

## What Explains the Gender Gap in College Track Dropout? Experimental and Administrative Evidence<sup>†</sup>

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In most developed countries, girls outperform boys in primary school through college (OECD 2012). Notably, the reversal of the gender gap took place at the same period across countries; around 1970 college attainment was higher for boys in most developed countries, while today it is in favor of girls. What is behind this trend is not well understood, but a recent wave of papers suggests that both family background and noncognitive skills are important for explaining gender differences in school choices and school performance (Autor et al. 2015; Autor and Wasserman 2015; Bertrand and Pan 2013; Buser, Niederle, and Oosterbeek 2014; Heckman, Pinto, and Savelyev 2013).

We exploit a unique dataset, combining rich experimental data with high-quality administrative data, to study dropout from the college track at high school in Norway, and, in particular, why boys are more likely to drop out than girls.<sup>1</sup> A representative sample of Norwegian adolescents

took part in a lab experiment in ninth grade (14–15 years old), just before they were to apply to high school and, in collaboration with Statistics Norway, we matched the data from the experiment to Norwegian register data on family background and school choices. The register data provide us with information about whether the adolescents chose the college track at high school, and if they did, whether they have stayed on the college track two years after they started.

We focus on overall dropout from the college track (which includes both adolescents who did not choose the college track and adolescents who dropped out after starting the college track), since it is well demonstrated that college attainment is an increasingly important determinant of success in the labor market and also more broadly associated with a wide range of positive life outcomes (Autor, Katz, and Kearney 2008; Oreopoulos and Salvanes 2011). In Figure 1, we show that the gender difference in college attainment in Norway is very much in line with what has been observed internationally (Murnane 2013): males are increasingly lagging behind. In recent years, males in Norway are almost 30 percent less likely than females to have a college education at the age of 35. The same pattern emerges in our sample, as shown in Figure 2: the overall dropout rate from the college track for the boys is 30 percent higher than for the girls (58.7 percent versus 45.1 percent).

The paper provides three main findings. First, we show that both family background and personal characteristics are of importance in explaining dropout, but they do not account for the observed gender difference in our analysis. In fact, we find that the estimated male effect on

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<sup>1</sup> The college track is the academically oriented track at high school and is required for university studies. The vocational track does not exclude the possibility of pursuing some further studies after high school, but severely

limits the set of educational opportunities. Both tracks are open and free of charge for all students in Norway, independent of their grades from secondary school.

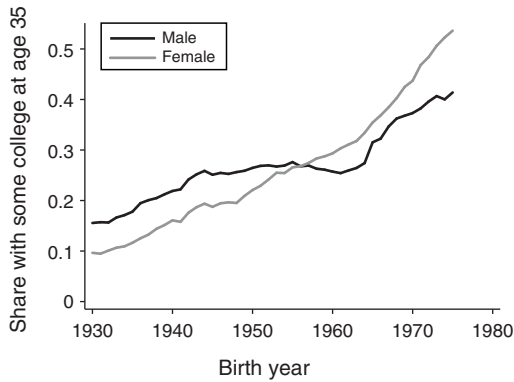


FIGURE 1. SHARE WITH SOME COLLEGE EDUCATION IN NORWAY

Source: Own calculations based on administrative data described in the text and the online Appendix.

dropout rates increases when we control for family background, abilities, preferences, beliefs, and noncognitive skills. Second, we show that the gender difference in dropout rates appears both when the adolescents select into the college track and after they have started: girls are much more likely both to choose the college track and to stay on the track. Third, we show that very different processes guide the choices of boys and girls of whether to drop out from the college track.

The paper contributes to the literature focusing on the growing public concern for high dropout rates and the “boy crisis” in school attainment (Bertrand and Pan 2013; Figlio, Karbownik, and Salvanes forthcoming; Goldin, Katz, and Kuziemko 2006; Heckman, Pinto, and Savelyev 2013; Murnane 2013) by providing new evidence on the importance of family background and a rich set of personal characteristics in explaining dropout from the college track. We also relate to the recent literature in experimental economics that studies the association between the willingness to compete and school choices (Buser, Niederle, and Oosterbeek 2014), and the more general literature on gender differences in preferences (Croson and Gneezy 2009; Niederle and Vesterlund 2011).

### I. Sample and Experimental Design

Our sample consists of students in Norway, who were in ninth grade (14–15 years old) when

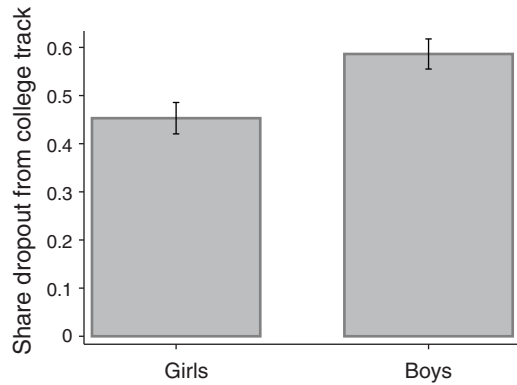


FIGURE 2. DROPOUT FROM COLLEGE TRACK IN EXPERIMENTAL SAMPLE

Source: Own calculations based on merged experimental and administrative data described in the text and the online Appendix.

the lab experiment was conducted in 2011. They were recruited from randomly selected schools in Bergen municipality, which is largely representative for Norway. At each school, we randomly selected some classes, and all students in these classes received a personal invitation to participate in the experiment. Out of 603 invited students from nine schools, 523 took part in the experiment, giving us a mean participation rate of 87 percent. Since the ninth grade is compulsory in Norway, with no grade repetition and basically all students completing the grade, we consider the sample to be representative for this age group in Norway.<sup>2</sup> In collaboration with Statistics Norway, we matched the data from the experiment to Norwegian register data, which is a linked national administrative high quality dataset. We have detailed parental background information on education and income and data on school choices for 483 of the 523 adolescents. In the present analysis, the administrative data provide us with indicator variables for whether at least one of the parents has completed some college and whether the adolescent chose the

<sup>2</sup>This is confirmed by comparing family background data for our sample with national data. The distribution of income and education of the parents of the participants in our sample is in line with official statistics for Norway. For a more detailed discussion of this issue, see Almås et al. (forthcoming b).

college track at high school and has continued on the college track two years after they started.

We conducted ten experimental sessions at NHH Norwegian School of Economics, where each session lasted for approximately two hours and used a web-based interface. All students received a show-up fee of 50 NOK (approximately US\$8 in 2011), in addition to what they earned in the lab experiment. The participants were not given any feedback on the different incentivized parts of the experiment until the end of the session. They were then given an overview of the outcomes and paid the sum of what they had earned in each part. The average total payment from the experiment was 361 NOK. The experiment was double blind, i.e., neither participants nor experimenters could associate decisions with particular participants.<sup>3</sup>

The experimental session consisted of two parts, an incentivized part and a nonincentivized part. In the present analysis, we focus on the following measures in the incentivized part: performance on a math task as a proxy for ability, competition preferences, risk preferences, time preferences, and the participants' beliefs about own abilities and about earning differences in the labor market. From the nonincentivized part, we use the data on psychological traits (the Big Five Inventory, John, Donahue, and Kentle 1991).

## II. Analysis

Our analysis proceeds in three steps. First, we provide descriptive statistics comparing the boys and girls in terms of family background and personal characteristics. Second, we study how overall dropout rates relate to these explanatory variables, and third we analyze the dynamics of the dropout process.

### A. Descriptive Statistics

As expected, we do not observe any gender differences in terms of family background.<sup>4</sup> Boys and girls are almost equally likely to come from a family where none of the parents has some college education (38.2 percent versus

36.8 percent), and there are also no gender differences in terms of family income. Family background can thus only explain the gender difference in dropout rates if it affects boys and girls differently. In terms of personal characteristics, however, we do indeed observe some important gender differences. Boys perform better on the ability test, they are more competitive (but not more risk-taking), they are more patient, and more confident regarding their own ability. Girls, on the other hand, have more informed beliefs about earnings differences in the labor market. The girls and boys also differ importantly when it comes to noncognitive skills as measured by the Big Five. The girls are more agreeable, conscientious, extroverted, and open, but also more neurotic. The observed gender differences in personal characteristics provide a possible channel for explaining the observed gender difference in dropout rates. For example, the fact that the girls are better informed about labor market earnings may make them invest more than boys in schooling (Betts 1996; Jensen 2010), and the personality of the girls may also be better aligned with the college track than the personality of the boys (Autor et al. 2015; Bertrand and Pan 2013).

### B. Dropout: Family Background and Personal Characteristics

Table 1 provides a set of linear probability regressions on how dropout from the college track relates to family background and personal characteristics. We observe from columns 1 and 2 that the estimated gender gap increases when the family background and personal characteristics variables are included in the regression. In the online Appendix, we show that this increase is driven by the inclusion of the ability, preference, and beliefs variables (Table A1), which suggests that the fact that the boys perform better on the ability test and are more competitive and confident in itself makes it less likely that they drop out from the college track. We also observe from Table A1 that the estimated gender gap decreases when we include the Big Five measures, which is in line with the existing literature suggesting that females have noncognitive skills that are more aligned with school attainment than those of boys (Bertrand and Pan 2013).

From column 2, we observe that both family background and personal characteristics are

<sup>3</sup>A detailed description of the experiment is reported in Almås et al. (forthcoming b).

<sup>4</sup>In online Appendix Figure A1, we provide an overview of how the girls and boys differ in the explanatory variables.

TABLE 1—EXPLAINING ADOLESCENT DROPOUT FROM COLLEGE TRACK

	All		Boys	Girls
	(1)	(2)	(3)	(4)
Male	0.133*** (0.045)	0.156*** (0.044)		
Parents with some college		−0.141*** (0.049)	−0.122* (0.071)	−0.131* (0.072)
Family income		−0.165** (0.076)	−0.187* (0.110)	−0.144 (0.112)
Ability		−0.085*** (0.023)	−0.083*** (0.031)	−0.097*** (0.034)
Patience		−0.019 (0.021)	−0.025 (0.028)	−0.022 (0.034)
Risk-taking		0.001 (0.022)	0.009 (0.029)	−0.004 (0.030)
Compete		−0.009 (0.024)	−0.007 (0.033)	−0.007 (0.036)
Informed beliefs		−0.052** (0.022)	0.001 (0.029)	−0.114*** (0.030)
Confidence		−0.054** (0.025)	−0.090** (0.035)	−0.025 (0.037)
BF agreeableness		0.022 (0.021)	−0.001 (0.033)	0.018 (0.028)
BF conscientiousness		−0.071*** (0.024)	−0.016 (0.032)	−0.129*** (0.033)
BF extraversion		−0.024 (0.022)	−0.022 (0.034)	−0.031 (0.030)
BF neuroticism		−0.010 (0.024)	0.005 (0.034)	−0.033 (0.036)
BF openness		−0.001 (0.022)	−0.037 (0.031)	0.038 (0.031)
Constant	0.453*** (0.033)	0.612*** (0.051)	0.780*** (0.060)	0.612*** (0.069)
Observations	483	483	249	234
R <sup>2</sup>	0.018	0.199	0.182	0.246

*Notes:* Linear probability models explaining dropout from college track by participant characteristics. Male and parents with some college are 0/1 indicator variables, family income is a rank variable between 0 and 1. The other variables are normalized to zero mean and unit variance. Robust standard errors are given in parentheses. BF refers to the Big Five Inventory.

\*\*\*Significant at the 1 percent level.

\*\*Significant at the 5 percent level.

\*Significant at the 10 percent level.

*Source:* Merged experimental and administrative data described in the text and the online Appendix.

associated with dropout from the college track. Having a parent with some college education strongly reduces the likelihood of dropping out from the college track, even when controlling for family income, which is consistent with the existing literature on intergenerational mobility in education (Bertrand, Kamenica, and Pan

2015; Björklund and Salvanes 2011; Figlio, Karbownik, and Salvanes forthcoming). One mechanism that potentially explains this pattern is that parents with a college background devote more time to their adolescents than less educated parents (Guryan, Hurst, and Kearney 2008), and our data provide some suggestive

evidence consistent with parental investment in adolescents reducing dropout rates. We also observe that greater abilities, more knowledge about earnings in the labor markets, and more confidence contribute to less dropout, and in the online Appendix we observe that the role of family background is significantly reduced when the personal characteristics are included in the regression (Table A1). This is consistent with family background not only having a direct effect on dropout, but also being of importance in shaping adolescents along these dimensions (Almås et al. forthcoming a, b). Finally, we observe that conscientiousness is the only personality variable significantly associated with dropout.

To shed some further light on the gender difference in dropout rates, we report in columns 3 and 4 separate regressions for boys and girls. Interestingly, we observe that there is no gender difference in how family background affects dropout; the effect of coming from a family where a parent has some college education is equally strong for boys and girls. We do observe some interesting gender differences in how personal characteristics shape dropout: confidence only reduces dropout among boys, while informed beliefs about the labor market and conscientiousness only reduce dropout among girls. These differences suggest that there may be very different mechanisms at play when girls and boys drop out of school.

*C. Dropout: Dynamics*

Dropout from the college track may happen at two stages. The adolescents may choose not to start the college track at high school and they may decide not to continue the college track after having started. Figure 3 provides an overview of the dynamics of dropout by gender in our sample. We observe that there is a striking gender difference at both stages. Girls are much more likely than boys to choose the college track (54 percent versus 46 percent), and girls are much less likely than boys to drop out from the college track after having started (76 percent versus 86 percent).<sup>5</sup> To illustrate the importance of each of these two stages for the gender difference in overall dropout rates, we may consider what

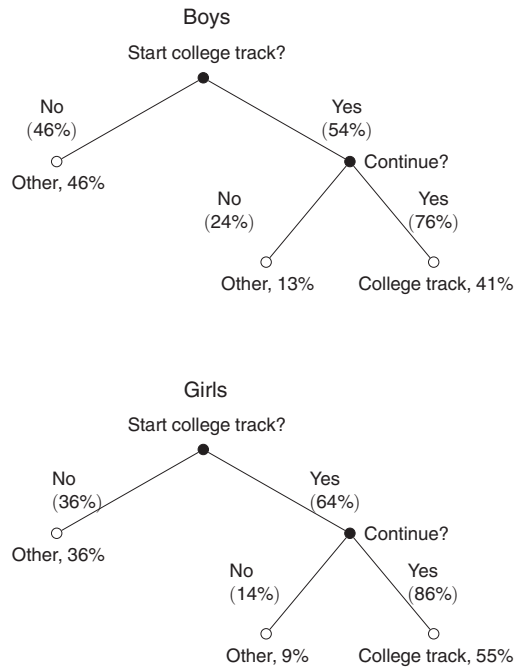


FIGURE 3. DYNAMICS OF DROPOUT

Source: Own calculations based on merged experimental and administrative data described in the text and the online Appendix.

would happen if we had managed to make the boys equal to the girls at each of the two stages. If the boys chose the college track at high school at the same rate as the girls (with no change in dropout rates after having started), then the gender difference in overall dropout rates would be reduced from almost 14 percent to around 6.4 percent. On the other hand, if the boys dropped out from the college track after having started at the same rate as the girls (but with no change in the rates choosing the college track), the gender difference in overall dropout rates would be reduced to around 8.6 percent.

We study each of these two stages in more detail in the online Appendix, where we report linear probability regressions on indicator variables for whether the adolescent chose the college track and whether he or she dropped out after having started (Table A2). We find that the choices of boys and girls are shaped by very different processes. Boys are more likely to choose the college track if they have high ability and confidence, while girls are particularly likely to

<sup>5</sup>In the online Appendix, we show that these gender differences are not sensitive to family background (Figure A2).

choose the college track if they have informed beliefs about the labor market and are conscientious. In contrast, when it comes to dropping out after having started, we observe that ability, the preference measures, and confidence matter significantly for the girls, while only confidence matters significantly for the boys.<sup>6</sup>

Further, we find that the willingness to take risks and the willingness to compete are positively associated with both choosing the college track and dropping out after having started, particularly for the girls. This may suggest that a strong willingness to take risks or to compete may sometimes cause people to choose college track even if it does not fit their abilities or interests. We observe that the same pattern does not emerge for patience. More patience increases the likelihood of girls choosing the college track, but has no effect on the likelihood of dropping out after having started. Finally, we observe that family background is a highly significant explanatory variable for both boys' and girls' choice of college track, but not for whether they drop out after having started. This may suggest that the family shapes the adolescent by transmitting preferences for a particular education, which provides an interesting perspective on the importance of intergenerational mobility of socioeconomic status (Roemer 2012).

### III. Concluding Remarks

The findings in our study are potentially of great importance for the present debate on how to respond to the fact that boys are lagging behind in college attainment. We demonstrate that the gender difference in overall dropout rates appears at two different stages. First, boys are less likely than girls to select into the college track, and, second, boys are more likely to drop out of the college track after having started. The gender difference at the first stage may partly reflect different educational preferences among boys and girls, and it is not obvious that this difference should call for policy intervention. The gender difference at the second stage may be more worrisome, and it is interesting to observe that family background

and personal characteristics cannot account for boys being more likely than girls to drop out from the college track after having started. An alternative explanation of the gender gap may be that the school system itself is disfavoring the boys. There is field evidence from schools (Lavy 2008) and recent experimental evidence suggesting gender stereotyping against boys in performance settings (Cappelen, Falch, and Tungodden 2015), which is consistent with boys being disfavored at the college track. Finally, our study provides evidence of very different processes guiding the school choices of boys and girls, which suggests that gender-specific policy interventions may be needed when aiming to reduce dropout rates. An important avenue for future research is to investigate more carefully in field settings how society can support boys and girls in adolescence in order to ensure that they make good school choices in line with their abilities and preferences.

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<sup>6</sup>It should be noted that the difference between the estimates for boys and girls are not always statistically significant, see Table A2 in the online Appendix.

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