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# Boys' and girls' educational choices in secondary education. The role of gender ideology

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**ABSTRACT**

This study aims to explain why boys and girls in secondary education choose different educational tracks. We argue that adolescents internalise gender expectations as to what is "appropriate" male and female behaviour in their gender ideology. Gender ideology can affect educational choices by influencing (1) how adolescents evaluate their competence in certain subjects (competence beliefs), (2) what they find important in a future occupation (occupational values) and (3) what school subject they prefer right now (subject preferences). Longitudinal data collected among adolescents at age 15 and 16 ($N$ = 1062) are used. Multinomial path models show that gender ideology shapes boys' occupational values and subject preferences, whereas for girls it shapes their competence beliefs. Only for boys this leads to gender-stereotypical educational choices, however. Our results support the idea that gender expectations are stricter for boys than for girls and may prevent men from entering more feminine career tracks.

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Educational choices; gender ideology; competence beliefs; occupational values; subject preferences

## Introduction

Despite the recent increase in women in higher education, men and women are still concentrated in different educational programmes and occupations (Barone 2011; Gerber and Cheung 2008). Such gender segregation results from persisting gender differences in educational choices, which lead to different educational opportunities and labour market prospects. Educational choices already differ in early adolescence, with boys being more likely to choose mathematics and science tracks and girls tending to choose non-science tracks (Charles and Bradley 2009; Pinxten et al. 2012; Van Langen, Rekers-Mombarg, and Dekkers 2006, 2008).

To explain boys' and girls' educational choices, studies have focused mainly on gender differences in ability, with boys thought to be better at math, spatial or non-verbal activities and girls at verbal reasoning and writing. Although ability is a strong predictor for what track adolescents choose, a growing body of research shows that ability does not entirely explain how boys and girls make their educational choices (Ceci and Williams 2011; Hyde

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and Mertz 2009; Riegle-Crumb et al. 2012). Not only do girls frequently outperform boys in male-dominated areas, but when assessed purely on ability, there should be more boys in feminine tracks and more girls in masculine tracks.

To explain boys' and girls' different educational choices over and above differences in ability, researchers began to focus on how gender expectations affect educational choices (Alon and DiPrete 2015; Correll 2004; Davis and Pearce 2007; Hyde and Mertz 2009). The social environment in which boys and girls grow up (i.e. peers, parents, media, school) conveys cultural beliefs about what is "appropriate" male or female behaviour. Adolescents internalise these gender role expectations in their *gender ideology*. Although previous research identified gender ideology as an important explanation for why boys and girls make different educational choices, its influence is often assumed and not tested (e.g. Charles and Bradley 2009). Additionally, the underlying mechanisms by which gender ideology might affect educational choices remain unclear. This study aims to increase our understanding of the different ways in which gender ideology (might) affect boys' and girls' educational choices.

Previous research has mainly focused on why girls are not opting for more masculine, math-intensive tracks. This study additionally evaluates why boys are not opting for more feminine tracks, which is important for at least two reasons. First, just as women are underrepresented in gender-stereotypical masculine tracks (i.e. computer science and mathematics), men are underrepresented in gender-stereotypical feminine educational tracks (i.e. humanities, arts and education [OECD 2009; A3.6]). Overrepresentation of men or women in educational fields can reinforce children's ideas about what is considered typical "feminine" and "masculine" behaviour, which in turn underpins traditional gender role patterns and increases gender inequality (Geerdink, Bergen, and Dekkers 2011). Second, whereas women who choose masculine fields are viewed as moving up the ladder, the opposite is true for men entering feminine fields. Men working in non-traditional occupations often find their male identity, sexuality and ability to "compete in a man's world" being challenged (Perra and Ruspini 2013). More understanding of gendered and cross-gendered choices might lower the barrier for men to enter female-dominated fields.

This study focuses on students in upper secondary education in the Netherlands. At the end of their third year of secondary education (15 years old), Dutch adolescents choose to continue in one of four tracks that vary in math intensity and core subjects: science & technology, with a focus on pure mathematics, chemistry and physics; science & health, with a focus on physics and biology; economics & society, with a focus on economics and history; and culture & society, with a focus on modern languages and humanities. Science & technology is the most math-intense and teaches mathematics at the most advanced level, followed by science & health, economics & society and culture & society. The educational track that they choose affects adolescents' options after secondary education. For example, if they wish to study science in higher education, they must complete a science track in secondary education. The Netherlands is a special case because, unlike other countries (e.g. Sweden; Van Langen and Dekkers 2005) where it is relatively easy to get back on a science track at a later point, the choices Dutch students make in secondary school are more or less final, and a "wrong" choice is hard to reverse. This highlights the importance of evaluating how educational choices are made during secondary education.

In sum, this study focuses on how gender ideology affects boys' and girls' educational track choice in secondary education in the Netherlands. We contribute by testing the effect of gender ideology on boys' and girls' educational choices, and by unravelling the different

ways in which it might do so. Moreover, our focus lies not only on why girls are not opting for more masculine tracks, but also on why boys are not opting for more feminine tracks.

## Theory

In traditional gender role expectations, men are expected to be breadwinners and women homemakers and caregivers (Davis and Greenstein 2009). Likewise, men are supposed to be more rational and mathematical and women more nurturing and verbal (Jacobs et al. 2002; Parsons and Bales 1955). According to gender socialisation theories (Fagot, Rodgers, and Leinbach 2000), adolescents internalise these gender role expectations in their gender ideology and conform to the behavioural prescriptions of their gender category because doing so confirms their identity (Akerlof and Kranton 2000; Sinclair and Carlsson 2013). Similarly, not conforming to internalised gender role expectations leads to uncertainty and guilt, which they will try to avoid. Because adolescents are still shaping their gender identity, they are very likely to conform to gender roles (Galambos, Almeida, and Petersen 1990). The more boys and girls have internalised a traditional gender ideology, the more they will make masculine or feminine educational choices, respectively. Below, we evaluate three important ways in which gender ideology can affect educational choices. Figure 1 summarises our theoretical model.

First, gender ideology can affect educational choices by influencing how boys and girls evaluate their competence in a certain area (Correll 2004; Wigfield and Eccles 2000). Research shows that, in keeping with traditional gender norms, boys have more confidence in their math or science ability than girls (Correll 2004; Crombie et al. 2005; Sikora and Pokropek 2012), who often evaluate their competence in reading, language and social activities more positively (Chow and Salmela-Aro 2011; Jacobs et al. 2002). Sikora and Propopek's (2012) study of 15-year-old adolescents in 50 countries shows that in almost each country, boys have more confidence than girls in their science ability, even after actual science ability is taken into account. It also shows that students who have a positive view of their science ability are more likely to consider a career in science. Other studies have identified these achievement-related competence beliefs as important predictors for educational choices (Crombie et al. 2005; Osborne, Simon, and Collins 2003; Wigfield and Eccles 2000). We would expect that students who have a positive opinion of their verbal or mathematical competence will be more likely to choose a more feminine or masculine educational track, respectively. In

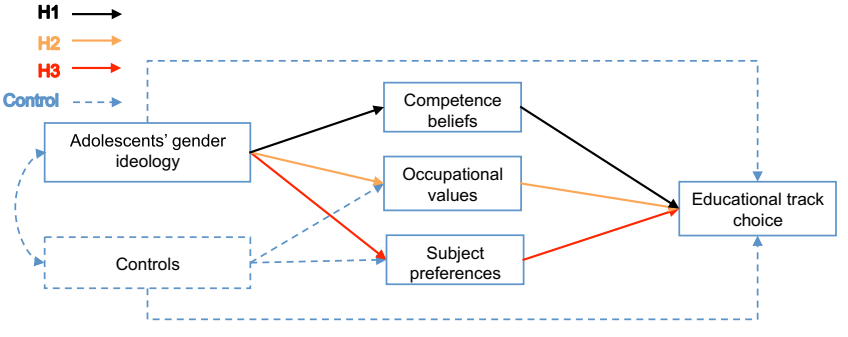


**Figure 1.** Theoretical model.

sum, we expect that *boys and girls with a more traditional gender ideology have more traditional competence beliefs and will therefore choose more traditional gender-stereotypical educational tracks (H1)*.

The second way in which gender ideology can steer boys and girls towards different educational tracks is by influencing what they value in a future occupation. Research has shown that women value working with people and emphasise social and altruistic values in their ideal job, whereas men like to work with things and value economic wealth, prestige and status (Diekman et al. 2010; Su, Rounds, and Armstrong 2009). These results concur with traditional gender ideology, in which men are supposed to be breadwinners and women are supposed to be caregivers. We thus expect that when boys and girls have a more traditional gender ideology, boys will have more traditional masculine occupational values (e.g. valuing income and status in a future job) and girls will have more traditional feminine occupational values (e.g. valuing helping others and working with people in a future job). In turn, these occupational values influence what types of skills they seek to learn in the course of their education. Research shows that what people want in the future, including their occupational values, can be a powerful predictor of the field they choose (Beal and Crockett 2010; Diekman et al. 2010). Boys who have traditional values would tend to go into economic, science or mathematics tracks, as these generally provide a higher status and more income, whereas girls would be inclined to focus on more social and people-oriented tracks. We expect that *boys and girls with a more traditional gender ideology have more traditional occupational values and will therefore choose more traditional gender-stereotypical educational tracks (H2)*.

The third way in which gender ideology might affect educational choices is by influencing academic subject preferences. Traditionally, more science-related subjects, for example mathematics and information technology, are considered masculine subjects, whereas art, language and humanities are typical feminine subjects (Colley and Comber 2003; Whitehead 1996). If boys and girls choose according to their gender ideology, they will be more likely to have more masculine and feminine subject preferences, respectively. However, research on gender differences in subject preferences has not been unanimous. Colley and Comber (2003) concluded that, although some preferences change over time, there are persisting gender differences in subject preferences. Their research among 15- to 16-year-old adolescents shows that boys tend to prefer math as well as physical education and information and communication technology, whereas girls are more likely to prefer drama, English, geography and art. However, other research suggests that the gender gap in the subject preferences of adolescents (of similar age) is narrowing, with traditional patterns persisting in subjects liked least, but not in favourite subjects (Francis 2000). Still others found no significant gender differences in subject preferences for children aged 8, 12 and 16 (Miller and Budd 1999). Researchers have identified liking or enjoying a task or a subject as an important predictor for what educational track students choose (Elsworth et al. 1999; Lyons 2006; Van Langen, Rekers-Mombarg, and Dekkers 2006). More feminine or masculine subject preferences should therefore lead to more feminine or masculine track choices. To summarise, we expect that *boys and girls with a more traditional gender ideology have more traditional subject preferences and will therefore choose more traditional gender-stereotypical educational tracks (H3)*.

## Method

### The Dutch education system

After primary education (age 12), students in the Netherlands can enter three levels of secondary education, depending on their grades and test results in primary education. Unlike the lowest level of secondary education (VMBO; 4 years), the two highest levels (HAVO & VWO; 5 and 6 years respectively) give access to tertiary education. Students who enter VMBO make their track choices in grade 8 (age 13–14; second year of secondary school), while students who enter the HAVO and VWO make their track choices at the end of the 9th grade (age 14–15; third year of secondary school). Since our data were collected when the respondents were in grade 9 (first wave) and grade 10 (second wave), VMBO students already made a track choice at T1 and were therefore excluded from our study. Of all respondents who participated in both waves, 37% attended HAVO/VWO. Our dependent variable, track choice, was measured at the second point in time, along with competence beliefs, occupational values and subject preferences. Gender ideology and all control variables were measured at the first point in time.

### Data and sample

Our data-set is taken from the *Children of Immigrants Longitudinal Survey in Four European Countries (CILS4EU;* Kalter et al. 2014). Funded by NORFACE (New Opportunities for Research Funding Agency Co-Operation in Europe), this project was set up to explore the structural, cultural and social integration of immigrant and non-immigrant children in Germany, the Netherlands, Sweden and the United Kingdom. The present study uses data collected in the Netherlands in 2010/2011 (wave 1) and 2011/2012 (wave 2).

Respondents were selected using a three-stage sample design that was stratified according to educational level and percentage of non-Western immigrants in a school. First, schools were randomly chosen, with an oversampling of schools with higher proportions of immigrant children. Very small schools were excluded, as well as schools for mentally and physically disabled children or children with a learning disability (school level exclusion = 6.8%). To increase the response rate among schools (34.9%), non-responding schools were replaced with other similar schools, leading to a school participation rate of 91.7%. Within schools, two school classes were randomly selected (class level participation rate = 94.5%) and all students in these classes were surveyed (student level participation rate = 91.1%).

In total, 4363 children were surveyed in 222 classes at 100 schools, of whom 3211 (73.59%) also participated in school in the second wave. Of these, 1196 (37.25%) respondents are in the upper two levels of secondary education (HAVO and VWO). After excluding respondents with missing data, we analysed 1062 respondents at 36 schools.

### Measures

#### Dependent variable

*Educational track* reflects the educational track choice made by upper level secondary school students. The options are *science & technology, science & health, economics & society,* and *culture & society.* In total, 93 adolescents had chosen both science & technology and science & health and 19 adolescents had chosen both economics & society and culture & society.

This is because, although each track focuses on some core subjects, students are allowed to customise tracks and take courses from other tracks. For example, a student can choose the economics & society track but also study French, which is part of the culture & society track. Students who had chosen two tracks were assigned the track that is more science and math-intense (i.e. combined culture & society and economics & society were recoded as economics & society, and combined science & technology and science & health was recoded as science & technology).[1]

In our data, 38% of the adolescents enrolled in the science & technology track are girls, compared to 66% in science & health, 52% in economics & society, and 87% in culture & society. National statistics from the Netherlands report similar figures for 2011/2012, with girls representing 23% of adolescents enrolled in the science & technology track, 62% in science & health, 46% in economics & society and 81% in culture & society (Statistics Netherlands 2014). Based on these statistics, science & technology can be considered the most masculine choice, followed by economics & society, science & health, and culture & society.

### *Independent variables*

*Traditional gender ideology* reflects the extent to which people identify with family roles traditionally linked to gender. A common way to measure gender ideology is to ask respondents who should bear more responsibility for certain tasks (Davis and Greenstein 2009). In our case, the tasks were as follows: (1) take care of the children, (2) cook, (3) earn money and (4) clean the house. The response categories were as follows: "mostly the man"; "mostly the woman"; and "both about the same". For the caretaking item, cooking and cleaning, students received a score of 2 when they responded "mostly the woman," 1 when they responded "both about the same," and 0 when they responded "mostly the man." For the item on income, students received a score of 2 when they responded "mostly the man," 1 when they responded "both about the same," and 0 when they responded "mostly the woman." Averaging these items resulted in a scale ($\alpha = 0.67$) that ranges from 0.5 to 2, with higher scores indicating a more traditional gender ideology.

Competence beliefs consist of *verbal competence* beliefs and *mathematics competence* beliefs. Students were asked: How good are you in the following subjects? Math, English, and Dutch. Response categories were "not good at all" (0) to "very good" (4). For verbal competence, we averaged the scores for English and Dutch. Competence beliefs thus reflect how good adolescents thought themselves to be in mathematics as well as reading, writing and speaking English or Dutch. Higher scores indicated a more positive evaluation of the student's competence beliefs.

Occupational values reflect what adolescents consider important in a future job. Using a four-point scale ranging from "not at all important" (0) to "very important" (3), the respondents indicated how important they think the following is in a future occupation: "Helping people" and "Having a high income". The first two items represent gender stereotypical masculine or feminine occupational values. Theoretically, helping people fits the feminine gender role, whereas having a high income fits the breadwinner gender role. We added both variables separately in the analyses as *helping others* and *income*.

*Feminine subject preference* was measured by asking "What is your favourite subject?". The answers were coded into fields of study based on the International Standard Classification of Education Scale, ISCED97 (UNESCO 2006). These are field of study options in tertiary education. To indicate the masculinity or femininity of adolescents' subject preferences,

we extracted the percentage of women enrolled in these fields of study in the Netherlands in 2012 (the same year as the survey), based on data collected by Statistics Netherlands (Statistics Netherlands 2014). In total, we classified school subjects into 24 fields, with the percentage of female enrolment ranging from 13.48 (physics) to 81.23% (French). Higher scores indicate more feminine subject preferences.

### *Controls*

We controlled for ability because it is not only a powerful predictor for what track an adolescent might follow but is also likely to be linked to competence beliefs, occupational values and subject preferences. Ability can be measured by both verbal and nonverbal cognitive tests. The *verbal ability* test is a measure of Dutch language abilities. Respondents were asked to find synonyms for 30 words on a list of 5 response options ("Synoniemen" from the "Nederlandse Intelligentietiest voor onderwijsniveau"; NIO [Van Dijk and Tellegen 2004]). This resulted in 30 items indicating whether the respondent answered the question correctly (1) or not (0). A sum scale with a Kuder-Richardson coefficient of reliability (suitable for binary data) of 0.69 was calculated. Nonverbal *cognitive ability* was measured with a standard cognitive ability test (CFT20R, "Grundintelligenztest Skala 2 Revision"; [Weiß 2006]) based on graph problems and therefore considered language-free and "culturally fair". In these measures, a sum scale with Kuder-Richardson reliability of 0.62 was created from 27 items indicating whether the graph problems were solved correctly (1) or not (0).

We controlled for socioeconomic status (SES) because having a higher SES increases a student's uptake in mathematics and science tracks (Van de Werfhorst, Sullivan, and Cheung 2003). As an indication of high SES, we use *highest parental occupational status* and *highest parental education* as reported by the parent. Parents were given the questionnaire in the first wave. If they did not respond, they were sent a reminder and ultimately contacted by phone if possible (response rate parents' questionnaire: 74.4%). Parents were asked about their current and last occupation and their main activities in this occupation, as well as that of their partners (if present). Their occupations were coded according to the International Standard Classification of Occupations 2008 (ISCO08). We used conversion tools (Ganzeboom and Treiman 2010) to recode the ISCO08 into the standard International Socio-Economic Index of occupational status scores (ISEI). If we had information on both parents, we took the current occupation with the highest status ($n = 510$). If this was not available, we took the status of their last occupation ($n = 158$). When respondents lived with one parent, we used only one parent's current or last occupational status ($n = 145$). As not all parents completed the questionnaire, the remaining missing values were replaced with information provided by the adolescents, who also answered questions about their parents' main occupation. However, adolescents reported this information specifically for their biological parents. We therefore only replaced missing parental occupational status scores if the respondent indicated that (s)he lived with both biological parents ($n = 231$), or only their biological mother or biological father ($n = 18$). The scores for highest parental occupational status range from 12.34 to 88.96, with higher scores indicating higher occupational status.

*Highest parental education* reflects the highest educational level attained within a couple. The parent was asked to indicate the highest educational level that he/she and his/her partner had attained. We took the maximum educational level attained either within the couple ($n = 688$) or by only one parent ($n = 243$). This resulted in a measure with 6 categories: no education (0), primary education (1), secondary education (2), intermediate vocational

education (3), higher vocational education (4) and university (5). We again replaced missing values with information provided by the adolescent. Adolescents were asked about their biological mothers' and fathers' highest education. We replaced parental missing values if the respondent lived with both biological parents ($n$ = 113) or only the biological mother or the biological father ($n$ = 18).

We controlled for family structure because educational choices may vary by family structure. Adolescents living in a single-parent family or in a stepparent household may have limited educational opportunities owing to a lack of resources (Davis and Pearce 2007). *Intact family* indicates whether a child lives with both biological parents (1) in wave 1. The reference category is all other living arrangements (0).

To control for differences between the two upper secondary educational levels, we constructed the variable *VWO,* which indicated whether students are in a HAVO (0) or a VWO (1) programme in wave 1.

Lastly, because the data contains an oversampling of immigrant adolescents, we controlled for the immigrant background of adolescents. If an adolescent, or at least one of the parents, was born abroad, we consider the pupil to have an *immigrant* background (1), whereas if both parents were born in the Netherlands, we consider the adolescent part of the native group (0). Table 1 shows the descriptive statistics for all respondents and for boys and girls separately.

## Analyses

We performed multinomial path analyses in STATA to test our hypotheses. These analyses give odds ratios, which are difficult to interpret due to unobserved heterogeneity (Mood 2010). We therefore calculated average marginal effects. Marginal effects indicate the change in the probability of an adolescent choosing a track for every one-unit change in

**Table 1.** Descriptive statistics for boys (n = 468) and girls (n = 594).

| | *M* | | | *SD* | | |
|---|---|---|---|---|---|---|
| | Total | Boys | Girls | Total | Boys | Girls |
| Science & technology (0–1) | 0.23 | 0.33 | 0.16 | | | |
| Economics & society (0–1) | 0.43 | 0.47 | 0.40 | | | |
| Science & health (0–1) | 0.22 | 0.17 | 0.25 | | | |
| Culture & society (0–1) | 0.12 | 0.04 | 0.19 | | | |
| Traditional gender ideology (0.5–2) | 1.37 | 1.45 | 1.31 | 0.35 | 0.36 | 0.34 |
| Competence beliefs | | | | | | |
| Verbal competence (0–4) | 2.46 | 2.48 | 2.45 | 0.73 | 0.71 | 0.74 |
| Mathematical competence (0–4) | 2.29 | 2.42 | 2.18 | 1.03 | 0.96 | 1.07 |
| Occupational values | | | | | | |
| Helping others (0–3) | 1.97 | 1.76 | 2.13 | 0.66 | 0.69 | 0.59 |
| Income (0–3) | 2.14 | 2.26 | 2.05 | 0.55 | 0.55 | 0.52 |
| Feminine subject preferences (13–81) | 42.52 | 35.52 | 48.04 | 17.19 | 14.05 | 17.43 |
| Verbal ability (0–30) | 19.87 | 20.25 | 19.57 | 3.91 | 3.68 | 4.06 |
| Cognitive ability (4–27) | 21.48 | 21.34 | 21.59 | 3.04 | 3.27 | 2.84 |
| Parental SES | | | | | | |
| Highest occupational status parents (12–89) | 60.58 | 61.05 | 60.21 | 18.49 | 18.22 | 18.71 |
| Highest educational level parents (0–5) | 3.48 | 3.48 | 3.47 | 1.13 | 1.14 | 1.13 |
| Intact family (0–1) | 0.83 | 0.85 | 0.81 | | | |
| Immigrant (0–1) | 0.23 | 0.23 | 0.23 | | | |
| VWO (0–1) | 0.58 | 0.56 | 0.60 | | | |

Note: For categorical variables proportions are given.

an explanatory variable. These marginal effects were estimated for every individual in our data and subsequently averaged and multiplied by 100. This allows us to say how much more or less likely it is (in percentages) that an adolescent will choose a particular track for every one-unit increase in an explanatory variable.

Standard errors were bootstrapped from 1000 sampling distributions. Since our data are hierarchically structured (students are nested within classes and schools), standard errors were adjusted to take into account the non-independence of our data. Classes in grade 4 of upper secondary education in the Netherlands differ considerably from those in grade 3 because in grade 4, students are grouped together according to their chosen track. We therefore controlled for clustering of adolescents at school level ($n = 36$ schools), and not at class level. To assess model fit, we used generalised Hosmer and Lemeshow goodness-of-fit, which is appropriate for a multinomial logistic regression model (Fagerland and Hosmer 2012). A non-significant $p$-value means that the observed values and the model-predicted values do not differ from each other, indicating a good fit. The model fit statistics presented are not controlled for clustering, because this is not yet available.

We conducted our analyses separately for boys and girls because a traditional gender ideology means something different for each group.

As illustrated in Figure 1, our model consists of direct and indirect effects. Our interest lies in the indirect effects of gender ideology, as we have argued that adolescents with more traditional gender ideologies make more traditional educational choices because they have more traditional competence beliefs (H1), more traditional occupational values (H2) and more traditional subject preferences (H3). For practical reasons, we only display significant effects of gender ideology for boys (Figure 2) and girls (Figure 3). All other effects can be

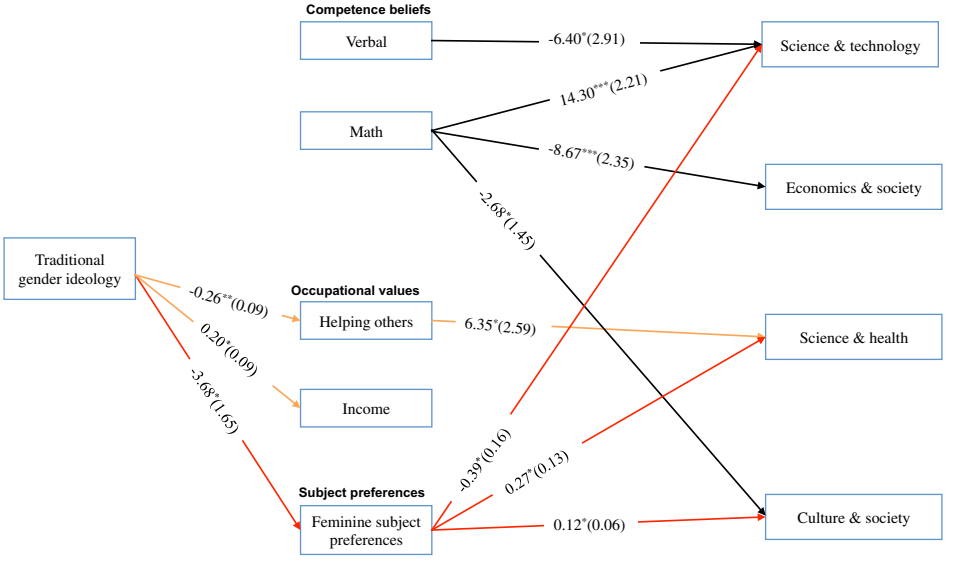


**Figure 2.** Results for boys. The direct effects of gender ideology on mediators (regular regression coefficients) and of mediators on educational track choice (average marginal effects × 100). Results are controlled for: cognitive ability; verbal ability; highest parental occupational status; highest parental education; family structure (1 = intact family); level of secondary education (1 = VWO); ethnicity (1 = minority); $^{*}p < 0.05$; $^{**}p < 0.01$; $^{***}p < 0.001$ (two-tailed test).

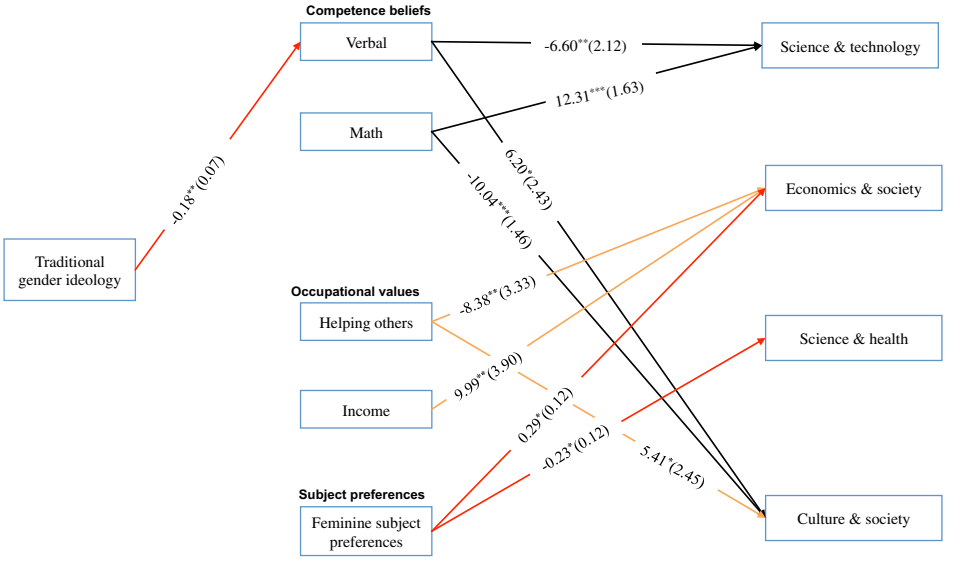


**Figure 3.** Results for girls. The direct effects of gender ideology on mediators (regular regression coefficients) and of mediators on educational track choice (average marginal effects × 100). Results are controlled for: cognitive ability; verbal ability; highest parental occupational status; highest parental education; family structure (1 = intact family); level of secondary education (1 = VWO); ethnicity (1 = minority); $^{*}p < 0.05$; $^{**}p < 0.01$; $^{***}p < 0.001$ (two-tailed test).

found in Appendix 1 (i.e., all significant and non-significant effects of gender ideology and mediators on track choices: Table 1 and 2; overall indirect effects: Table 3; and direct effects of all variables: Table 4). As our mediators are continuous variables, the effects of gender ideology on the mediators are interpretable as regular regression coefficients. The effects of competence beliefs, occupational values and subject preferences on the dependent variable track choice are average marginal effects (×100).

## *Results*

Figure 2 shows the results for boys. The goodness of fit tests indicate that the observed and predicted models do not significantly differ from each other, indicating a good model fit ($p = 0.79$). Figure 2 shows that gender ideology does not affect boys' competence beliefs, refuting hypothesis 1 for boys. Competence beliefs do affect boys' educational track choices. When boys evaluate their verbal skills more positively (by one point), they are on average 6.40% less likely to choose science & technology. However, verbal competence does not affect the likelihood of their choosing other tracks. When boys evaluate their math skills to be better (by one point), they are on average 14.30% more likely to choose the science & technology track, 8.67% less likely to choose the economics & society track and 2.68% less likely to choose the culture & society track. When boys' competence beliefs in math are more positive, they are thus more likely to choose the most scientific, math-intense track. Notably, the likelihood of their choosing the science & health track – which is more math-intense than the economics & society and culture & society tracks – is not affected.

The results partly confirm hypothesis 2 for boys. Boys with a more traditional gender ideology have more traditional occupational values because they value income more ($b = 0.20$, $p < 0.05$) and helping others less in a future occupation ($b = -0.26$, $p < 0.01$). However, having more traditional values only partly leads to more traditional educational choices for boys. Boys who value helping others in a future occupation are 6.35% more likely to choose the science & health track.

Hypothesis 3 is also partly supported for boys. Boys with a more traditional gender ideology have less feminine subject preferences ($b = -3.68$, $p < 0.05$). With every percentage increase in the feminine nature of boys' subject preferences, boys are on average 0.39% less likely to choose science & technology, 0.27% more likely to choose science & health and 0.12% more likely to choose culture & society. Subject preferences do not affect the likelihood of choosing economics & society.

Figure 3 displays the results for girls. The goodness-of-fit tests indicate that the observed and predicted model do not significantly differ from each other, indicating a good model fit ($p = 0.08$). Contrary to what we expected, Figure 3 shows that for girls having a more traditional gender ideology leads to lower verbal competence beliefs ($b = -0.18$, $p < 0.05$). For every point increase in how girls evaluate their competence in languages, they are on average 6.60% less likely to choose the science & technology track and 6.20% more likely to choose the culture & society track. Gender ideology does not affect competence beliefs in math. However, for every point increase in mathematical competence, girls' likelihood of choosing science & technology increases on average by 12.31% and the probability of their choosing culture & society decreases on average by 10.04%.

Hypothesis 2 and 3 are not supported for girls. Gender ideology does not affect occupational values or subject preferences. We see that if girls value helping others more (by one unit), they are on average 8.38% less likely to choose the economics & society track. Similarly, if they have less traditional occupational values (value income more), they are 9.99% more likely to choose the economics & society track and 5.41% more likely to choose culture & society. For subject preferences, we find that for every percent increase in the feminine nature of girls' subject preferences, girls are on average 0.23% less likely to choose the science & health track and 0.29% more likely to choose the economics & society track.

The overall indirect effects of gender ideology on track choice via competence beliefs, occupational values and subject preferences were not significant for either sex (see Table 3 Appendix 1). This could be because some effects cancel each other out. For example, a positive effect of gender ideology on subject preferences and a negative effect of subject preferences on track choice could result in no overall indirect effect. It could also be due to our having too few respondents in our data, in particular given the complex nature of our model.

We additionally tested the direct effect of gender ideology on educational choice (see Table 4, Appendix 1). This direct effect was not significant, meaning that gender ideology has no remaining effects on educational choice that are not explained by our mediators.

## *Conclusions and discussion*

This study evaluated how adolescents' gender ideology affects educational choices via competence beliefs, occupational values and subject preferences in upper secondary education in the Netherlands. We considered not only why girls are not opting for more masculine

tracks, but also why boys are not choosing more feminine ones. We argued that adolescents with a more traditional gender ideology have more traditional competence beliefs, occupational values and subject preferences, leading them to make more gender-stereotypical educational track choices. Using two waves of the CILS4EU data, we analysed 1062 students using multinomial path analyses.

Results show that a more traditional gender ideology leads to more traditional occupational values for boys, but not girls. In line with the breadwinner ideology, boys with a more traditional gender ideology value having a high income in a future occupation and find helping others less important. These gender-stereotypical traditional values only partially affect educational choices. Boys, who value helping others in a future occupation, are more likely to opt for a track with a focus on biology and physics (science & health). This finding is consistent with previous research suggesting that the domain of health and biology can be categorised as more social and people-oriented, which are often considered more feminine (Sikora and Pokropek 2012). Boys who have a more traditional gender ideology find helping others less important in a future job, and shy away from this domain.

Gender ideology also affects boys' subject preferences, but not those of girls. Boys with a more traditional gender ideology have more masculine subject preferences. Consequently, they are more likely to enter a more masculine track with a focus on pure science (science & technology) and less likely to choose the more feminine tracks that focuse on biology and physics (science & health) and languages and humanities (culture & society). The fact that gender ideology affects boys' values and preferences and not girls' highlights the importance of studying not only why girls are not making masculine educational choices, but also why boys are not opting for more feminine tracks. Our results show that gender expectations steer boys into educational tracks because they affect what boys prefer to do right now and what they find important in the future. Gender ideology thus partly explains why boys are not choosing more feminine educational tracks and it is therefore important to take that ideology into account when studying boys' educational choices.

Our results also show that, although they are not affected by gender ideology, girls with more feminine subject preferences are more likely to choose an economic track (economics & society) and less likely to choose a track that focuses on physics and biology (science & health). Even though science & health can be considered more feminine because it involves biology (i.e. social and people-oriented), girls with more feminine preferences still shy away from this science-oriented track. However, feminine preferences do lead girls to choose economics & society. One argument could be that girls choose this track because it also involves the humanities (e.g. history). Nevertheless, girls with more feminine subject preferences are not more likely to choose the culture & society track, which focuses on the humanities and modern languages. Our results suggest that science remains a more masculine option for girls, but that economics is not incompatible with feminine preferences. This suggests that economics is no longer perceived as a typically masculine domain and fits in with the rising number of women entering business and the growing acceptance of women making "masculine" choices (England and Li 2006).

Contrary to our expectations, a more traditional gender ideology leads girls to evaluate their verbal competence more negatively. They are subsequently less likely to choose a gender-stereotypical feminine track (culture & society) and more likely to choose a gender-stereotypical masculine track (science & technology). One explanation could be that it is not just that more traditional girls evaluate their competence more negatively, but that

girls who are less traditional believe that they should be really good at languages and thus overestimate their competence. However, our result could also be due to our measurement of gender ideology. Girls with a traditional gender ideology may identify with the caregiver/homemaker role. Although care giving and verbal competence are both considered feminine, they may in fact be two separate domains. Measuring competence beliefs in care giving might reveal more about how gender ideology affects educational choices.

Gender ideology was not related to girls' mathematical competence beliefs or to boys' verbal *and* mathematical competence beliefs. These results are in line with recent research indicating that gender stereotypes associated with math and language are changing. Boys and girls still view language as a typically feminine domain, whereas they no longer regard mathematics as a typically masculine domain (Kurtz-Costes et al. 2014; Plante, Théorêt, and Favreau 2009). If mathematics is becoming more gender neutral, then it would not fit in with either male *or* female gender ideology, thus explaining why we did not find that gender ideology affects boys' or girls' mathematical competence beliefs. Additional evidence of changing stereotypes comes from a study that found boys and girls to have (increasingly) similar mathematical competence beliefs, but to differ more in their verbal competence beliefs (Jacobs et al. 2002). Changes in stereotypes also explain our finding that girls' gender ideology affects their verbal competence beliefs, although they do not explain why traditional boys do not evaluate their verbal competence more negatively. It could be that boys tend to overestimate their own ability (Correll 2001).

This study is one of the few to look specifically at the verbal competence beliefs of boys and girls. Previous literature focused mainly on mathematical/science competence beliefs (e.g. Crombie et al. 2005) or on gender differences in competence beliefs (e.g. Jacobs et al. 2002). Verbal competence is a more interesting research subject than mathematical competence, however. In the first place because our findings indicate that gender expectations lead girls to evaluate their verbal competence negatively, irrespective of their actual verbal ability, and second because although attitudes towards mathematics are becoming more gender neutral, that might not be the case for verbal competence.

In sum, gender ideology influences boys' educational choices because it affects what they consider important in the future as well as what they enjoy doing right now, leading to more gender-stereotypical educational choices. In the case of girls, gender ideology affects how they evaluate their verbal competence. Our results support the idea that gender expectations are stricter for boys than for girls. Whereas it is increasingly acceptable for girls to make more masculine choices, there is less acceptance of cross-gendered choices for boys (Kane 2006; Perra and Ruspini 2013). Future research should further examine the role of gender ideology in explaining boys' educational choices, as this may help explain why boys are not choosing more traditional feminine tracks.

The findings of this study should be viewed within the context of its limitations. Owing to data limitations, our dependent and mediator variables were measured at the same point in time (second wave), making it impossible to infer causal claims on the relationship between competence beliefs, occupational values, subject preferences and educational track choice. However, gender ideology was measured at an earlier time point, which supports our conclusion that gender ideology affects competence beliefs, occupational values and subject preferences. Additionally, although some constructs (e.g. ability) are precisely measured, we measured other concepts with a single item. More elaborate measures would contribute to the stability of our results. Lastly, the indirect effect of gender ideology on educational

choices via all three mediators was not significant. This could be because some effects cancel each other out, or because we did not have a sufficient number of respondents from which to draw our data. Replication of our study using a larger sample of adolescents could reveal more effects.

Despite these limitations, gender ideology is an important concept in shaping boys' and girls' competence beliefs, occupational values and subject preferences, and it affects boys and girls in different ways. We recommend that future research examines the effect of gender expectations on the educational choices of boys and girls. Not only does this effect remain under-examined, but it is important to understand why boys and girl continue to make different educational choices because such choices affect their future educational and occupational careers. If talented individuals are choosing to do what is socially desirable, rather than doing what they do best, society might very well be missing out.

## Note

1. We ran all analyses again leaving out these respondents and coding the 19 and 93 adolescents as enrolled in culture & society and science & health, respectively. The results were very similar.

## Disclosure statement

No potential conflict of interest was reported by the authors.

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## Appendix 1.

**Table 1.** Unstandardised regression effects of gender ideology on competence beliefs, occupational values and subject preferences for boys and girls.

| | Boys | | Girls | |
|---|---|---|---|---|
| *Effect of gender ideology on:* | B | SE | B | SE |
| Competence beliefs | | | | |
| Verbal | 0.02 | 0.09 | −0.18** | 0.07 |
| Mathematical | 0.06 | 0.15 | 0.17 | 0.15 |
| Occupational values | | | | |
| Helping | −0.26** | 0.09 | 0.14 | 0.09 |
| Income | 0.20* | 0.09 | −0.05 | 0.08 |
| Feminine subject preferences | −3.68* | 1.65 | 2.02 | 1.71 |

#$p < 0.10$; *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$ (two-tailed test)

**Table 2.** Average marginal effects (×100) of competence beliefs, occupational values and subject preferences on educational track choice for boys and girls.

| | Science & technology | | | | Economics & society | | | | Science & health | | | | Culture & society | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Boys | | Girls | | Boys | | Girls | | Boys | | Girls | | Boys | | Girls | |
| | B | SE | B | SE | B | SE | B | SE | B | SE | B | SE | B | SE | B | SE |
| Competence beliefs | | | | | | | | | | | | | | | | |
| Verbal | −6.40$^{*}$ | 2.91 | −6.60$^{**}$ | 2.12 | 6.24$^{\#}$ | 3.44 | 2.85 | 3.07 | 0.64 | 2.73 | −2.45 | 2.80 | −0.48 | 1.85 | 6.20$^{*}$ | 2.43 |
| Mathematical | 14.30$^{***}$ | 2.21 | 12.31$^{***}$ | 1.63 | −8.67$^{***}$ | 2.35 | −1.00 | 1.96 | −2.76 | 1.89 | −1.27 | 1.74 | −3.86$^{*}$ | 1.45 | −10.04$^{***}$ | 1.46 |
| Occupational values | | | | | | | | | | | | | | | | |
| Helping | −0.55 | 2.81 | −1.49 | 2.46 | −5.72$^{\#}$ | 3.17 | −8.38$^{*}$ | 3.33 | 6.35$^{*}$ | 2.59 | 4.47 | 3.07 | −0.08 | 1.13 | 5.41$^{*}$ | 2.45 |
| Income | −2.93 | 3.80 | −1.92 | 2.76 | 5.51 | 4.32 | 9.99$^{*}$ | 3.90 | −2.43 | 3.57 | −6.21$^{\#}$ | 3.40 | −0.16 | 1.45 | −1.86 | 3.20 |
| Feminine subject preferences | −0.39$^{*}$ | 0.16 | −0.05 | 0.09 | −0.01 | 0.17 | 0.29 | 0.12 | 0.27$^{*}$ | 0.13 | −0.23$^{*}$ | 0.12 | 0.12$^{*}$ | 0.06 | −0.01 | 0.09 |

$^{\#}p < 0.10$; $^{*}p < 0.05$; $^{**}p < 0.01$; $^{***}p < 0.001$ (two-tailed test).

**Table 3.** Indirect average marginal effects of gender ideology on educational track choice via competence beliefs, occupational values and subject preferences for boys and girls.

| | Science & technology | | | | Economics & society | | | | Science & health | | | | Culture & society | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Boys | | Girls | | Boys | | Girls | | Boys | | Girls | | Boys | | Girls | |
| *Mediators* | B | SE | B | SE | B | SE | B | SE | B | SE | B | SE | B | SE | B | SE |
| Competence beliefs | | | | | | | | | | | | | | | | |
| Verbal | −0.10 | 0.62 | 1.17 | 0.79 | 0.10 | 0.66 | −0.51 | 0.68 | 0.01 | 0.26 | 0.43 | 0.61 | −0.01 | 0.18 | −1.10 | 0.79 |
| Mathematical | 0.84 | 1.74 | 2.03 | 1.64 | −0.51 | 1.03 | −0.17 | 0.44 | −0.16 | 0.42 | −0.21 | 0.40 | −0.17 | 0.43 | −1.66 | 1.33 |
| Occupational values | | | | | | | | | | | | | | | | |
| Helping | 0.14 | 0.77 | −0.20 | 0.39 | 1.48 | 1.05 | −1.13 | 0.83 | −1.65$^{\#}$ | 0.98 | 0.60 | 0.59 | 0.02 | 0.31 | 0.73 | 0.55 |
| Income | −0.59 | 0.84 | 0.10 | 0.30 | 1.12 | 1.06 | −0.53 | 0.77 | −0.49 | 0.80 | 0.33 | 0.51 | −0.03 | 0.31 | 0.10 | 0.30 |
| Feminine subject preferences | 1.43 | 0.97 | −0.11 | 0.29 | 0.02 | 0.66 | 0.59 | 0.75 | −0.02 | 0.66 | −0.47 | 0.61 | −0.46 | 0.37 | −0.01 | 0.29 |

$^{\#}p < 0.10$; $^{*}p < 0.05$; $^{**}p < 0.01$; $^{***}p < 0.001$ (two-tailed test).

**Table 4.** Direct average marginal effects (x100) of gender ideology and control variables on educational track choice for boys and girls.

| | Science & technology | | | | Economics & society | | | | Science & health | | | | Culture & society | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Boys | | Girls | | Boys | | Girls | | Boys | | Girls | | Boys | | Girls | |
| | B | SE | B | SE | B | SE | B | SE | B | SE | B | SE | B | SE | B | SE |
| Traditional gender ideology | −6.77 | 5.99 | −0.15 | 4.55 | 9.70 | 6.63 | 7.14 | 6.04 | 2.38 | 4.74 | −0.54 | 5.57 | −5.31 | 3.63 | −6.45 | 4.61 |
| Cognitive ability | 2.63** | 0.80 | −0.09 | 0.47 | −2.66** | 0.76 | −0.37 | 0.75 | 0.54 | 0.57 | 0.85 | 0.70 | −0.51# | 0.29 | −0.39 | 0.61 |
| Verbal ability | 0.67 | 0.59 | 1.14* | 0.46 | −0.25 | 0.66 | −0.97 | 0.59 | −0.16 | 0.56 | 0.31 | 0.54 | −0.26 | 0.27 | −0.48 | 0.46 |
| Highest occupational status parents | −0.13 | 0.15 | −0.01 | 0.11 | 0.03 | 0.15 | −0.10 | 0.13 | 0.24# | 0.13 | 0.05 | 0.13 | 0.14* | 0.06 | 0.05 | 0.10 |
| Highest educational level parents | 2.70 | 2.18 | 3.00# | 1.68 | −3.22 | 2.41 | 0.90 | 2.19 | −1.16 | 1.92 | −1.54 | 1.98 | 1.68 | 1.20 | −2.35 | 1.65 |
| Intact family | 17.89** | 6.57 | −5.40 | 3.34 | 24.14** | 6.85 | 9.05# | 5.46 | 7.30 | 6.17 | 1.12 | 4.68 | −1.04 | 4.50 | −4.77 | 4.04 |
| Immigrant | 4.28 | 5.52 | 8.32* | 3.61 | −8.02 | 5.78 | 10.23* | 5.14 | 5.43 | 4.56 | 2.17 | 4.55 | −1.69 | 2.71 | −0.26 | 4.05 |
| VWO | 15.03*** | 4.32 | 7.72* | 3.08 | 15.82*** | 4.67 | 0.09 | 4.41 | 2.52 | 3.55 | −5.18 | 3.96 | −1.73 | 2.77 | −2.63 | 3.31 |

#$p < 0.10$; *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$ (two-tailed test).