Setting the Course for the Future: How do Adolescents Choose School Tracks at Age 15?

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Motivation In the Danish education system – similar to many others – adolescents take far-reaching decisions based on limited information. Specifically, at age 15, they decide to embark on a vocational track or a "high school track". Conditional on the high school or the vocational track, students decide which subjects to specialize in. These decisions have important implications for later career options. For instance, to be able to enroll in a STEM major at university, students must specialize in math for their A-levels. Thus, the choices made in grade 9 affect lifetime economic outcomes such as employment and earnings (Joensen and Nielsen, 2009).

In this proposed project, we aim to contribute to our understanding of the reasoning of 15-year-olds regarding their choice of education after compulsory school. Understanding the concerns of 15-year-olds, and how these concerns influence early career choices, will set the foundation for policy-makers to develop targeted policy interventions that support young individuals in reaching up to their potential, regardless of their gender and socioeconomic background.

Research Questions and Empirical Approach We focus on students' educational choice at age 15, namely the choice to embark in the high school track vs. the vocational track and, conditional on track choice, the decision to specialize in a math-intensive field vs. another field. Using a twofold approach, our first step is to take an agnostic view and ask: What are the **first-order concerns** of 15-year-olds when it comes to the educational choices they make in grade 9, i.e. what considerations do adolescents have on top of their mind, how do these considerations vary by individual characteristics such as gender and socioeconomic background, and how do they relate to actual track choice? For this part of our project we are going to work with open text responses elicited in surveys – a novel tool in economics. Second, we want to investigate the role of students' **earnings expectations** associated with different specializations. For this question, we focus on the large subset of students interested in the high school track and investigate their

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choice of whether to enroll in the highest level of math. In this step, we will ask: To what extent are 9th-graders aware of differences in later life earnings associated with different specializations? How does knowledge vary by individual characteristics such as parental background, gender and GPA, and do earnings expectations play a role in the educational choices of 15-year-olds?

To advance the literature along these margins, we plan to create a novel large data set consisting of survey-based information on i) the self-reported first-order concerns of 15-year-olds regarding their track choice, ii) their beliefs about the average earnings of Danish individuals who are now 30 years old and had chosen different tracks at age 15, iii) own expected future earnings conditional on different choices, and iv) intended track choice a few weeks prior to the actual choice. Importantly, we want to link this survey-based information, at an individual level, to objective and precisely measured information in the Danish register data on i) students' actual track choices made around six weeks after our survey, and ii) students' family background, gender and previous school grades. Moreover, we are planning to re-contact our respondents around three months into grade 10 to understand how students' concerns evolve over time and to shed light on factors that determine whether students stick to their initial specialization or switch.[3]

Outline of Survey and Data Analysis We plan to invite 14,000 Danish residents born in 2007 to participate in a survey at the beginning of the year 2023[4], and expect around 2,800 completed questionnaires. In the survey, students will answer an initial question on whether they plan to choose the high school track or a vocational education, and they are asked to write down the considerations that come to their mind regarding this choice, using their own words. In addition, we will ask those who plan to choose the high school track for their planned specialization, and there will be another open text question asking for the main considerations they have on their mind concerning the option of choosing the highest level of math. Those who plan to go for a vocational education will be asked a similar question regarding their concerns around the possible choice of going for the mechanical track.

We will manually encode the open-text responses into different categories. For instance, we are going to encode, at the individual level i) how many words each respondent writes, ii) whether or not the respondent refers to future labor market outcomes including income, iii) mentions of

[3]There is a three-month window at the beginning of grade 10 in which students on the high school track can adjust their specialization, before it is definite.

[4]By 2023, the 2007-cohort will be at least 15 years old, i.e. they will have access to their own E-Boks and will no longer need parental consent to participate in a survey. We have received confirmation from Statistics Denmark (DST) that it is possible to obtain the cpr numbers of a subset of 20% of the cohort, corresponding to roughly 14,000 individuals, which we are all going to invite to our survey. Moreover, we have received a positive response from the ethics board of the Department of Economics at KU and it will be a matter of weeks until we obtain offical approval.

enjoyment of (math) content, iv) mentions of worries about math/technical ability, v) mentions of friends' choices, vi) mentions of details on the rules of the education system, vii) expressions of uncertainty, viii) mentions of (expected) discrimination, etc. We will validate our hand-coding based on a classical multiple-choice question following the open text question. This descriptive part of our study will provide a powerful lense into the first-order concerns of 15-year-olds in relation to their educational path. We will be able to shed light on the predictors of these concerns, such as gender, parental background, the interaction between the two and objective academic performance. Moreover, the unique Danish setting will allow us to document how first-order concerns, conditional on objective school performance, predict actual track choice.

The second part of the survey will focus on earnings expectation. We will elicit students' beliefs about the average monthly incomes among individuals who are now 30 years old, working full-time, and had chosen math 15 years ago, alongside students' beliefs related to individuals who are 30 years old and had chosen the student's preferred specialization.[5] Subsequently, half of the students will be exposed to objective information on the earnings of 30-year-old individuals who had chosen "Math A" in high school. We will calculate this information based on the Danish register data. By linking the survey data to actual track choices recorded in the registers, we are going to be able to study the causal effect of earnings expectations on track choice.

Policy Relevance In the Danish education system, grade nine is the first point in time where adolescents take a crucial decisions that affect future labor market outcomes. At the same time, there is pronounced inequality, both by gender as well as by socioeconomic background, in terms of career choice. In particular, a substantial fraction of boys in Denmark as well as in other countries do not obtain more than compulsory schooling (Pihl and Kirkbak, 2021; Dalskov and Mølgaard, 2010; Almås et al., 2016). Girls obtain more years of schooling on average but tend to "shy away from math", even conditional on objective math performance. Within the vocational educations, the gender differences are especially pronounced, with only 6% of applicants to the mechanical track being girls. Moreover, children from disadvantaged socioeconomic backgrounds generally rank lower in terms of academic self-concept (Crampton and Hall, 2017), which may have implications for important educational decisions.

Our evidence on students' first-order concerns when making educational choices is going to offer guidance for policy makers who aim to ensure that young individuals meet up to their potential. Even though subconscious factors might play a role as well, the concerns students have "on top of mind" should arguably play a powerful role in their decision-making. If, for instance,

[5] In case the student's preferred track is math, the second track will be chosen at random.

a large share of girls mention worries about not enjoying math or not being good enough at it, even conditional on past performance, then policy makers interested in mitigating the gender gap in math track choice should focus on supporting the academic self-concept of young girls through targeted interventions before adolescence. Conversely, if a dominant concern is that young individuals want to stay in the same class with their friends, then a promising avenue for Danish policy makers could be to make class composition less dependent on field of specialization.

Similarly, our findings on the causal role of earnings expectations will be highly policy-relevant. Think of the case in which our results suggest that adolescents, on average, are unaware of the role of track choice in shaping later-life earnings but, once exposed to information, take it into account. This case would suggest a powerful role for schools in discussing the lifecycle implications of the track choice with adolescents in order to prepare them optimally for their decision. Think of the converse case in which we find that earnings expectations have zero causal impact on field of specialization. This case would suggest that providing information about future earnings is not going to make a difference. In that case, our open text responses might be able to give an indication about other useful interventions.

Contribution to the Academic Literature Our study is going to advance the academic literature along several margins. First, we aim to contribute to a literature in economics studying factors that determine educational decisions during adolescence and adulthood, such as earnings expectations (Zafar, 2013; Reuben et al., 2017), self-assessments (Exley and Kessler, 2022), exposure to role models (Riise et al., 2020; Porter and Serra, 2020), and competitiveness (Buser et al., 2014). We contribute to this literature by i) taking an agnostic view and documenting the association between first-order concerns on top of students' minds and track choice and ii) by zooming in on the causal role of earnings expectations in driving career-relevant education choices during adolescence.

While open-text responses are an established tool for research in psychology, they are only starting to emerge as a tool in economics. (For examples see e.g. ongoing work by Stantcheva (2020) on policy views and by Andre et al. (2021) on inflation expectations.) Open-text responses have important advantages: They allow for unbiased insights by not restricting the set of possible responses to factors the researcher had thought of when designing the questionnaire, and by avoiding to prime respondents. In a related study with adults, Gino et al. (2015) use open text questions to document that women, on average, pursue a higher number of life goals than men, and see more conflicts between different life goals, which might explain less ambitious career choices. We will add to these findings by zooming in on adolescents and studying individual considerations during this decisive period in life.

The second part of our study, in which we focus on the role of earnings expectations, is based on standard theory suggesting that individuals should make educational decisions based on the expected costs and benefits of different options. Empirically, most of the literature has focused on undergraduate students, finding mixed evidence on the role of earnings expectations (Zafar, 2013; Reuben et al., 2017). Focusing on a sample of adolescents, Lergetporer et al. (2021) find that the educational aspirations gap by socioeconomic background does not close in response to information about the monetary returns of obtaining a university degree. In contrast, Bleemer and Zafar (2018) find that information on the returns to college has a causal effect on intended college attendance in a US sample. One of the main advantages of our planned study is that we will be able to observe actual educational choices of a large sample that is close to representative of the general population of 9th graders in Denmark. Moreover, we will be able to track individuals over time in the register data. Therefore, if our information treatment affects actual track choices, we are going to be able to document not just this treatment effect but also the longer-run effects on university education and later life incomes.

Timeline and Expected Output The output of the project is expected to be 1-2 academic papers. Depending on the results, we will write either two separate papers – one on first-order concerns and one on the role of earnings expectations, or one bigger paper in which we also look at the heterogeneous effect of the information intervention by first-order concerns. We aim for publication in a general interest or a top field journal in Economics, or for a general interest outlet such as PNAS. In addition, we hope to present the results to Danish policy makers in a variety of ways. Specifically, we plan to document our evidence on first order-concerns in easy-to-interpret charts such as word clouds, which are a powerful way of illustrating the dominant considerations of 15-year-olds. The following table outlines our planned timeline. We plan to roll out our E-Boks survey around the end of January 2023, given that students have to submit their choice of specialization by first of March.

Both applicants have proven experience with the planned empirical approaches: Sonja Settele has published several papers based on self-collected survey data and information interventions embedded in surveys in journals such as the *American Economic Review: Insights* and the *American Economic Journal: Economic Policy* (Roth et al., 2022; Settele, 2022). Helene Willadsen has independently run projects based on linked survey-register data sets and has designed tailored interventions for children before (Willadsen, 2020; Piovesan and Willadsen, 2021). Both applicants have some experience working with the Danish register data, and access to a broad network of colleagues and RAs with extensive experience.

Table 1: Timeline

Date	To Do
June 2022	Obtain ethics approval (see table footnote)
August 2022	Contract with Statistics Denmark
August 2022 - September 2022	Survey piloting, and obtain sample
January - February 2023	Roll-out of survey
February 2023	Hand-coding of open text responses
March - May 2023	Obtain linked survey-register data
November-December 2023	Follow-up survey
January 2024	Obtain linked follow-up-register data
July - March 2024	Data analysis and write up working paper
August 2023-December 2024	Presentation at workshops and conferences
2024 - 2025	First submission to academic journal

Notes: We submitted an application for ethics approval and received an answer on May 19th. The ethics committee is asking for minor points, i.e. they would like to see our consent form before granting final approval.

Budget In total, we would like to apply for financial support amounting to **DKK 346,200**. The following Table provides an outline of the planned use of funds.

Table 2: Budget overview

Item Description	Number of items and costs per item	Amount in DKK
Pilot Study	800 respondents à DKK40	32,000
DST project cost	fixed price	15,000
Sample from DST	20% of cohort (14,000 cpr numbers)	20,000
Sending out invitations main survey	approx. DKK3 per letter (incl. reminder)	42,000
Sending out invitations follow-up	approx. DKK3 per letter (incl. reminder)	42,000
Lottery Incentive	Ten lottery winners à DKK500	5,000
Other incentivized choices	50 choices à DKK700	35,000
Taxes on incentives	17.5% of incentives	7,000
Send out vouchers through E-Boks		1000
Cost for research assistant	300 hours à DKK200	60,000
Cost for programming assistant	25 hours à DKK280	7,000
Travel costs for conferences		22,500
Sub-Total Project		288,500
Overhead	20% of other costs	57,700
Total		**346,200**

Notes: We plan to conduct our pilot studies using a commercial sample provided by a survey company such as Lucid or ResearchNow. The exact costs for the pilot study depend on how much piloting is needed until we are satisfied with our questionnaire. The exact costs for the incentivized choices depend on the choices made by the respondents during the experiment.

References

Almås, Ingvild, Alexander W Cappelen, Kjell G Salvanes, Erik Ø Sørensen, and Bertil Tungodden, "What explains the gender gap in college track dropout? Experimental and administrative evidence," *American Economic Review*, 2016, *106* (5), 296–302.

Andre, Peter, Ingar Haaland, Christopher Roth, and Johannes Wohlfart, "Inflation Narratives," *Available at SSRN*, 2021.

Bleemer, Zachary and Basit Zafar, "Intended college attendance: Evidence from an experiment on college returns and costs," *Journal of Public Economics*, 2018, *157*, 184–211.

Buser, Thomas, Muriel Niederle, and Hessel Oosterbeek, "Gender, competitiveness, and career choices," *The Quarterly Journal of Economics*, 2014, *129* (3), 1409–1447.

Crampton, Alexandria and James Hall, "Unpacking socio-economic risks for reading and academic self-concept in primary school: Differential effects and the role of the preschool home learning environment," *British Journal of Educational Psychology*, 2017, *87* (3), 365–382.

Dalskov, Mie and Andreas Mølgaard, "Yngre mænd og indvandrere er 'de nye ufaglærte'," Technical Report 2010.

Exley, Christine L and Judd B Kessler, "The Gender Gap in Self-Promotion," *The Quarterly Journal of Economics*, 2022.

Gino, Francesca, Caroline Ashley Wilmuth, and Alison Wood Brooks, "Compared to men, women view professional advancement as equally attainable, but less desirable," *Proceedings of the National Academy of Sciences*, 2015, *112* (40), 12354–12359.

Joensen, Juanna Schrøter and Helena Skyt Nielsen, "Is there a causal effect of high school math on labor market outcomes?," *Journal of Human Resources*, 2009, *44* (1), 171–198.

Lergetporer, Philipp, Katharina Werner, and Ludger Woessmann, "Does ignorance of economic returns and costs explain the educational aspiration gap? Representative evidence from adults and adolescents," *Economica*, 2021, *88* (351), 624–670.

Pihl, Mie Dalskov and Jesper Kirkbak, "15-29-årige: 76.600 er uden uddannelse og arbejde," Technical Report 2021.

Piovesan, Marco and Helene Willadsen, "Risk preferences and personality traits in children and adolescents," *Journal of Economic Behavior & Organization*, 2021, *186*, 523–532.

Porter, Catherine and Danila Serra, "Gender differences in the choice of major: The importance of female role models," *American Economic Journal: Applied Economics*, 2020, *12* (3), 226–54.

Reuben, Ernesto, Matthew Wiswall, and Basit Zafar, "Preferences and biases in educational choices and labour market expectations: Shrinking the black box of gender," *The Economic Journal*, 2017, *127* (604), 2153–2186.

Riise, Julie, Barton Willage, and Alexander Willén, "Can Female Doctors Cure the Gender STEMM Gap? Evidence from Exogenously-Assigned General Practitioners," *The Review of Economics and Statistics*, 2020, pp. 1–45.

Roth, Christopher, Sonja Settele, and Johannes Wohlfart, "Risk exposure and acquisition of macroeconomic information," *American Economic Review: Insights*, 2022, *4* (1), 34–53.

Settele, Sonja, "How do beliefs about the gender wage gap affect the demand for public policy?," *American Economic Journal: Economic Policy*, 2022, *14* (2), 475–508.

Stantcheva, Stefanie, "Understanding economic policies: What do people know and learn," *Unpublished Manuscript, Harvard University*, 2020.

Willadsen, Helene, "Economic Behaviour of Children and Young Adults." PhD dissertation 2020.

Zafar, Basit, "College major choice and the gender gap," *Journal of Human Resources*, 2013, *48* (3), 545–595.