items can range from 1 to 7, whereas the standard Big Five range from 1 to 5. This possibility raises the question: Does the anchoring improve reliability because it accounts for reference bias or because it allows for a greater variance in the items? To address this question, we recoded the anchor-adjusted Big Five items so that it has five categories by combining the bottom two response options and the top two response options. The resulting reliabilities are very similar to those of the original anchor-

adjusted Big Five, suggesting that the improvement in reliability arises by adjusting for reference bias.

**Figure 3. Cronbach's alpha for the Big Five with and without adjusting for reference bias**




Sources: Chicago Public Schools administrative data, 2016-2017 school year. Student survey, 2016-2017 school year.

# VII. EFFECTS OF INCENTIVES ON NON-COGNITIVE MEASURES

In this section, we present results from an experiment that tested the extent to which incentives can influence students' reports on non-cognitive skills. Measures of non-cognitive skills are increasingly being used in higher-stakes settings, such as for accountability in schools. For example, a group of districts in California are using measures of non-cognitive skills for accountability and school improvement (West et al. 2018). In such situations, it is plausible that teachers or school administrators might seek to improve their school's scores by providing students with incentives for their reports on measures of non-cognitive skills. In this section, we present results from an experiment that tested the extent to which incentives could affect students' reports of Conscientiousness.

As the measurement framework (Figure 1) suggests, any measures of a psychological attribute could depend on aspects of the situation, including incentives. For example, experiments demonstrated that incentives—part of a person's situation—can affect performance on cognitive tests, such as IQ tests (see discussion in Section II). The same types of issues might apply to measures of non-cognitive skills. For example, students might respond differently if rewarded for exhibiting a particular trait. However, little is known about the degree to which situations or incentives can affect how students respond to self-reported measures of non-cognitive skills.[12]

## Experimental design

To explore this issue, we implemented an experiment in Part B of the survey in which students were randomly assigned to a treatment condition that received incentives based on their self-reported non-cognitive skills or to a control condition that did not. In Part A of the survey, we collected baseline measures of the full set of Big Five-2 items. In Part B of the survey, we included items that measured Conscientiousness. In Part B, however, the instructions differed based on whether students were randomly assigned to a treatment or control condition (Table 19). Students in the control condition received instructions that explained the definition of Conscientiousness and provided standard instructions for completing the items. Students in the treatment condition received instructions that also indicated they could receive a $5 gift card if their classroom was above average in Conscientiousness for their school. To improve statistical power, we conducted random assignment at the student level, rather than the classroom level. All classrooms had some students with both sets of instructions so that each classroom was eligible for the award.

[12] Some recent experimental evidence studies the effect of survey administration conditions on self-reported non-cognitive skills (Chen et al. Forthcoming).

**Table 19. Experimental conditions for incentive experiment**

| Condition | Instructions that preceded the Conscientiousness items |
|---|---|
| Control | Here are a number of characteristics that may or may not apply to you. Some of these characteristics include being careful, thorough, and hard-working. All of these characteristics are related to a skill called "Conscientiousness" so that people who are careful, thorough, and hard-working have higher levels of "Conscientiousness." |
| Treatment | Here are a number of characteristics that may or may not apply to you. Some of these characteristics include being careful, thorough, and hard-working. All of these characteristics are related to a skill called "Conscientiousness" so that people who are careful, thorough, and hard-working have higher levels of "Conscientiousness."<br><br>Your class at school will be ranked based on your responses to these questions. The scores of your class will be compared to the other 9th-grade classes in the school. Classes that report **higher levels** of Conscientiousness will receive higher scores. Your responses to other questions on this survey will not influence the rankings of classes.<br><br>If your class is ranked in the top half of your school, **our project team will send you and the other students in your class a $5 gift card.** We will mail these to your principal who will make sure you receive the gift card. |

## Analysis approach

To estimate the impact of the incentives on reported Conscientiousness, we use ordinary least squares (OLS) to estimate the following equation:

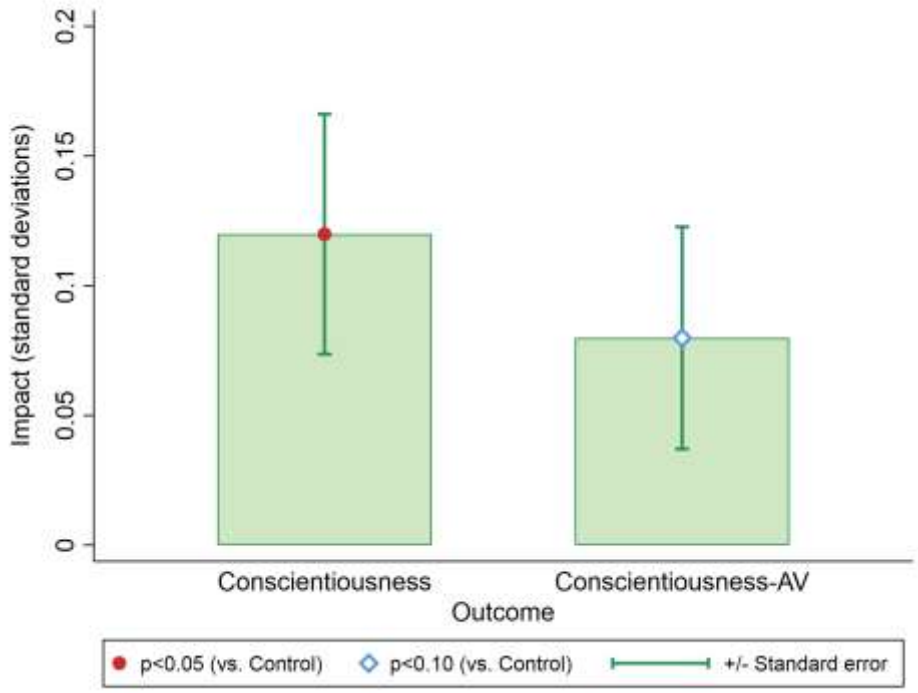
$$Y_{is} = \alpha + \beta T_{is} + \gamma X_{is} + \varepsilon_{is},$$

where $Y_{is}$ is measure of Conscientiousness for individual $i$ in school $s$, $T_{is}$ is an indicator for treatment status, $X_{is}$ is a vector of baseline covariates, and $\varepsilon_{is}$ is an error term. Reported standard errors are corrected for heteroscedasticity with the Huber-White sandwich estimator. To increase the precision of the estimates, our main specification controls for a parsimonious set of covariates (Schochet 2008). In particular, it includes baseline measures of the Big Five-2 and school fixed effects.

## Results

Providing incentives increased students' reports of Conscientiousness by about 0.12 standard deviations and Conscientiousness-AV by about 0.08 standard deviations (Figure 4). These effects are relatively large compared to effects found in the evaluation literature. For example, a meta-analysis of short-term, school-based interventions designed to boost non-cognitive skills found effect sizes of 0.22 to 0.27 across five domains and 0.57 for another domain (Durlak et al. 2011). Although the meta-analysis did not detail the extent to which the programs used incentives, programs designed to boost non-cognitive skills (such as the Quantum Opportunity Program (Schirm et al. 2006)) do provide incentives for positive outcomes. These findings suggests that self-reported measures of non-cognitive skills can depend on relatively small incentives, so should be used with caution in applications where incentives could play a role, such as with school accountability.

**Figure 4. Impact of incentives on Conscientiousness**




Sources: Chicago Public Schools administrative data, 2016-2017 school year. Student survey, 2016-2017 school year.

# APPENDICES

Note: The appendices follow the same numbering and naming as the sections of the report. When there are no references to the appendix in the section of the report, the corresponding appendix appears blank.

# A1. INTRODUCTION

There are no references to the appendix in the corresponding section of the report.

# A2. MEASUREMENT FRAMEWORK

There are no references to the appendix in the corresponding section of the report.

# A3. DATA

## Detailed data definitions

### Table A1. Description of administrative variables

| Variable | Definition | Source |
|---|---|---|
| **Student characteristics** | | |
| Race/ethnicity | Indicators of whether a student was classified as black, Hispanic, white, or other/multiracial at enrollment in the 2016-2017 school year | CPS |
| Primary language spoken at home | Indicators of whether the primary language that the student and the student's family speak at home, as reported by the parent or guardian during enrollment in a given school year, was English, Spanish, or another language | CPS |
| Free or reduced price lunch | Indicator of whether or not a student received free or reduced price lunch in a given school year | CPS |
| Special education enrollment | Indicator of whether or not a student received special education services in a given school year | CPS |
| English as a second language | Indicator of whether or not a student received English as a second language services in a given school year | CPS |
| Gender | Indicator of whether a student was classified as female or male at enrollment in the 2016-2017 school year | CPS |
| Distance from school | Distance in miles, in a straight line, between a student's home address and main school, defined as the school in which the student was enrolled for the most days in the term | CPS |
| **Skill measures based on administrative records** | | |
| Grade point average[1] (GPA) | Average grade on a scale from 0 (F) to 4 (A) in a given semester | CPS |
| Grade point average adjusted for rigor[1, 2] (GPA adjusted) | Average grade on a scale for 0 (F) to 6 (A in an advanced course) in a given semester | CPS |
| Credits earned[3] | Total number of high-school credits earned in a given semester | CPS |
| Minor misconduct offenses (group 1, 2)[4] | Number of behaviors that are inappropriate (group 1) or that disrupt (group 2) reported for a student in a given semester<br>Examples include "Running and/or making excessive noise in the hall or building," "Leaving the classroom without permission," and "Loitering, or occupying an unauthorized place in the school or on school grounds" (group 1), as well as "Leaving the school without permission," "Initiating or participating in an unacceptable minor physical actions," and "Use of the CPS Network for the purposes of distributing or downloading non-educational material" (group 2)<br>These behaviors are not grounds for suspension | CPS |

| Variable | Definition | Source |
|---|---|---|
| Severe misconduct offenses (group 3-6)[4] | Number of behaviors that seriously disrupt (group 3), that very seriously disrupt (group 4), that most seriously disrupt (group 5), or that are illegal and most seriously disrupt (group 6) reported for a student in a given semester<br>Examples include "Disruptive behavior on the school bus," "Gambling - participating in games of chance or skill for money or things of value," "Fighting - physical contact between two people with intent to harm, but no injuries result" (group 3), "Extortion - obtaining money or information from another be coercion or intimidation," "Possession, use, sale, or distribution of fireworks," "Use or possession of alcohol in school or at, before, or after a school related function, first documented behavior" (group 4), "Gang activity or overt displays of gang affiliation," "False activation of a fire alarm which causes a school facility to be evacuated or causes emergency services to be notified," "Inappropriate consensual sexual activity" (group 5), "Arson - knowingly damaging, by means of fire or explosive, a building and/or the personal property of others," "Robbery - taking personal property in the possession of another by use of force or by threatening the imminent use of force," and "Attempted murder - an act that constitutes a substantial step toward intended commission of murder" (group 6)<br>These behaviors may be grounds for suspension | CPS |
| Fraction of days absent | Total number of days absent as a proportion (0 to 1) of total number of days enrolled in any CPS school in a given semester | CPS |
| PSAT test score | Overall score from a standardized test that covers reading comprehension, writing/mechanics, and mathematics on a scale from 320 to 1520 | CPS |
| PSAT reading test score | Score on a scale from 8 to 38 based on the multiple-choice reading comprehension questions in a broader standardized test | CPS |
| PSAT expression of ideas sub-score | Sub-score on a scale from 1 to 15 based on multiple-choice questions that ask students how best to make a writing sample more effective at communicating its point in a broader standardized test | CPS |
| PSAT standard English conventions sub-score | Sub-score on a scale from 1 to 15 based on multiple-choice questions that ask students how best to correct grammar in a writing sample in a broader standardized test | CPS |
| PSAT heart of algebra sub-score | Sub-score on a scale from 1 to 15 based on algebra questions in a broader standardized test | CPS |
| PSAT problem solving and data analysis sub-score | Sub-score on a scale from 1 to 15 from a multiple-choice test administered in the tenth grade based on questions that ask students to interpret word problems, graphs, and tables in a broader standardized test | CPS |
| **Key outcome variables** | | |
| On-track | Indicator for whether or not a student has progressed as expected in a given year compared to grade level upon study enrollment | CPS |

| Variable | Definition | Source |
|---|---|---|
| | Students who are actively enrolled in CPS and have progressed on average at least one grade per year since the 2016-2017 school year are classified as on-track, as are students who graduated from a CPS school and those who were on-track when last enrolled and transferred to homeschooling or a non-CPS school<br>Students who have not advanced at least one grade level per year on average since 2016-2017 or who are not enrolled in CPS and did not either graduate or transfer to homeschooling or a non-CPS school are classified as not on-track; this includes students transferred to correctional institutions or treatment facilities who have not re-enrolled | |

[1] For students in high school, grades are weighted by the number of credits associated with each course and exclude courses completed ungraded (i.e. courses passed on a pass/fail basis). For students in elementary school, individual standards on which students are graded are weighted so that the following categories of standards receive equal total weight: English language arts, mathematics, other academic subjects, and non-academic subjects. Within each category, individual standards are weighted equally. Students with a combination of high-school and elementary grades in a given semester received grade point averages based on their elementary-school assessments alone, as most students in this category had more complete elementary-school performance data. Grades in each semester are available overall, including only high-school courses, and for each of the following subject-matter categories: English language arts, mathematics, other academic subjects, all academic subjects, and non-academic subjects.

[2] Following CPS practices in adjusting grade point averages for course rigor, these averages assign grades of C or above one extra point for honors courses and two extra points for advanced courses. For significantly modified courses, the points associated with each grade are divided by two and rounded up to the nearest integer. These adjustments affect only high-school course grades.

[3] Credits earned exclude credits attempted and failed. In each semester, they are available overall and for each of the following subject-matter categories: English language arts, mathematics, other academic subjects, all academic subjects, and non-academic subjects.

[4] Behavior is categorized by the severity associated with the behavior at the time it occurred, despite changes in how similar behavior may have been categorized at other times. For example, "Unauthorized activation or use of cellular telephones or other information technology device" categorized as behavior that seriously disrupts (group 3) until the 2014-2015 school year, when "Unauthorized use or possession of cellular telephones or other information technology devices" was categorized as behavior that is inappropriate (group 1). Individual incidents may involve multiple kinds of behavior proscribed by the Student Code of Conduct; each behavior reported is counted separately even if they are part of a single incident.

## Table A2. Description of survey variables

| Variable | Definition | Source |
|---|---|---|
| **Traditional measures of non-cognitive skills** | | |
| Big Five | Measures of Openness to Experience, Conscientiousness, Extraversion, Agreeableness, and Emotional Stability based on responses to the Big Five Inventory-II. For each dimension, the measure is calculated as a regression factor score. | Soto and John 2017 |
| **Modifications to standard measures of non-cognitive skills** | | |
| Big Five adjusted for anchoring vignettes (Big Five adjusted) | Measures of Openness to Experience, Conscientiousness, Extraversion, Agreeableness, and Emotional Stability based on responses to the Big Five Inventory-II. Each response is adjusted for reference bias using the methodology described in Section II. For each dimension, the measure is calculated as a regression factor score. | Soto and John 2017, Study |
| Situational judgement test for Conscientiousness | A measure of Conscientiousness based on three items that place respondents in a hypothetical situation and ask which actions they would take in that situation. The measure is calculated as a regression factor score. | Study |
| **Preferences** | | |
| Patience | A scale that elicits a respondent's tendency to be patient. It is constructed as a weighted average of responses to two survey items based on the Global Preferences Survey (Falk et al. 2016). The first item presents respondents with a series of questions about the extent to which they prefer a payment of a given size today compared to a larger payment in the future. The second item asks respondents to rate the extent to which the following statement describes them: "I do not spend money today so that I will be able to afford more tomorrow." The values for each of these items are normalized to have a standard deviation of one and a mean of zero. The items are averaged by using the weights derived for the Global Preferences Survey (Falk et al. 2018). | Falk et al. 2016, Falk et al. 2018 |
| Risk Taking | A scale that elicits a respondent's tendency to take risks. It is constructed as a weighted average of responses to two survey items based on the Global Preferences Survey (Falk et al. 2016). The first item presents respondents with a series of questions about the extent to which they prefer sure payment relative to a lottery. The second item asks respondents to rate the extent to which they take risks: "Are you a person who is generally willing to take risks, or do you try to avoid taking risks?" The values for each of these items are normalized to have a standard deviation of one and a mean of zero. The items are averaged by using the weights derived for the Global Preferences Survey (Falk et al. 2018). | Falk et al. 2016, Falk et al. 2018 |
| Positive Reciprocity | A measure that elicits a respondent's tendency to respond in a positive way when someone treats them positively. The item asks respondents to rate the extent to which the following statement describes them: "When someone does me a favor, I | Falk et al. 2016 |

| Variable | Definition | Source |
|---|---|---|
| | am willing to return the favor." The values for the item are normalized to have a standard deviation of one and a mean of zero. | |
| Negative Reciprocity | A measure that elicits a respondent's tendency to respond in a negative way when someone else treats them or someone else poorly. It is constructed as a weighted average of responses to two survey items based on the Global Preferences Survey (Falk et al. 2016). The first item asks respondents to rate the extent to which the following statement describes them: "When someone does me a favor, I am willing to return the favor" (reverse-coded). The second items asks respondents "How willing are you to punish someone who treats others unfairly, even if there may be costs for you?" The values for each of these items are normalized to have a standard deviation of one and a mean of zero. The items are averaged by using the weights derived for the Global Preferences Survey (Falk et al. 2018). | Falk et al. 2016, Falk et al. 2018 |
| Altruism | A measure that captures the extent to which students are willing to share resources with others without seeking repayment. It is constructed as a weighted average of responses to two survey items based on the Global Preferences Survey (Falk et al. 2016). The first item asks how much (of an unexpected $1,600), the respondent would donate to charity. The second item asks respondents to rate the extent to which the following statement describes them: "I do not understand why people spend their whole lives fighting for a cause that does not directly benefit them" (reverse-coded). The values for each of these items are normalized to have a standard deviation of one and a mean of zero. The items are averaged by using the weights derived for the Global Preferences Survey (Falk et al. 2018). | Falk et al. 2016, Falk et al. 2018 |
| Cognitive Reflection | A three-item measure that captures a person's ability to make deliberate and thoughtful decisions by inhibiting initial responses and reactions. We measured cognitive reflection using the Cognitive Reflection Test, a standard three-item measure (Frederick 2005), which we detail in Table 6. We estimate a factor model in which we model the probability that a respondent answers a question correctly as a function of their underlying Cognitive Reflection. We then calculate regression factor scores for each student. | Frederick 2005 |

## Reducing dimensionality of administrative data

We use a factor model to (1) reduce the dimensionality of these administrative data (grade point average, credits, disciplinary infractions, and sub-scores on achievement test) and (2) provide a clearer interpretation to our impact estimates. First, by applying standard methods to explore how many latent factors underlie the data, we determined that two factors are sufficient to explain the variation in measures. To test this possibility, we conduct a "scree test" by performing a principal component analysis on the full set of 9th-grade measures. We find that the first two eigenvalues are greater than 1 and the third is less than 1.The Kaiser criterion with Horn's adjustment for sampling error also suggest two factors (Horn 1965, Kaiser 1960)

We then define a measurement system that allows each measure $M_j$ to depend on a factor that represents cognitive skills $(\theta_c)$ and one that represents non-cognitive skills $(\theta_N)$. As discussed by recent studies in economics, these measures themselves are forms of behavior and could be influenced by incentives or aspects of a person's situation (Heckman and Kautz 2012, Kautz et al. 2014), which we denote as $W_j$. In our application, for example, we allow attendance to depend on the distance a student lives from school, which proxies for the level of effort students would have to exert to attend classes. We use a linear model to capture the relationship between the measures and latent variables:

$$M_j = \alpha_{C,j}\theta_C + \alpha_{N,j}\theta_N + \beta_j W_j + \varepsilon_j,$$

where $\varepsilon_j$ is the measurement error and $\alpha_{k,j}$ $k \in \{C, N\}$ are the "factor loadings" of skill $k$ on measurement $j$. We assume that $\varepsilon_j$ is statistically independent of $(\theta_k, W_j)$ and $\varepsilon_j$ is independent of $\varepsilon_i$ for $j \neq i$.

We set the scale of the latent variables so that for one measure $(k)$ the factor loading on cognitive skill is one $(\alpha_{C,k} = 1)$ and that for another measure $(l)$ the factor loading on non-cognitive skill is one $(\alpha_{N,l} = 1)$. An alternative normalization that would lead to the same variance explained in the outcomes sets each of the factor variances to one. This factor model is identified if there are at least two measures of cognitive skill and three measures that depend on both cognitive and non-cognitive skills (Anderson and Rubin 1956, Williams 2019).

Under these normalizations, the cognitive skill factor represents what is measured by achievement tests (after correcting for measurement error) and the non-cognitive skill factor represents the underlying dimension that is captured by the other 9th-grade measures that is not explained by cognitive skill. In this way, any predictive power of non-cognitive skills represents the additional gain from using the other measures to supplement achievement tests. This operational definition is particularly interpretable in the context of the US educational system, which relies on achievement test scores to evaluate students. However, it understates the true importance of non-cognitive skills, because performance on achievement tests depends on non-cognitive skills to some degree (Borghans et al. 2011b).

# Survey Instrument #1

MATHEMATICA
Policy Research

**Social and Emotional Skills Project: Survey A**

## Instructions

- This survey will ask you questions about yourself. The survey should take about 30 minutes.
- Your answers are private and no one at your school will see your answers.
- Please use a pencil or a blue or black pen. Write dark and clearly.
- In each section, please read the directions carefully before starting.
- There are no right or wrong answers. Answer each question as best as you can.

**Before answering any questions, please write down your student ID number and the current time in the boxes below.**

| | |
|---|---|
| Your student ID number | |

| | | |
|---|---|---|
| What is the current time to the nearest minute? | | HH:MM |

## Section 1

**In this section, you will be asked to rate each characteristic according to how well it describes you. Please read the directions carefully before you begin and answer each line on the grid as best as you can. There are no right or wrong answers.**

**Here are a number of characteristics that may or may not apply to you.**
**Please check a box to indicate the extent to which** you agree or disagree with each statement.

| **I am someone who…** | | **Disagree strongly** | **Disagree a little** | **Neither agree nor disagree** | **Agree a little** | **Agree strongly** |
|---|---|---|---|---|---|---|
| | | **MARK ONE FOR EACH ROW** | | | | |
| 1. | Is outgoing or sociable | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 2. | Is compassionate or has a soft heart | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 3. | Tends to be disorganized | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 4. | Is relaxed or handles stress well | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 5. | Has few artistic interests | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 6. | Has an assertive, strong, or bold personality | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 7. | Is respectful or treats others with respect | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 8. | Tends to be lazy | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 9. | Stays optimistic after experiencing a setback | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 10. | Is curious about many different things | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 11. | Rarely feels excited or eager | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 12. | Tends to find fault with others | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 13. | Is dependable, steady | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 14. | Is moody or has up and down mood swings | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 15. | Is inventive or finds clever ways to do things | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 16. | Tends to be quiet | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 17. | Feels little sympathy for others | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 18. | Is systematic or likes to keep things in order | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |

**Here are a number of characteristics that may or may not apply to you. Please check a box to indicate the extent to which** you agree or disagree with each statement.

**MARK ONE FOR EACH ROW**

| **I am someone who…** | | **Disagree strongly** | **Disagree a little** | **Neither agree nor disagree** | **Agree a little** | **Agree strongly** |
|---|---|---|---|---|---|---|
| 19. | Can be tense | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 20. | Is fascinated by art, music, or literature | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 21. | Is dominant or acts as a leader | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 22. | Starts arguments with others | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 23. | Has difficulty getting started on tasks | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 24. | Feels secure or comfortable with myself | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 25. | Avoids intellectual, academic, or philosophical discussions | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 26. | Is less active than other people | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 27. | Has a forgiving nature | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 28. | Can be somewhat careless | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 29. | Is emotionally stable or not easily upset | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 30. | Has little creativity | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 31. | Is sometimes shy or introverted | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 32. | Is helpful and unselfish with others | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 33. | Keeps things neat and tidy | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 34. | Worries a lot | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 35. | Values art and beauty | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 36. | Finds it hard to influence people | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 37. | Is sometimes rude to others | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 38. | Is efficient or gets things done | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 39. | Often feels sad | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 40. | Is complex or a deep thinker | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |

**Here are a number of characteristics that may or may not apply to you. Please check a box to indicate the extent to which** you agree or disagree with each statement.

**MARK ONE FOR EACH ROW**

| **I am someone who…** | | **Disagree strongly** | **Disagree a little** | **Neither agree nor disagree** | **Agree a little** | **Agree strongly** |
|---|---|---|---|---|---|---|
| 41. | Is full of energy | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 42. | Is suspicious of others' intentions | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 43. | Is reliable and can always be counted on | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 44. | Keeps their emotions under control | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 45. | Has difficulty imagining things | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 46. | Is talkative | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 47. | Can be cold and uncaring | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 48. | Leaves a mess or doesn't clean up | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 49. | Rarely feels anxious or afraid | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 50. | Thinks poetry and plays are boring | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 51. | Prefers to have others take charge | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 52. | Is polite or courteous to others | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 53. | Is persistent or works until the task is finished | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 54. | Tends to feel depressed, blue, or down | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 55. | Has little interest in abstract ideas | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 56. | Shows a lot of enthusiasm | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 57. | Assumes the best about people | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 58. | Sometimes behaves irresponsibly | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 59. | Is temperamental or gets emotional easily | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 60. | Is original or comes up with new ideas | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |

## Section 2

**In this section, you will be asked to read a few short paragraphs and rate the actions of the person in the paragraph. Please read the question carefully and answer each question as best as you can.**

**1.** **Jamie is willing to try new foods and experiences especially when suggested by friends. When given a reading assignment on a new topic, Jamie reads what is assigned but will be interested in the material and will have questions to raise in class.**

**How much do you agree or disagree that Jamie is someone who is curious?**

| Disagree strongly | Disagree a little | Neither agree nor disagree | Agree a little | Agree strongly |
|---|---|---|---|---|
| ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |

**2.** **Alex prefers to stick to a routine and does not like trying new activities. When given a reading assignment on a new topic, Alex reads what is assigned and will not have questions about the material.**

**How much do you agree or disagree that Alex is someone who is curious?**

| Disagree strongly | Disagree a little | Neither agree nor disagree | Agree a little | Agree strongly |
|---|---|---|---|---|
| ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |

**3.** **Morgan reads books covering many different subjects during free time and enjoys trying new foods, music, and experiences. When given a reading assignment on a new topic, Morgan often has questions about the material and reads other related materials on the topic to find answers.**

**How much do you agree or disagree that Morgan is someone who is curious?**

| Disagree strongly | Disagree a little | Neither agree nor disagree | Agree a little | Agree strongly |
|---|---|---|---|---|
| ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |

**4.** **Jordan talks to many different people at parties and will start conversations with new people. Jordan likes to be the center of attention.**

**How much do you agree or disagree that Jordan is someone who is outgoing?**

| Disagree strongly | Disagree a little | Neither agree nor disagree | Agree a little | Agree strongly |
|---|---|---|---|---|
| ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |

**5.** **Dylan prefers to spend time with a few close friends and does not enjoy meeting new people. At parties, Dylan will not approach new people and feels uncomfortable when approached by new people.**

**How much do you agree or disagree that Dylan is someone who is outgoing?**

| Disagree strongly | Disagree a little | Neither agree nor disagree | Agree a little | Agree strongly |
|---|---|---|---|---|
| ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |

**6.** **Riley enjoys spending time with others and occasionally meets new people. At parties, Riley feels comfortable talking with new people but does not actively seek to be the center of attention in conversations.**

**How much do you agree or disagree that Riley is someone who is outgoing?**

| Disagree strongly | Disagree a little | Neither agree nor disagree | Agree a little | Agree strongly |
|---|---|---|---|---|
| ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |

**7.** **Angel spends time listening to peers and their problems, leans on peers when in need of help, and has constructive conversations with teachers and parents when they disagree. Angel will occasionally get angry if insulted by someone.**

**How much do you agree or disagree that Angel is someone who is friendly?**

| Disagree strongly | Disagree a little | Neither agree nor disagree | Agree a little | Agree strongly |
|---|---|---|---|---|
| ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |

**8.** **Bailey is the friend that others always go to for support and advice. Bailey tries to help others, avoid conflicts, and find a solution that will work for everyone in a disagreement.**

**How much do you agree or disagree that Bailey is someone who is friendly?**

| Disagree strongly | Disagree a little | Neither agree nor disagree | Agree a little | Agree strongly |
|---|---|---|---|---|
| ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |

**9.** **Cory insults peers, does not spend time listening to other people's problems, and will frequently get into arguments with teachers and parents.**

**How much do you agree or disagree that Cory is someone who is friendly?**

| Disagree strongly | Disagree a little | Neither agree nor disagree | Agree a little | Agree strongly |
|---|---|---|---|---|
| ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |

**10.** **Kelley always remains calm in stressful situations. When Kelley is well-prepared for a test in school, Kelley does not feel nervous about doing well.**

**How much do you agree or disagree that Kelley is someone who is anxious?**

| Disagree strongly | Disagree a little | Neither agree nor disagree | Agree a little | Agree strongly |
|---|---|---|---|---|
| ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |

**11.** **Sam finds it hard to remain calm in stressful situations. Even when well-prepared for a test in school, Sam has trouble sleeping due to nervousness about not doing well.**

**How much do you agree or disagree that Sam is someone who is anxious?**

| Disagree strongly | Disagree a little | Neither agree nor disagree | Agree a little | Agree strongly |
|---|---|---|---|---|
| ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |

**12.** **Nat tends to remain calm in stressful situations but sometimes feels overwhelmed. When well-prepared for a test in school, Nat is still somewhat nervous but can calm down eventually.**

**How much do you agree or disagree that Nat is someone who is anxious?**

| Disagree strongly | Disagree a little | Neither agree nor disagree | Agree a little | Agree strongly |
|---|---|---|---|---|
| ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |

**13.** **When Jesse is given a school assignment, Jesse starts the assignment right away, works on it until the assignment is completed, and double checks the answers. Jesse organizes books in the locker and keeps all of the school papers in separate folders for each subject.**

**How much do you agree or disagree that Jesse is someone who is organized?**

| Disagree strongly | Disagree a little | Neither agree nor disagree | Agree a little | Agree strongly |
|---|---|---|---|---|
| ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |

**14.** **When Robin is given a school assignment, Robin usually remembers deadlines but sometimes will turn assignments in late. When in a hurry, Robin might leave a school locker messy. Robin uses a folder for school papers and homework.**

**How much do you agree or disagree that Robin is someone who is organized?**

| Disagree strongly | Disagree a little | Neither agree nor disagree | Agree a little | Agree strongly |
|---|---|---|---|---|
| ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |

**15.** **When Taylor is given a school assignment, Taylor does not usually start the assignment until right before the deadline and frequently does not meet deadlines. Taylor does not arrange materials in the school locker and places all of the papers in a backpack without using a folder.**

**How much do you agree or disagree that Taylor is someone who is organized?**

| Disagree strongly | Disagree a little | Neither agree nor disagree | Agree a little | Agree strongly |
|---|---|---|---|---|
| ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |

## Section 3

**In this section, you will be asked to rate your willingness to take risks and then to imagine a few different scenarios. Please read the directions carefully before you begin and answer each question as best as you can.**

**1.** **How do you see yourself: are you a person who is generally willing to take risks, or do you try to avoid taking risks?**

**Please use a scale from 0 to 10, where a 0 means you are "completely unwilling to take risks" and a 10 means you are "very willing to take risks". You can also use the values in-between to indicate where you fall on the scale.**

| Completely unwilling to take risks | | | | | | | | | | Very willing to take risks |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| ☐ 0 | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 | ☐ 6 | ☐ 7 | ☐ 8 | ☐ 9 | ☐ 10 |

**2.** **Please imagine the following situation: Someone is offering you money and they give you two choices about how you want it. The first is a lottery where you have a 50 percent chance of receiving $450 and a 50 percent chance you receive nothing. The second is guaranteed payment (meaning, you will get the money no matter what).**

**Now in each of the following situations, imagine you had to choose between a 50/50 chance of winning $450 and a guaranteed payment.**

**You will be presented with five different situations. The lottery is the same in all situations: a 50/50 chance of winning $450. The guaranteed payment is different in every situation.**

**2a.** **Would you prefer a 50/50 chance of winning $450 or the amount of $240 as a guaranteed payment?**

☐ 1 50/50 chance of $450 → **GO TO QUESTION 2q**

☐ 2 Guaranteed payment of $240 → **GO TO QUESTION 2b**

**2b.** **Would you prefer the 50/50 chance of winning $450 or the amount of $120 as a guaranteed payment?**

- ☐ 1 50/50 chance of $450 → **GO TO QUESTION 2j**
- ☐ 2 Guaranteed payment of $120 **GO TO QUESTION 2c**

**2c.** **Would you prefer the 50/50 chance of winning $450 or the amount of $60 as a guaranteed payment?**

- ☐ 1 50/50 chance of $450 **GO TO QUESTION 2d**
- ☐ 2 Guaranteed payment of $60 → **GO TO QUESTION 2g**

**2d.** **Would you prefer the 50/50 chance of winning $450 or the amount of $90 as a guaranteed payment?**

- ☐ 1 50/50 chance of $450 **GO TO QUESTION 2e**
- ☐ 2 Guaranteed payment of $90 → **GO TO QUESTION 2f**

**2e.** **Would you prefer the 50/50 chance of winning $450 or the amount of $105 as a guaranteed payment?**

- ☐ 1 50/50 chance of $450 → **STOP. GO TO SECTION 4 (PAGE 17)**
- ☐ 2 Guaranteed payment of $105 → **STOP. GO TO SECTION 4 (PAGE 17)**

**2f.** **Would you prefer the 50/50 chance of winning $450 or the amount of $75 as a guaranteed payment?**

- ☐ 1 50/50 chance of $450 → **STOP. GO TO SECTION 4 (PAGE 17)**
- ☐ 2 Guaranteed payment of $75 → **STOP. GO TO SECTION 4 (PAGE 17)**

**2g.** **Would you prefer the 50/50 chance of winning $450 or the amount of $30 as a guaranteed payment?**

- ☐ 1 50/50 chance of $450 → **GO TO QUESTION 2h**
- ☐ 2 Guaranteed payment of $30 → **GO TO QUESTION 2i**

**2h.** **Would you prefer the 50/50 chance of winning $450 or the amount of $45 as a guaranteed payment?**

- ☐ 1 50/50 chance of $450 → **STOP. GO TO SECTION 4 (PAGE 17)**
- ☐ 2 Guaranteed payment of $45 → **STOP. GO TO SECTION 4 (PAGE 17)**

**2i.** **Would you prefer the 50/50 chance of winning $450 or the amount of $15 as a guaranteed payment?**

- ☐ 1 50/50 chance of $450 → **STOP. GO TO SECTION 4 (PAGE 17)**
- ☐ 2 Guaranteed payment of $15 → **STOP. GO TO SECTION 4 (PAGE 17)**

**2j.** **Would you prefer the 50/50 chance of winning $450 or the amount of $180 as a guaranteed payment?**

- ☐ 1 50/50 chance of $450 → **GO TO QUESTION 2n**
- ☐ 2 Guaranteed payment of $180 **GO TO QUESTION 2k**

**2k.** **Would you prefer the 50/50 chance of winning $450 or the amount of $150 as a guaranteed payment?**

- ☐ 1 50/50 chance of $450 → **GO TO QUESTION 2m**
- ☐ 2 Guaranteed payment of $150 **GO TO QUESTION 2l**

**2l.** **Would you prefer the 50/50 chance of winning $450 or the amount of $135 as a guaranteed payment?**

- ☐ 1 50/50 chance of $450 → **STOP. GO TO SECTION 4 (PAGE 17)**
- ☐ 2 Guaranteed payment of $135 → **STOP. GO TO SECTION 4 (PAGE 17)**

**2m.** **Would you prefer the 50/50 chance of winning $450 or the amount of $165 as a guaranteed payment?**

- ☐ 1 50/50 chance of $450 → **STOP. GO TO SECTION 4 (PAGE 17)**
- ☐ 2 Guaranteed payment of $165 → **STOP. GO TO SECTION 4 (PAGE 17)**

**2n.** **Would you prefer the 50/50 chance of winning $450 or the amount of $210 as a guaranteed payment?**

- ☐ 1 50/50 chance of $450 → **GO TO QUESTION 2o**
- ☐ 2 Guaranteed payment of $210 → **GO TO QUESTION 2p**

**2o.** **Would you prefer the 50/50 chance of winning $450 or the amount of $225 as a guaranteed payment?**

- ☐ 1 50/50 chance of $450 → **STOP. GO TO SECTION 4 (PAGE 17)**
- ☐ 2 Guaranteed payment of $225 → **STOP. GO TO SECTION 4 (PAGE 17)**

**2p.** **Would you prefer the 50/50 chance of winning $450 or the amount of $195 as a guaranteed payment?**

- ☐ 1 50/50 chance of $450 → **STOP. GO TO SECTION 4 (PAGE 17)**
- ☐ 2 Guaranteed payment of $195 → **STOP. GO TO SECTION 4 (PAGE 17)**

**2q.** **Would you prefer the 50/50 chance of winning $450 or the amount of $360 as a guaranteed payment?**

- ☐ 1 50/50 chance of $450 → **GO TO QUESTION 2y**
- ☐ 2 Guaranteed payment of $360 **GO TO QUESTION 2r**

**2r.** **Would you prefer the 50/50 chance of winning $450 or the amount of $300 as a guaranteed payment?**

- ☐ 1 50/50 chance of $450 → **GO TO QUESTION 2v**
- ☐ 2 Guaranteed payment of $300 → **GO TO QUESTION 2s**

**2s.** **Would you prefer the 50/50 chance of winning $450 or the amount of $270 as a guaranteed payment?**

- ☐ 1 50/50 chance of $450 → **GO TO QUESTION 2t**
- ☐ 2 Guaranteed payment of $270 → **GO TO QUESTION 2u**

**2t.** **Would you prefer the 50/50 chance of winning $450 or the amount of $285 as a guaranteed payment?**

- ☐ 1 50/50 chance of $450 → **STOP. GO TO SECTION 4 (PAGE 17)**
- ☐ 2 Guaranteed payment of $285 → **STOP. GO TO SECTION 4 (PAGE 17)**

**2u.** **Would you prefer the 50/50 chance of winning $450 or the amount of $255 as a guaranteed payment?**

- ☐ 1 50/50 chance of $450 → **STOP. GO TO SECTION 4 (PAGE 17)**
- ☐ 2 Guaranteed payment of $255 → **STOP. GO TO SECTION 4 (PAGE 17)**

**2v.** **Would you prefer the 50/50 chance of winning $450 or the amount of $330 as a guaranteed payment?**

- ☐ 1 50/50 chance of $450 **GO TO QUESTION 2w**
- ☐ 2 Guaranteed payment of $330 → **GO TO QUESTION 2x**

**2w.** **Would you prefer the 50/50 chance of winning $450 or the amount of $345 as a guaranteed payment?**

- ☐ 1 50/50 chance of $450 → **STOP. GO TO SECTION 4 (PAGE 17)**
- ☐ 2 Guaranteed payment of $345 → **STOP. GO TO SECTION 4 (PAGE 17)**

**2x.** **Would you prefer the 50/50 chance of winning $450 or the amount of $315 as a guaranteed payment?**

- ☐ 1 50/50 chance of $450 → **STOP. GO TO SECTION 4 (PAGE 17)**
- ☐ 2 Guaranteed payment of $315 → **STOP. GO TO SECTION 4 (PAGE 17)**

**2y.** **Would you prefer the 50/50 chance of winning $450 or the amount of $420 as a guaranteed payment?**

- ☐ 1 50/50 chance of $450 → **GO TO QUESTION 2ac**
- ☐ 2 Guaranteed payment of $420 → **GO TO QUESTION 2z**

**2z.** **Would you prefer the 50/50 chance of winning $450 or the amount of $390 as a guaranteed payment?**

- ☐ 1 50/50 chance of $450 → **GO TO QUESTION 2aa**
- ☐ 2 Guaranteed payment of $390 → **GO TO QUESTION 2ab**

**2aa.** **Would you prefer the 50/50 chance of winning $450 or the amount of $405 as a guaranteed payment?**

- ☐ 1 50/50 chance of $450 → **STOP. GO TO SECTION 4 (PAGE 17)**
- ☐ 2 Guaranteed payment of $405 → **STOP. GO TO SECTION 4 (PAGE 17)**

**2ab.** **Would you prefer the 50/50 chance of winning $450 or the amount of $375 as a guaranteed payment?**

- ☐ 1 50/50 chance of $450 → **STOP. GO TO SECTION 4 (PAGE 17)**
- ☐ 2 Guaranteed payment of $375 → **STOP. GO TO SECTION 4 (PAGE 17)**

**2ac.** **Would you prefer the 50/50 chance of winning $450 or the amount of $450 as a guaranteed payment?**

- ☐ 1 50/50 chance of $450 → **GO TO QUESTION 2ae**
- ☐ 2 Guaranteed payment of $450 **GO TO QUESTION 2ad**

**2ad.** **Would you prefer the 50/50 chance of winning $450 or the amount of $435 as a guaranteed payment?**

- ☐ 1 50/50 chance of $450 → **STOP. GO TO SECTION 4 (PAGE 17)**
- ☐ 2 Guaranteed payment of $435 → **STOP. GO TO SECTION 4 (PAGE 17)**

**2ae.** **Would you prefer the 50/50 chance of winning $450 or the amount of $465 as a guaranteed payment?**

- ☐ 1 50/50 chance of $450 → **STOP. GO TO SECTION 4 (PAGE 17)**
- ☐ 2 Guaranteed payment of $465 → **STOP. GO TO SECTION 4 (PAGE 17)**

## Section 4

**In this section, you will be asked a few questions about yourself and your family. Please read the directions before you begin and answer each question as best as you can.**

**1.** **On a typical school night, how much time do you spend doing your homework? Your best estimate is fine. If none, please enter "0".**

☐☐ HOURS ☐☐ MINUTES

**2.** **Do you participate in any of the following activities at school or outside of school?**

| | | MARK ONE FOR EACH ROW | |
|---|---|---|---|
| | | Yes | No |
| a. | Student government | ☐1 | ☐0 |
| b. | Band, orchestra, chorus, or choir | ☐1 | ☐0 |
| c. | School plays or musicals | ☐1 | ☐0 |
| d. | Organized sports or exercise | ☐1 | ☐0 |
| e. | A school yearbook, newspaper, or magazine | ☐1 | ☐0 |
| f. | Community service or volunteer activities | ☐1 | ☐0 |
| g. | Academic clubs, such as a math club, or foreign language club, or an academic honor society, like the National Honor Society | ☐1 | ☐0 |
| h. | Other types of clubs, for example, an arts or crafts club, computer club, drama club, or games club | ☐1 | ☐0 |
| i. | Tutoring (receiving or providing) | ☐1 | ☐0 |
| j. | Have you participated in any other activities, which are not already mentioned? (*specify*) | ☐1 | ☐0 |

**3.** **Last week in school, how many days did you do each of the following things? Please enter a number between 0 days and 5 days. Do not count days you were not in school.**

| | | NUMBER OF DAYS (0-5) |
|---|---|---|
| a. | I went to all of my classes prepared | |
| b. | I remained calm even when things happened that could upset me | |
| c. | I paid attention in all of my classes | |
| d. | I listened to other students speak without interrupting them | |
| e. | I was polite to adults and other students | |
| f. | I remembered and followed directions | |
| g. | I controlled my temper | |
| h. | I got to work right away rather than procrastinating | |
| i. | I set specific academic goals at school, such as getting a good grade in a particular test or class | |
| j. | I worked on school assignments with classmates outside of school | |
| k. | I used a planner or calendar to keep track of assignments | |

**4.** **As things stand now, how far in school do you think you will get?**

**MARK ONE BOX**

- ☐ 1 Less than high school graduation
- ☐ 2 GED or other equivalency only
- ☐ 3 High school graduation only
- ☐ 4 Attend or complete a 1- or 2-year program in a community college or vocational school
- ☐ 5 Attend college, but not complete a 4- or 5-year degree
- ☐ 6 Graduate from college (4- or 5-year degree)
- ☐ 7 Obtain a Master's degree or equivalent
- ☐ 8 Obtain an M.D. (medical doctor), J.D. (lawyer), Ph.D. (doctor of philosophy), or other advanced degree

**5.** **What is your mother's highest level of education?**

**MARK ONE BOX**

- ☐ 1 Less than high school education
- ☐ 2 GED or other equivalency only
- ☐ 3 High school education only
- ☐ 4 Completed a 1- or 2-year community college or vocational school degree
- ☐ 5 Some schooling through a 4- or 5-year college degree
- ☐ 6 4- or 5-year college degree
- ☐ 7 Master's degree or equivalent
- ☐ 8 M.D. (Medical Doctor), J.D. (Lawyer), Ph.D. (Doctor of Philosophy), or other advanced degree
- ☐ 9 No formal education
- ☐ d Don't know

**6. What is your father's highest level of education?**

**MARK ONE BOX**

- ☐ 1 Less than high school education
- ☐ 2 GED or other equivalency only
- ☐ 3 High school education only
- ☐ 4 Completed a 1- or 2-year community college or vocational school degree
- ☐ 5 Some schooling through a 4- or 5-year college degree
- ☐ 6 4- or 5-year college degree
- ☐ 7 Master's degree or equivalent
- ☐ 8 M.D. (Medical Doctor), J.D. (Lawyer), Ph.D. (Doctor of Philosophy), or other advanced degree
- ☐ 9 No formal education
- ☐ d Don't know

**Have you answered all of the questions? If not, please complete any remaining questions.**

**If you have answered all of the questions, please write down the current time in the box below.**

| What is the current time to the nearest minute? | | HH:MM |
|---|---|---|

**Thank you for your participation!**

## Survey Instrument #2

(Note: We have included only the control version of the instrument. Please see Section VII for a discussion of the differences between the treatment and the control versions.)

MATHEMATICA
Policy Research

**Social and Emotional Skills Project: Survey B**

## Instructions

- This survey will ask you questions about you. The survey should take about 30 minutes.
- Your answers are private and no one at your school will see your answers.
- Please use a pencil or a blue or black pen. Write dark and clearly.
- In each section, please read the directions carefully before starting.
- Answer each question as best as you can.

**Before answering any questions, please write down your student ID number and the current time in the boxes below.**

| | |
|---|---|
| Your student ID number | |

| | | |
|---|---|---|
| What is the current time to the nearest minute? | : | HH:MM |

## Section 1

**In this section, you will be asked a few different types of questions. Please read the directions carefully and answer each question as best as you can.**

**How well do the following statements describe you as a person?**

**Using a scale from 0 to 10, where 0 means "does not describe me at all" and 10 means "describes me perfectly," please mark where you fall on the scale.**

**1.** ***"I do not spend money today so that I will be able to afford more tomorrow."***

| Does not describe me at all | | | | | | | | | | Describes me perfectly |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| ☐ 0 | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 | ☐ 6 | ☐ 7 | ☐ 8 | ☐ 94 | ☐ 10 |

**2.** ***"I tend to put off things even though it would be better to get them done right away."***

| Does not describe me at all | | | | | | | | | | Describes me perfectly |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| ☐ 0 | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 | ☐ 6 | ☐ 7 | ☐ 8 | ☐ 94 | ☐ 10 |

**3.** **In the next questions, you will be given the choice between receiving a payment of $500 today or receiving a payment in 12 months. The 12 month payment is guaranteed.**

**You will be presented with five situations. The payment today is always $500. The payment in 12 months is different in every situation. For each of these situations we would like to know which you would choose. You will be asked to go to a different question depending on your response to each question.**

**3a.** **Would you rather receive $500 today or $825 in 12 months?**

- ☐ 1 $500 today → **GO TO QUESTION 3q**
- ☐ 2 $825 in 12 months **GO TO QUESTION 3b**

**3b.** **Would you rather receive $500 today or $655 in 12 months?**

- ☐ 1 $500 today → **GO TO QUESTION 3j**
- ☐ 2 $655 in 12 months **GO TO QUESTION 3c**

**3c.** **Would you rather receive $500 today or $565 in 12 months?**

- ☐ 1 $500 today → **GO TO QUESTION 3g**
- ☐ 2 $565 in 12 months **GO TO QUESTION 3d**

**3d.** **Would you rather receive $500 today or $530 in 12 months?**

- ☐ 1 $500 today → **GO TO QUESTION 3f**
- ☐ 2 $530 in 12 months **GO TO QUESTION 3e**

**3e.** **Would you rather receive $500 today or $515 in 12 months?**

- ☐ 1 $500 today → **STOP. GO TO SECTION 2 (PAGE 11)**
- ☐ 2 $515 in 12 months → **STOP. GO TO SECTION 2 (PAGE 11)**

**3f.** **Would you rather receive $500 today or $545 in 12 months?**

- ☐ 1 $500 today → **STOP. GO TO SECTION 2 (PAGE 11)**
- ☐ 2 $545 in 12 months → **STOP. GO TO SECTION 2 (PAGE 11)**

**3g.** **Would you rather receive $500 today or $595 in 12 months?**

- ☐ 1 $500 today **GO TO QUESTION 3h**
- ☐ 2 $595 in 12 months → **GO TO QUESTION 3i**

**3h.** **Would you rather receive $500 today or $610 in 12 months?**

- ☐ 1 $500 today → **STOP. GO TO SECTION 2 (PAGE 11)**
- ☐ 2 $610 in 12 months → **STOP. GO TO SECTION 2 (PAGE 11)**

**3i.** **Would you rather receive $500 today or $580 in 12 months?**

- ☐ 1 $500 today → **STOP. GO TO SECTION 2 (PAGE 11)**
- ☐ 2 $580 in 12 months → **STOP. GO TO SECTION 2 (PAGE 11)**

**3j.** **Would you rather receive $500 today or $695 in 12 months?**

- ☐ 1 $500 today → **GO TO QUESTION 3n**
- ☐ 2 $695 in 12 months **GO TO QUESTION 3k**

**3k.** **Would you rather receive $500 today or $665 in 12 months?**

- ☐ 1 $500 today → **GO TO QUESTION 3m**
- ☐ 2 $665 in 12 months → **GO TO QUESTION 3l (NEXT PAGE)**

**3l.** **Would you rather receive $500 today or $645 in 12 months?**

- ☐ 1 $500 today → **STOP. GO TO SECTION 2 (PAGE 11)**
- ☐ 2 $645 in 12 months → **STOP. GO TO SECTION 2 (PAGE 11)**

**3m.** **Would you rather receive $500 today or $680 in 12 months?**

- ☐ 1 $500 today → **STOP. GO TO SECTION 2 (PAGE 11)**
- ☐ 2 $680 in 12 months → **STOP. GO TO SECTION 2 (PAGE 11)**

**3n.** **Would you rather receive $500 today or $730 in 12 months?**

- ☐ 1 $500 today → **GO TO QUESTION 3p**
- ☐ 2 $730 in 12 months **GO TO QUESTION 3o**

**3o.** **Would you rather receive $500 today or $715 in 12 months?**

- ☐ 1 $500 today → **STOP. GO TO SECTION 2 (PAGE 11)**
- ☐ 2 $715 in 12 months → **STOP. GO TO SECTION 2 (PAGE 11)**

**3p.** **Would you rather receive $500 today or $750 in 12 months?**

- ☐ 1 $500 today → **STOP. GO TO SECTION 2 (PAGE 11)**
- ☐ 2 $750 in 12 months → **STOP. GO TO SECTION 2 (PAGE 11)**

**3q.** **Would you rather receive $500 today or $925 in 12 months?**

- ☐ 1 $500 today → **GO TO QUESTION 3r (NEXT PAGE)**
- ☐ 2 $925 in 12 months → **GO TO QUESTION 3y**

**3r.** **Would you rather receive $500 today or $1010 in 12 months?**

- ☐ 1 $500 today → **GO TO QUESTION 3v**
- ☐ 2 $1010 in 12 months **GO TO QUESTION 3s**

**3s.** **Would you rather receive $500 today or $965 in 12 months?**

- ☐ 1 $500 today **GO TO QUESTION 3t**
- ☐ 2 $965 in 12 months → **GO TO QUESTION 3u**

**3t.** **Would you rather receive $500 today or $990 in 12 months?**

- ☐ 1 $500 today → **STOP. GO TO SECTION 2 (PAGE 11)**
- ☐ 2 $990 in 12 months → **STOP. GO TO SECTION 2 (PAGE 11)**

**3u.** **Would you rather receive $500 today or $945 in 12 months?**

- ☐ 1 $500 today → **STOP. GO TO SECTION 2 (PAGE 11)**
- ☐ 2 $945 in 12 months → **STOP. GO TO SECTION 2 (PAGE 11)**

**3v.** **Would you rather receive $500 today or $1050 in 12 months?**

- ☐ 1 $500 today **GO TO QUESTION 3w**
- ☐ 2 $1050 in 12 months → **GO TO QUESTION 3x**

**3w.** **Would you rather receive $500 today or $1070 in 12 months?**

- ☐ 1 $500 today → **STOP. GO TO SECTION 2 (PAGE 11)**
- ☐ 2 $1070 in 12 months → **STOP. GO TO SECTION 2 (PAGE 11)**

**3x.** **Would you rather receive $500 today or $1030 in 12 months?**

- ☐ 1 $500 today → **STOP. GO TO SECTION 2 (PAGE 11)**
- ☐ 2 $1030 in 12 months → **STOP. GO TO SECTION 2 (PAGE 11)**

**3y.** **Would you rather receive $500 today or $845 in 12 months?**

- ☐ 1 $500 today → **STOP. GO TO SECTION 2 (PAGE 11)**
- ☐ 2 $845 in 12 months → **STOP. GO TO SECTION 2 (PAGE 11)**

**3z.** **Would you rather receive $500 today or $805 in 12 months?**

- ☐ 1 $500 today → **GO TO QUESTION 3ab**
- ☐ 2 $805 in 12 months **GO TO QUESTION 3aa**

**3aa.** **Would you rather receive $500 today or $790 in 12 months?**

- ☐ 1 $500 today → **STOP. GO TO SECTION 2 (PAGE 11)**
- ☐ 2 $790 in 12 months → **STOP. GO TO SECTION 2 (PAGE 11)**

**3ab.** **Would you rather receive $500 today or $825 in 12 months?**

- ☐ 1 $500 today → **STOP. GO TO SECTION 2 (PAGE 11)**
- ☐ 2 $825 in 12 months → **STOP. GO TO SECTION 2 (PAGE 11)**

**3ac.** **Would you rather receive $500 today or $885 in 12 months?**

- ☐ 1 $500 today → **GO TO QUESTION 3ae**
- ☐ 2 $885 in 12 months **GO TO QUESTION 3ad**

**3ad.** **Would you rather receive $500 today or $865 in 12 months?**

☐ 1 $500 today → **STOP. GO TO SECTION 2 (PAGE 11)**

☐ 2 $865 in 12 months → **STOP. GO TO SECTION 2 (PAGE 11)**

**3ae.** **Would you rather receive $500 today or $905 in 12 months?**

☐ 1 $500 today → **STOP. GO TO SECTION 2 (PAGE 11)**

☐ 2 $905 in 12 months → **STOP. GO TO SECTION 2 (PAGE 11)**

## Section 2

In this section, you will be asked to answer a few different types of questions. Please read the directions carefully before you begin and answer each question as best as you can.

**1.** **How would you assess your willingness to share with others without expecting anything in return, for example your willingness to give to charity?**

**Using a scale from 0 to 10, where 0 means "completely unwilling to give something up" and 10 means "very willing to give something up," please mark where you fall on the scale. You can also use the values in between to indicate where you fall on the scale.**

| Completely unwilling to give something up | | | | | | | | | | Very willing to give something up |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| ☐ 0 | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 | ☐ 6 | ☐ 7 | ☐ 8 | ☐ 94 | ☐ 10 |

**2.** **Imagine the following situation: Today you unexpectedly received $1600.**

**How much of this amount would you donate to charity?** ***(Values between 0 and 1600 are allowed)***

$ ☐☐☐☐

**3.** **How well does the following statement describe you as a person?**

***"I do not understand why people spend their whole lives fighting for a cause that does not directly benefit them."***

**Using a scale from 0 to 10, where 0 means "does not describe me at all" and 10 means "describes me perfectly," please mark where you fall on the scale. You can also use the values in between to indicate where you fall on the scale.**

| Does not describe me at all | | | | | | | | | | Describes me perfectly |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| ☐ 0 | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 | ☐ 6 | ☐ 7 | ☐ 8 | ☐ 94 | ☐ 10 |

## Section 3

In this section, you will be asked how you would rate yourself based on different statements in a few different scenarios. Please read the directions carefully before you begin and answer each question as best as you can.

**1.** **How well does the following statement describe you as a person?**

***"When someone does me a favor, I am willing to return the favor."***

**Using a scale from 0 to 10, where 0 means "does not describe me at all" and 10 means "describes me perfectly," please mark where you fall on the scale. You can also use the values in-between to indicate where you fall on the scale.**

| Does not describe me at all | | | | | | | | | | Describes me perfectly |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| ☐ 0 | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 | ☐ 6 | ☐ 7 | ☐ 8 | ☐ 94 | ☐ 10 |

**2.** **How willing are you to punish someone who treats others unfairly, even if there may be costs for you?**

**Using a scale from 0 to 10, where 0 means "Completely unwilling to do so" and 10 means "Very willing to do so," please mark where you fall on the scale. You can also use the values in-between to indicate where you fall on the scale.**

| Completely unwilling to do so | | | | | | | | | | Very willing to do so |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| ☐ 0 | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 | ☐ 6 | ☐ 7 | ☐ 8 | ☐ 94 | ☐ 10 |

**3.** **How well does the following statement describe you as a person?**

***"If somebody hurts me on purpose, I will try to hurt them back."***

**Using a scale from 0 to 10, where 0 means "Does not describe me at all" and 10 means "Describes me perfectly," please mark where you fall on the scale. You can also use the values in-between to indicate where you fall on the scale.**

| Does not describe me at all | | | | | | | | | | Describes me perfectly |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| ☐ 0 | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 | ☐ 6 | ☐ 7 | ☐ 8 | ☐ 94 | ☐ 10 |

## Section 4

**In this section, you will be asked a few different types of questions. Please read the directions carefully and answer each question as best as you can.**

**1.** **How many adults live with you in your home? By "adult", we mean anyone over the age of 18.**

| | |
|---|---|

ADULTS OVER 18 YEARS OLD

**2.** **What is your relationship to the adults who live with you in your home?**

**MARK ALL THAT APPLY**

- ☐ 1 Mother
- ☐ 2 Stepmother, foster mother, or female guardian
- ☐ 3 Father
- ☐ 4 Stepfather, foster father, or male guardian
- ☐ 5 Grandparent(s)
- ☐ 6 Other adult(s) who are relatives, including siblings age 18 and over
- ☐ 7 Other adult(s) who are not relatives

**3.** **In this question, you will be asked to rate how much you agree or disagree with each statement. Please read the directions carefully before you begin and answer each line on the grid as best as you can.**

| | | MARK ONE FOR EACH ROW | | | | |
|---|---|---|---|---|---|---|
| | | Disagree strongly | Disagree a little | Neither agree nor disagree | Agree a little | Agree strongly |
| 1. | There is an adult or role model in my life who supports me and encourages me to do well in school. | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 2. | There is a family member, friend, or other person in my life that I can count on to listen to me when I need to talk. | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 3. | My family members are willing and able to help me with school assignments. | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 4. | My teachers take a personal interest in me and help me achieve my goals. | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 5. | I worry about my physical safety in my home or neighborhood. | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 6. | I have trouble focusing on schoolwork outside of school because of distractions (for example, loud noises or trouble with family members). | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 7. | I have other responsibilities outside of school that prevent me from doing schoolwork (for example, a job or taking care of family members). | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |

**4.** **To what extent are you absent from schools?**

- ☐ 1 Almost never
- ☐ 2 Sometimes
- ☐ 3 Often
- ☐ 4 Very often

**5.** **In the last month have you been absent for the following reasons?**

| | | MARK ONE FOR EACH ROW | |
|---|---|---|---|
| | | YES | NO |
| a. | Did not have a way to get to school (for example, no transportation) | ☐ 1 | ☐ 0 |
| b. | Was sick or ill | ☐ 1 | ☐ 0 |
| c. | Was not interested in school | ☐ 1 | ☐ 0 |
| d. | Felt unsafe or uncomfortable at school | ☐ 1 | ☐ 0 |
| e. | Was working or taking care of a family member | ☐ 1 | ☐ 0 |
| f. | Other reason *Specify* → | ☐ 1 | ☐ 0 |

## Section 5

**In this section, you will be asked to rate how much you agree or disagree with each statement. Please read the directions carefully before you begin and answer each line on the grid as best as you can.**

Here are a number of characteristics that may or may not apply to you. Some of these characteristics include being careful, thorough, and hard-working. All of these characteristics are related to a skill called "Conscientiousness" so that people who are careful, thorough, and hard-working have higher levels of "Conscientiousness."

| | | MARK ONE FOR EACH ROW | | | | |
|---|---|---|---|---|---|---|
| **I am someone who…** | | **Disagree strongly** | **Disagree a little** | **Neither agree nor disagree** | **Agree a little** | **Agree strongly** |
| 1. | Tends to be disorganized | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 2. | Tends to be lazy | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 3. | Is dependable, steady | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 4. | Has difficulty getting started on tasks | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 5. | Can be somewhat careless | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 6. | Keeps things neat and tidy | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 7. | Is efficient or gets things done | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 8. | Is reliable and can always be counted on | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 9. | Leaves a mess or doesn't clean up | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 10. | Is persistent or works until the task is finished | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |
| 11. | Sometimes behaves irresponsibly | ☐ 1 | ☐ 2 | ☐ 3 | ☐ 4 | ☐ 5 |

## Section 6

**In this section, you will be asked three brain teaser questions. Please read the questions carefully and fill in the blanks as best as you can.**

**1.** **A bat and a ball cost $1.10 in total. The bat costs $1.00 more than the ball. How much does the ball cost?**

$ **0.** ☐☐ CENTS

**2.** **If it takes 5 machines 5 minutes to make 5 widgets, how long would it take 100 machines to make 100 widgets?**

☐☐ MINUTES

**3.** **In a lake, there is a patch of lily pads. Every day, the patch doubles in size. If it takes 48 days for the patch to cover the entire lake, how long would it take for the patch to cover half of the lake?**

☐☐ DAYS

**4.** **Imagine that you are at home working on homework that is due tomorrow morning. You thought it would take you 1 hour, but you have already spent 1 hour on it and think it will take you 1 more hour to do a good job. Keeping this in mind, consider the following three situations.**

**4a.** **Situation 1: It is 5:00pm and you have no other plans for the evening. What would you do?**

**I would…**

- ☐ 1 Stop working on the assignment
- ☐ 2 Work a little bit longer but leave part of it unfinished
- ☐ 3 Rush to finish the assignment, knowing I might make some mistakes
- ☐ 4 Finish the assignment and double-check it to make sure there are no mistakes

**4b.** **Situation 2: It is 5:00pm and you have plans with a friend starting in 15 minutes. What would you do?**

**I would…**

- ☐ 1 Stop working on the assignment
- ☐ 2 Keep my plans, work on it a bit longer but leave part of it unfinished
- ☐ 3 Delay my plans but rush to finish the assignment, knowing I might make some mistakes
- ☐ 4 Cancel my plans, finish the assignment, and double-check it make sure there are no mistakes

**4c.** **Situation 3: It is midnight and you have school in the morning. What would you do?**

**I would…**

- ☐ 1 Stop working on the assignment
- ☐ 2 Work a little bit longer but leave part of it unfinished
- ☐ 3 Rush to finish the assignment, knowing I might make some mistakes
- ☐ 4 Finish the assignment and double-check it make sure there are no mistakes

**Have you answered all of the questions? If not, please complete any remaining questions.**

**If you have answered all of the questions, please write down the current time in the box below.**

| | | |
|---|---|---|
| What is the current time to the nearest minute? | : | HH:MM |

**Thank you for your participation!**

# A4. RELATIONSHIPS AMONG MEASURES

### Table A3. Female: Correlation among standard measures of personality, preferences, and cognitive skills

| Measure | Openness | Conscientiousness | Extraversion | Agreeableness | Emotional stability | Patience | Risk taking | Positive reciprocity | Negative reciprocity | Altruism | Cognitive reflection |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Openness | 1.00 | | | | | | | | | | |
| Conscientiousness | 0.30*** | 1.00 | | | | | | | | | |
| Extraversion | 0.28*** | 0.17*** | 1.00 | | | | | | | | |
| Agreeableness | 0.22*** | 0.45*** | 0.00 | 1.00 | | | | | | | |
| Emotional stability | -0.01 | 0.37*** | 0.13*** | 0.38*** | 1.00 | | | | | | |
| Patience | 0.08* | 0.13*** | -0.01 | 0.16*** | 0.13*** | 1.00 | | | | | |
| Risk taking | 0.17*** | -0.01 | 0.24*** | -0.05 | -0.02 | 0.02 | 1.00 | | | | |
| Positive reciprocity | 0.16*** | 0.12** | 0.09* | 0.22*** | 0.03 | 0.19*** | -0.01 | 1.00 | | | |
| Negative reciprocity | -0.05 | -0.26*** | 0.04 | -0.45*** | -0.14*** | 0.00 | 0.09* | 0.03 | 1.00 | | |
| Altruism | 0.12** | 0.18*** | 0.02 | 0.33*** | 0.05 | 0.16*** | 0.11** | 0.30*** | -0.12** | 1.00 | |
| Cognitive reflection | 0.11** | -0.13** | -0.01 | 0.00 | 0.03 | 0.15*** | 0.11** | 0.00 | -0.02 | 0.02 | 1.00 |

Sources: Chicago Public Schools administrative data, 2016–2017 school year. Student survey, 2016–2017 school year.

Note: Openness, Conscientiousness, Extraversion, Agreeableness, and Emotional Stability are measured using regression factor scores based on the Big Five Inventory-2 (Soto and John 2017). Patience, Risk Taking, Positive Reciprocity, Negative Reciprocity, and Altruism are measured using items from the Global Preferences Survey (Falk et al. 2016). Cognitive Reflection is measured using regression factor scores based on the Cognitive Reflection Test (Frederick 2005).

* Significantly different from zero at the .10 level, two-tailed test.

** Significantly different from zero at the .05 level, two-tailed test.

*** Significantly different from zero at the .01 level, two-tailed test.

## Table A4. Male: Correlation among standard measures of personality, preferences, and cognitive skills

| Measure | Openness | Conscientiousness | Extraversion | Agreeableness | Emotional stability | Patience | Risk taking | Positive reciprocity | Negative reciprocity | Altruism | Cognitive reflection |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Openness | 1.00 | | | | | | | | | | |
| Conscientiousness | 0.28*** | 1.00 | | | | | | | | | |
| Extraversion | 0.41*** | 0.22*** | 1.00 | | | | | | | | |
| Agreeableness | 0.28*** | 0.37*** | 0.16** | 1.00 | | | | | | | |
| Emotional stability | 0.16** | 0.33*** | 0.33*** | 0.27*** | 1.00 | | | | | | |
| Patience | 0.04 | 0.11* | -0.08 | 0.09 | 0.03 | 1.00 | | | | | |
| Risk taking | 0.18*** | 0.02 | 0.27*** | -0.08 | 0.12* | -0.05 | 1.00 | | | | |
| Positive reciprocity | 0.25*** | 0.07 | 0.09 | 0.28*** | 0.07 | 0.13** | 0.08 | 1.00 | | | |
| Negative reciprocity | 0.06 | -0.19*** | 0.18*** | -0.12* | -0.03 | 0.05 | 0.18*** | 0.19*** | 1.00 | | |
| Altruism | 0.20*** | 0.18*** | 0.08 | 0.28*** | 0.05 | 0.09 | 0.06 | 0.22*** | 0.06 | 1.00 | |
| Cognitive reflection | 0.09 | -0.10 | -0.10 | 0.06 | -0.04 | 0.03 | 0.05 | 0.12* | -0.01 | -0.02 | 1.00 |

Sources: Chicago Public Schools administrative data, 2016–2017 school year. Student survey, 2016–2017 school year.

Note: Openness, Conscientiousness, Extraversion, Agreeableness, and Emotional Stability are measured using regression factor scores based on the Big Five Inventory-2 (Soto and John 2017). Patience, Risk Taking, Positive Reciprocity, Negative Reciprocity, and Altruism are measured using items from the Global Preferences Survey (Falk et al. 2016). Cognitive Reflection is measured using regression factor scores based on the Cognitive Reflection Test (Frederick 2005).

* Significantly different from zero at the .10 level, two-tailed test.

** Significantly different from zero at the .05 level, two-tailed test.

*** Significantly different from zero at the .01 level, two-tailed test.

## Table A5. Female: Correlations among advanced survey-based measures

| Measure | Openness-AV | Conscientiousness-AV | Extraversion-AV | Agreeableness-AV | Emotional Stability-AV | Conscientiousness-SJT |
|---|---|---|---|---|---|---|
| Openness-AV | 1.00 | | | | | |
| Conscientiousness-AV | 0.16*** | 1.00 | | | | |
| Extraversion-AV | 0.09* | 0.12** | 1.00 | | | |
| Agreeableness-AV | 0.04 | 0.39*** | 0.00 | 1.00 | | |
| Emotional Stability-AV | -0.09* | 0.22*** | 0.13*** | 0.26*** | 1.00 | |
| Conscientiousness-SJT | 0.15*** | 0.34*** | 0.08 | 0.25*** | 0.18*** | 1.00 |

Sources: Chicago Public Schools administrative data, 2016–2017 school year. Student survey, 2016–2017 school year.

Note: Openness-AV, Conscientiousness-AV, Extraversion-AV, Agreeableness-AV, and Emotional Stability-AV are measured using regression factor scores based on an anchor-adjusted version of the Big Five Inventory-2 (Soto and John 2017). Conscientiousness-SJT is based on a study-developed situational judgement test designed to measure Conscientiousness.

* Significantly different from zero at the .10 level, two-tailed test.

** Significantly different from zero at the .05 level, two-tailed test.

*** Significantly different from zero at the .01 level, two-tailed test.

## Table A6. Male: Correlations among advanced survey-based measures

| Measure | Openness-AV | Conscientiousness-AV | Extraversion-AV | Agreeableness-AV | Emotional Stability-AV | Conscientiousness-SJT |
|---|---|---|---|---|---|---|
| Openness-AV | 1.00 | | | | | |
| Conscientiousness-AV | 0.13** | 1.00 | | | | |
| Extraversion-AV | 0.38*** | 0.15** | 1.00 | | | |
| Agreeableness-AV | 0.07 | 0.22*** | 0.09 | 1.00 | | |
| Emotional Stability-AV | 0.04 | 0.15** | 0.19*** | 0.12* | 1.00 | |
| Conscientiousness-SJT | 0.15** | 0.17*** | 0.15** | 0.13** | 0.17*** | 1.00 |

Sources: Chicago Public Schools administrative data, 2016—2017 school year. Student survey, 2016—2017 school year.

Note: Openness-AV, Conscientiousness-AV, Extraversion-AV, Agreeableness-AV, and Emotional Stability-AV are measured using regression factor scores based on an anchor-adjusted version of the Big Five Inventory-2 (Soto and John 2017). Conscientiousness-SJT is based on a study-developed situational judgement test designed to measure Conscientiousness.

* Significantly different from zero at the .10 level, two-tailed test.

** Significantly different from zero at the .05 level, two-tailed test.

*** Significantly different from zero at the .01 level, two-tailed test.

## Table A7. Female: Correlations between standard and advanced survey-based measures

| Measure | Openness-AV | Conscientiousness-AV | Extraversion-AV | Agreeableness-AV | Emotional Stability-AV | Conscientiousness-SJT |
|---|---|---|---|---|---|---|
| Openness | 0.59*** | 0.22*** | 0.13*** | 0.06 | -0.04 | 0.13** |
| Conscientiousness | 0.19*** | 0.74*** | 0.17*** | 0.34*** | 0.28*** | 0.40*** |
| Extraversion | 0.10** | 0.06 | 0.73*** | -0.09* | 0.13*** | 0.05 |
| Agreeableness | 0.09* | 0.42*** | 0.01 | 0.71*** | 0.31*** | 0.34*** |
| Emotional stability | -0.05 | 0.33*** | 0.16*** | 0.34*** | 0.76*** | 0.21*** |
| Patience | 0.08 | 0.17*** | 0.02 | 0.11** | 0.09* | 0.18*** |
| Risk taking | 0.10** | -0.06 | 0.15*** | -0.02 | 0.00 | -0.09* |
| Positive reciprocity | -0.02 | 0.14*** | 0.02 | 0.14*** | 0.04 | 0.12** |
| Negative reciprocity | -0.04 | -0.23*** | 0.00 | -0.37*** | -0.11** | -0.23*** |
| Altruism | 0.07 | 0.14*** | 0.04 | 0.20*** | 0.07 | 0.17*** |
| Cognitive reflection | 0.10** | -0.09* | -0.06 | -0.02 | -0.01 | 0.02 |

Sources: Chicago Public Schools administrative data, 2016–2017 school year. Student survey, 2016–2017 school year.

Note: Openness, Conscientiousness, Extraversion, Agreeableness, and Emotional Stability are measured using regression factor scores based on the Big Five Inventory-2 (Soto and John 2017). Patience, Risk Taking, Positive Reciprocity, Negative Reciprocity, and Altruism are measured using items from the Global Preferences Survey (Falk et al. 2016). Cognitive Reflection is measured using regression factor scores based on the Cognitive Reflection Test (Frederick 2005). Openness-AV, Conscientiousness-AV, Extraversion-AV, Agreeableness-AV, and Emotional Stability-AV are measured using regression factor scores based on an anchor-adjusted version of the Big Five Inventory-2 (Soto and John 2017). Conscientiousness-SJT is based on a study-developed situational judgement test designed to measure Conscientiousness.

* Significantly different from zero at the .10 level, two-tailed test.

** Significantly different from zero at the .05 level, two-tailed test.

*** Significantly different from zero at the .01 level, two-tailed test.

## Table A8. Male: Correlations between standard and advanced survey-based measures

| Measure | Openness-AV | Conscientiousness-AV | Extraversion-AV | Agreeableness-AV | Emotional Stability-AV | Conscientiousness-SJT |
|---|---|---|---|---|---|---|
| Openness | 0.63*** | 0.15** | 0.32*** | 0.07 | 0.15** | 0.24*** |
| Conscientiousness | 0.18*** | 0.64*** | 0.09 | 0.27*** | 0.25*** | 0.31*** |
| Extraversion | 0.32*** | 0.07 | 0.69*** | 0.06 | 0.29*** | 0.15** |
| Agreeableness | 0.09 | 0.26*** | 0.07 | 0.53*** | 0.22*** | 0.26*** |
| Emotional stability | 0.09 | 0.22*** | 0.22*** | 0.08 | 0.67*** | 0.17*** |
| Patience | 0.03 | 0.16** | -0.03 | 0.02 | 0.01 | -0.01 |
| Risk taking | 0.13** | -0.02 | 0.20*** | -0.01 | 0.16** | 0.08 |
| Positive reciprocity | 0.14** | 0.08 | 0.09 | 0.08 | 0.05 | 0.21*** |
| Negative reciprocity | 0.05 | -0.05 | 0.18*** | -0.11 | 0.02 | -0.11 |
| Altruism | 0.09 | 0.13* | 0.10 | 0.18*** | 0.07 | 0.22*** |
| Cognitive reflection | -0.09 | -0.06 | -0.13** | -0.10 | -0.06 | 0.07 |

Sources: Chicago Public Schools administrative data, 2016—2017 school year. Student survey, 2016—2017 school year.

Note: Openness, Conscientiousness, Extraversion, Agreeableness, and Emotional Stability are measured using regression factor scores based on the Big Five Inventory-2 (Soto and John 2017). Patience, Risk Taking, Positive Reciprocity, Negative Reciprocity, and Altruism are measured using items from the Global Preferences Survey (Falk et al. 2016). Cognitive Reflection is measured using regression factor scores based on the Cognitive Reflection Test (Frederick 2005). Openness-AV, Conscientiousness-AV, Extraversion-AV, Agreeableness-AV, and Emotional Stability-AV are measured using regression factor scores based on an anchor-adjusted version of the Big Five Inventory-2 (Soto and John 2017). Conscientiousness-SJT is based on a study-developed situational judgement test designed to measure Conscientiousness.

* Significantly different from zero at the .10 level, two-tailed test.

** Significantly different from zero at the .05 level, two-tailed test.

*** Significantly different from zero at the .01 level, two-tailed test.

## Table A9. Female: Correlations among academic indicators and factors

| Measure | PSAT score | GPA | GPA (adjusted) | Credits earned | Fraction days absent | Misconduct offenses | Achievement factor | Behavioral factor |
|---|---|---|---|---|---|---|---|---|
| PSAT score | 1.00 | | | | | | | |
| GPA | 0.49*** | 1.00 | | | | | | |
| GPA (adjusted) | 0.58*** | 0.95*** | 1.00 | | | | | |
| Credits earned | 0.19*** | 0.50*** | 0.50*** | 1.00 | | | | |
| Fraction days absent | -0.32*** | -0.63*** | -0.61*** | -0.59*** | 1.00 | | | |
| Misconduct offenses | -0.24*** | -0.28*** | -0.32*** | -0.15*** | 0.46*** | 1.00 | | |
| Achievement factor | 0.98*** | 0.50*** | 0.59*** | 0.13*** | -0.33*** | -0.29*** | 1.00 | |
| Behavioral factor | 0.09* | 0.90*** | 0.81*** | 0.62*** | -0.67*** | -0.30*** | 0.12** | 1.00 |

Sources: Chicago Public Schools administrative data, 2016–2017 school year. Student survey, 2016–2017 school year.

Note: The Achievement factor is a predicted regression factor score based on the components of the PSAT test. The Behavioral factor is a predicted regression factor score based on the fall and spring GPAs from ninth grade, the faction of days absent in the fall and spring of ninth grade, credits accumulated in the fall and spring of ninth grade, and total misconduct incidents in ninth grade.

* Significantly different from zero at the .10 level, two-tailed test.

** Significantly different from zero at the .05 level, two-tailed test.

*** Significantly different from zero at the .01 level, two-tailed test.

## Table A10. Male: Correlations among academic indicators and factors

| Measure | PSAT score | GPA | GPA (adjusted) | Credits earned | Fraction days absent | Misconduct offenses | Achievement factor | Behavioral factor |
|---|---|---|---|---|---|---|---|---|
| PSAT score | 1.00 | | | | | | | |
| GPA | 0.46*** | 1.00 | | | | | | |
| GPA (adjusted) | 0.55*** | 0.96*** | 1.00 | | | | | |
| Credits earned | 0.23*** | 0.65*** | 0.64*** | 1.00 | | | | |
| Fraction days absent | -0.28*** | -0.61*** | -0.59*** | -0.75*** | 1.00 | | | |
| Misconduct offenses | -0.24*** | -0.23*** | -0.27*** | -0.21*** | 0.29*** | 1.00 | | |
| Achievement factor | 0.98*** | 0.48*** | 0.61*** | 0.18*** | -0.34*** | -0.32*** | 1.00 | |
| Behavioral factor | -0.04 | 0.87*** | 0.73*** | 0.57*** | -0.52*** | -0.12* | 0.00 | 1.00 |

Sources: Chicago Public Schools administrative data, 2016–2017 school year. Student survey, 2016–2017 school year.

Note: The Achievement factor is a predicted regression factor score based on the components of the PSAT test. The Behavioral factor is a predicted regression factor score based on the fall and spring GPAs from ninth grade, the faction of days absent in the fall and spring of ninth grade, credits accumulated in the fall and spring of ninth grade, and total misconduct incidents in ninth grade.

* Significantly different from zero at the .10 level, two-tailed test.

** Significantly different from zero at the .05 level, two-tailed test.

*** Significantly different from zero at the .01 level, two-tailed test.

## Table A11. Female: Correlations between survey-based measures and academic indicators from administrative data

| Measure | PSAT score | GPA | GPA (adjusted) | Credits earned | Fraction days absent | Misconduct offenses | Achievement factor | Behavioral factor |
|---|---|---|---|---|---|---|---|---|
| Openness | 0.15*** | 0.12** | 0.15*** | 0.00 | -0.01 | -0.05 | 0.16*** | 0.05 |
| Conscientiousness | -0.04 | 0.31*** | 0.29*** | 0.09* | -0.04 | -0.04 | -0.02 | 0.33*** |
| Extraversion | -0.07 | -0.06 | -0.04 | 0.06 | 0.03 | 0.06 | -0.10** | -0.01 |
| Agreeableness | 0.12** | 0.31*** | 0.30*** | 0.16*** | -0.23*** | -0.23*** | 0.14*** | 0.29*** |
| Emotional stability | 0.06 | 0.22*** | 0.22*** | 0.12** | -0.08 | -0.06 | 0.05 | 0.22*** |
| Openness-AV | -0.03 | 0.05 | 0.03 | -0.03 | 0.06 | 0.07 | -0.01 | 0.03 |
| Conscientiousness-AV | 0.05 | 0.28*** | 0.28*** | 0.08* | -0.05 | -0.08 | 0.07 | 0.26*** |
| Extraversion-AV | -0.05 | 0.02 | 0.04 | 0.10** | 0.02 | 0.04 | -0.07 | 0.06 |
| Agreeableness-AV | 0.04 | 0.20*** | 0.20*** | 0.07 | -0.12** | -0.19*** | 0.03 | 0.21*** |
| Emotional Stability-AV | -0.01 | 0.13*** | 0.13** | 0.08* | -0.03 | -0.07 | -0.02 | 0.15*** |
| Conscientiousness-SJT | 0.14*** | 0.26*** | 0.28*** | 0.05 | -0.06 | -0.07 | 0.15*** | 0.20*** |
| Patience | 0.26*** | 0.22*** | 0.23*** | 0.08 | -0.09* | -0.13*** | 0.25*** | 0.12** |
| Risk taking | 0.08 | 0.03 | 0.02 | -0.01 | 0.02 | 0.01 | 0.06 | -0.01 |
| Positive reciprocity | 0.13** | 0.09* | 0.12** | -0.05 | -0.01 | -0.11** | 0.13** | 0.03 |
| Negative reciprocity | -0.01 | -0.20*** | -0.19*** | -0.14*** | 0.16*** | 0.15*** | 0.00 | -0.24*** |
| Altruism | 0.08* | 0.07 | 0.06 | 0.04 | -0.04 | -0.08 | 0.10* | 0.03 |
| Cognitive reflection | 0.28*** | 0.12** | 0.14*** | -0.01 | -0.08 | -0.08* | 0.28*** | 0.00 |

Sources: Chicago Public Schools administrative data, 2016–2017 school year. Student survey, 2016–2017 school year.

Note: Openness, Conscientiousness, Extraversion, Agreeableness, and Emotional Stability are measured using regression factor scores based on the Big Five Inventory-2 (Soto and John 2017). Patience, Risk Taking, Positive Reciprocity, Negative Reciprocity, and Altruism are measured using items from the Global Preferences Survey (Falk et al. 2016). Cognitive Reflection is measured using regression factor scores based on the Cognitive Reflection Test (Frederick 2005). Openness-AV, Conscientiousness-AV, Extraversion-AV, Agreeableness-AV, and Emotional Stability-AV are measured using regression factor scores based on an anchor-adjusted version of the Big Five Inventory-2 (Soto and John 2017). Conscientiousness-SJT is based on a study-developed situational judgement test designed to measure Conscientiousness. The Achievement factor is a predicted regression factor score based on the components of the PSAT test. The Behavioral factor is a predicted regression factor score based on the fall and spring GPAs from ninth grade, the faction of days absent in the fall and spring of ninth grade, credits accumulated in the fall and spring of ninth grade, and total misconduct incidents in ninth grade.

* Significantly different from zero at the .10 level, two-tailed test.

** Significantly different from zero at the .05 level, two-tailed test.

*** Significantly different from zero at the .01 level, two-tailed test.

## Table A12. Male: Correlations between survey-based measures and academic indicators from administrative data

| Measure | PSAT score | GPA | GPA (adjusted) | Credits earned | Fraction days absent | Misconduct offenses | Achievement factor | Behavioral factor |
|---|---|---|---|---|---|---|---|---|
| Openness | 0.20*** | 0.03 | 0.03 | 0.02 | 0.11* | -0.03 | 0.19*** | -0.08 |
| Conscientiousness | -0.07 | 0.26*** | 0.17*** | 0.14** | -0.04 | -0.02 | -0.04 | 0.30*** |
| Extraversion | 0.03 | -0.04 | -0.01 | 0.01 | 0.04 | 0.06 | 0.03 | -0.06 |
| Agreeableness | 0.15** | 0.25*** | 0.24*** | 0.12* | -0.11* | -0.16** | 0.16** | 0.20*** |
| Emotional stability | 0.10 | 0.08 | 0.13** | 0.10 | -0.07 | -0.02 | 0.11* | 0.04 |
| Openness-AV | -0.05 | -0.08 | -0.10 | -0.03 | 0.13* | 0.04 | -0.06 | -0.07 |
| Conscientiousness-AV | -0.09 | 0.22*** | 0.14** | 0.04 | -0.10 | 0.01 | -0.06 | 0.27*** |
| Extraversion-AV | -0.06 | -0.05 | -0.05 | -0.04 | 0.05 | 0.12* | -0.06 | -0.03 |
| Agreeableness-AV | -0.12* | 0.15** | 0.10 | 0.11* | -0.14** | -0.01 | -0.10 | 0.23*** |
| Emotional Stability-AV | 0.08 | 0.05 | 0.09 | 0.11* | -0.14** | -0.09 | 0.08 | 0.04 |
| Conscientiousness-SJT | 0.22*** | 0.28*** | 0.27*** | 0.18*** | -0.12* | -0.08 | 0.24*** | 0.19*** |
| Patience | 0.15** | 0.06 | 0.04 | -0.10 | -0.01 | -0.05 | 0.16** | -0.04 |
| Risk taking | 0.05 | -0.12* | -0.06 | -0.07 | 0.05 | -0.10 | 0.04 | -0.15** |
| Positive reciprocity | 0.25*** | 0.07 | 0.14** | 0.00 | -0.01 | -0.11 | 0.25*** | -0.06 |
| Negative reciprocity | 0.00 | -0.20*** | -0.15** | -0.09 | 0.10 | 0.01 | -0.01 | -0.22*** |
| Altruism | 0.11* | 0.05 | 0.05 | 0.07 | -0.04 | -0.06 | 0.10 | 0.01 |
| Cognitive reflection | 0.42*** | 0.17*** | 0.20*** | -0.06 | -0.07 | -0.09 | 0.43*** | -0.05 |

Sources: Chicago Public Schools administrative data, 2016–2017 school year. Student survey, 2016–2017 school year.

Note: Openness, Conscientiousness, Extraversion, Agreeableness, and Emotional Stability are measured using regression factor scores based on the Big Five Inventory-2 (Soto and John 2017). Patience, Risk Taking, Positive Reciprocity, Negative Reciprocity, and Altruism are measured using items from the Global Preferences Survey (Falk et al. 2016). Cognitive Reflection is measured using regression factor scores based on the Cognitive Reflection Test (Frederick 2005). Openness-AV, Conscientiousness-AV, Extraversion-AV, Agreeableness-AV, and Emotional Stability-AV are measured using regression factor scores based on an anchor-adjusted version of the Big Five Inventory-2 (Soto and John 2017). Conscientiousness-SJT is based on a study-developed situational judgement test designed to measure Conscientiousness. The Achievement factor is a predicted regression factor score based on the components of the PSAT test. The Behavioral factor is a predicted regression factor score based on the fall and spring GPAs from ninth grade, the faction of days absent in the fall and spring of ninth grade, credits accumulated in the fall and spring of ninth grade, and total misconduct incidents in ninth grade.

* Significantly different from zero at the .10 level, two-tailed test.

** Significantly different from zero at the .05 level, two-tailed test.

*** Significantly different from zero at the .01 level, two-tailed test.

## Table A13. English spoken in home: Correlation among standard measures of personality, preferences, and cognitive skills

| Measure | Openness | Conscientiousness | Extraversion | Agreeableness | Emotional stability | Patience | Risk taking | Positive reciprocity | Negative reciprocity | Altruism | Cognitive reflection |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Openness | 1.00 | | | | | | | | | | |
| Conscientiousness | 0.27*** | 1.00 | | | | | | | | | |
| Extraversion | 0.34*** | 0.19*** | 1.00 | | | | | | | | |
| Agreeableness | 0.29*** | 0.39*** | 0.06 | 1.00 | | | | | | | |
| Emotional stability | -0.04 | 0.29*** | 0.13** | 0.25*** | 1.00 | | | | | | |
| Patience | 0.14** | 0.12** | -0.05 | 0.21*** | 0.05 | 1.00 | | | | | |
| Risk taking | 0.14** | 0.00 | 0.24*** | -0.11* | 0.06 | -0.03 | 1.00 | | | | |
| Positive reciprocity | 0.22*** | 0.05 | 0.05 | 0.24*** | 0.03 | 0.23*** | -0.06 | 1.00 | | | |
| Negative reciprocity | 0.05 | -0.17*** | 0.11** | -0.29*** | -0.03 | 0.02 | 0.15*** | 0.08 | 1.00 | | |
| Altruism | 0.23*** | 0.20*** | 0.07 | 0.32*** | -0.01 | 0.18*** | 0.06 | 0.30*** | -0.07 | 1.00 | |
| Cognitive reflection | 0.08 | -0.13** | -0.08 | -0.01 | 0.03 | 0.16*** | 0.10* | 0.07 | -0.01 | -0.03 | 1.00 |

Sources: Chicago Public Schools administrative data, 2016–2017 school year. Student survey, 2016–2017 school year.

Note: Openness, Conscientiousness, Extraversion, Agreeableness, and Emotional Stability are measured using regression factor scores based on the Big Five Inventory-2 (Soto and John 2017). Patience, Risk Taking, Positive Reciprocity, Negative Reciprocity, and Altruism are measured using items from the Global Preferences Survey (Falk et al. 2016). Cognitive Reflection is measured using regression factor scores based on the Cognitive Reflection Test (Frederick 2005).

* Significantly different from zero at the .10 level, two-tailed test.

** Significantly different from zero at the .05 level, two-tailed test.

*** Significantly different from zero at the .01 level, two-tailed test.

## Table A14. Spanish or other language spoken in home: Correlation among standard measures of personality, preferences, and cognitive skills

| Measure | Openness | Conscientiousness | Extraversion | Agreeableness | Emotional stability | Patience | Risk taking | Positive reciprocity | Negative reciprocity | Altruism | Cognitive reflection |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Openness | 1.00 | | | | | | | | | | |
| Conscientiousness | 0.36*** | 1.00 | | | | | | | | | |
| Extraversion | 0.32*** | 0.19*** | 1.00 | | | | | | | | |
| Agreeableness | 0.24*** | 0.48*** | 0.09 | 1.00 | | | | | | | |
| Emotional stability | 0.03 | 0.30*** | 0.27*** | 0.31*** | 1.00 | | | | | | |
| Patience | 0.03 | 0.15*** | 0.00 | 0.05 | 0.08 | 1.00 | | | | | |
| Risk taking | 0.19*** | -0.03 | 0.29*** | -0.06 | 0.03 | -0.01 | 1.00 | | | | |
| Positive reciprocity | 0.18*** | 0.17*** | 0.19*** | 0.22*** | 0.06 | 0.06 | 0.10* | 1.00 | | | |
| Negative reciprocity | -0.12** | -0.34*** | 0.04 | -0.42*** | -0.09 | -0.01 | 0.12** | 0.10* | 1.00 | | |
| Altruism | 0.08 | 0.17*** | 0.03 | 0.31*** | 0.06 | 0.09 | 0.10* | 0.20*** | -0.07 | 1.00 | |
| Cognitive reflection | 0.05 | -0.16*** | -0.01 | -0.02 | 0.06 | -0.01 | 0.06 | -0.01 | 0.05 | -0.02 | 1.00 |

Sources: Chicago Public Schools administrative data, 2016–2017 school year. Student survey, 2016–2017 school year.

Note: Openness, Conscientiousness, Extraversion, Agreeableness, and Emotional Stability are measured using regression factor scores based on the Big Five Inventory-2 (Soto and John 2017). Patience, Risk Taking, Positive Reciprocity, Negative Reciprocity, and Altruism are measured using items from the Global Preferences Survey (Falk et al. 2016). Cognitive Reflection is measured using regression factor scores based on the Cognitive Reflection Test (Frederick 2005).

* Significantly different from zero at the .10 level, two-tailed test.

** Significantly different from zero at the .05 level, two-tailed test.

*** Significantly different from zero at the .01 level, two-tailed test.

## Table A15. English spoken in home: Correlations among advanced survey-based measures

| Measure | Openness-AV | Conscientiousness-AV | Extraversion-AV | Agreeableness-AV | Emotional Stability-AV | Conscientiousness-SJT |
|---|---|---|---|---|---|---|
| Openness-AV | 1.00 | | | | | |
| Conscientiousness-AV | 0.15*** | 1.00 | | | | |
| Extraversion-AV | 0.26*** | 0.15*** | 1.00 | | | |
| Agreeableness-AV | 0.07 | 0.30*** | 0.05 | 1.00 | | |
| Emotional Stability-AV | -0.08 | 0.21*** | 0.14*** | 0.18*** | 1.00 | |
| Conscientiousness-SJT | 0.10* | 0.26*** | 0.15*** | 0.22*** | 0.20*** | 1.00 |

Sources: Chicago Public Schools administrative data, 2016–2017 school year. Student survey, 2016–2017 school year.

Note: Openness-AV, Conscientiousness-AV, Extraversion-AV, Agreeableness-AV, and Emotional Stability-AV are measured using regression factor scores based on an anchor-adjusted version of the Big Five Inventory-2 (Soto and John 2017). Conscientiousness-SJT is based on a study-developed situational judgement test designed to measure Conscientiousness.

* Significantly different from zero at the .10 level, two-tailed test.

** Significantly different from zero at the .05 level, two-tailed test.

*** Significantly different from zero at the .01 level, two-tailed test.

## Table A16. Spanish or other language spoken in home: Correlations among advanced survey-based measures

| Measure | Openness-AV | Conscientiousness-AV | Extraversion-AV | Agreeableness-AV | Emotional Stability-AV | Conscientiousness-SJT |
|---|---|---|---|---|---|---|
| Openness-AV | 1.00 | | | | | |
| Conscientiousness-AV | 0.17*** | 1.00 | | | | |
| Extraversion-AV | 0.12** | 0.12** | 1.00 | | | |
| Agreeableness-AV | 0.04 | 0.36*** | 0.01 | 1.00 | | |
| Emotional Stability-AV | 0.00 | 0.13** | 0.19*** | 0.20*** | 1.00 | |
| Conscientiousness-SJT | 0.22*** | 0.30*** | 0.05 | 0.20*** | 0.12** | 1.00 |

Sources: Chicago Public Schools administrative data, 2016–2017 school year. Student survey, 2016–2017 school year.

Note: Openness-AV, Conscientiousness-AV, Extraversion-AV, Agreeableness-AV, and Emotional Stability-AV are measured using regression factor scores based on an anchor-adjusted version of the Big Five Inventory-2 (Soto and John 2017). Conscientiousness-SJT is based on a study-developed situational judgement test designed to measure Conscientiousness.

* Significantly different from zero at the .10 level, two-tailed test.

** Significantly different from zero at the .05 level, two-tailed test.

*** Significantly different from zero at the .01 level, two-tailed test.

## Table A17. English spoken in home: Correlations between standard and advanced survey-based measures

| Measure | Openness-AV | Conscientiousness-AV | Extraversion-AV | Agreeableness-AV | Emotional Stability-AV | Conscientiousness-SJT |
|---|---|---|---|---|---|---|
| Openness | 0.63*** | 0.20*** | 0.22*** | 0.09* | -0.06 | 0.16*** |
| Conscientiousness | 0.17*** | 0.71*** | 0.13** | 0.30*** | 0.24*** | 0.34*** |
| Extraversion | 0.23*** | 0.07 | 0.68*** | 0.00 | 0.10* | 0.17*** |
| Agreeableness | 0.11** | 0.33*** | 0.00 | 0.62*** | 0.20*** | 0.31*** |
| Emotional stability | -0.01 | 0.24*** | 0.18*** | 0.20*** | 0.76*** | 0.16*** |
| Patience | 0.12** | 0.13** | 0.00 | 0.12** | 0.06 | 0.13** |
| Risk taking | 0.12** | -0.05 | 0.19*** | -0.01 | 0.09* | -0.02 |
| Positive reciprocity | 0.10* | 0.09* | 0.03 | 0.07 | 0.05 | 0.16*** |
| Negative reciprocity | 0.04 | -0.10* | 0.13** | -0.29*** | -0.01 | -0.13** |
| Altruism | 0.14** | 0.15*** | 0.09 | 0.19*** | 0.01 | 0.20*** |
| Cognitive reflection | -0.01 | -0.09 | -0.13** | -0.08 | -0.01 | 0.01 |

Sources: Chicago Public Schools administrative data, 2016—2017 school year. Student survey, 2016—2017 school year.

Note: Openness, Conscientiousness, Extraversion, Agreeableness, and Emotional Stability are measured using regression factor scores based on the Big Five Inventory-2 (Soto and John 2017). Patience, Risk Taking, Positive Reciprocity, Negative Reciprocity, and Altruism are measured using items from the Global Preferences Survey (Falk et al. 2016). Cognitive Reflection is measured using regression factor scores based on the Cognitive Reflection Test (Frederick 2005). Openness-AV, Conscientiousness-AV, Extraversion-AV, Agreeableness-AV, and Emotional Stability-AV are measured using regression factor scores based on an anchor-adjusted version of the Big Five Inventory-2 (Soto and John 2017). Conscientiousness-SJT is based on a study-developed situational judgement test designed to measure Conscientiousness.

* Significantly different from zero at the .10 level, two-tailed test.

** Significantly different from zero at the .05 level, two-tailed test.

*** Significantly different from zero at the .01 level, two-tailed test.

## Table A18. Spanish or other language spoken in home: Correlations between standard and advanced survey-based measures

| Measure | Openness-AV | Conscientiousness-AV | Extraversion-AV | Agreeableness-AV | Emotional Stability-AV | Conscientiousness-SJT |
|---|---|---|---|---|---|---|
| Openness | 0.58*** | 0.22*** | 0.14** | 0.06 | 0.03 | 0.20*** |
| Conscientiousness | 0.22*** | 0.71*** | 0.13** | 0.35*** | 0.20*** | 0.39*** |
| Extraversion | 0.13** | 0.06 | 0.74*** | -0.06 | 0.27*** | 0.03 |
| Agreeableness | 0.10* | 0.41*** | 0.05 | 0.68*** | 0.27*** | 0.30*** |
| Emotional stability | 0.00 | 0.26*** | 0.22*** | 0.24*** | 0.74*** | 0.20*** |
| Patience | 0.00 | 0.21*** | 0.00 | 0.03 | 0.01 | 0.09 |
| Risk taking | 0.12** | -0.06 | 0.17*** | -0.05 | 0.05 | -0.04 |
| Positive reciprocity | -0.03 | 0.14** | 0.09 | 0.16*** | 0.02 | 0.12** |
| Negative reciprocity | -0.08 | -0.25*** | 0.01 | -0.30*** | -0.06 | -0.24*** |
| Altruism | 0.01 | 0.12** | 0.04 | 0.19*** | 0.08 | 0.17*** |
| Cognitive reflection | 0.03 | -0.11* | -0.01 | -0.08 | 0.03 | 0.05 |

Sources: Chicago Public Schools administrative data, 2016—2017 school year. Student survey, 2016—2017 school year.

Note: Openness, Conscientiousness, Extraversion, Agreeableness, and Emotional Stability are measured using regression factor scores based on the Big Five Inventory-2 (Soto and John 2017). Patience, Risk Taking, Positive Reciprocity, Negative Reciprocity, and Altruism are measured using items from the Global Preferences Survey (Falk et al. 2016). Cognitive Reflection is measured using regression factor scores based on the Cognitive Reflection Test (Frederick 2005). Openness-AV, Conscientiousness-AV, Extraversion-AV, Agreeableness-AV, and Emotional Stability-AV are measured using regression factor scores based on an anchor-adjusted version of the Big Five Inventory-2 (Soto and John 2017). Conscientiousness-SJT is based on a study-developed situational judgement test designed to measure Conscientiousness.

* Significantly different from zero at the .10 level, two-tailed test.

** Significantly different from zero at the .05 level, two-tailed test.

*** Significantly different from zero at the .01 level, two-tailed test.

## Table A19. English spoken in home: Correlations among academic indicators and factors

| Measure | PSAT score | GPA | GPA (adjusted) | Credits earned | Fraction days absent | Misconduct offenses | Achievement factor | Behavioral factor |
|---|---|---|---|---|---|---|---|---|
| PSAT score | 1.00 | | | | | | | |
| GPA | 0.45*** | 1.00 | | | | | | |
| GPA (adjusted) | 0.53*** | 0.95*** | 1.00 | | | | | |
| Credits earned | 0.20*** | 0.61*** | 0.60*** | 1.00 | | | | |
| Fraction days absent | -0.26*** | -0.61*** | -0.60*** | -0.63*** | 1.00 | | | |
| Misconduct offenses | -0.26*** | -0.27*** | -0.34*** | -0.15*** | 0.37*** | 1.00 | | |
| Achievement factor | 0.98*** | 0.48*** | 0.58*** | 0.17*** | -0.31*** | -0.33*** | 1.00 | |
| Behavioral factor | 0.06 | 0.90*** | 0.81*** | 0.65*** | -0.63*** | -0.26*** | 0.10** | 1.00 |

Sources: Chicago Public Schools administrative data, 2016–2017 school year. Student survey, 2016–2017 school year.

Note: The Achievement factor is a predicted regression factor score based on the components of the PSAT test. The Behavioral factor is a predicted regression factor score based on the fall and spring GPAs from ninth grade, the faction of days absent in the fall and spring of ninth grade, credits accumulated in the fall and spring of ninth grade, and total misconduct incidents in ninth grade.

* Significantly different from zero at the .10 level, two-tailed test.

** Significantly different from zero at the .05 level, two-tailed test.

*** Significantly different from zero at the .01 level, two-tailed test.

## Table A20. Spanish or other language spoken in home: Correlations among academic indicators and factors

| Measure | PSAT score | GPA | GPA (adjusted) | Credits earned | Fraction days absent | Misconduct offenses | Achievement factor | Behavioral factor |
|---|---|---|---|---|---|---|---|---|
| PSAT score | 1.00 | | | | | | | |
| GPA | 0.42*** | 1.00 | | | | | | |
| GPA (adjusted) | 0.56*** | 0.95*** | 1.00 | | | | | |
| Credits earned | 0.20*** | 0.56*** | 0.55*** | 1.00 | | | | |
| Fraction days absent | -0.24*** | -0.56*** | -0.54*** | -0.78*** | 1.00 | | | |
| Misconduct offenses | -0.12*** | -0.13*** | -0.14*** | -0.27*** | 0.27*** | 1.00 | | |
| Achievement factor | 0.98*** | 0.39*** | 0.53*** | 0.09 | -0.20*** | -0.05 | 1.00 | |
| Behavioral factor | -0.12** | 0.87*** | 0.72*** | 0.51*** | -0.51*** | -0.12** | -0.09* | 1.00 |

Sources: Chicago Public Schools administrative data, 2016–2017 school year. Student survey, 2016–2017 school year.

Note: The Achievement factor is a predicted regression factor score based on the components of the PSAT test. The Behavioral factor is a predicted regression factor score based on the fall and spring GPAs from ninth grade, the faction of days absent in the fall and spring of ninth grade, credits accumulated in the fall and spring of ninth grade, and total misconduct incidents in ninth grade.

* Significantly different from zero at the .10 level, two-tailed test.

** Significantly different from zero at the .05 level, two-tailed test.

*** Significantly different from zero at the .01 level, two-tailed test.

## Table A21. English spoken in home: Correlations between survey-based measures and academic indicators from administrative data

| Measure | PSAT score | GPA | GPA (adjusted) | Credits earned | Fraction days absent | Misconduct offenses | Achievement factor | Behavioral factor |
|---|---|---|---|---|---|---|---|---|
| Openness | 0.18*** | 0.07 | 0.09* | -0.03 | 0.11** | -0.05 | 0.19*** | -0.04 |
| Conscientiousness | -0.14** | 0.21*** | 0.20*** | 0.08 | 0.07 | -0.01 | -0.12** | 0.25*** |
| Extraversion | -0.04 | -0.03 | -0.01 | 0.04 | 0.00 | 0.04 | -0.05 | 0.00 |
| Agreeableness | 0.15*** | 0.32*** | 0.33*** | 0.19*** | -0.19*** | -0.23*** | 0.16*** | 0.30*** |
| Emotional stability | 0.00 | 0.10* | 0.14** | 0.15*** | -0.08 | -0.08 | -0.01 | 0.13** |
| Openness-AV | -0.03 | -0.02 | -0.04 | -0.05 | 0.13** | 0.07 | -0.02 | -0.04 |
| Conscientiousness-AV | -0.11** | 0.20*** | 0.18*** | 0.06 | 0.02 | -0.04 | -0.09 | 0.23*** |
| Extraversion-AV | -0.06 | 0.00 | 0.02 | 0.07 | 0.00 | 0.06 | -0.07 | 0.03 |
| Agreeableness-AV | -0.06 | 0.18*** | 0.17*** | 0.11** | -0.11** | -0.15*** | -0.05 | 0.23*** |
| Emotional Stability-AV | -0.02 | 0.08 | 0.12** | 0.13** | -0.10* | -0.13** | -0.03 | 0.13** |
| Conscientiousness-SJT | 0.10* | 0.16*** | 0.17*** | 0.11** | 0.01 | -0.06 | 0.10* | 0.12** |
| Patience | 0.23*** | 0.13** | 0.12** | 0.03 | 0.00 | -0.11** | 0.23*** | 0.03 |
| Risk taking | 0.06 | -0.01 | 0.01 | 0.05 | 0.05 | 0.00 | 0.03 | -0.02 |
| Positive reciprocity | 0.18*** | 0.05 | 0.10* | -0.04 | 0.04 | -0.10* | 0.19*** | -0.04 |
| Negative reciprocity | 0.00 | -0.20*** | -0.19*** | -0.14** | 0.14** | 0.12** | -0.01 | -0.23*** |
| Altruism | 0.07 | 0.06 | 0.04 | 0.04 | 0.00 | -0.06 | 0.07 | 0.03 |
| Cognitive reflection | 0.34*** | 0.17*** | 0.18*** | 0.03 | -0.10* | -0.08 | 0.34*** | 0.03 |

Sources: Chicago Public Schools administrative data, 2016–2017 school year. Student survey, 2016–2017 school year.

Note: Openness, Conscientiousness, Extraversion, Agreeableness, and Emotional Stability are measured using regression factor scores based on the Big Five Inventory-2 (Soto and John 2017). Patience, Risk Taking, Positive Reciprocity, Negative Reciprocity, and Altruism are measured using items from the Global Preferences Survey (Falk et al. 2016). Cognitive Reflection is measured using regression factor scores based on the Cognitive Reflection Test (Frederick 2005). Openness-AV, Conscientiousness-AV, Extraversion-AV, Agreeableness-AV, and Emotional Stability-AV are measured using regression factor scores based on an anchor-adjusted version of the Big Five Inventory-2 (Soto and John 2017). Conscientiousness-SJT is based on a study-developed situational judgement test designed to measure Conscientiousness. The Achievement factor is a predicted regression factor score based on the components of the PSAT test. The Behavioral factor is a predicted regression factor score based on the fall and spring GPAs from ninth grade, the faction of days absent in the fall and spring of ninth grade, credits accumulated in the fall and spring of ninth grade, and total misconduct incidents in ninth grade.

* Significantly different from zero at the .10 level, two-tailed test.

** Significantly different from zero at the .05 level, two-tailed test.

*** Significantly different from zero at the .01 level, two-tailed test.

## Table A22. Spanish or other language spoken in home: Correlations between survey-based measures and academic indicators from administrative data

| Measure | PSAT score | GPA | GPA (adjusted) | Credits earned | Fraction days absent | Misconduct offenses | Achievement factor | Behavioral factor |
|---|---|---|---|---|---|---|---|---|
| Openness | 0.15*** | 0.17*** | 0.17*** | 0.06 | -0.07 | -0.05 | 0.15*** | 0.10* |
| Conscientiousness | -0.02 | 0.42*** | 0.32*** | 0.14** | -0.15** | -0.03 | 0.02 | 0.42*** |
| Extraversion | 0.04 | -0.03 | -0.01 | 0.06 | 0.01 | 0.10* | 0.01 | -0.03 |
| Agreeableness | 0.03 | 0.24*** | 0.20*** | 0.08 | -0.08 | -0.10* | 0.05 | 0.22*** |
| Emotional stability | 0.18*** | 0.16*** | 0.16*** | 0.04 | -0.15** | 0.02 | 0.18*** | 0.08 |
| Openness-AV | -0.01 | 0.08 | 0.03 | 0.00 | -0.07 | -0.01 | 0.01 | 0.07 |
| Conscientiousness-AV | 0.06 | 0.35*** | 0.29*** | 0.07 | -0.16*** | -0.15*** | 0.09 | 0.31*** |
| Extraversion-AV | 0.00 | 0.01 | 0.02 | 0.03 | -0.01 | 0.05 | -0.02 | 0.02 |
| Agreeableness-AV | -0.07 | 0.15*** | 0.13** | 0.05 | -0.04 | -0.06 | -0.06 | 0.19*** |
| Emotional Stability-AV | 0.08 | 0.06 | 0.05 | 0.03 | -0.06 | 0.10* | 0.08 | 0.02 |
| Conscientiousness-SJT | 0.20*** | 0.39*** | 0.38*** | 0.08 | -0.17*** | -0.08 | 0.24*** | 0.28*** |
| Patience | 0.13** | 0.18*** | 0.20*** | -0.01 | -0.08 | -0.07 | 0.15*** | 0.11* |
| Risk taking | 0.03 | -0.13** | -0.11* | -0.16*** | 0.06 | -0.01 | 0.03 | -0.16*** |
| Positive reciprocity | 0.09 | 0.06 | 0.09 | -0.04 | 0.01 | -0.01 | 0.07 | 0.02 |
| Negative reciprocity | 0.06 | -0.21*** | -0.17*** | -0.11* | 0.08 | 0.10* | 0.06 | -0.25*** |
| Altruism | 0.05 | 0.03 | 0.05 | 0.05 | -0.03 | -0.04 | 0.07 | 0.01 |
| Cognitive reflection | 0.34*** | 0.02 | 0.07 | -0.11* | -0.01 | -0.10* | 0.33*** | -0.15*** |

Sources: Chicago Public Schools administrative data, 2016–2017 school year. Student survey, 2016–2017 school year.

Note: Openness, Conscientiousness, Extraversion, Agreeableness, and Emotional Stability are measured using regression factor scores based on the Big Five Inventory-2 (Soto and John 2017). Patience, Risk Taking, Positive Reciprocity, Negative Reciprocity, and Altruism are measured using items from the Global Preferences Survey (Falk et al. 2016). Cognitive Reflection is measured using regression factor scores based on the Cognitive Reflection Test (Frederick 2005). Openness-AV, Conscientiousness-AV, Extraversion-AV, Agreeableness-AV, and Emotional Stability-AV are measured using regression factor scores based on an anchor-adjusted version of the Big Five Inventory-2 (Soto and John 2017). Conscientiousness-SJT is based on a study-developed situational judgement test designed to measure Conscientiousness. The Achievement factor is a predicted regression factor score based on the components of the PSAT test. The Behavioral factor is a predicted regression factor score based on the fall and spring GPAs from ninth grade, the faction of days absent in the fall and spring of ninth grade, credits accumulated in the fall and spring of ninth grade, and total misconduct incidents in ninth grade.

* Significantly different from zero at the .10 level, two-tailed test.

** Significantly different from zero at the .05 level, two-tailed test.

*** Significantly different from zero at the .01 level, two-tailed test.

## Table A23. Race/ethnicity - Black: Correlation among standard measures of personality, preferences, and cognitive skills

| Measure | Openness | Conscientiousness | Extraversion | Agreeableness | Emotional stability | Patience | Risk taking | Positive reciprocity | Negative reciprocity | Altruism | Cognitive reflection |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Openness | 1.00 | | | | | | | | | | |
| Conscientiousness | 0.37*** | 1.00 | | | | | | | | | |
| Extraversion | 0.29*** | 0.15** | 1.00 | | | | | | | | |
| Agreeableness | 0.30*** | 0.42*** | 0.06 | 1.00 | | | | | | | |
| Emotional stability | -0.02 | 0.26*** | 0.14** | 0.30*** | 1.00 | | | | | | |
| Patience | 0.11* | 0.13** | -0.07 | 0.16** | 0.05 | 1.00 | | | | | |
| Risk taking | 0.14** | 0.05 | 0.15** | -0.11* | 0.06 | -0.01 | 1.00 | | | | |
| Positive reciprocity | 0.20*** | 0.04 | 0.07 | 0.22*** | 0.05 | 0.13** | -0.02 | 1.00 | | | |
| Negative reciprocity | 0.04 | -0.17*** | 0.10 | -0.28*** | -0.07 | 0.00 | 0.12* | 0.08 | 1.00 | | |
| Altruism | 0.18*** | 0.27*** | 0.05 | 0.27*** | -0.01 | 0.18*** | 0.10 | 0.25*** | -0.08 | 1.00 | |
| Cognitive reflection | 0.11* | -0.10 | 0.03 | -0.01 | 0.07 | 0.02 | 0.16** | 0.01 | -0.03 | -0.04 | 1.00 |

Sources: Chicago Public Schools administrative data, 2016–2017 school year. Student survey, 2016–2017 school year.

Note: Openness, Conscientiousness, Extraversion, Agreeableness, and Emotional Stability are measured using regression factor scores based on the Big Five Inventory-2 (Soto and John 2017). Patience, Risk Taking, Positive Reciprocity, Negative Reciprocity, and Altruism are measured using items from the Global Preferences Survey (Falk et al. 2016). Cognitive Reflection is measured using regression factor scores based on the Cognitive Reflection Test (Frederick 2005).

* Significantly different from zero at the .10 level, two-tailed test.

** Significantly different from zero at the .05 level, two-tailed test.

*** Significantly different from zero at the .01 level, two-tailed test.

## Table A24. Race/ethnicity - Hispanic, white, other: Correlation among standard measures of personality, preferences, and cognitive skills

| Measure | Openness | Conscientiousness | Extraversion | Agreeableness | Emotional stability | Patience | Risk taking | Positive reciprocity | Negative reciprocity | Altruism | Cognitive reflection |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Openness | 1.00 | | | | | | | | | | |
| Conscientiousness | 0.28*** | 1.00 | | | | | | | | | |
| Extraversion | 0.36*** | 0.19*** | 1.00 | | | | | | | | |
| Agreeableness | 0.24*** | 0.47*** | 0.08 | 1.00 | | | | | | | |
| Emotional stability | 0.01 | 0.30*** | 0.22*** | 0.29*** | 1.00 | | | | | | |
| Patience | 0.06 | 0.17*** | 0.00 | 0.11** | 0.10** | 1.00 | | | | | |
| Risk taking | 0.17*** | -0.03 | 0.32*** | -0.06 | 0.06 | -0.04 | 1.00 | | | | |
| Positive reciprocity | 0.20*** | 0.20*** | 0.14*** | 0.25*** | 0.07 | 0.17*** | 0.02 | 1.00 | | | |
| Negative reciprocity | -0.08 | -0.32*** | 0.07 | -0.41*** | -0.06 | 0.02 | 0.15*** | 0.09* | 1.00 | | |
| Altruism | 0.15*** | 0.15*** | 0.06 | 0.35*** | 0.07 | 0.09* | 0.06 | 0.27*** | -0.07 | 1.00 | |
| Cognitive reflection | 0.04 | -0.14*** | -0.06 | -0.03 | 0.07 | 0.05 | 0.04 | 0.02 | 0.05 | -0.05 | 1.00 |

Sources: Chicago Public Schools administrative data, 2016–2017 school year. Student survey, 2016–2017 school year.

Note: Openness, Conscientiousness, Extraversion, Agreeableness, and Emotional Stability are measured using regression factor scores based on the Big Five Inventory-2 (Soto and John 2017). Patience, Risk Taking, Positive Reciprocity, Negative Reciprocity, and Altruism are measured using items from the Global Preferences Survey (Falk et al. 2016). Cognitive Reflection is measured using regression factor scores based on the Cognitive Reflection Test (Frederick 2005).

* Significantly different from zero at the .10 level, two-tailed test.

** Significantly different from zero at the .05 level, two-tailed test.

*** Significantly different from zero at the .01 level, two-tailed test.

## Table A25. Race/ethnicity - Black: Correlations among advanced survey-based measures

| Measure | Openness-AV | Conscientiousness-AV | Extraversion-AV | Agreeableness-AV | Emotional Stability-AV | Conscientiousness-SJT |
|---|---|---|---|---|---|---|
| Openness-AV | 1.00 | | | | | |
| Conscientiousness-AV | 0.18*** | 1.00 | | | | |
| Extraversion-AV | 0.19*** | 0.13** | 1.00 | | | |
| Agreeableness-AV | 0.06 | 0.34*** | 0.00 | 1.00 | | |
| Emotional Stability-AV | -0.08 | 0.19*** | 0.12** | 0.22*** | 1.00 | |
| Conscientiousness-SJT | 0.10 | 0.30*** | 0.12* | 0.25*** | 0.22*** | 1.00 |

Sources: Chicago Public Schools administrative data, 2016–2017 school year. Student survey, 2016–2017 school year.

Note: Openness-AV, Conscientiousness-AV, Extraversion-AV, Agreeableness-AV, and Emotional Stability-AV are measured using regression factor scores based on an anchor-adjusted version of the Big Five Inventory-2 (Soto and John 2017). Conscientiousness-SJT is based on a study-developed situational judgement test designed to measure Conscientiousness.

* Significantly different from zero at the .10 level, two-tailed test.

** Significantly different from zero at the .05 level, two-tailed test.

*** Significantly different from zero at the .01 level, two-tailed test.

## Table A26. Race/ethnicity - Hispanic, white, other: Correlations among advanced survey-based measures

| Measure | Openness-AV | Conscientiousness-AV | Extraversion-AV | Agreeableness-AV | Emotional Stability-AV | Conscientiousness-SJT |
|---|---|---|---|---|---|---|
| Openness-AV | 1.00 | | | | | |
| Conscientiousness-AV | 0.13*** | 1.00 | | | | |
| Extraversion-AV | 0.19*** | 0.12** | 1.00 | | | |
| Agreeableness-AV | 0.06 | 0.34*** | 0.05 | 1.00 | | |
| Emotional Stability-AV | -0.04 | 0.15*** | 0.18*** | 0.18*** | 1.00 | |
| Conscientiousness-SJT | 0.20*** | 0.27*** | 0.09* | 0.18*** | 0.13*** | 1.00 |

Sources: Chicago Public Schools administrative data, 2016–2017 school year. Student survey, 2016–2017 school year.

Note: Openness-AV, Conscientiousness-AV, Extraversion-AV, Agreeableness-AV, and Emotional Stability-AV are measured using regression factor scores based on an anchor-adjusted version of the Big Five Inventory-2 (Soto and John 2017). Conscientiousness-SJT is based on a study-developed situational judgement test designed to measure Conscientiousness.

* Significantly different from zero at the .10 level, two-tailed test.

** Significantly different from zero at the .05 level, two-tailed test.

*** Significantly different from zero at the .01 level, two-tailed test.

## Table A27. Race/ethnicity - Black: Correlations between standard and advanced survey-based measures

| Measure | Openness-AV | Conscientiousness-AV | Extraversion-AV | Agreeableness-AV | Emotional Stability-AV | Conscientiousness-SJT |
|---|---|---|---|---|---|---|
| Openness | 0.55*** | 0.26*** | 0.14** | 0.08 | 0.03 | 0.16*** |
| Conscientiousness | 0.18*** | 0.70*** | 0.07 | 0.31*** | 0.21*** | 0.36*** |
| Extraversion | 0.12* | 0.03 | 0.62*** | -0.06 | 0.14** | 0.15** |
| Agreeableness | 0.08 | 0.34*** | -0.04 | 0.62*** | 0.28*** | 0.36*** |
| Emotional stability | -0.06 | 0.25*** | 0.17*** | 0.25*** | 0.74*** | 0.13** |
| Patience | 0.13** | 0.12* | 0.02 | 0.11* | 0.06 | 0.11* |
| Risk taking | 0.12* | -0.03 | 0.10 | -0.02 | 0.10* | -0.03 |
| Positive reciprocity | 0.11 | 0.07 | 0.02 | 0.06 | 0.10 | 0.17*** |
| Negative reciprocity | 0.06 | -0.13** | 0.13** | -0.28*** | -0.01 | -0.15** |
| Altruism | 0.13** | 0.18*** | 0.02 | 0.18*** | 0.05 | 0.19*** |
| Cognitive reflection | 0.01 | -0.11* | -0.06 | -0.02 | 0.02 | -0.02 |

Sources: Chicago Public Schools administrative data, 2016–2017 school year. Student survey, 2016–2017 school year.

Note: Openness, Conscientiousness, Extraversion, Agreeableness, and Emotional Stability are measured using regression factor scores based on the Big Five Inventory-2 (Soto and John 2017). Patience, Risk Taking, Positive Reciprocity, Negative Reciprocity, and Altruism are measured using items from the Global Preferences Survey (Falk et al. 2016). Cognitive Reflection is measured using regression factor scores based on the Cognitive Reflection Test (Frederick 2005). Openness-AV, Conscientiousness-AV, Extraversion-AV, Agreeableness-AV, and Emotional Stability-AV are measured using regression factor scores based on an anchor-adjusted version of the Big Five Inventory-2 (Soto and John 2017). Conscientiousness-SJT is based on a study-developed situational judgement test designed to measure Conscientiousness.

* Significantly different from zero at the .10 level, two-tailed test.

** Significantly different from zero at the .05 level, two-tailed test.

*** Significantly different from zero at the .01 level, two-tailed test.

## Table A28. Race/ethnicity - Hispanic, white, other: Correlations between standard and advanced survey-based measures

| Measure | Openness-AV | Conscientiousness-AV | Extraversion-AV | Agreeableness-AV | Emotional Stability-AV | Conscientiousness-SJT |
|---|---|---|---|---|---|---|
| Openness | 0.64*** | 0.17*** | 0.21*** | 0.08 | -0.03 | 0.18*** |
| Conscientiousness | 0.18*** | 0.71*** | 0.14*** | 0.36*** | 0.22*** | 0.39*** |
| Extraversion | 0.21*** | 0.07 | 0.75*** | -0.02 | 0.21*** | 0.06 |
| Agreeableness | 0.13** | 0.40*** | 0.07 | 0.67*** | 0.22*** | 0.27*** |
| Emotional stability | 0.01 | 0.25*** | 0.20*** | 0.21*** | 0.75*** | 0.23*** |
| Patience | 0.05 | 0.22*** | -0.01 | 0.06 | 0.04 | 0.11** |
| Risk taking | 0.13** | -0.06 | 0.22*** | -0.03 | 0.07 | -0.03 |
| Positive reciprocity | 0.02 | 0.18*** | 0.07 | 0.16*** | 0.00 | 0.11** |
| Negative reciprocity | -0.06 | -0.22*** | 0.03 | -0.31*** | -0.06 | -0.22*** |
| Altruism | 0.07 | 0.11** | 0.09* | 0.20*** | 0.06 | 0.18*** |
| Cognitive reflection | 0.03 | -0.09* | -0.06 | -0.11** | 0.02 | 0.04 |

Sources: Chicago Public Schools administrative data, 2016–2017 school year. Student survey, 2016–2017 school year.

Note: Openness, Conscientiousness, Extraversion, Agreeableness, and Emotional Stability are measured using regression factor scores based on the Big Five Inventory-2 (Soto and John 2017). Patience, Risk Taking, Positive Reciprocity, Negative Reciprocity, and Altruism are measured using items from the Global Preferences Survey (Falk et al. 2016). Cognitive Reflection is measured using regression factor scores based on the Cognitive Reflection Test (Frederick 2005). Openness-AV, Conscientiousness-AV, Extraversion-AV, Agreeableness-AV, and Emotional Stability-AV are measured using regression factor scores based on an anchor-adjusted version of the Big Five Inventory-2 (Soto and John 2017). Conscientiousness-SJT is based on a study-developed situational judgement test designed to measure Conscientiousness.

* Significantly different from zero at the .10 level, two-tailed test.

** Significantly different from zero at the .05 level, two-tailed test.

*** Significantly different from zero at the .01 level, two-tailed test.

## Table A29. Race/ethnicity - Black: Correlations among academic indicators and factors

| Measure | PSAT score | GPA | GPA (adjusted) | Credits earned | Fraction days absent | Misconduct offenses | Achievement factor | Behavioral factor |
|---|---|---|---|---|---|---|---|---|
| PSAT score | 1.00 | | | | | | | |
| GPA | 0.36*** | 1.00 | | | | | | |
| GPA (adjusted) | 0.46*** | 0.94*** | 1.00 | | | | | |
| Credits earned | 0.16*** | 0.58*** | 0.59*** | 1.00 | | | | |
| Fraction days absent | -0.20*** | -0.61*** | -0.61*** | -0.60*** | 1.00 | | | |
| Misconduct offenses | -0.23*** | -0.26*** | -0.35*** | -0.12*** | 0.38*** | 1.00 | | |
| Achievement factor | 0.96*** | 0.42*** | 0.51*** | 0.02 | -0.29*** | -0.32*** | 1.00 | |
| Behavioral factor | 0.06 | 0.92*** | 0.83*** | 0.65*** | -0.67*** | -0.29*** | 0.08 | 1.00 |

Sources: Chicago Public Schools administrative data, 2016–2017 school year. Student survey, 2016–2017 school year.

Note: The Achievement factor is a predicted regression factor score based on the components of the PSAT test. The Behavioral factor is a predicted regression factor score based on the fall and spring GPAs from ninth grade, the faction of days absent in the fall and spring of ninth grade, credits accumulated in the fall and spring of ninth grade, and total misconduct incidents in ninth grade.

* Significantly different from zero at the .10 level, two-tailed test.

** Significantly different from zero at the .05 level, two-tailed test.

*** Significantly different from zero at the .01 level, two-tailed test.

## Table A30. Race/ethnicity - Hispanic, white, other: Correlations among academic indicators and factors

| Measure | PSAT score | GPA | GPA (adjusted) | Credits earned | Fraction days absent | Misconduct offenses | Achievement factor | Behavioral factor |
|---|---|---|---|---|---|---|---|---|
| PSAT score | 1.00 | | | | | | | |
| GPA | 0.45*** | 1.00 | | | | | | |
| GPA (adjusted) | 0.57*** | 0.96*** | 1.00 | | | | | |
| Credits earned | 0.21*** | 0.60*** | 0.57*** | 1.00 | | | | |
| Fraction days absent | -0.22*** | -0.57*** | -0.55*** | -0.78*** | 1.00 | | | |
| Misconduct offenses | -0.14*** | -0.18*** | -0.19*** | -0.29*** | 0.25*** | 1.00 | | |
| Achievement factor | 0.98*** | 0.41*** | 0.55*** | 0.19*** | -0.17*** | -0.10** | 1.00 | |
| Behavioral factor | -0.09* | 0.88*** | 0.75*** | 0.52*** | -0.52*** | -0.15*** | -0.05 | 1.00 |

Sources: Chicago Public Schools administrative data, 2016–2017 school year. Student survey, 2016–2017 school year.

Note: The Achievement factor is a predicted regression factor score based on the components of the PSAT test. The Behavioral factor is a predicted regression factor score based on the fall and spring GPAs from ninth grade, the faction of days absent in the fall and spring of ninth grade, credits accumulated in the fall and spring of ninth grade, and total misconduct incidents in ninth grade.

* Significantly different from zero at the .10 level, two-tailed test.

** Significantly different from zero at the .05 level, two-tailed test.

*** Significantly different from zero at the .01 level, two-tailed test.

## Table A31. Race/ethnicity - Black: Correlations between survey-based measures and academic indicators from administrative data

| Measure | PSAT score | GPA | GPA (adjusted) | Credits earned | Fraction days absent | Misconduct offenses | Achievement factor | Behavioral factor |
|---|---|---|---|---|---|---|---|---|
| Openness | 0.23*** | 0.08 | 0.11* | -0.03 | 0.14** | -0.05 | 0.21*** | -0.02 |
| Conscientiousness | 0.01 | 0.28*** | 0.28*** | 0.08 | 0.04 | -0.08 | 0.05 | 0.23*** |
| Extraversion | 0.06 | -0.03 | 0.01 | 0.09 | 0.02 | 0.05 | 0.00 | -0.02 |
| Agreeableness | 0.19*** | 0.37*** | 0.38*** | 0.17*** | -0.23*** | -0.24*** | 0.23*** | 0.32*** |
| Emotional stability | 0.04 | 0.14** | 0.18*** | 0.16*** | -0.13** | -0.13** | 0.03 | 0.16*** |
| Openness-AV | 0.02 | 0.04 | 0.01 | -0.07 | 0.10* | 0.05 | 0.06 | -0.01 |
| Conscientiousness-AV | -0.02 | 0.25*** | 0.24*** | 0.05 | -0.01 | -0.09 | 0.03 | 0.23*** |
| Extraversion-AV | -0.02 | 0.01 | 0.03 | 0.10 | -0.01 | 0.07 | -0.04 | 0.03 |
| Agreeableness-AV | 0.00 | 0.23*** | 0.22*** | 0.11* | -0.14** | -0.18*** | 0.01 | 0.25*** |
| Emotional Stability-AV | 0.03 | 0.13** | 0.16*** | 0.13** | -0.14** | -0.19*** | 0.01 | 0.15** |
| Conscientiousness-SJT | 0.11* | 0.18*** | 0.20*** | 0.10* | 0.00 | -0.08 | 0.12* | 0.13** |
| Patience | 0.13** | 0.10 | 0.07 | 0.04 | 0.01 | -0.08 | 0.10* | 0.06 |
| Risk taking | 0.05 | 0.03 | 0.03 | 0.06 | 0.09 | 0.01 | 0.04 | 0.00 |
| Positive reciprocity | 0.18*** | 0.04 | 0.10 | -0.03 | 0.04 | -0.08 | 0.18*** | -0.03 |
| Negative reciprocity | -0.02 | -0.17*** | -0.16** | -0.11* | 0.10* | 0.13** | -0.03 | -0.18*** |
| Altruism | -0.02 | 0.08 | 0.03 | 0.04 | 0.00 | -0.04 | -0.02 | 0.08 |
| Cognitive reflection | 0.19*** | 0.01 | 0.02 | -0.04 | -0.03 | -0.03 | 0.17*** | -0.04 |

Sources: Chicago Public Schools administrative data, 2016–2017 school year. Student survey, 2016–2017 school year.

Note: Openness, Conscientiousness, Extraversion, Agreeableness, and Emotional Stability are measured using regression factor scores based on the Big Five Inventory-2 (Soto and John 2017). Patience, Risk Taking, Positive Reciprocity, Negative Reciprocity, and Altruism are measured using items from the Global Preferences Survey (Falk et al. 2016). Cognitive Reflection is measured using regression factor scores based on the Cognitive Reflection Test (Frederick 2005). Openness-AV, Conscientiousness-AV, Extraversion-AV, Agreeableness-AV, and Emotional Stability-AV are measured using regression factor scores based on an anchor-adjusted version of the Big Five Inventory-2 (Soto and John 2017). Conscientiousness-SJT is based on a study-developed situational judgement test designed to measure Conscientiousness. The Achievement factor is a predicted regression factor score based on the components of the PSAT test. The Behavioral factor is a predicted regression factor score based on the fall and spring GPAs from ninth grade, the faction of days absent in the fall and spring of ninth grade, credits accumulated in the fall and spring of ninth grade, and total misconduct incidents in ninth grade.

* Significantly different from zero at the .10 level, two-tailed test.

** Significantly different from zero at the .05 level, two-tailed test.

*** Significantly different from zero at the .01 level, two-tailed test.

## Table A32. Race/ethnicity - Hispanic, white, other: Correlations between survey-based measures and academic indicators from administrative data

| Measure | PSAT score | GPA | GPA (adjusted) | Credits earned | Fraction days absent | Misconduct offenses | Achievement factor | Behavioral factor |
|---|---|---|---|---|---|---|---|---|
| Openness | 0.14*** | 0.12** | 0.13** | 0.05 | -0.03 | 0.01 | 0.15*** | 0.05 |
| Conscientiousness | -0.05 | 0.39*** | 0.31*** | 0.16*** | -0.17*** | -0.02 | -0.03 | 0.43*** |
| Extraversion | -0.01 | -0.03 | -0.02 | 0.02 | -0.01 | 0.09* | -0.02 | -0.02 |
| Agreeableness | 0.01 | 0.22*** | 0.19*** | 0.11** | -0.05 | -0.09* | 0.02 | 0.22*** |
| Emotional stability | 0.20*** | 0.16*** | 0.18*** | 0.07 | -0.14*** | 0.00 | 0.19*** | 0.09* |
| Openness-AV | 0.01 | 0.03 | 0.01 | 0.02 | 0.00 | 0.03 | 0.00 | 0.03 |
| Conscientiousness-AV | 0.01 | 0.32*** | 0.27*** | 0.09* | -0.15*** | -0.09* | 0.03 | 0.33*** |
| Extraversion-AV | -0.02 | -0.01 | 0.01 | 0.02 | 0.00 | 0.07 | -0.04 | 0.02 |
| Agreeableness-AV | -0.11** | 0.14*** | 0.12** | 0.06 | -0.04 | -0.05 | -0.10** | 0.20*** |
| Emotional Stability-AV | 0.09* | 0.07 | 0.07 | 0.07 | -0.08 | 0.08 | 0.08 | 0.04 |
| Conscientiousness-SJT | 0.18*** | 0.33*** | 0.33*** | 0.08* | -0.14*** | -0.02 | 0.21*** | 0.25*** |
| Patience | 0.15*** | 0.15*** | 0.16*** | -0.05 | -0.01 | -0.06 | 0.17*** | 0.06 |
| Risk taking | 0.01 | -0.14*** | -0.10** | -0.16*** | 0.03 | 0.03 | -0.01 | -0.15*** |
| Positive reciprocity | 0.06 | 0.04 | 0.06 | -0.08 | 0.05 | -0.01 | 0.07 | 0.00 |
| Negative reciprocity | 0.06 | -0.24*** | -0.20*** | -0.13** | 0.15*** | 0.13** | 0.06 | -0.30*** |
| Altruism | 0.06 | 0.00 | 0.03 | 0.04 | 0.00 | -0.05 | 0.08 | -0.03 |
| Cognitive reflection | 0.34*** | 0.08 | 0.12** | -0.09* | -0.03 | -0.09* | 0.34*** | -0.09* |

Sources: Chicago Public Schools administrative data, 2016–2017 school year. Student survey, 2016–2017 school year.

Note: Openness, Conscientiousness, Extraversion, Agreeableness, and Emotional Stability are measured using regression factor scores based on the Big Five Inventory-2 (Soto and John 2017). Patience, Risk Taking, Positive Reciprocity, Negative Reciprocity, and Altruism are measured using items from the Global Preferences Survey (Falk et al. 2016). Cognitive Reflection is measured using regression factor scores based on the Cognitive Reflection Test (Frederick 2005). Openness-AV, Conscientiousness-AV, Extraversion-AV, Agreeableness-AV, and Emotional Stability-AV are measured using regression factor scores based on an anchor-adjusted version of the Big Five Inventory-2 (Soto and John 2017). Conscientiousness-SJT is based on a study-developed situational judgement test designed to measure Conscientiousness. The Achievement factor is a predicted regression factor score based on the components of the PSAT test. The Behavioral factor is a predicted regression factor score based on the fall and spring GPAs from ninth grade, the faction of days absent in the fall and spring of ninth grade, credits accumulated in the fall and spring of ninth grade, and total misconduct incidents in ninth grade.

* Significantly different from zero at the .10 level, two-tailed test.

** Significantly different from zero at the .05 level, two-tailed test.

*** Significantly different from zero at the .01 level, two-tailed test.

# A5. PREDICTIVE POWER

### Table A33. Predictive power (*r*) of Big Five variables with various anchoring vignette adjustment rules and samples

| Measure | PSAT Score, 10th grade | GPA , 10th grade | GPA (adjusted), 10th grade | Credits earned, 10th grade | Fraction days absent, 10th grade | Misconduct offenses, 10th grade | On-track, 10th grade | On-track, 11th grade |
|---|---|---|---|---|---|---|---|---|
| **Standard Big Five, full sample** | | | | | | | | |
| Openness | 0.11*** | 0.07* | 0.09** | 0.02 | -0.01 | -0.12*** | 0.00 | 0.02 |
| Conscientiousness | -0.07 | 0.27*** | 0.25*** | 0.07* | -0.12*** | -0.03 | -0.02 | 0.02 |
| Extraversion | -0.11*** | -0.08* | -0.06 | 0.01 | 0.08* | 0.09** | 0.05 | 0.06 |
| Agreeableness | 0.10** | 0.24*** | 0.24*** | 0.12*** | -0.17*** | -0.15*** | -0.05 | 0.05 |
| Emotional Stability | 0.05 | 0.07* | 0.11*** | 0.08** | -0.09** | -0.02 | 0.01 | 0.05 |
| **Anchor-adjusted Big Five (mid recoding), full sample** | | | | | | | | |
| Openness-AV | -0.07* | -0.03 | -0.05 | -0.04 | 0.09** | 0.00 | -0.03 | -0.04 |
| Conscientiousness-AV | 0.02 | 0.28*** | 0.27*** | 0.08** | -0.16*** | -0.04 | 0.00 | 0.04 |
| Extraversion-AV | -0.11*** | -0.02 | -0.02 | 0.07* | 0.03 | 0.10** | 0.05 | 0.11*** |
| Agreeableness-AV | -0.01 | 0.16*** | 0.15*** | 0.07* | -0.12*** | -0.05 | 0.03 | 0.04 |
| Emotional Stability-AV | -0.04 | 0.04 | 0.06 | 0.11*** | -0.10** | -0.04 | 0.04 | 0.05 |
| **Anchor-adjusted Big Five (min recoding), full sample** | | | | | | | | |
| Openness-AV-min | 0.14*** | 0.05 | 0.08* | 0.05 | -0.06 | -0.12*** | 0.01 | 0.07* |
| Conscientiousness-AV-min | 0.19*** | 0.30*** | 0.33*** | 0.12*** | -0.26*** | -0.13*** | 0.05 | 0.10** |
| Extraversion-AV-min | 0.08* | 0.06 | 0.10** | 0.11*** | -0.06 | -0.02 | 0.05 | 0.13*** |
| Agreeableness-AV-min | 0.14*** | 0.24*** | 0.27*** | 0.14*** | -0.22*** | -0.13*** | 0.06 | 0.08** |
| Emotional Stability-AV-min | 0.19*** | 0.12*** | 0.17*** | 0.13*** | -0.18*** | -0.14*** | 0.08* | 0.07* |
| **Anchor-adjusted Big Five (max recoding), full sample** | | | | | | | | |
| Openness-AV-max | -0.20*** | -0.07* | -0.12*** | -0.10** | 0.17*** | 0.10** | -0.05 | -0.11*** |
| Conscientiousness-AV-max | -0.21*** | 0.09** | 0.04 | -0.02 | 0.07* | 0.10** | -0.07* | -0.06 |
| Extraversion-AV-max | -0.23*** | -0.08* | -0.10** | 0.01 | 0.09** | 0.15*** | 0.03 | 0.06 |
| Agreeableness-AV-max | -0.17*** | 0.01 | -0.03 | -0.03 | 0.05 | 0.06 | -0.02 | -0.03 |
| Emotional Stability-AV-max | -0.27*** | -0.05 | -0.09** | 0.02 | 0.03 | 0.08* | -0.03 | 0.00 |
| **Standard Big Five, consistent vignette response sample** | | | | | | | | |
| Openness | 0.03 | 0.00 | -0.01 | -0.02 | 0.07 | -0.07 | 0.05 | 0.07 |
| Conscientiousness | -0.08 | 0.27*** | 0.23*** | -0.01 | -0.08 | 0.02 | -0.09* | -0.05 |
| Extraversion | -0.15*** | -0.08 | -0.07 | 0.01 | 0.08 | 0.13** | 0.07 | 0.10* |
| Agreeableness | 0.11* | 0.30*** | 0.30*** | 0.09* | -0.21*** | -0.06 | 0.01 | 0.04 |
| Emotional Stability | 0.06 | 0.11* | 0.14** | 0.10* | -0.15*** | 0.07 | 0.05 | 0.06 |
| **Adjusted Big Five, consistent vignette response sample** | | | | | | | | |
| Openness-AV | -0.02 | -0.05 | -0.05 | -0.01 | 0.04 | -0.05 | 0.08 | 0.01 |
| Conscientiousness-AV | -0.03 | 0.25*** | 0.24*** | 0.00 | -0.10* | 0.02 | -0.08 | -0.03 |
| Extraversion-AV | -0.16*** | -0.05 | -0.04 | 0.04 | 0.07 | 0.11* | 0.02 | 0.11** |
| Agreeableness-AV | 0.01 | 0.22*** | 0.23*** | 0.05 | -0.13** | -0.06 | 0.03 | 0.03 |
| Emotional Stability-AV | -0.03 | 0.07 | 0.09 | 0.12** | -0.13** | 0.07 | 0.07 | 0.09* |

Sources: Chicago Public Schools administrative data, 2015-2016, 2016-2017, and 2017-2018 school years. Student survey, 2015-16 school year.

Note: The table displays the correlation between each outcome and the predictors indicated in the left column. Openness, Conscientiousness, Extraversion, Agreeableness, and Emotional Stability are measured using regression factor scores based on the Big Five Inventory-2 (Soto and John 2017). Openness-AV, Conscientiousness-AV, Extraversion-AV, Agreeableness-AV, and

Emotional Stability-AV are measured using regression factor scores based on an anchor-adjusted version of the Big Five Inventory-2 (Soto and John 2017).

## Table A34. Female: Predictive power (*r*) of individual 9th-grade measures for 10th- and 11th-grade outcomes

| Measure | PSAT score, 10th grade | GPA, 10th grade | GPA (adjusted), 10th grade | Credits earned, 10th grade | Fraction days absent, 10th grade | Misconduct offenses, 10th grade | On-track, 10th grade | On-track, 11th grade |
|---|---|---|---|---|---|---|---|---|
| Openness | 0.16*** | 0.06 | 0.09* | 0.02 | -0.02 | -0.16*** | 0.03 | 0.03 |
| Conscientiousness | 0.00 | 0.28*** | 0.28*** | 0.06 | -0.10** | -0.07 | -0.04 | 0.03 |
| Extraversion | -0.12** | -0.10* | -0.08 | -0.01 | 0.07 | 0.11** | 0.02 | 0.03 |
| Agreeableness | 0.13** | 0.25*** | 0.26*** | 0.17*** | -0.23*** | -0.15*** | 0.00 | 0.09* |
| Emotional stability | 0.05 | 0.17*** | 0.18*** | 0.11** | -0.05 | -0.03 | 0.02 | 0.05 |
| Openness-AV | -0.01 | 0.01 | -0.01 | 0.00 | 0.09* | -0.03 | -0.05 | -0.02 |
| Conscientiousness-AV | 0.09* | 0.29*** | 0.31*** | 0.10* | -0.14*** | -0.11** | 0.00 | 0.06 |
| Extraversion-AV | -0.10* | 0.00 | 0.01 | 0.08* | 0.00 | 0.08 | 0.03 | 0.11** |
| Agreeableness-AV | 0.05 | 0.14*** | 0.16*** | 0.12** | -0.13*** | -0.07 | 0.06 | 0.04 |
| Emotional Stability-AV | -0.08 | 0.09* | 0.09* | 0.10* | -0.04 | 0.01 | 0.03 | 0.03 |
| Conscientiousness-SJT | 0.12** | 0.23*** | 0.26*** | 0.09* | -0.11** | -0.12** | -0.05 | 0.01 |
| Patience | 0.24*** | 0.21*** | 0.24*** | 0.03 | -0.13** | -0.14*** | -0.01 | 0.03 |
| Risk taking | 0.06 | 0.04 | 0.04 | 0.00 | 0.03 | 0.01 | -0.02 | 0.00 |
| Positive reciprocity | 0.13** | 0.02 | 0.06 | -0.04 | -0.05 | -0.01 | -0.08 | -0.06 |
| Negative reciprocity | -0.03 | -0.17*** | -0.17*** | -0.11** | 0.19*** | 0.09* | -0.07 | -0.09* |
| Altruism | 0.08 | 0.02 | 0.03 | 0.05 | -0.07 | -0.05 | -0.03 | 0.02 |
| Cognitive reflection | 0.26*** | 0.05 | 0.09* | 0.01 | -0.07 | -0.08 | 0.06 | 0.03 |
| PSAT score | 0.86*** | 0.44*** | 0.54*** | 0.19*** | -0.35*** | -0.21*** | 0.11*** | 0.17*** |
| GPA | 0.51*** | 0.80*** | 0.81*** | 0.35*** | -0.58*** | -0.27*** | 0.17*** | 0.29*** |
| GPA (adjusted) | 0.62*** | 0.77*** | 0.85*** | 0.36*** | -0.60*** | -0.33*** | 0.19*** | 0.30*** |
| Credits earned | 0.15*** | 0.40*** | 0.41*** | 0.46*** | -0.41*** | -0.04 | 0.32*** | 0.47*** |
| Fraction days absent | -0.32*** | -0.51*** | -0.52*** | -0.43*** | 0.76*** | 0.17*** | -0.37*** | -0.43*** |
| Misconduct offenses | -0.20*** | -0.22*** | -0.26*** | -0.26*** | 0.44*** | 0.32*** | -0.23*** | -0.20*** |
| Achievement factor | 0.84*** | 0.46*** | 0.56*** | 0.23*** | -0.38*** | -0.25*** | 0.06 | 0.18*** |
| Behavioral factor | 0.13*** | 0.72*** | 0.68*** | 0.41*** | -0.58*** | -0.20*** | 0.16*** | 0.40*** |

Sources: Chicago Public Schools administrative data, 2016–2017, 2017–2018, and 2018–2019 school years. Student survey, 2016–2017 school year.

Note: The table displays the correlation between the outcomes and the predictors indicated in the left column. Openness, Conscientiousness, Extraversion, Agreeableness, and Emotional Stability are measured using regression factor scores based on the Big Five Inventory-2 (Soto and John 2017). Patience, Risk Taking, Positive Reciprocity, Negative Reciprocity, and Altruism are measured using items from the Global Preferences Survey (Falk et al. 2016). Cognitive Reflection is measured using regression factor scores based on the Cognitive Reflection Test (Frederick 2005). Openness-AV, Conscientiousness-AV, Extraversion-AV, Agreeableness-AV, and Emotional Stability-AV are measured using regression factor scores based on an anchor-adjusted version of the Big Five Inventory-2 (Soto and John 2017). Conscientiousness-SJT is based on a study-developed situational judgement test designed to measure Conscientiousness. The Achievement factor is a predicted regression factor score based on the components of the PSAT test. The Behavioral factor is a predicted regression factor score based on the fall and spring GPAs from

ninth grade, the faction of days absent in the fall and spring of ninth grade, credits accumulated in the fall and spring of ninth grade, and total misconduct incidents in ninth grade.

* Significantly different from zero at the .10 level, two-tailed test.

** Significantly different from zero at the .05 level, two-tailed test.

*** Significantly different from zero at the .01 level, two-tailed test.

## Table A35. Male: Predictive power (*r*) of individual 9th-grade measures for 10th- and 11th-grade outcomes

| Measure | PSAT score, 10th grade | GPA, 10th grade | GPA (adjusted), 10th grade | Credits earned, 10th grade | Fraction days absent, 10th grade | Misconduct offenses, 10th grade | On-track, 10th grade | On-track, 11th grade |
|---|---|---|---|---|---|---|---|---|
| Openness | 0.09 | 0.01 | 0.03 | -0.01 | 0.01 | -0.04 | -0.05 | -0.01 |
| Conscientiousness | -0.10 | 0.22*** | 0.17*** | 0.05 | -0.15** | 0.01 | -0.04 | -0.02 |
| Extraversion | -0.06 | -0.06 | -0.02 | 0.04 | 0.08 | 0.06 | 0.10 | 0.11* |
| Agreeableness | 0.11 | 0.18*** | 0.19*** | 0.01 | -0.09 | -0.17*** | -0.12* | -0.01 |
| Emotional stability | 0.07 | 0.07 | 0.14** | 0.01 | -0.13* | 0.00 | 0.07 | -0.01 |
| Openness-AV | -0.12* | -0.10 | -0.11* | -0.10 | 0.08 | 0.04 | 0.02 | -0.06 |
| Conscientiousness-AV | -0.06 | 0.23*** | 0.19*** | 0.03 | -0.16** | 0.06 | -0.04 | -0.02 |
| Extraversion-AV | -0.12* | -0.04 | -0.04 | 0.05 | 0.10 | 0.11 | 0.10 | 0.13* |
| Agreeableness-AV | -0.13* | 0.13* | 0.08 | -0.02 | -0.08 | -0.02 | 0.01 | 0.03 |
| Emotional Stability-AV | 0.06 | 0.10 | 0.15** | 0.11 | -0.18*** | -0.11* | 0.11* | 0.07 |
| Conscientiousness-SJT | 0.11 | 0.21*** | 0.21*** | 0.04 | -0.08 | -0.05 | -0.01 | 0.02 |
| Patience | 0.10 | 0.05 | 0.05 | 0.06 | -0.07 | 0.00 | 0.01 | 0.04 |
| Risk taking | 0.00 | -0.17** | -0.10 | 0.01 | 0.05 | 0.11* | -0.04 | 0.06 |
| Positive reciprocity | 0.19*** | 0.04 | 0.10 | -0.05 | -0.08 | -0.09 | -0.10 | -0.03 |
| Negative reciprocity | 0.03 | -0.12* | -0.09 | 0.02 | 0.11* | -0.02 | 0.02 | 0.07 |
| Altruism | 0.04 | 0.03 | 0.03 | 0.04 | -0.04 | -0.02 | -0.11* | 0.07 |
| Cognitive reflection | 0.49*** | 0.08 | 0.14** | -0.09 | -0.09 | -0.01 | -0.15** | -0.11* |
| PSAT score | 0.86*** | 0.38*** | 0.49*** | 0.16*** | -0.26*** | -0.19*** | 0.03 | 0.10*** |
| GPA | 0.49*** | 0.72*** | 0.76*** | 0.42*** | -0.57*** | -0.16*** | 0.29*** | 0.32*** |
| GPA (adjusted) | 0.59*** | 0.69*** | 0.79*** | 0.41*** | -0.58*** | -0.20*** | 0.28*** | 0.31*** |
| Credits earned | 0.22*** | 0.24*** | 0.30*** | 0.53*** | -0.49*** | -0.10*** | 0.52*** | 0.52*** |
| Fraction days absent | -0.28*** | -0.26*** | -0.31*** | -0.48*** | 0.69*** | 0.16*** | -0.50*** | -0.46*** |
| Misconduct offenses | -0.25*** | -0.25*** | -0.28*** | -0.23*** | 0.41*** | 0.72*** | -0.15*** | -0.22*** |
| Achievement factor | 0.89*** | 0.37*** | 0.52*** | 0.08 | -0.33*** | -0.22*** | 0.04 | 0.07 |
| Behavioral factor | -0.03 | 0.65*** | 0.58*** | 0.29*** | -0.45*** | -0.01 | 0.11* | 0.13** |

Sources: Chicago Public Schools administrative data, 2016–2017, 2017–2018, and 2018–2019 school years. Student survey, 2016–2017 school year.

Note: The table displays the correlation between the outcomes and the predictors indicated in the left column. Openness, Conscientiousness, Extraversion, Agreeableness, and Emotional Stability are measured using regression factor scores based on the Big Five Inventory-2 (Soto and John 2017). Patience, Risk Taking, Positive Reciprocity, Negative Reciprocity, and Altruism are measured using items from the Global Preferences Survey (Falk et al. 2016). Cognitive Reflection is measured using regression factor scores based on the Cognitive Reflection Test (Frederick 2005). Openness-AV, Conscientiousness-AV, Extraversion-AV, Agreeableness-AV, and Emotional Stability-AV are measured using regression factor scores based on an anchor-adjusted version of the Big Five Inventory-2 (Soto and John 2017). Conscientiousness-SJT is based on a study-developed situational judgement test designed to measure Conscientiousness. The Achievement factor is a predicted regression factor score based on the components of the PSAT test. The Behavioral factor is a predicted regression factor score based on the fall and spring GPAs from

ninth grade, the faction of days absent in the fall and spring of ninth grade, credits accumulated in the fall and spring of ninth grade, and total misconduct incidents in ninth grade.

* Significantly different from zero at the .10 level, two-tailed test.

** Significantly different from zero at the .05 level, two-tailed test.

*** Significantly different from zero at the .01 level, two-tailed test.

## Table A36. Female: Predictive power (*R*) of 9th-grade measures for 10th- and 11th-grade outcomes

| Measure | PSAT score, 10th grade | GPA, 10th grade | GPA (adjusted), 10th grade | Credits earned, 10th grade | Fraction days absent, 10th grade | Misconduct offenses, 10th grade | On-track, 10th grade | On-track, 11th grade |
|---|---|---|---|---|---|---|---|---|
| **Standard and advanced Big Five measures** | | | | | | | | |
| Big Five | 0.25 | 0.33 | 0.33 | 0.15 | 0.22 | 0.22 | 0.00 | 0.00 |
| Big Five-AV | 0.13 | 0.28 | 0.30 | 0.12 | 0.17 | 0.09 | 0.00 | 0.07 |
| Conscientiousness-SJT | 0.11 | 0.23 | 0.25 | 0.08 | 0.09 | 0.10 | 0.00 | 0.00 |
| Big Five + Big Five-AV | 0.33 | 0.35 | 0.38 | 0.17 | 0.27 | 0.23 | 0.00 | 0.09 |
| Big Five + Big Five-AV + Conscientiousness-SJT | 0.35 | 0.36 | 0.40 | 0.16 | 0.27 | 0.24 | 0.00 | 0.06 |
| **Preferences** | | | | | | | | |
| Traditional preferences | 0.25 | 0.19 | 0.22 | 0.00 | 0.09 | 0.13 | 0.00 | 0.00 |
| Social preferences | 0.10 | 0.15 | 0.16 | 0.09 | 0.18 | 0.07 | 0.05 | 0.08 |
| Cognitive Reflection | 0.26 | 0.00 | 0.07 | 0.00 | 0.05 | 0.06 | 0.02 | 0.00 |
| Traditional preferences + Social preferences | 0.25 | 0.26 | 0.28 | 0.05 | 0.20 | 0.13 | 0.00 | 0.00 |
| Traditional preferences + Social preferences + Cognitive Reflection | 0.33 | 0.26 | 0.28 | 0.02 | 0.20 | 0.13 | 0.00 | 0.00 |
| **Measures based on academic indicators** | | | | | | | | |
| Academic indicators | 0.87 | 0.80 | 0.85 | 0.43 | 0.77 | 0.43 | 0.41 | 0.43 |
| Achievement and behavioral factors | 0.85 | 0.82 | 0.85 | 0.45 | 0.66 | 0.31 | 0.15 | 0.41 |
| Academic indicators + Achievement and Behavioral factors | 0.89 | 0.83 | 0.88 | 0.57 | 0.85 | 0.51 | 0.34 | 0.51 |

Sources: Chicago Public Schools administrative data, 2016–2017, 2017–2018, and 2018–2019 school years. Student survey, 2016–2017 school year.

Note: The table displays the square root of the adjusted *R*-squared from regressions of each outcome on the predictors indicated in the left column. Big Five includes Openness, Conscientiousness, Extraversion, Agreeableness, and Emotional Stability, which are measured using regression factor scores based on the Big Five Inventory-2 (Soto and John 2017). Big Five-AV includes Openness-AV, Conscientiousness-AV, Extraversion-AV, Agreeableness-AV, and Emotional Stability-AV, which are measured using regression factor scores based on an anchor-adjusted version of the Big Five Inventory-2 (Soto and John 2017). Conscientiousness-SJT is based on a study-developed situational judgement test designed to measure Conscientiousness. Traditional preference include Patience, Risk Taking, and social preferences include Positive Reciprocity, Negative Reciprocity, and Altruism. All preferences are measured using items from the Global Preferences Survey (Falk et al. 2016). Cognitive Reflection is measured using regression factor scores based on the Cognitive Reflection Test (Frederick 2005). Academic indicators include PSAT score, GPA, GPA (adjusted), credits earned, fraction of days absent, and misconduct offenses. The Achievement factor is a predicted regression factor score based on the components of the PSAT test. The Behavioral factor is a predicted regression factor score based on the fall and spring GPAs from ninth grade, the faction of days absent in the fall and spring of ninth grade, credits accumulated in the fall and spring of ninth grade, and total misconduct incidents in ninth grade.

## Table A37. Male: Predictive power (*R*) of 9th-grade measures for 10th- and 11th-grade outcomes

| Measure | PSAT score, 10th grade | GPA, 10th grade | GPA (adjusted), 10th grade | Credits earned, 10th grade | Fraction days absent, 10th grade | Misconduct offenses, 10th grade | On-track, 10th grade | On-track, 11th grade |
|---|---|---|---|---|---|---|---|---|
| **Standard and advanced Big Five measures** | | | | | | | | |
| Big Five | 0.21 | 0.24 | 0.20 | 0.00 | 0.17 | 0.15 | 0.14 | 0.00 |
| Big Five-AV | 0.15 | 0.25 | 0.24 | 0.08 | 0.24 | 0.10 | 0.07 | 0.11 |
| Conscientiousness-SJT | 0.09 | 0.20 | 0.20 | 0.00 | 0.05 | 0.00 | 0.00 | 0.00 |
| Big Five + Big Five-AV | 0.32 | 0.26 | 0.25 | 0.00 | 0.21 | 0.20 | 0.13 | 0.03 |
| Big Five + Big Five-AV + Conscientiousness-SJT | 0.35 | 0.30 | 0.29 | 0.00 | 0.22 | 0.19 | 0.11 | 0.00 |
| **Preferences** | | | | | | | | |
| Traditional preferences | 0.03 | 0.16 | 0.08 | 0.00 | 0.00 | 0.06 | 0.00 | 0.00 |
| Social preferences | 0.15 | 0.07 | 0.09 | 0.00 | 0.11 | 0.00 | 0.09 | 0.02 |
| Cognitive Reflection | 0.48 | 0.05 | 0.13 | 0.07 | 0.06 | 0.00 | 0.14 | 0.09 |
| Traditional preferences + Social preferences | 0.11 | 0.15 | 0.10 | 0.00 | 0.07 | 0.00 | 0.03 | 0.00 |
| Traditional preferences + Social preferences + Cognitive Reflection | 0.48 | 0.16 | 0.15 | 0.00 | 0.08 | 0.00 | 0.13 | 0.04 |
| **Measures based on academic indicators** | | | | | | | | |
| Academic indicators | 0.87 | 0.78 | 0.84 | 0.51 | 0.76 | 0.51 | 0.19 | 0.38 |
| Achievement and behavioral factors | 0.89 | 0.76 | 0.80 | 0.29 | 0.56 | 0.20 | 0.08 | 0.12 |
| Academic indicators + Achievement and Behavioral factors | 0.91 | 0.76 | 0.82 | 0.46 | 0.73 | 0.64 | 0.23 | 0.39 |

Sources: Chicago Public Schools administrative data, 2016–2017, 2017–2018, and 2018–2019 school years. Student survey, 2016–2017 school year.

Note: The table displays the square root of the adjusted *R*-squared from regressions of each outcome on the predictors indicated in the left column. Big Five includes Openness, Conscientiousness, Extraversion, Agreeableness, and Emotional Stability, which are measured using regression factor scores based on the Big Five Inventory-2 (Soto and John 2017). Big Five-AV includes Openness-AV, Conscientiousness-AV, Extraversion-AV, Agreeableness-AV, and Emotional Stability-AV, which are measured using regression factor scores based on an anchor-adjusted version of the Big Five Inventory-2 (Soto and John 2017). Conscientiousness-SJT is based on a study-developed situational judgement test designed to measure Conscientiousness. Traditional preference include Patience, Risk Taking, and social preferences include Positive Reciprocity, Negative Reciprocity, and Altruism. All preferences are measured using items from the Global Preferences Survey (Falk et al. 2016). Cognitive Reflection is measured using regression factor scores based on the Cognitive Reflection Test (Frederick 2005). Academic indicators include PSAT score, GPA, GPA (adjusted), credits earned, fraction of days absent, and misconduct offenses. The Achievement factor is a predicted regression factor score based on the components of the PSAT test. The Behavioral factor is a predicted regression factor score based on the fall and spring GPAs from ninth grade, the faction of days absent in the fall and spring of ninth grade, credits accumulated in the fall and spring of ninth grade, and total misconduct incidents in ninth grade.

## Table A38. Female: Predictive power (*R*) of 9th-grade measures (Big Five, preferences, and school records) for 10th- and 11th-grade outcomes

| Measure | PSAT score, 10th grade | GPA, 10th grade | GPA (adjusted), 10th grade | Credits earned, 10th grade | Fraction days absent, 10th grade | Misconduct offenses, 10th grade | On-track, 10th grade | On-track, 11th grade |
|---|---|---|---|---|---|---|---|---|
| **Standard Big Five, separate 9th-grade school records** | | | | | | | | |
| Big Five | 0.25 | 0.33 | 0.33 | 0.15 | 0.22 | 0.22 | 0.00 | 0.00 |
| Preferences | 0.33 | 0.26 | 0.28 | 0.02 | 0.20 | 0.13 | 0.00 | 0.00 |
| Academic indicators | 0.87 | 0.80 | 0.85 | 0.43 | 0.77 | 0.43 | 0.41 | 0.43 |
| Big Five + Preferences | 0.38 | 0.37 | 0.37 | 0.12 | 0.24 | 0.23 | 0.00 | 0.00 |
| Big Five + Academic indicators | 0.89 | 0.83 | 0.88 | 0.55 | 0.83 | 0.51 | 0.30 | 0.47 |
| Preferences + Academic indicators | 0.89 | 0.82 | 0.87 | 0.57 | 0.83 | 0.51 | 0.30 | 0.51 |
| Big Five + Preferences + Academic indicators | 0.89 | 0.83 | 0.87 | 0.57 | 0.84 | 0.53 | 0.28 | 0.51 |
| **Advanced Big Five, separate 9th-grade school records** | | | | | | | | |
| Big Five (adv) | 0.17 | 0.31 | 0.34 | 0.12 | 0.20 | 0.12 | 0.00 | 0.04 |
| Preferences | 0.33 | 0.26 | 0.28 | 0.02 | 0.20 | 0.13 | 0.00 | 0.00 |
| Academic indicators | 0.87 | 0.80 | 0.85 | 0.43 | 0.77 | 0.43 | 0.41 | 0.43 |
| Big Five (adv) + Preferences | 0.37 | 0.37 | 0.40 | 0.10 | 0.24 | 0.15 | 0.00 | 0.00 |
| Big Five (adv) + Academic indicators | 0.89 | 0.82 | 0.87 | 0.55 | 0.83 | 0.51 | 0.31 | 0.49 |
| Preferences + Academic indicators | 0.89 | 0.82 | 0.87 | 0.57 | 0.83 | 0.51 | 0.30 | 0.51 |
| Big Five (adv) + Preferences + Academic indicators | 0.89 | 0.82 | 0.87 | 0.58 | 0.84 | 0.51 | 0.28 | 0.51 |
| **Standard Big Five, separate 9th-grade Achievement and Behavioral factors** | | | | | | | | |
| Big Five | 0.25 | 0.33 | 0.33 | 0.15 | 0.22 | 0.22 | 0.00 | 0.00 |
| Preferences | 0.33 | 0.26 | 0.28 | 0.02 | 0.20 | 0.13 | 0.00 | 0.00 |
| Academic factors | 0.85 | 0.82 | 0.85 | 0.45 | 0.66 | 0.31 | 0.15 | 0.41 |
| Big Five + Preferences | 0.38 | 0.37 | 0.37 | 0.12 | 0.24 | 0.23 | 0.00 | 0.00 |
| Big Five + Academic factors | 0.85 | 0.83 | 0.85 | 0.41 | 0.66 | 0.33 | 0.15 | 0.35 |
| Preferences + Academic factors | 0.85 | 0.82 | 0.84 | 0.42 | 0.66 | 0.30 | 0.14 | 0.36 |
| Big Five + Preferences + Academic factors | 0.85 | 0.82 | 0.85 | 0.41 | 0.66 | 0.33 | 0.13 | 0.35 |
| **Advanced Big Five, separate 9th-grade Achievement and Behavioral factors** | | | | | | | | |
| Big Five (adv) | 0.17 | 0.31 | 0.34 | 0.12 | 0.20 | 0.12 | 0.00 | 0.04 |
| Preferences | 0.33 | 0.26 | 0.28 | 0.02 | 0.20 | 0.13 | 0.00 | 0.00 |
| Academic factors | 0.85 | 0.82 | 0.85 | 0.45 | 0.66 | 0.31 | 0.15 | 0.41 |
| Big Five (adv) + Preferences | 0.37 | 0.37 | 0.40 | 0.10 | 0.24 | 0.15 | 0.00 | 0.00 |
| Big Five (adv) + Academic factors | 0.85 | 0.82 | 0.85 | 0.40 | 0.65 | 0.31 | 0.16 | 0.36 |
| Preferences + Academic factors | 0.85 | 0.82 | 0.84 | 0.42 | 0.66 | 0.30 | 0.14 | 0.36 |
| Big Five (adv) + Preferences + Academic factors | 0.85 | 0.82 | 0.85 | 0.41 | 0.66 | 0.29 | 0.12 | 0.36 |
| **All 9th-grade measures** | | | | | | | | |

| Measure | PSAT score, 10th grade | GPA, 10th grade | GPA (adjusted), 10th grade | Credits earned, 10th grade | Fraction days absent, 10th grade | Misconduct offenses, 10th grade | On-track, 10th grade | On-track, 11th grade |
|---|---|---|---|---|---|---|---|---|
| Big Five + Big Five (adv) + Preferences + Academic indicators + Academic factors | 0.89 | 0.83 | 0.87 | 0.58 | 0.84 | 0.52 | 0.27 | 0.50 |

Sources: Chicago Public Schools administrative data, 2016–2017, 2017–2018, and 2018–2019 school years. Student survey, 2016–2017 school year.

Note: The table displays the square root of the adjusted *R*-squared from regressions of each outcome on the predictors indicated in the left columns. Big Five includes Openness, Conscientiousness, Extraversion, Agreeableness, and Emotional Stability, which are measured using regression factor scores based on the Big Five Inventory-2 (Soto and John 2017). Big Five (adv) includes Big Five-AV and Conscientiousness-SJT. Big Five-AV includes Openness-AV, Conscientiousness-AV, Extraversion-AV, Agreeableness-AV, and Emotional Stability-AV, which are measured using regression factor scores based on an anchor-adjusted version of the Big Five Inventory-2 (Soto and John 2017). Conscientiousness-SJT is based on a study-developed situational judgement test designed to measure Conscientiousness. Preferences include Patience, Risk Taking, Positive Reciprocity, Negative Reciprocity, and Altruism, which are measured using items from the Global Preferences Survey (Falk et al. 2016). Academic indicators include PSAT score, GPA, GPA (adjusted), credits earned, fraction of days absent, and misconduct offenses. The Achievement factor is a predicted regression factor score based on the components of the PSAT test. The Behavioral factor is a predicted regression factor score based on the fall and spring GPAs from ninth grade, the faction of days absent in the fall and spring of ninth grade, credits accumulated in the fall and spring of ninth grade, and total misconduct incidents in ninth grade.

## Table A39. Male: Predictive power ($R$) of 9th-grade measures (Big Five, preferences, and school records) for 10th- and 11th-grade outcomes

| Measure | PSAT score, 10th grade | GPA, 10th grade | GPA (adjusted), 10th grade | Credits earned, 10th grade | Fraction days absent, 10th grade | Misconduct offenses, 10th grade | On-track, 10th grade | On-track, 11th grade |
|---|---|---|---|---|---|---|---|---|
| **Standard Big Five, separate 9th-grade school records** | | | | | | | | |
| Big Five | 0.21 | 0.24 | 0.20 | 0.00 | 0.17 | 0.15 | 0.14 | 0.00 |
| Preferences | 0.48 | 0.16 | 0.15 | 0.00 | 0.08 | 0.00 | 0.13 | 0.04 |
| Academic indicators | 0.87 | 0.78 | 0.84 | 0.51 | 0.76 | 0.51 | 0.19 | 0.38 |
| Big Five + Preferences | 0.50 | 0.25 | 0.22 | 0.00 | 0.17 | 0.06 | 0.15 | 0.00 |
| Big Five + Academic indicators | 0.91 | 0.76 | 0.82 | 0.46 | 0.74 | 0.64 | 0.28 | 0.40 |
| Preferences + Academic indicators | 0.91 | 0.75 | 0.81 | 0.47 | 0.72 | 0.68 | 0.26 | 0.38 |
| Big Five + Preferences + Academic indicators | 0.91 | 0.75 | 0.81 | 0.47 | 0.73 | 0.68 | 0.26 | 0.38 |
| **Advanced Big Five, separate 9th-grade school records** | | | | | | | | |
| Big Five (adv) | 0.20 | 0.31 | 0.30 | 0.03 | 0.25 | 0.11 | 0.04 | 0.09 |
| Preferences | 0.48 | 0.16 | 0.15 | 0.00 | 0.08 | 0.00 | 0.13 | 0.04 |
| Academic indicators | 0.87 | 0.78 | 0.84 | 0.51 | 0.76 | 0.51 | 0.19 | 0.38 |
| Big Five (adv) + Preferences | 0.50 | 0.35 | 0.33 | 0.00 | 0.25 | 0.05 | 0.15 | 0.07 |
| Big Five (adv) + Academic indicators | 0.91 | 0.76 | 0.82 | 0.47 | 0.73 | 0.70 | 0.24 | 0.40 |
| Preferences + Academic indicators | 0.91 | 0.75 | 0.81 | 0.47 | 0.72 | 0.68 | 0.26 | 0.38 |
| Big Five (adv) + Preferences + Academic indicators | 0.91 | 0.75 | 0.82 | 0.47 | 0.72 | 0.68 | 0.24 | 0.39 |
| **Standard Big Five, separate 9th-grade Achievement and Behavioral factors** | | | | | | | | |
| Big Five | 0.21 | 0.24 | 0.20 | 0.00 | 0.17 | 0.15 | 0.14 | 0.00 |
| Preferences | 0.48 | 0.16 | 0.15 | 0.00 | 0.08 | 0.00 | 0.13 | 0.04 |
| Academic factors | 0.89 | 0.76 | 0.80 | 0.29 | 0.56 | 0.20 | 0.08 | 0.12 |
| Big Five + Preferences | 0.50 | 0.25 | 0.22 | 0.00 | 0.17 | 0.06 | 0.15 | 0.00 |
| Big Five + Academic factors | 0.90 | 0.76 | 0.80 | 0.29 | 0.57 | 0.23 | 0.20 | 0.15 |
| Preferences + Academic factors | 0.90 | 0.76 | 0.79 | 0.34 | 0.53 | 0.22 | 0.21 | 0.20 |
| Big Five + Preferences + Academic factors | 0.90 | 0.75 | 0.79 | 0.32 | 0.54 | 0.24 | 0.24 | 0.20 |
| **Advanced Big Five, separate 9th-grade Achievement and Behavioral factors** | | | | | | | | |
| Big Five (adv) | 0.20 | 0.31 | 0.30 | 0.03 | 0.25 | 0.11 | 0.04 | 0.09 |
| Preferences | 0.48 | 0.16 | 0.15 | 0.00 | 0.08 | 0.00 | 0.13 | 0.04 |
| Academic factors | 0.89 | 0.76 | 0.80 | 0.29 | 0.56 | 0.20 | 0.08 | 0.12 |
| Big Five (adv) + Preferences | 0.50 | 0.35 | 0.33 | 0.00 | 0.25 | 0.05 | 0.15 | 0.07 |
| Big Five (adv) + Academic factors | 0.89 | 0.76 | 0.80 | 0.32 | 0.57 | 0.22 | 0.14 | 0.17 |
| Preferences + Academic factors | 0.90 | 0.76 | 0.79 | 0.34 | 0.53 | 0.22 | 0.21 | 0.20 |
| Big Five (adv) + Preferences + Academic factors | 0.90 | 0.75 | 0.79 | 0.34 | 0.55 | 0.24 | 0.22 | 0.21 |
| **All 9th-grade measures** | | | | | | | | |

| Measure | PSAT score, 10th grade | GPA, 10th grade | GPA (adjusted), 10th grade | Credits earned, 10th grade | Fraction days absent, 10th grade | Misconduct offenses, 10th grade | On-track, 10th grade | On-track, 11th grade |
|---|---|---|---|---|---|---|---|---|
| Big Five + Big Five (adv) + Preferences + Academic indicators + Academic factors | 0.91 | 0.75 | 0.81 | 0.48 | 0.72 | 0.69 | 0.21 | 0.37 |

Sources: Chicago Public Schools administrative data, 2016–2017, 2017–2018, and 2018–2019 school years. Student survey, 2016–2017 school year.

Note: The table displays the square root of the adjusted *R*-squared from regressions of each outcome on the predictors indicated in the left columns. Big Five includes Openness, Conscientiousness, Extraversion, Agreeableness, and Emotional Stability, which are measured using regression factor scores based on the Big Five Inventory-2 (Soto and John 2017). Big Five (adv) includes Big Five-AV and Conscientiousness-SJT. Big Five-AV includes Openness-AV, Conscientiousness-AV, Extraversion-AV, Agreeableness-AV, and Emotional Stability-AV, which are measured using regression factor scores based on an anchor-adjusted version of the Big Five Inventory-2 (Soto and John 2017). Conscientiousness-SJT is based on a study-developed situational judgement test designed to measure Conscientiousness. Preferences include Patience, Risk Taking, Positive Reciprocity, Negative Reciprocity, and Altruism, which are measured using items from the Global Preferences Survey (Falk et al. 2016). Academic indicators include PSAT score, GPA, GPA (adjusted), credits earned, fraction of days absent, and misconduct offenses. The Achievement factor is a predicted regression factor score based on the components of the PSAT test. The Behavioral factor is a predicted regression factor score based on the fall and spring GPAs from ninth grade, the faction of days absent in the fall and spring of ninth grade, credits accumulated in the fall and spring of ninth grade, and total misconduct incidents in ninth grade.

## Table A40. English spoken in home: Predictive power (*r*) of individual 9th-grade measures for 10th- and 11th-grade outcomes

| Measure | PSAT score, 10th grade | GPA, 10th grade | GPA (adjusted), 10th grade | Credits earned, 10th grade | Fraction days absent, 10th grade | Misconduct offenses, 10th grade | On-track, 10th grade | On-track, 11th grade |
|---|---|---|---|---|---|---|---|---|
| Openness | 0.13** | 0.03 | 0.05 | 0.00 | 0.03 | -0.09 | 0.04 | 0.02 |
| Conscientiousness | -0.11* | 0.19*** | 0.17*** | 0.05 | -0.02 | -0.03 | -0.02 | 0.06 |
| Extraversion | -0.11** | -0.10* | -0.07 | -0.02 | 0.06 | 0.08 | 0.10* | 0.02 |
| Agreeableness | 0.13** | 0.25*** | 0.26*** | 0.14*** | -0.17*** | -0.18*** | -0.01 | 0.11* |
| Emotional stability | 0.00 | 0.06 | 0.11* | 0.09 | -0.06 | -0.02 | -0.01 | 0.04 |
| Openness-AV | -0.06 | -0.06 | -0.07 | -0.08 | 0.14*** | 0.03 | 0.00 | -0.01 |
| Conscientiousness-AV | -0.08 | 0.22*** | 0.19*** | 0.05 | -0.06 | 0.00 | -0.01 | 0.04 |
| Extraversion-AV | -0.13** | -0.04 | -0.03 | 0.03 | 0.00 | 0.09 | 0.11** | 0.05 |
| Agreeableness-AV | -0.04 | 0.15*** | 0.14** | 0.09* | -0.07 | -0.04 | 0.04 | 0.08 |
| Emotional Stability-AV | -0.06 | 0.08 | 0.11** | 0.12** | -0.13** | -0.07 | 0.04 | 0.05 |
| Conscientiousness-SJT | 0.03 | 0.13** | 0.14** | 0.08 | -0.05 | -0.08 | -0.08 | 0.02 |
| Patience | 0.13** | 0.13** | 0.14** | 0.06 | -0.08 | -0.07 | -0.05 | 0.06 |
| Risk taking | -0.02 | -0.05 | -0.01 | 0.06 | 0.04 | 0.08 | 0.05 | 0.04 |
| Positive reciprocity | 0.11* | -0.02 | 0.03 | -0.06 | -0.03 | -0.02 | -0.11* | -0.06 |
| Negative reciprocity | -0.04 | -0.15*** | -0.15*** | -0.10* | 0.15*** | 0.07 | -0.01 | -0.05 |
| Altruism | 0.00 | 0.00 | -0.01 | 0.06 | -0.03 | -0.05 | -0.11** | 0.05 |
| Cognitive reflection | 0.39*** | 0.08 | 0.12** | 0.01 | -0.14** | -0.01 | -0.01 | -0.02 |
| PSAT score | 0.84*** | 0.39*** | 0.49*** | 0.15*** | -0.29*** | -0.17*** | 0.04 | 0.13*** |
| GPA | 0.47*** | 0.74*** | 0.76*** | 0.38*** | -0.54*** | -0.21*** | 0.24*** | 0.32*** |
| GPA (adjusted) | 0.58*** | 0.71*** | 0.80*** | 0.39*** | -0.57*** | -0.27*** | 0.25*** | 0.33*** |
| Credits earned | 0.17*** | 0.32*** | 0.36*** | 0.47*** | -0.40*** | -0.06 | 0.37*** | 0.44*** |
| Fraction days absent | -0.26*** | -0.36*** | -0.39*** | -0.42*** | 0.70*** | 0.15*** | -0.38*** | -0.43*** |
| Misconduct offenses | -0.24*** | -0.21*** | -0.29*** | -0.24*** | 0.42*** | 0.52*** | -0.14*** | -0.19*** |
| Achievement factor | 0.87*** | 0.41*** | 0.54*** | 0.14*** | -0.39*** | -0.23*** | 0.06 | 0.13** |
| Behavioral factor | 0.07 | 0.68*** | 0.64*** | 0.41*** | -0.52*** | -0.10* | 0.12** | 0.38*** |

Sources: Chicago Public Schools administrative data, 2016–2017, 2017–2018, and 2018–2019 school years. Student survey, 2016–2017 school year.

Note: The table displays the correlation between the outcomes and the predictors indicated in the left column. Openness, Conscientiousness, Extraversion, Agreeableness, and Emotional Stability are measured using regression factor scores based on the Big Five Inventory-2 (Soto and John 2017). Patience, Risk Taking, Positive Reciprocity, Negative Reciprocity, and Altruism are measured using items from the Global Preferences Survey (Falk et al. 2016). Cognitive Reflection is measured using regression factor scores based on the Cognitive Reflection Test (Frederick 2005). Openness-AV, Conscientiousness-AV, Extraversion-AV, Agreeableness-AV, and Emotional Stability-AV are measured using regression factor scores based on an anchor-adjusted version of the Big Five Inventory-2 (Soto and John 2017). Conscientiousness-SJT is based on a study-developed situational judgement test designed to measure Conscientiousness. The Achievement factor is a predicted regression factor score based on the components of the PSAT test. The Behavioral factor is a predicted regression factor score based on the fall and spring GPAs from

ninth grade, the faction of days absent in the fall and spring of ninth grade, credits accumulated in the fall and spring of ninth grade, and total misconduct incidents in ninth grade.

* Significantly different from zero at the .10 level, two-tailed test.

** Significantly different from zero at the .05 level, two-tailed test.

*** Significantly different from zero at the .01 level, two-tailed test.

## Table A41. Spanish or other language spoken in home: Predictive power (*r*) of individual 9th-grade measures for 10th- and 11th-grade outcomes

| Measure | PSAT score, 10th grade | GPA, 10th grade | GPA (adjusted), 10th grade | Credits earned, 10th grade | Fraction days absent, 10th grade | Misconduct offenses, 10th grade | On-track, 10th grade | On-track, 11th grade |
|---|---|---|---|---|---|---|---|---|
| Openness | 0.14** | 0.11* | 0.14** | 0.03 | -0.05 | -0.14** | -0.04 | 0.00 |
| Conscientiousness | 0.00 | 0.36*** | 0.34*** | 0.05 | -0.21*** | -0.02 | -0.04 | -0.07 |
| Extraversion | -0.03 | -0.04 | -0.01 | 0.08 | 0.05 | 0.08 | 0.01 | 0.14** |
| Agreeableness | 0.04 | 0.20*** | 0.20*** | 0.01 | -0.12** | -0.08 | -0.08 | -0.06 |
| Emotional stability | 0.16*** | 0.14** | 0.16*** | 0.06 | -0.15*** | -0.05 | 0.07 | 0.01 |
| Openness-AV | -0.03 | 0.04 | 0.01 | 0.05 | -0.03 | -0.06 | -0.04 | -0.07 |
| Conscientiousness-AV | 0.10 | 0.33*** | 0.34*** | 0.09 | -0.23*** | -0.09 | -0.02 | -0.01 |
| Extraversion-AV | -0.05 | 0.01 | 0.02 | 0.17*** | 0.03 | 0.07 | 0.00 | 0.22*** |
| Agreeableness-AV | -0.06 | 0.11* | 0.11* | -0.01 | -0.09 | -0.04 | 0.04 | -0.06 |
| Emotional Stability-AV | 0.03 | 0.05 | 0.05 | 0.07 | -0.07 | 0.00 | 0.06 | 0.03 |
| Conscientiousness-SJT | 0.17*** | 0.31*** | 0.33*** | 0.04 | -0.12** | -0.10* | 0.02 | -0.03 |
| Patience | 0.21*** | 0.17*** | 0.20*** | -0.02 | -0.08 | -0.09 | 0.06 | -0.03 |
| Risk taking | 0.05 | -0.09 | -0.07 | -0.13** | 0.09 | 0.04 | -0.13** | -0.02 |
| Positive reciprocity | 0.12** | 0.03 | 0.07 | -0.08 | -0.01 | -0.04 | -0.06 | -0.08 |
| Negative reciprocity | 0.08 | -0.17*** | -0.15** | 0.01 | 0.14** | 0.00 | -0.07 | 0.00 |
| Altruism | 0.07 | 0.03 | 0.06 | -0.01 | -0.04 | 0.03 | 0.01 | -0.01 |
| Cognitive reflection | 0.33*** | -0.02 | 0.03 | -0.14** | 0.02 | -0.09 | -0.11* | -0.09 |
| PSAT score | 0.86*** | 0.36*** | 0.49*** | 0.14*** | -0.22*** | -0.21*** | 0.06 | 0.07* |
| GPA | 0.49*** | 0.78*** | 0.81*** | 0.36*** | -0.56*** | -0.17*** | 0.22*** | 0.23*** |
| GPA (adjusted) | 0.62*** | 0.76*** | 0.85*** | 0.36*** | -0.56*** | -0.19*** | 0.23*** | 0.23*** |
| Credits earned | 0.21*** | 0.29*** | 0.33*** | 0.56*** | -0.57*** | -0.14*** | 0.60*** | 0.59*** |
| Fraction days absent | -0.25*** | -0.31*** | -0.35*** | -0.49*** | 0.72*** | 0.14*** | -0.57*** | -0.45*** |
| Misconduct offenses | -0.20*** | -0.23*** | -0.23*** | -0.19*** | 0.33*** | 0.81*** | -0.28*** | -0.22*** |
| Achievement factor | 0.84*** | 0.35*** | 0.48*** | 0.14** | -0.19*** | -0.22*** | 0.03 | 0.08 |
| Behavioral factor | -0.02 | 0.71*** | 0.65*** | 0.24*** | -0.49*** | -0.12** | 0.18*** | 0.12** |

Sources: Chicago Public Schools administrative data, 2016–2017, 2017–2018, and 2018–2019 school years. Student survey, 2016–2017 school year.

Note: The table displays the correlation between the outcomes and the predictors indicated in the left column. Openness, Conscientiousness, Extraversion, Agreeableness, and Emotional Stability are measured using regression factor scores based on the Big Five Inventory-2 (Soto and John 2017). Patience, Risk Taking, Positive Reciprocity, Negative Reciprocity, and Altruism are measured using items from the Global Preferences Survey (Falk et al. 2016). Cognitive Reflection is measured using regression factor scores based on the Cognitive Reflection Test (Frederick 2005). Openness-AV, Conscientiousness-AV, Extraversion-AV, Agreeableness-AV, and Emotional Stability-AV are measured using regression factor scores based on an anchor-adjusted version of the Big Five Inventory-2 (Soto and John 2017). Conscientiousness-SJT is based on a study-developed situational judgement test designed to measure Conscientiousness. The Achievement factor is a predicted regression factor score based on the components of the PSAT test. The Behavioral factor is a predicted regression factor score based on the fall and spring GPAs from

ninth grade, the faction of days absent in the fall and spring of ninth grade, credits accumulated in the fall and spring of ninth grade, and total misconduct incidents in ninth grade.

* Significantly different from zero at the .10 level, two-tailed test.

** Significantly different from zero at the .05 level, two-tailed test.

*** Significantly different from zero at the .01 level, two-tailed test.

## Table A42. English spoken in home: Predictive power (*R*) of 9th-grade measures for 10th- and 11th-grade outcomes

| Measure | PSAT score, 10th grade | GPA, 10th grade | GPA (adjusted), 10th grade | Credits earned, 10th grade | Fraction days absent, 10th grade | Misconduct offenses, 10th grade | On-track, 10th grade | On-track, 11th grade |
|---|---|---|---|---|---|---|---|---|
| **Standard and advanced Big Five measures** | | | | | | | | |
| Big Five | 0.28 | 0.27 | 0.27 | 0.11 | 0.16 | 0.18 | 0.00 | 0.00 |
| Big Five-AV | 0.08 | 0.23 | 0.21 | 0.11 | 0.16 | 0.02 | 0.04 | 0.00 |
| Conscientiousness-SJT | 0.00 | 0.11 | 0.13 | 0.05 | 0.00 | 0.05 | 0.05 | 0.00 |
| Big Five + Big Five-AV | 0.33 | 0.28 | 0.29 | 0.12 | 0.23 | 0.20 | 0.00 | 0.00 |
| Big Five + Big Five-AV + Conscientiousness-SJT | 0.35 | 0.28 | 0.29 | 0.10 | 0.23 | 0.21 | 0.04 | 0.00 |
| **Preferences** | | | | | | | | |
| Traditional preferences | 0.11 | 0.10 | 0.10 | 0.04 | 0.00 | 0.06 | 0.04 | 0.00 |
| Social preferences | 0.08 | 0.12 | 0.13 | 0.09 | 0.12 | 0.00 | 0.10 | 0.02 |
| Cognitive Reflection | 0.39 | 0.05 | 0.11 | 0.00 | 0.13 | 0.00 | 0.00 | 0.00 |
| Traditional preferences + Social preferences | 0.12 | 0.19 | 0.19 | 0.12 | 0.11 | 0.00 | 0.10 | 0.00 |
| Traditional preferences + Social preferences + Cognitive Reflection | 0.39 | 0.19 | 0.20 | 0.10 | 0.15 | 0.00 | 0.08 | 0.00 |
| **Measures based on academic indicators** | | | | | | | | |
| Academic indicators | 0.86 | 0.76 | 0.82 | 0.44 | 0.74 | 0.47 | 0.32 | 0.39 |
| Achievement and behavioral factors | 0.87 | 0.77 | 0.81 | 0.42 | 0.62 | 0.23 | 0.10 | 0.39 |
| Academic indicators + Achievement and Behavioral factors | 0.89 | 0.78 | 0.83 | 0.50 | 0.82 | 0.56 | 0.32 | 0.46 |

Sources: Chicago Public Schools administrative data, 2016–2017, 2017–2018, and 2018–2019 school years. Student survey, 2016–2017 school year.

Note: The table displays the square root of the adjusted *R*-squared from regressions of each outcome on the predictors indicated in the left column. Big Five includes Openness, Conscientiousness, Extraversion, Agreeableness, and Emotional Stability, which are measured using regression factor scores based on the Big Five Inventory-2 (Soto and John 2017). Big Five-AV includes Openness-AV, Conscientiousness-AV, Extraversion-AV, Agreeableness-AV, and Emotional Stability-AV, which are measured using regression factor scores based on an anchor-adjusted version of the Big Five Inventory-2 (Soto and John 2017). Conscientiousness-SJT is based on a study-developed situational judgement test designed to measure Conscientiousness. Traditional preference include Patience, Risk Taking, and social preferences include Positive Reciprocity, Negative Reciprocity, and Altruism. All preferences are measured using items from the Global Preferences Survey (Falk et al. 2016). Cognitive Reflection is measured using regression factor scores based on the Cognitive Reflection Test (Frederick 2005). Academic indicators include PSAT score, GPA, GPA (adjusted), credits earned, fraction of days absent, and misconduct offenses. The Achievement factor is a predicted regression factor score based on the components of the PSAT test. The Behavioral factor is a predicted regression factor score based on the fall and spring GPAs from ninth grade, the faction of days absent in the fall and spring of ninth grade, credits accumulated in the fall and spring of ninth grade, and total misconduct incidents in ninth grade.

## Table A43. Spanish or other language spoken in home: Predictive power ($R^2$) of 9th-grade measures for 10th- and 11th-grade outcomes

| Measure | PSAT score, 10th grade | GPA, 10th grade | GPA (adjusted), 10th grade | Credits earned, 10th grade | Fraction days absent, 10th grade | Misconduct offenses, 10th grade | On-track, 10th grade | On-track, 11th grade |
|---|---|---|---|---|---|---|---|---|
| **Standard and advanced Big Five measures** | | | | | | | | |
| Big Five | 0.22 | 0.36 | 0.34 | 0.00 | 0.23 | 0.17 | 0.04 | 0.13 |
| Big Five-AV | 0.10 | 0.31 | 0.32 | 0.14 | 0.21 | 0.04 | 0.00 | 0.22 |
| Conscientiousness-SJT | 0.16 | 0.31 | 0.33 | 0.00 | 0.11 | 0.08 | 0.00 | 0.00 |
| Big Five + Big Five-AV | 0.32 | 0.37 | 0.38 | 0.10 | 0.22 | 0.16 | 0.06 | 0.21 |
| Big Five + Big Five-AV + Conscientiousness-SJT | 0.35 | 0.41 | 0.43 | 0.08 | 0.22 | 0.17 | 0.06 | 0.20 |
| **Preferences** | | | | | | | | |
| Traditional preferences | 0.21 | 0.18 | 0.20 | 0.11 | 0.08 | 0.05 | 0.12 | 0.00 |
| Social preferences | 0.10 | 0.15 | 0.14 | 0.00 | 0.10 | 0.00 | 0.00 | 0.00 |
| Cognitive Reflection | 0.33 | 0.00 | 0.00 | 0.13 | 0.00 | 0.06 | 0.09 | 0.06 |
| Traditional preferences + Social preferences | 0.21 | 0.22 | 0.23 | 0.09 | 0.11 | 0.00 | 0.10 | 0.00 |
| Traditional preferences + Social preferences + Cognitive Reflection | 0.39 | 0.21 | 0.23 | 0.15 | 0.10 | 0.00 | 0.13 | 0.00 |
| **Measures based on academic indicators** | | | | | | | | |
| Academic indicators | 0.88 | 0.82 | 0.88 | 0.50 | 0.75 | 0.53 | 0.15 | 0.40 |
| Achievement and behavioral factors | 0.84 | 0.82 | 0.85 | 0.27 | 0.55 | 0.26 | 0.17 | 0.12 |
| Academic indicators + Achievement and Behavioral factors | 0.88 | 0.82 | 0.87 | 0.59 | 0.76 | 0.51 | 0.34 | 0.41 |

Sources: Chicago Public Schools administrative data, 2016–2017, 2017–2018, and 2018–2019 school years. Student survey, 2016–2017 school year.

Note: The table displays the square root of the adjusted *R*-squared from regressions of each outcome on the predictors indicated in the left column. Big Five includes Openness, Conscientiousness, Extraversion, Agreeableness, and Emotional Stability, which are measured using regression factor scores based on the Big Five Inventory-2 (Soto and John 2017). Big Five-AV includes Openness-AV, Conscientiousness-AV, Extraversion-AV, Agreeableness-AV, and Emotional Stability-AV, which are measured using regression factor scores based on an anchor-adjusted version of the Big Five Inventory-2 (Soto and John 2017). Conscientiousness-SJT is based on a study-developed situational judgement test designed to measure Conscientiousness. Traditional preference include Patience, Risk Taking, and social preferences include Positive Reciprocity, Negative Reciprocity, and Altruism. All preferences are measured using items from the Global Preferences Survey (Falk et al. 2016). Cognitive Reflection is measured using regression factor scores based on the Cognitive Reflection Test (Frederick 2005). Academic indicators include PSAT score, GPA, GPA (adjusted), credits earned, fraction of days absent, and misconduct offenses. The Achievement factor is a predicted regression factor score based on the components of the PSAT test. The Behavioral factor is a predicted regression factor score based on the fall and spring GPAs from ninth grade, the faction of days absent in the fall and spring of ninth grade, credits accumulated in the fall and spring of ninth grade, and total misconduct incidents in ninth grade.

## Table A44. English spoken in home: Predictive power ($R$) of 9th-grade measures (Big Five, preferences, and school records) for 10th- and 11th-grade outcomes

| Measure | PSAT score, 10th grade | GPA, 10th grade | GPA (adjusted), 10th grade | Credits earned, 10th grade | Fraction days absent, 10th grade | Misconduct offenses, 10th grade | On-track, 10th grade | On-track, 11th grade |
|---|---|---|---|---|---|---|---|---|
| **Standard Big Five, separate 9th-grade school records** | | | | | | | | |
| Big Five | 0.28 | 0.27 | 0.27 | 0.11 | 0.16 | 0.18 | 0.00 | 0.00 |
| Preferences | 0.39 | 0.19 | 0.20 | 0.10 | 0.15 | 0.00 | 0.08 | 0.00 |
| Academic indicators | 0.86 | 0.76 | 0.82 | 0.44 | 0.74 | 0.47 | 0.32 | 0.39 |
| Big Five + Preferences | 0.44 | 0.29 | 0.29 | 0.14 | 0.17 | 0.14 | 0.09 | 0.00 |
| Big Five + Academic indicators | 0.89 | 0.77 | 0.83 | 0.45 | 0.81 | 0.55 | 0.30 | 0.41 |
| Preferences + Academic indicators | 0.89 | 0.76 | 0.83 | 0.49 | 0.81 | 0.56 | 0.27 | 0.46 |
| Big Five + Preferences + Academic indicators | 0.90 | 0.76 | 0.82 | 0.48 | 0.81 | 0.56 | 0.28 | 0.45 |
| **Advanced Big Five, separate 9th-grade school records** | | | | | | | | |
| Big Five (adv) | 0.11 | 0.24 | 0.22 | 0.11 | 0.17 | 0.08 | 0.06 | 0.00 |
| Preferences | 0.39 | 0.19 | 0.20 | 0.10 | 0.15 | 0.00 | 0.08 | 0.00 |
| Academic indicators | 0.86 | 0.76 | 0.82 | 0.44 | 0.74 | 0.47 | 0.32 | 0.39 |
| Big Five (adv) + Preferences | 0.39 | 0.28 | 0.28 | 0.14 | 0.23 | 0.00 | 0.04 | 0.00 |
| Big Five (adv) + Academic indicators | 0.89 | 0.76 | 0.82 | 0.44 | 0.81 | 0.57 | 0.31 | 0.42 |
| Preferences + Academic indicators | 0.89 | 0.76 | 0.83 | 0.49 | 0.81 | 0.56 | 0.27 | 0.46 |
| Big Five (adv) + Preferences + Academic indicators | 0.89 | 0.76 | 0.83 | 0.48 | 0.81 | 0.56 | 0.26 | 0.45 |
| **Standard Big Five, separate 9th-grade Achievement and Behavioral factors** | | | | | | | | |
| Big Five | 0.28 | 0.27 | 0.27 | 0.11 | 0.16 | 0.18 | 0.00 | 0.00 |
| Preferences | 0.39 | 0.19 | 0.20 | 0.10 | 0.15 | 0.00 | 0.08 | 0.00 |
| Academic factors | 0.87 | 0.77 | 0.81 | 0.42 | 0.62 | 0.23 | 0.10 | 0.39 |
| Big Five + Preferences | 0.44 | 0.29 | 0.29 | 0.14 | 0.17 | 0.14 | 0.09 | 0.00 |
| Big Five + Academic factors | 0.87 | 0.77 | 0.80 | 0.38 | 0.61 | 0.25 | 0.11 | 0.31 |
| Preferences + Academic factors | 0.88 | 0.76 | 0.79 | 0.40 | 0.59 | 0.25 | 0.16 | 0.35 |
| Big Five + Preferences + Academic factors | 0.88 | 0.76 | 0.79 | 0.39 | 0.59 | 0.26 | 0.16 | 0.33 |
| **Advanced Big Five, separate 9th-grade Achievement and Behavioral factors** | | | | | | | | |
| Big Five (adv) | 0.11 | 0.24 | 0.22 | 0.11 | 0.17 | 0.08 | 0.06 | 0.00 |
| Preferences | 0.39 | 0.19 | 0.20 | 0.10 | 0.15 | 0.00 | 0.08 | 0.00 |
| Academic factors | 0.87 | 0.77 | 0.81 | 0.42 | 0.62 | 0.23 | 0.10 | 0.39 |
| Big Five (adv) + Preferences | 0.39 | 0.28 | 0.28 | 0.14 | 0.23 | 0.00 | 0.04 | 0.00 |
| Big Five (adv) + Academic factors | 0.87 | 0.75 | 0.80 | 0.38 | 0.60 | 0.25 | 0.14 | 0.31 |
| Preferences + Academic factors | 0.88 | 0.76 | 0.79 | 0.40 | 0.59 | 0.25 | 0.16 | 0.35 |
| Big Five (adv) + Preferences + Academic factors | 0.88 | 0.76 | 0.80 | 0.40 | 0.60 | 0.25 | 0.13 | 0.33 |

| Measure | PSAT score, 10th grade | GPA, 10th grade | GPA (adjusted), 10th grade | Credits earned, 10th grade | Fraction days absent, 10th grade | Misconduct offenses, 10th grade | On-track, 10th grade | On-track, 11th grade |
|---|---|---|---|---|---|---|---|---|
| **All 9th-grade measures** | | | | | | | | |
| Big Five + Big Five (adv) + Preferences + Academic indicators + Academic factors | 0.89 | 0.76 | 0.82 | 0.47 | 0.82 | 0.56 | 0.26 | 0.44 |

Sources: Chicago Public Schools administrative data, 2016–2017, 2017–2018, and 2018–2019 school years. Student survey, 2016–2017 school year.

Note: The table displays the square root of the adjusted *R*-squared from regressions of each outcome on the predictors indicated in the left columns. Big Five includes Openness, Conscientiousness, Extraversion, Agreeableness, and Emotional Stability, which are measured using regression factor scores based on the Big Five Inventory-2 (Soto and John 2017). Big Five (adv) includes Big Five-AV and Conscientiousness-SJT. Big Five-AV includes Openness-AV, Conscientiousness-AV, Extraversion-AV, Agreeableness-AV, and Emotional Stability-AV, which are measured using regression factor scores based on an anchor-adjusted version of the Big Five Inventory-2 (Soto and John 2017). Conscientiousness-SJT is based on a study-developed situational judgement test designed to measure Conscientiousness. Preferences include Patience, Risk Taking, Positive Reciprocity, Negative Reciprocity, and Altruism, which are measured using items from the Global Preferences Survey (Falk et al. 2016). Academic indicators include PSAT score, GPA, GPA (adjusted), credits earned, fraction of days absent, and misconduct offenses. The Achievement factor is a predicted regression factor score based on the components of the PSAT test. The Behavioral factor is a predicted regression factor score based on the fall and spring GPAs from ninth grade, the faction of days absent in the fall and spring of ninth grade, credits accumulated in the fall and spring of ninth grade, and total misconduct incidents in ninth grade.

## Table A45. Spanish or other language spoken in home: Predictive power ($R^2$) of 9th-grade measures (Big Five, preferences, and school records) for 10th- and 11th-grade outcomes

| Measure | PSAT score, 10th grade | GPA, 10th grade | GPA (adjusted), 10th grade | Credits earned, 10th grade | Fraction days absent, 10th grade | Misconduct offenses, 10th grade | On-track, 10th grade | On-track, 11th grade |
|---|---|---|---|---|---|---|---|---|
| **Standard Big Five, separate 9th-grade school records** | | | | | | | | |
| Big Five | 0.22 | 0.36 | 0.34 | 0.00 | 0.23 | 0.17 | 0.04 | 0.13 |
| Preferences | 0.39 | 0.21 | 0.23 | 0.15 | 0.10 | 0.00 | 0.13 | 0.00 |
| Academic indicators | 0.88 | 0.82 | 0.88 | 0.50 | 0.75 | 0.53 | 0.15 | 0.40 |
| Big Five + Preferences | 0.43 | 0.36 | 0.35 | 0.17 | 0.20 | 0.19 | 0.20 | 0.15 |
| Big Five + Academic indicators | 0.88 | 0.83 | 0.87 | 0.59 | 0.76 | 0.52 | 0.34 | 0.42 |
| Preferences + Academic indicators | 0.89 | 0.82 | 0.87 | 0.59 | 0.76 | 0.51 | 0.36 | 0.41 |
| Big Five + Preferences + Academic indicators | 0.89 | 0.82 | 0.87 | 0.59 | 0.76 | 0.52 | 0.36 | 0.42 |
| **Advanced Big Five, separate 9th-grade school records** | | | | | | | | |
| Big Five (adv) | 0.19 | 0.39 | 0.41 | 0.13 | 0.21 | 0.05 | 0.00 | 0.21 |
| Preferences | 0.39 | 0.21 | 0.23 | 0.15 | 0.10 | 0.00 | 0.13 | 0.00 |
| Academic indicators | 0.88 | 0.82 | 0.88 | 0.50 | 0.75 | 0.53 | 0.15 | 0.40 |
| Big Five (adv) + Preferences | 0.43 | 0.38 | 0.41 | 0.23 | 0.18 | 0.05 | 0.09 | 0.21 |
| Big Five (adv) + Academic indicators | 0.89 | 0.82 | 0.87 | 0.61 | 0.76 | 0.51 | 0.33 | 0.45 |
| Preferences + Academic indicators | 0.89 | 0.82 | 0.87 | 0.59 | 0.76 | 0.51 | 0.36 | 0.41 |
| Big Five (adv) + Preferences + Academic indicators | 0.89 | 0.82 | 0.87 | 0.61 | 0.76 | 0.51 | 0.35 | 0.45 |
| **Standard Big Five, separate 9th-grade Achievement and Behavioral factors** | | | | | | | | |
| Big Five | 0.22 | 0.36 | 0.34 | 0.00 | 0.23 | 0.17 | 0.04 | 0.13 |
| Preferences | 0.39 | 0.21 | 0.23 | 0.15 | 0.10 | 0.00 | 0.13 | 0.00 |
| Academic factors | 0.84 | 0.82 | 0.85 | 0.27 | 0.55 | 0.26 | 0.17 | 0.12 |
| Big Five + Preferences | 0.43 | 0.36 | 0.35 | 0.17 | 0.20 | 0.19 | 0.20 | 0.15 |
| Big Five + Academic factors | 0.84 | 0.83 | 0.85 | 0.28 | 0.54 | 0.28 | 0.23 | 0.24 |
| Preferences + Academic factors | 0.84 | 0.82 | 0.85 | 0.35 | 0.54 | 0.22 | 0.19 | 0.15 |
| Big Five + Preferences + Academic factors | 0.84 | 0.82 | 0.85 | 0.36 | 0.53 | 0.27 | 0.28 | 0.26 |
| **Advanced Big Five, separate 9th-grade Achievement and Behavioral factors** | | | | | | | | |
| Big Five (adv) | 0.19 | 0.39 | 0.41 | 0.13 | 0.21 | 0.05 | 0.00 | 0.21 |
| Preferences | 0.39 | 0.21 | 0.23 | 0.15 | 0.10 | 0.00 | 0.13 | 0.00 |
| Academic factors | 0.84 | 0.82 | 0.85 | 0.27 | 0.55 | 0.26 | 0.17 | 0.12 |
| Big Five (adv) + Preferences | 0.43 | 0.38 | 0.41 | 0.23 | 0.18 | 0.05 | 0.09 | 0.21 |
| Big Five (adv) + Academic factors | 0.84 | 0.82 | 0.85 | 0.31 | 0.55 | 0.24 | 0.17 | 0.27 |
| Preferences + Academic factors | 0.84 | 0.82 | 0.85 | 0.35 | 0.54 | 0.22 | 0.19 | 0.15 |
| Big Five (adv) + Preferences + Academic factors | 0.84 | 0.82 | 0.85 | 0.39 | 0.54 | 0.20 | 0.20 | 0.29 |

| Measure | PSAT score, 10th grade | GPA, 10th grade | GPA (adjusted), 10th grade | Credits earned, 10th grade | Fraction days absent, 10th grade | Misconduct offenses, 10th grade | On-track, 10th grade | On-track, 11th grade |
|---|---|---|---|---|---|---|---|---|
| **All 9th-grade measures** | | | | | | | | |
| Big Five + Big Five (adv) + Preferences + Academic indicators + Academic factors | 0.89 | 0.82 | 0.87 | 0.61 | 0.75 | 0.50 | 0.38 | 0.45 |

Sources: Chicago Public Schools administrative data, 2016–2017, 2017–2018, and 2018–2019 school years. Student survey, 2016–2017 school year.

Note: The table displays the square root of the adjusted *R*-squared from regressions of each outcome on the predictors indicated in the left columns. Big Five includes Openness, Conscientiousness, Extraversion, Agreeableness, and Emotional Stability, which are measured using regression factor scores based on the Big Five Inventory-2 (Soto and John 2017). Big Five (adv) includes Big Five-AV and Conscientiousness-SJT. Big Five-AV includes Openness-AV, Conscientiousness-AV, Extraversion-AV, Agreeableness-AV, and Emotional Stability-AV, which are measured using regression factor scores based on an anchor-adjusted version of the Big Five Inventory-2 (Soto and John 2017). Conscientiousness-SJT is based on a study-developed situational judgement test designed to measure Conscientiousness. Preferences include Patience, Risk Taking, Positive Reciprocity, Negative Reciprocity, and Altruism, which are measured using items from the Global Preferences Survey (Falk et al. 2016). Academic indicators include PSAT score, GPA, GPA (adjusted), credits earned, fraction of days absent, and misconduct offenses. The Achievement factor is a predicted regression factor score based on the components of the PSAT test. The Behavioral factor is a predicted regression factor score based on the fall and spring GPAs from ninth grade, the faction of days absent in the fall and spring of ninth grade, credits accumulated in the fall and spring of ninth grade, and total misconduct incidents in ninth grade.

## Table A46. Race/ethnicity - Black: Predictive power (*r*) of individual 9th-grade measures for 10th- and 11th-grade outcomes

| Measure | PSAT score, 10th grade | GPA, 10th grade | GPA (adjusted), 10th grade | Credits earned, 10th grade | Fraction days absent, 10th grade | Misconduct offenses, 10th grade | On-track, 10th grade | On-track, 11th grade |
|---|---|---|---|---|---|---|---|---|
| Openness | 0.14** | 0.05 | 0.07 | -0.01 | 0.05 | -0.10 | 0.00 | -0.01 |
| Conscientiousness | 0.06 | 0.19*** | 0.21*** | 0.07 | -0.07 | -0.05 | -0.05 | 0.05 |
| Extraversion | -0.04 | -0.10 | -0.06 | 0.02 | 0.08 | 0.09 | 0.13** | 0.06 |
| Agreeableness | 0.18*** | 0.29*** | 0.31*** | 0.13** | -0.20*** | -0.21*** | -0.08 | 0.05 |
| Emotional stability | 0.07 | 0.09 | 0.14** | 0.10 | -0.11* | -0.03 | 0.02 | 0.01 |
| Openness-AV | 0.00 | -0.01 | -0.04 | 0.00 | 0.11* | 0.01 | -0.07 | -0.01 |
| Conscientiousness-AV | 0.03 | 0.24*** | 0.23*** | 0.07 | -0.11* | -0.01 | -0.02 | 0.02 |
| Extraversion-AV | -0.08 | -0.01 | 0.00 | 0.08 | -0.01 | 0.12* | 0.15** | 0.12* |
| Agreeableness-AV | 0.04 | 0.16** | 0.15** | 0.10* | -0.11* | -0.05 | 0.00 | 0.06 |
| Emotional Stability-AV | -0.02 | 0.09 | 0.14** | 0.13** | -0.17*** | -0.13** | 0.05 | 0.04 |
| Conscientiousness-SJT | 0.02 | 0.18*** | 0.18*** | 0.10 | -0.05 | -0.05 | -0.10 | 0.02 |
| Patience | 0.10 | 0.12* | 0.12* | 0.10 | -0.05 | -0.04 | -0.01 | 0.11* |
| Risk taking | -0.03 | 0.03 | 0.05 | 0.07 | 0.06 | 0.12* | -0.01 | 0.04 |
| Positive reciprocity | 0.08 | -0.01 | 0.04 | -0.07 | -0.03 | -0.02 | -0.12* | -0.06 |
| Negative reciprocity | -0.05 | -0.09 | -0.09 | -0.06 | 0.12* | 0.03 | 0.02 | -0.02 |
| Altruism | -0.08 | 0.00 | -0.03 | 0.02 | -0.05 | -0.01 | -0.12* | 0.03 |
| Cognitive reflection | 0.18*** | 0.05 | 0.08 | -0.12* | -0.09 | 0.09 | -0.03 | -0.09 |
| PSAT score | 0.77*** | 0.38*** | 0.47*** | 0.07* | -0.24*** | -0.17*** | -0.02 | 0.08* |
| GPA | 0.38*** | 0.73*** | 0.74*** | 0.35*** | -0.53*** | -0.17*** | 0.19*** | 0.29*** |
| GPA (adjusted) | 0.51*** | 0.70*** | 0.79*** | 0.36*** | -0.56*** | -0.24*** | 0.21*** | 0.30*** |
| Credits earned | 0.12*** | 0.33*** | 0.37*** | 0.44*** | -0.37*** | -0.05 | 0.34*** | 0.42*** |
| Fraction days absent | -0.21*** | -0.37*** | -0.40*** | -0.39*** | 0.71*** | 0.17*** | -0.37*** | -0.41*** |
| Misconduct offenses | -0.23*** | -0.23*** | -0.31*** | -0.23*** | 0.45*** | 0.59*** | -0.09** | -0.17*** |
| Achievement factor | 0.77*** | 0.47*** | 0.54*** | 0.06 | -0.37*** | -0.21*** | -0.08 | 0.00 |
| Behavioral factor | 0.09 | 0.66*** | 0.63*** | 0.41*** | -0.54*** | -0.08 | 0.14** | 0.41*** |

Sources: Chicago Public Schools administrative data, 2016–2017, 2017–2018, and 2018–2019 school years. Student survey, 2016–2017 school year.

Note: The table displays the correlation between the outcomes and the predictors indicated in the left column. Openness, Conscientiousness, Extraversion, Agreeableness, and Emotional Stability are measured using regression factor scores based on the Big Five Inventory-2 (Soto and John 2017). Patience, Risk Taking, Positive Reciprocity, Negative Reciprocity, and Altruism are measured using items from the Global Preferences Survey (Falk et al. 2016). Cognitive Reflection is measured using regression factor scores based on the Cognitive Reflection Test (Frederick 2005). Openness-AV, Conscientiousness-AV, Extraversion-AV, Agreeableness-AV, and Emotional Stability-AV are measured using regression factor scores based on an anchor-adjusted version of the Big Five Inventory-2 (Soto and John 2017). Conscientiousness-SJT is based on a study-developed situational judgement test designed to measure Conscientiousness. The Achievement factor is a predicted regression factor score based on the components of the PSAT test. The Behavioral factor is a predicted regression factor score based on the fall and spring GPAs from

ninth grade, the faction of days absent in the fall and spring of ninth grade, credits accumulated in the fall and spring of ninth grade, and total misconduct incidents in ninth grade.

* Significantly different from zero at the .10 level, two-tailed test.

** Significantly different from zero at the .05 level, two-tailed test.

*** Significantly different from zero at the .01 level, two-tailed test.

## Table A47. Race/ethnicity - Hispanic, white, other: Predictive power (*r*) of individual 9th-grade measures for 10th- and 11th-grade outcomes

| Measure | PSAT score, 10th grade | GPA, 10th grade | GPA (adjusted), 10th grade | Credits earned, 10th grade | Fraction days absent, 10th grade | Misconduct offenses, 10th grade | On-track, 10th grade | On-track, 11th grade |
|---|---|---|---|---|---|---|---|---|
| Openness | 0.13** | 0.06 | 0.09* | 0.02 | -0.03 | -0.10** | -0.01 | 0.03 |
| Conscientiousness | -0.03 | 0.37*** | 0.34*** | 0.08 | -0.22*** | -0.05 | 0.01 | -0.01 |
| Extraversion | -0.07 | -0.06 | -0.04 | 0.03 | 0.04 | 0.08 | 0.00 | 0.09* |
| Agreeableness | 0.03 | 0.19*** | 0.18*** | 0.05 | -0.10* | -0.06 | -0.03 | 0.01 |
| Emotional stability | 0.16*** | 0.13** | 0.16*** | 0.09* | -0.15*** | -0.08 | 0.06 | 0.07 |
| Openness-AV | 0.00 | 0.00 | 0.00 | -0.04 | 0.01 | -0.05 | 0.06 | -0.04 |
| Conscientiousness-AV | 0.05 | 0.33*** | 0.32*** | 0.09* | -0.21*** | -0.11** | 0.00 | 0.04 |
| Extraversion-AV | -0.08 | -0.02 | 0.00 | 0.09* | 0.03 | 0.04 | -0.01 | 0.14*** |
| Agreeableness-AV | -0.10* | 0.13** | 0.12** | 0.01 | -0.07 | -0.04 | 0.08 | -0.01 |
| Emotional Stability-AV | 0.04 | 0.07 | 0.08 | 0.10** | -0.09* | 0.02 | 0.08* | 0.06 |
| Conscientiousness-SJT | 0.16*** | 0.25*** | 0.28*** | 0.02 | -0.12** | -0.13*** | 0.03 | -0.02 |
| Patience | 0.15*** | 0.15*** | 0.17*** | -0.08 | -0.06 | -0.10** | -0.03 | -0.09* |
| Risk taking | 0.01 | -0.13*** | -0.10** | -0.11** | 0.08 | 0.02 | -0.09* | -0.02 |
| Positive reciprocity | 0.09* | 0.00 | 0.03 | -0.09* | 0.02 | 0.01 | -0.08 | -0.11** |
| Negative reciprocity | 0.06 | -0.21*** | -0.19*** | -0.05 | 0.17*** | 0.07 | -0.10** | -0.04 |
| Altruism | 0.05 | 0.01 | 0.04 | 0.03 | 0.01 | -0.02 | -0.01 | 0.01 |
| Cognitive reflection | 0.35*** | -0.02 | 0.03 | -0.08 | 0.00 | -0.09* | -0.14*** | -0.08 |
| PSAT score | 0.86*** | 0.36*** | 0.49*** | 0.16*** | -0.22*** | -0.21*** | 0.06* | 0.10*** |
| GPA | 0.50*** | 0.77*** | 0.81*** | 0.38*** | -0.56*** | -0.21*** | 0.28*** | 0.28*** |
| GPA (adjusted) | 0.63*** | 0.75*** | 0.84*** | 0.39*** | -0.56*** | -0.24*** | 0.26*** | 0.29*** |
| Credits earned | 0.22*** | 0.28*** | 0.32*** | 0.56*** | -0.53*** | -0.13*** | 0.59*** | 0.57*** |
| Fraction days absent | -0.24*** | -0.31*** | -0.36*** | -0.50*** | 0.70*** | 0.14*** | -0.54*** | -0.46*** |
| Misconduct offenses | -0.16*** | -0.21*** | -0.22*** | -0.21*** | 0.32*** | 0.66*** | -0.33*** | -0.24*** |
| Achievement factor | 0.86*** | 0.32*** | 0.46*** | 0.14*** | -0.19*** | -0.23*** | 0.07 | 0.15*** |
| Behavioral factor | 0.00 | 0.73*** | 0.67*** | 0.28*** | -0.50*** | -0.15*** | 0.12** | 0.14*** |

Sources: Chicago Public Schools administrative data, 2016–2017, 2017–2018, and 2018–2019 school years. Student survey, 2016–2017 school year.

Note: The table displays the correlation between the outcomes and the predictors indicated in the left column. Openness, Conscientiousness, Extraversion, Agreeableness, and Emotional Stability are measured using regression factor scores based on the Big Five Inventory-2 (Soto and John 2017). Patience, Risk Taking, Positive Reciprocity, Negative Reciprocity, and Altruism are measured using items from the Global Preferences Survey (Falk et al. 2016). Cognitive Reflection is measured using regression factor scores based on the Cognitive Reflection Test (Frederick 2005). Openness-AV, Conscientiousness-AV, Extraversion-AV, Agreeableness-AV, and Emotional Stability-AV are measured using regression factor scores based on an anchor-adjusted version of the Big Five Inventory-2 (Soto and John 2017). Conscientiousness-SJT is based on a study-developed situational judgement test designed to measure Conscientiousness. The Achievement factor is a predicted regression factor score based on the components of the PSAT test. The Behavioral factor is a predicted regression factor score based on the fall and spring GPAs from

ninth grade, the faction of days absent in the fall and spring of ninth grade, credits accumulated in the fall and spring of ninth grade, and total misconduct incidents in ninth grade.

* Significantly different from zero at the .10 level, two-tailed test.

** Significantly different from zero at the .05 level, two-tailed test.

*** Significantly different from zero at the .01 level, two-tailed test.

## Table A48. Race/ethnicity - Black: Predictive power (*R*) of 9th-grade measures for 10th- and 11th-grade outcomes

| Measure | PSAT score, 10th grade | GPA, 10th grade | GPA (adjusted), 10th grade | Credits earned, 10th grade | Fraction days absent, 10th grade | Misconduct offenses, 10th grade | On-track, 10th grade | On-track, 11th grade |
|---|---|---|---|---|---|---|---|---|
| **Standard and advanced Big Five measures** | | | | | | | | |
| Big Five | 0.17 | 0.30 | 0.31 | 0.07 | 0.19 | 0.20 | 0.10 | 0.00 |
| Big Five-AV | 0.00 | 0.22 | 0.24 | 0.09 | 0.18 | 0.13 | 0.12 | 0.00 |
| Conscientiousness-SJT | 0.00 | 0.16 | 0.16 | 0.07 | 0.00 | 0.00 | 0.07 | 0.00 |
| Big Five + Big Five-AV | 0.19 | 0.31 | 0.33 | 0.00 | 0.23 | 0.24 | 0.11 | 0.00 |
| Big Five + Big Five-AV + Conscientiousness-SJT | 0.19 | 0.33 | 0.33 | 0.00 | 0.24 | 0.24 | 0.12 | 0.00 |
| **Preferences** | | | | | | | | |
| Traditional preferences | 0.07 | 0.05 | 0.07 | 0.07 | 0.00 | 0.08 | 0.00 | 0.05 |
| Social preferences | 0.09 | 0.00 | 0.00 | 0.00 | 0.07 | 0.00 | 0.11 | 0.00 |
| Cognitive Reflection | 0.17 | 0.00 | 0.05 | 0.10 | 0.07 | 0.06 | 0.00 | 0.06 |
| Traditional preferences + Social preferences | 0.12 | 0.08 | 0.10 | 0.06 | 0.00 | 0.00 | 0.07 | 0.00 |
| Traditional preferences + Social preferences + Cognitive Reflection | 0.21 | 0.06 | 0.09 | 0.16 | 0.00 | 0.00 | 0.05 | 0.07 |
| **Measures based on academic indicators** | | | | | | | | |
| Academic indicators | 0.78 | 0.76 | 0.80 | 0.40 | 0.75 | 0.53 | 0.34 | 0.37 |
| Achievement and behavioral factors | 0.77 | 0.78 | 0.80 | 0.41 | 0.62 | 0.20 | 0.15 | 0.40 |
| Academic indicators + Achievement and Behavioral factors | 0.81 | 0.78 | 0.83 | 0.49 | 0.81 | 0.55 | 0.34 | 0.46 |

Sources: Chicago Public Schools administrative data, 2016–2017, 2017–2018, and 2018–2019 school years. Student survey, 2016–2017 school year.

Note: The table displays the square root of the adjusted *R*-squared from regressions of each outcome on the predictors indicated in the left column. Big Five includes Openness, Conscientiousness, Extraversion, Agreeableness, and Emotional Stability, which are measured using regression factor scores based on the Big Five Inventory-2 (Soto and John 2017). Big Five-AV includes Openness-AV, Conscientiousness-AV, Extraversion-AV, Agreeableness-AV, and Emotional Stability-AV, which are measured using regression factor scores based on an anchor-adjusted version of the Big Five Inventory-2 (Soto and John 2017). Conscientiousness-SJT is based on a study-developed situational judgement test designed to measure Conscientiousness. Traditional preference include Patience, Risk Taking, and social preferences include Positive Reciprocity, Negative Reciprocity, and Altruism. All preferences are measured using items from the Global Preferences Survey (Falk et al. 2016). Cognitive Reflection is measured using regression factor scores based on the Cognitive Reflection Test (Frederick 2005). Academic indicators include PSAT score, GPA, GPA (adjusted), credits earned, fraction of days absent, and misconduct offenses. The Achievement factor is a predicted regression factor score based on the components of the PSAT test. The Behavioral factor is a predicted regression factor score based on the fall and spring GPAs from ninth grade, the faction of days absent in the fall and spring of ninth grade, credits accumulated in the fall and spring of ninth grade, and total misconduct incidents in ninth grade.

## Table A49. Race/ethnicity - Hispanic, white, other: Predictive power ($R$) of 9th-grade measures for 10th- and 11th-grade outcomes

| Measure | PSAT score, 10th grade | GPA, 10th grade | GPA (adjusted), 10th grade | Credits earned, 10th grade | Fraction days absent, 10th grade | Misconduct offenses, 10th grade | On-track, 10th grade | On-track, 11th grade |
|---|---|---|---|---|---|---|---|---|
| **Standard and advanced Big Five measures** | | | | | | | | |
| Big Five | 0.27 | 0.38 | 0.35 | 0.00 | 0.23 | 0.16 | 0.00 | 0.00 |
| Big Five-AV | 0.13 | 0.32 | 0.31 | 0.12 | 0.20 | 0.06 | 0.07 | 0.12 |
| Conscientiousness-SJT | 0.15 | 0.25 | 0.28 | 0.00 | 0.11 | 0.12 | 0.00 | 0.00 |
| Big Five + Big Five-AV | 0.34 | 0.38 | 0.37 | 0.11 | 0.22 | 0.18 | 0.09 | 0.11 |
| Big Five + Big Five-AV + Conscientiousness-SJT | 0.37 | 0.39 | 0.39 | 0.10 | 0.22 | 0.19 | 0.08 | 0.10 |
| **Preferences** | | | | | | | | |
| Traditional preferences | 0.14 | 0.18 | 0.18 | 0.12 | 0.05 | 0.08 | 0.07 | 0.07 |
| Social preferences | 0.07 | 0.20 | 0.18 | 0.07 | 0.15 | 0.00 | 0.09 | 0.08 |
| Cognitive Reflection | 0.35 | 0.00 | 0.00 | 0.06 | 0.00 | 0.07 | 0.13 | 0.06 |
| Traditional preferences + Social preferences | 0.13 | 0.26 | 0.25 | 0.13 | 0.15 | 0.05 | 0.10 | 0.09 |
| Traditional preferences + Social preferences + Cognitive Reflection | 0.36 | 0.26 | 0.24 | 0.14 | 0.14 | 0.08 | 0.16 | 0.10 |
| **Measures based on academic indicators** | | | | | | | | |
| Academic indicators | 0.88 | 0.81 | 0.87 | 0.52 | 0.73 | 0.39 | 0.27 | 0.42 |
| Achievement and behavioral factors | 0.86 | 0.82 | 0.84 | 0.31 | 0.55 | 0.28 | 0.12 | 0.19 |
| Academic indicators + Achievement and Behavioral factors | 0.89 | 0.81 | 0.86 | 0.58 | 0.76 | 0.46 | 0.21 | 0.41 |

Sources: Chicago Public Schools administrative data, 2016–2017, 2017–2018, and 2018–2019 school years. Student survey, 2016–2017 school year.

Note: The table displays the square root of the adjusted $R$-squared from regressions of each outcome on the predictors indicated in the left column. Big Five includes Openness, Conscientiousness, Extraversion, Agreeableness, and Emotional Stability, which are measured using regression factor scores based on the Big Five Inventory-2 (Soto and John 2017). Big Five-AV includes Openness-AV, Conscientiousness-AV, Extraversion-AV, Agreeableness-AV, and Emotional Stability-AV, which are measured using regression factor scores based on an anchor-adjusted version of the Big Five Inventory-2 (Soto and John 2017). Conscientiousness-SJT is based on a study-developed situational judgement test designed to measure Conscientiousness. Traditional preference include Patience, Risk Taking, and social preferences include Positive Reciprocity, Negative Reciprocity, and Altruism. All preferences are measured using items from the Global Preferences Survey (Falk et al. 2016). Cognitive Reflection is measured using regression factor scores based on the Cognitive Reflection Test (Frederick 2005). Academic indicators include PSAT score, GPA, GPA (adjusted), credits earned, fraction of days absent, and misconduct offenses. The Achievement factor is a predicted regression factor score based on the components of the PSAT test. The Behavioral factor is a predicted regression factor score based on the fall and spring GPAs from ninth grade, the faction of days absent in the fall and spring of ninth grade, credits accumulated in the fall and spring of ninth grade, and total misconduct incidents in ninth grade.

## Table A50. Race/ethnicity - Black: Predictive power ($R^2$) of 9th-grade measures (Big Five, preferences, and school records) for 10th- and 11th-grade outcomes

| Measure | PSAT score, 10th grade | GPA, 10th grade | GPA (adjusted), 10th grade | Credits earned, 10th grade | Fraction days absent, 10th grade | Misconduct offenses, 10th grade | On-track, 10th grade | On-track, 11th grade |
|---|---|---|---|---|---|---|---|---|
| **Standard Big Five, separate 9th-grade school records** | | | | | | | | |
| Big Five | 0.17 | 0.30 | 0.31 | 0.07 | 0.19 | 0.20 | 0.10 | 0.00 |
| Preferences | 0.21 | 0.06 | 0.09 | 0.16 | 0.00 | 0.00 | 0.05 | 0.07 |
| Academic indicators | 0.78 | 0.76 | 0.80 | 0.40 | 0.75 | 0.53 | 0.34 | 0.37 |
| Big Five + Preferences | 0.25 | 0.32 | 0.34 | 0.19 | 0.15 | 0.21 | 0.08 | 0.00 |
| Big Five + Academic indicators | 0.82 | 0.78 | 0.82 | 0.43 | 0.80 | 0.54 | 0.32 | 0.41 |
| Preferences + Academic indicators | 0.81 | 0.77 | 0.82 | 0.48 | 0.80 | 0.57 | 0.30 | 0.46 |
| Big Five + Preferences + Academic indicators | 0.82 | 0.76 | 0.81 | 0.47 | 0.79 | 0.58 | 0.30 | 0.44 |
| **Advanced Big Five, separate 9th-grade school records** | | | | | | | | |
| Big Five (adv) | 0.00 | 0.25 | 0.26 | 0.09 | 0.19 | 0.15 | 0.13 | 0.00 |
| Preferences | 0.21 | 0.06 | 0.09 | 0.16 | 0.00 | 0.00 | 0.05 | 0.07 |
| Academic indicators | 0.78 | 0.76 | 0.80 | 0.40 | 0.75 | 0.53 | 0.34 | 0.37 |
| Big Five (adv) + Preferences | 0.16 | 0.26 | 0.29 | 0.19 | 0.20 | 0.15 | 0.07 | 0.00 |
| Big Five (adv) + Academic indicators | 0.82 | 0.77 | 0.82 | 0.41 | 0.80 | 0.57 | 0.31 | 0.40 |
| Preferences + Academic indicators | 0.81 | 0.77 | 0.82 | 0.48 | 0.80 | 0.57 | 0.30 | 0.46 |
| Big Five (adv) + Preferences + Academic indicators | 0.81 | 0.77 | 0.82 | 0.47 | 0.79 | 0.58 | 0.27 | 0.43 |
| **Standard Big Five, separate 9th-grade Achievement and Behavioral factors** | | | | | | | | |
| Big Five | 0.17 | 0.30 | 0.31 | 0.07 | 0.19 | 0.20 | 0.10 | 0.00 |
| Preferences | 0.21 | 0.06 | 0.09 | 0.16 | 0.00 | 0.00 | 0.05 | 0.07 |
| Academic factors | 0.77 | 0.78 | 0.80 | 0.41 | 0.62 | 0.20 | 0.15 | 0.40 |
| Big Five + Preferences | 0.25 | 0.32 | 0.34 | 0.19 | 0.15 | 0.21 | 0.08 | 0.00 |
| Big Five + Academic factors | 0.78 | 0.77 | 0.80 | 0.37 | 0.61 | 0.23 | 0.21 | 0.34 |
| Preferences + Academic factors | 0.77 | 0.76 | 0.78 | 0.41 | 0.59 | 0.23 | 0.17 | 0.37 |
| Big Five + Preferences + Academic factors | 0.77 | 0.76 | 0.78 | 0.39 | 0.59 | 0.27 | 0.20 | 0.35 |
| **Advanced Big Five, separate 9th-grade Achievement and Behavioral factors** | | | | | | | | |
| Big Five (adv) | 0.00 | 0.25 | 0.26 | 0.09 | 0.19 | 0.15 | 0.13 | 0.00 |
| Preferences | 0.21 | 0.06 | 0.09 | 0.16 | 0.00 | 0.00 | 0.05 | 0.07 |
| Academic factors | 0.77 | 0.78 | 0.80 | 0.41 | 0.62 | 0.20 | 0.15 | 0.40 |
| Big Five (adv) + Preferences | 0.16 | 0.26 | 0.29 | 0.19 | 0.20 | 0.15 | 0.07 | 0.00 |
| Big Five (adv) + Academic factors | 0.77 | 0.77 | 0.80 | 0.36 | 0.60 | 0.25 | 0.21 | 0.34 |
| Preferences + Academic factors | 0.77 | 0.76 | 0.78 | 0.41 | 0.59 | 0.23 | 0.17 | 0.37 |
| Big Five (adv) + Preferences + Academic factors | 0.76 | 0.76 | 0.79 | 0.40 | 0.60 | 0.29 | 0.17 | 0.35 |

| Measure | PSAT score, 10th grade | GPA, 10th grade | GPA (adjusted), 10th grade | Credits earned, 10th grade | Fraction days absent, 10th grade | Misconduct offenses, 10th grade | On-track, 10th grade | On-track, 11th grade |
|---|---|---|---|---|---|---|---|---|
| **All 9th-grade measures** | | | | | | | | |
| Big Five + Big Five (adv) + Preferences + Academic indicators + Academic factors | 0.82 | 0.77 | 0.82 | 0.45 | 0.80 | 0.58 | 0.28 | 0.43 |

Sources: Chicago Public Schools administrative data, 2016–2017, 2017–2018, and 2018–2019 school years. Student survey, 2016–2017 school year.

Note: The table displays the square root of the adjusted *R*-squared from regressions of each outcome on the predictors indicated in the left columns. Big Five includes Openness, Conscientiousness, Extraversion, Agreeableness, and Emotional Stability, which are measured using regression factor scores based on the Big Five Inventory-2 (Soto and John 2017). Big Five (adv) includes Big Five-AV and Conscientiousness-SJT. Big Five-AV includes Openness-AV, Conscientiousness-AV, Extraversion-AV, Agreeableness-AV, and Emotional Stability-AV, which are measured using regression factor scores based on an anchor-adjusted version of the Big Five Inventory-2 (Soto and John 2017). Conscientiousness-SJT is based on a study-developed situational judgement test designed to measure Conscientiousness. Preferences include Patience, Risk Taking, Positive Reciprocity, Negative Reciprocity, and Altruism, which are measured using items from the Global Preferences Survey (Falk et al. 2016). Academic indicators include PSAT score, GPA, GPA (adjusted), credits earned, fraction of days absent, and misconduct offenses. The Achievement factor is a predicted regression factor score based on the components of the PSAT test. The Behavioral factor is a predicted regression factor score based on the fall and spring GPAs from ninth grade, the faction of days absent in the fall and spring of ninth grade, credits accumulated in the fall and spring of ninth grade, and total misconduct incidents in ninth grade.

## Table A51. Race/ethnicity - Hispanic, white, other: Predictive power ($R^2$) of 9th-grade measures (Big Five, preferences, and school records) for 10th- and 11th-grade outcomes

| Measure | PSAT score, 10th grade | GPA, 10th grade | GPA (adjusted), 10th grade | Credits earned, 10th grade | Fraction days absent, 10th grade | Misconduct offenses, 10th grade | On-track, 10th grade | On-track, 11th grade |
|---|---|---|---|---|---|---|---|---|
| **Standard Big Five, separate 9th-grade school records** | | | | | | | | |
| Big Five | 0.27 | 0.38 | 0.35 | 0.00 | 0.23 | 0.16 | 0.00 | 0.00 |
| Preferences | 0.36 | 0.26 | 0.24 | 0.14 | 0.14 | 0.08 | 0.16 | 0.10 |
| Academic indicators | 0.88 | 0.81 | 0.87 | 0.52 | 0.73 | 0.39 | 0.27 | 0.42 |
| Big Five + Preferences | 0.42 | 0.39 | 0.36 | 0.16 | 0.23 | 0.16 | 0.16 | 0.13 |
| Big Five + Academic indicators | 0.89 | 0.82 | 0.87 | 0.57 | 0.77 | 0.46 | 0.15 | 0.40 |
| Preferences + Academic indicators | 0.89 | 0.81 | 0.86 | 0.58 | 0.77 | 0.45 | 0.22 | 0.42 |
| Big Five + Preferences + Academic indicators | 0.89 | 0.81 | 0.86 | 0.58 | 0.77 | 0.46 | 0.21 | 0.41 |
| **Advanced Big Five, separate 9th-grade school records** | | | | | | | | |
| Big Five (adv) | 0.20 | 0.36 | 0.37 | 0.11 | 0.21 | 0.11 | 0.04 | 0.12 |
| Preferences | 0.36 | 0.26 | 0.24 | 0.14 | 0.14 | 0.08 | 0.16 | 0.10 |
| Academic indicators | 0.88 | 0.81 | 0.87 | 0.52 | 0.73 | 0.39 | 0.27 | 0.42 |
| Big Five (adv) + Preferences | 0.40 | 0.38 | 0.38 | 0.20 | 0.21 | 0.11 | 0.16 | 0.17 |
| Big Five (adv) + Academic indicators | 0.89 | 0.81 | 0.86 | 0.59 | 0.77 | 0.45 | 0.19 | 0.43 |
| Preferences + Academic indicators | 0.89 | 0.81 | 0.86 | 0.58 | 0.77 | 0.45 | 0.22 | 0.42 |
| Big Five (adv) + Preferences + Academic indicators | 0.89 | 0.81 | 0.86 | 0.59 | 0.77 | 0.44 | 0.23 | 0.43 |
| **Standard Big Five, separate 9th-grade Achievement and Behavioral factors** | | | | | | | | |
| Big Five | 0.27 | 0.38 | 0.35 | 0.00 | 0.23 | 0.16 | 0.00 | 0.00 |
| Preferences | 0.36 | 0.26 | 0.24 | 0.14 | 0.14 | 0.08 | 0.16 | 0.10 |
| Academic factors | 0.86 | 0.82 | 0.84 | 0.31 | 0.55 | 0.28 | 0.12 | 0.19 |
| Big Five + Preferences | 0.42 | 0.39 | 0.36 | 0.16 | 0.23 | 0.16 | 0.16 | 0.13 |
| Big Five + Academic factors | 0.86 | 0.82 | 0.84 | 0.28 | 0.54 | 0.29 | 0.10 | 0.18 |
| Preferences + Academic factors | 0.86 | 0.81 | 0.84 | 0.35 | 0.54 | 0.25 | 0.22 | 0.25 |
| Big Five + Preferences + Academic factors | 0.86 | 0.81 | 0.84 | 0.34 | 0.54 | 0.27 | 0.22 | 0.26 |
| **Advanced Big Five, separate 9th-grade Achievement and Behavioral factors** | | | | | | | | |
| Big Five (adv) | 0.20 | 0.36 | 0.37 | 0.11 | 0.21 | 0.11 | 0.04 | 0.12 |
| Preferences | 0.36 | 0.26 | 0.24 | 0.14 | 0.14 | 0.08 | 0.16 | 0.10 |
| Academic factors | 0.86 | 0.82 | 0.84 | 0.31 | 0.55 | 0.28 | 0.12 | 0.19 |
| Big Five (adv) + Preferences | 0.40 | 0.38 | 0.38 | 0.20 | 0.21 | 0.11 | 0.16 | 0.17 |
| Big Five (adv) + Academic factors | 0.86 | 0.81 | 0.84 | 0.31 | 0.55 | 0.27 | 0.14 | 0.23 |
| Preferences + Academic factors | 0.86 | 0.81 | 0.84 | 0.35 | 0.54 | 0.25 | 0.22 | 0.25 |
| Big Five (adv) + Preferences + Academic factors | 0.86 | 0.81 | 0.84 | 0.37 | 0.54 | 0.24 | 0.23 | 0.30 |

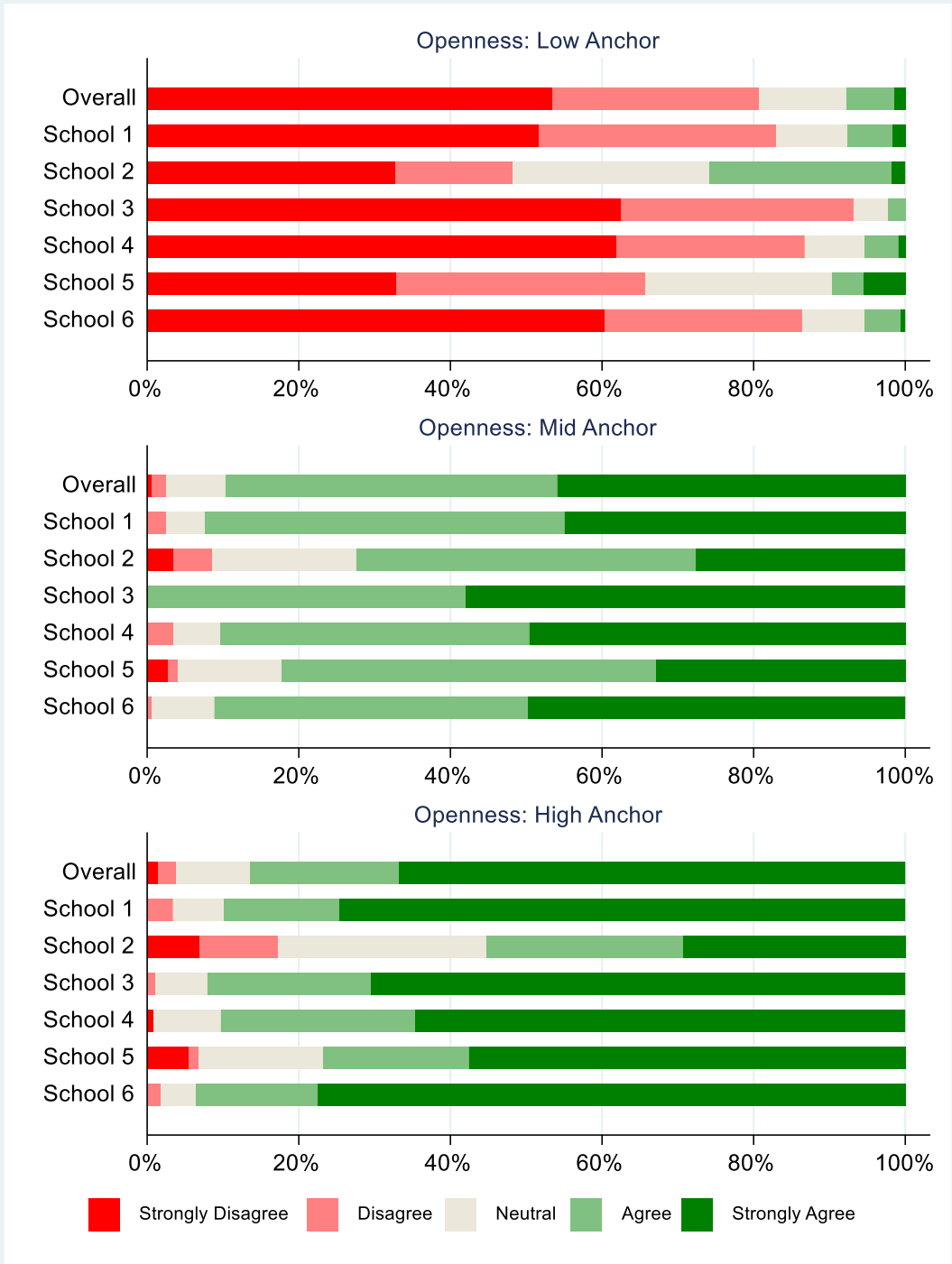
| Measure | PSAT score, 10th grade | GPA, 10th grade | GPA (adjusted), 10th grade | Credits earned, 10th grade | Fraction days absent, 10th grade | Misconduct offenses, 10th grade | On-track, 10th grade | On-track, 11th grade |
|---|---|---|---|---|---|---|---|---|
| **All 9th-grade measures** | | | | | | | | |
| Big Five + Big Five (adv) + Preferences + Academic indicators + Academic factors | 0.89 | 0.81 | 0.86 | 0.60 | 0.76 | 0.44 | 0.28 | 0.43 |

Sources: Chicago Public Schools administrative data, 2016–2017, 2017–2018, and 2018–2019 school years. Student survey, 2016–2017 school year.

Note: The table displays the square root of the adjusted *R*-squared from regressions of each outcome on the predictors indicated in the left columns. Big Five includes Openness, Conscientiousness, Extraversion, Agreeableness, and Emotional Stability, which are measured using regression factor scores based on the Big Five Inventory-2 (Soto and John 2017). Big Five (adv) includes Big Five-AV and Conscientiousness-SJT. Big Five-AV includes Openness-AV, Conscientiousness-AV, Extraversion-AV, Agreeableness-AV, and Emotional Stability-AV, which are measured using regression factor scores based on an anchor-adjusted version of the Big Five Inventory-2 (Soto and John 2017). Conscientiousness-SJT is based on a study-developed situational judgement test designed to measure Conscientiousness. Preferences include Patience, Risk Taking, Positive Reciprocity, Negative Reciprocity, and Altruism, which are measured using items from the Global Preferences Survey (Falk et al. 2016). Academic indicators include PSAT score, GPA, GPA (adjusted), credits earned, fraction of days absent, and misconduct offenses. The Achievement factor is a predicted regression factor score based on the components of the PSAT test. The Behavioral factor is a predicted regression factor score based on the fall and spring GPAs from ninth grade, the faction of days absent in the fall and spring of ninth grade, credits accumulated in the fall and spring of ninth grade, and total misconduct incidents in ninth grade.

# A6. ASSESSING AND ADDRESSING REFERENCE BIAS

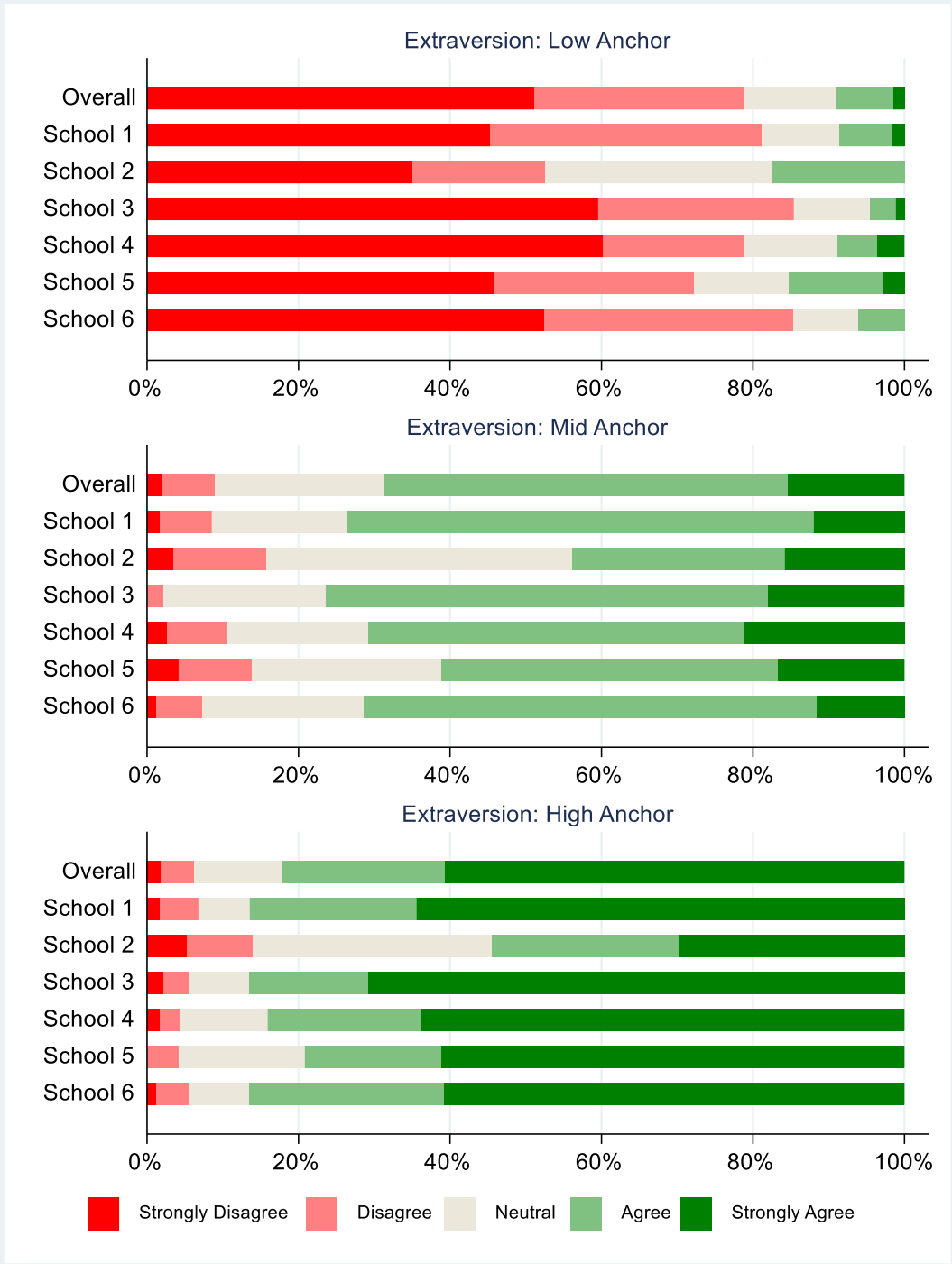
**Figure A1. Percentage of students selecting each response category for the Openness vignette by school (full sample)**




Sources: Chicago Public Schools administrative data, 2015-2016 school year. Student survey, 2015-16 school year.

Note: The figure displays the percentage of students selecting each response category for the anchoring vignette by school.

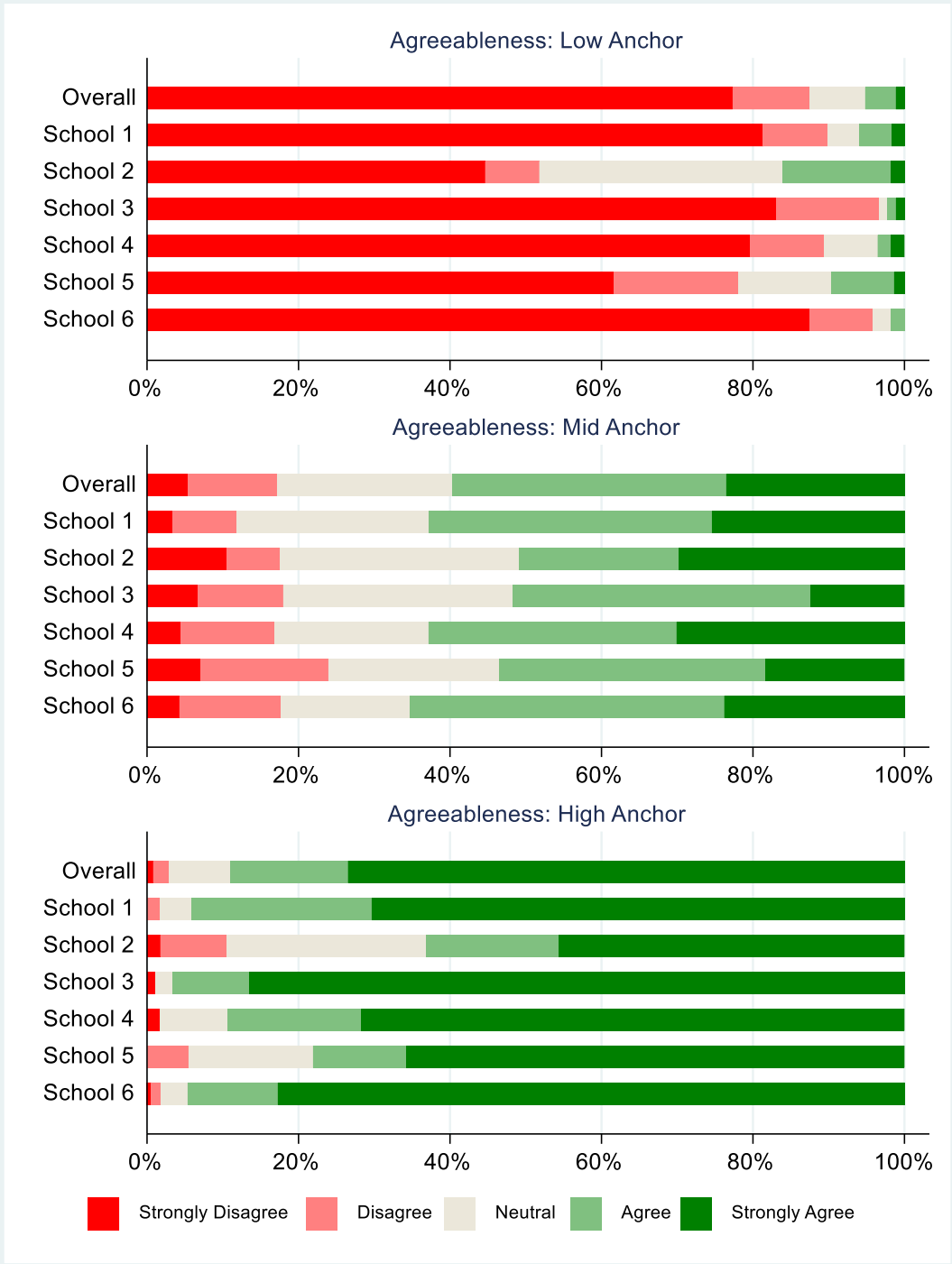
**Figure A2. Percentage of students selecting each response category for the Extraversion by school (full sample)**




Sources: Chicago Public Schools administrative data, 2015-2016 school year. Student survey, 2015-16 school year.

Note: The figure displays the percentage of students selecting each response category for the anchoring vignette by school.

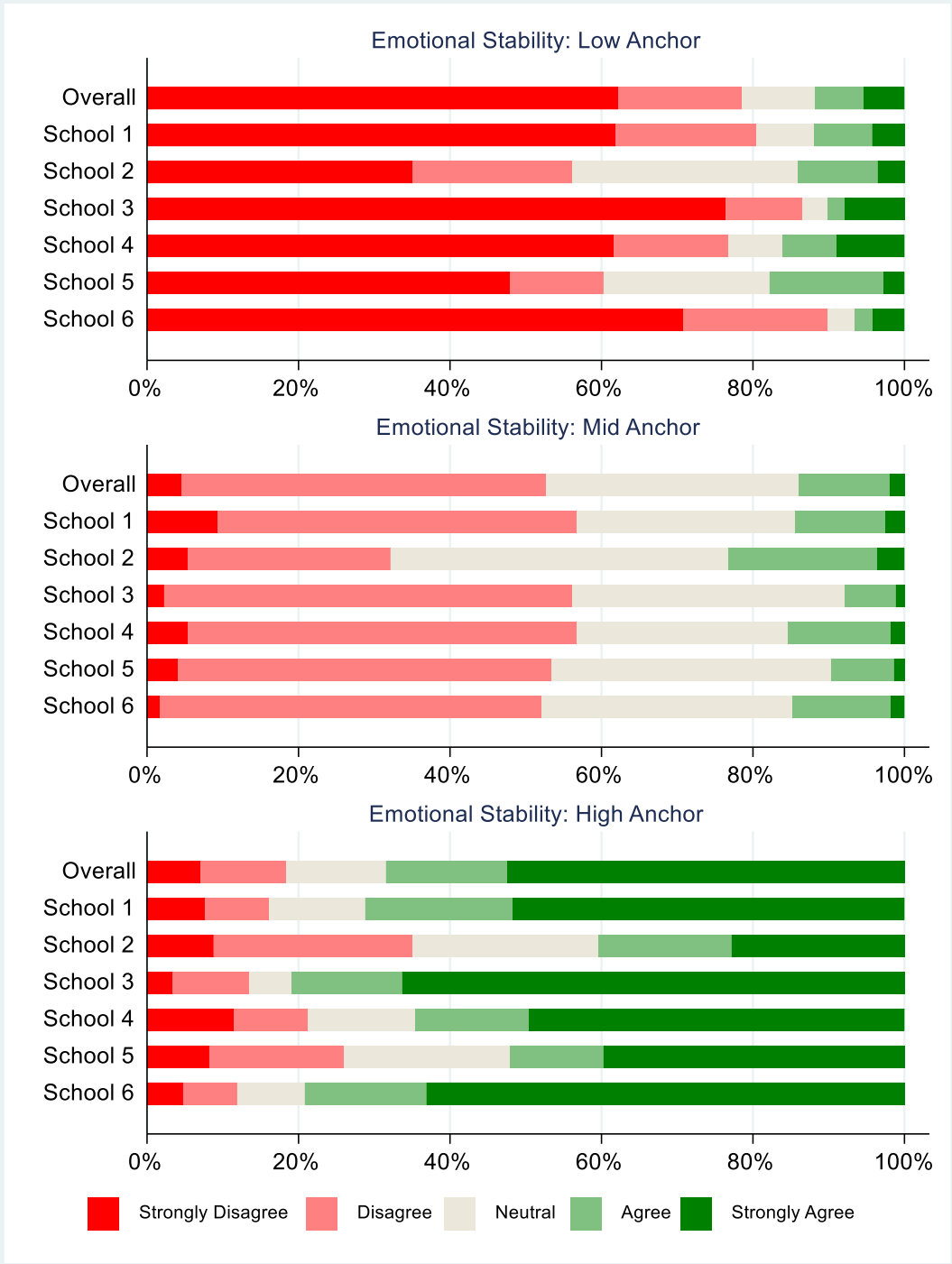
**Figure A3. Percentage of students selecting each response category for the Agreeableness vignette by school (full sample)**




Sources: Chicago Public Schools administrative data, 2015-2016 school year. Student survey, 2015-16 school year.

Note: The figure displays the percentage of students selecting each response category for the anchoring vignette by school.

**Figure A4. Percentage of students selecting each response category for the Emotional Stability vignette by school (full sample)**




Sources: Chicago Public Schools administrative data, 2015-2016 school year. Student survey, 2015-16 school year.

Note: The figure displays the percentage of students selecting each response category for the anchoring vignette by school.

## Table A52. Average value of 9th-grade measures across schools for with various anchoring vignette adjustment rules and samples

| Measure | School 6 | School 1 | School 3 | School 4 | School 5 | School 2 | *p*-value |
|---|---|---|---|---|---|---|---|
| PSAT score | 978.85 | 900.08 | 850.00 | 790.82 | 772.29 | 728.45 | 0.00 |
| GPA | 3.11 | 2.83 | 3.13 | 2.48 | 3.04 | 2.63 | 0.00 |
| GPA (adjusted) | 3.91 | 3.31 | 3.53 | 3.18 | 3.17 | 2.73 | 0.00 |
| Credits earned | 6.92 | 6.74 | 6.94 | 6.76 | 6.74 | 6.80 | 0.02 |
| Fraction days absent | 0.04 | 0.05 | 0.06 | 0.09 | 0.05 | 0.14 | 0.00 |
| Misconduct offenses | 0.04 | 0.21 | 0.20 | 0.31 | 0.56 | 6.83 | 0.00 |
| **Standard Big Five, full sample** | | | | | | | |
| Openness | 0.03 | 0.16 | 0.06 | 0.06 | -0.31 | -0.15 | 0.02 |
| Conscientiousness | -0.06 | -0.07 | 0.07 | 0.22 | -0.01 | 0.00 | 0.20 |
| Extraversion | -0.02 | 0.06 | -0.23 | 0.16 | -0.15 | 0.11 | 0.04 |
| Agreeableness | 0.12 | 0.09 | 0.16 | -0.06 | -0.04 | -0.36 | 0.02 |
| Emotional Stability | 0.08 | -0.07 | -0.33 | 0.25 | 0.02 | -0.03 | 0.00 |
| **Anchor-adjusted Big Five (mid recoding), full sample** | | | | | | | |
| Openness | -0.15 | 0.03 | 0.00 | 0.13 | -0.11 | 0.31 | 0.03 |
| Conscientiousness | 0.03 | -0.07 | 0.05 | 0.06 | -0.12 | 0.03 | 0.81 |
| Extraversion | 0.04 | -0.01 | -0.24 | 0.12 | -0.15 | 0.25 | 0.01 |
| Agreeableness | 0.04 | 0.02 | 0.17 | -0.07 | 0.02 | -0.30 | 0.15 |
| Emotional Stability | 0.04 | -0.01 | -0.27 | 0.24 | -0.01 | -0.08 | 0.01 |
| **Anchor-adjusted Big Five (min recoding), full sample** | | | | | | | |
| Openness | 0.00 | 0.15 | 0.18 | 0.12 | -0.24 | -0.51 | 0.00 |
| Conscientiousness | 0.12 | 0.03 | 0.21 | 0.11 | -0.24 | -0.59 | 0.00 |
| Extraversion | 0.15 | 0.09 | -0.07 | 0.17 | -0.28 | -0.39 | 0.00 |
| Agreeableness | 0.17 | 0.02 | 0.38 | -0.03 | -0.18 | -0.73 | 0.00 |
| Emotional Stability | 0.21 | 0.07 | -0.04 | 0.13 | -0.28 | -0.53 | 0.00 |
| **Anchor-adjusted Big Five (max recoding), full sample** | | | | | | | |
| Openness | -0.19 | -0.08 | -0.15 | 0.07 | 0.02 | 0.83 | 0.00 |
| Conscientiousness | -0.09 | -0.16 | -0.20 | -0.04 | 0.10 | 0.81 | 0.00 |
| Extraversion | -0.07 | -0.09 | -0.29 | 0.03 | 0.00 | 0.67 | 0.00 |
| Agreeableness | -0.10 | 0.00 | -0.12 | -0.09 | 0.23 | 0.29 | 0.07 |
| Emotional Stability | -0.17 | -0.08 | -0.34 | 0.22 | 0.26 | 0.42 | 0.00 |
| **Standard Big Five, consistent vignette response sample** | | | | | | | |
| Openness | -0.17 | 0.17 | -0.08 | -0.08 | -0.13 | -0.12 | 0.47 |
| Conscientiousness | -0.06 | -0.12 | 0.18 | 0.10 | 0.39 | -0.04 | 0.14 |
| Extraversion | -0.15 | -0.11 | -0.34 | 0.10 | -0.35 | 0.12 | 0.12 |
| Agreeableness | 0.22 | 0.08 | 0.19 | -0.01 | 0.19 | -0.41 | 0.46 |
| Emotional Stability | 0.07 | -0.08 | -0.43 | 0.17 | -0.01 | 0.40 | 0.03 |
| **Anchor-adjusted Big Five, consistent vignette response sample** | | | | | | | |
| Openness | -0.12 | 0.22 | -0.15 | 0.12 | -0.06 | 0.12 | 0.41 |
| Conscientiousness | 0.15 | -0.02 | 0.20 | 0.11 | 0.22 | 0.52 | 0.68 |
| Extraversion | -0.18 | -0.20 | -0.36 | 0.05 | -0.31 | 0.20 | 0.13 |
| Agreeableness | 0.30 | 0.22 | 0.20 | 0.17 | 0.16 | -0.57 | 0.39 |
| Emotional Stability | 0.00 | -0.14 | -0.34 | 0.18 | 0.08 | 0.21 | 0.07 |

Sources: Chicago Public Schools administrative data, 2015-2016 school year. Student survey, 2015-16 school year.

Notes: The table displays the average value of each measure in the left column for each school. The colors indicate the school's relative rank, with a greener shade indicating a more favorable rank and a redder shade indicating a less favorable rank. The *p*-value is based on an *F*-test with the null hypothesis that all schools have the same mean for a given measure. Openness, Conscientiousness, Extraversion, Agreeableness, and Emotional Stability are measured using regression factor scores based on the Big Five Inventory-2 (Soto and John 2017). Openness-AV, Conscientiousness-AV, Extraversion-AV, Agreeableness-AV, and Emotional Stability-AV are measured using regression factor scores based on an anchor-adjusted version of the Big Five Inventory-2 (Soto and John 2017).

# A7. EFFECTS OF INCENTIVES ON NON-COGNITIVE MEASURES

There are no references to the appendix in the corresponding section of the report.

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