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Childhood Behavior and Sexual Debut in Adolescence: A Danish National Birth Cohort Study

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Abstract

Sexual debut is an important event in people's lives, and it is linked with later physical and mental health. Previous research has examined the role of personal, family, and peer factors in explaining sexual behavior in adolescence. Childhood emotions and behaviors, such as internalizing, externalizing, and prosocial behavior, have been overlooked as potential determinants for sexual debut. We seek to fill this gap by linking behavioral indicators measured at age 11 with age at sexual debut. High-quality data from the Danish National Birth Cohort (DNBC) provide information on 27,456 adolescents who were followed from birth up to age 18. We model age at sexual debut with accelerated failure time models and probability of early sexual debut by age 15 with linear probability models. Findings show that high internalizing behavior scores at age 11 were linked to later sexual debut for both boys and girls,

whereas high externalizing behavior scores were associated with earlier sexual debut among girls, but not among boys. High levels of prosocial behavior were associated with earlier sexual debut among boys, but not girls. The results were generally supported by dichotomous analyses on early sexual debut. Our findings improve the understanding of sexual behavior in adolescence, and help to identify factors associated with early sexual debut.

Keywords

Behavioral factors, Strengths and difficulties questionnaire, Age at first sex

Introduction

The average age at sexual debut in Nordic countries is around 16.5 years, and is therefore relatively low compared to that in many other European countries, with the average age ranging from almost 16 years in Iceland to 18 years in Slovakia (Avery & Lazdane, 2010). In Denmark, the median age at sexual debut is around 16 years for girls and 17 years for boys, with both ages remaining relatively stable across birth cohorts (Frisch et al., 2019; Sex & Samfund, 2025). At the same time, the share of Danish-born females who have had their sexual debut by ages 14-17 has consistently increased across birth cohorts from 1965 to 1994 (Hansen et al., 2019). In parallel, the age at pubertal development has been declining, as indicated by the lower age at menarche (Brix et al., 2018) as well as the earlier onset of breast and genital growth reported in recent years (Aksglaede et al., 2009) (Sørensen et al., 2010).

Sexual debut often has a special emotional and social meaning for individuals. For instance, some adolescents may aim to develop a feeling of sexual readiness before having sex for the first time, which may result in these adolescents postponing their sexual debut longer than their peers who do not aim for readiness (Symons et al., 2014). Indeed, having sexual competence (readiness, preparation) when having sex for the first time has been shown to be an important predictor of well-being later in life (Sprecher et al., 2019). However, a late sexual debut may contribute to worse emotional outcomes, e.g., through stigmatization, loneliness, shamefulness, or low self-esteem (Hansen & Laursen, 2024).

An earlier sexual debut is linked with numerous risk factors that are relevant for family formation and public health, e.g., having little knowledge about sexuality and contraception or engaging in risky sexual behavior such as less condom use at first sexual intercourse (Shu et al., 2016). Therefore, an earlier sexual debut is associated with a higher risk of receiving a sexually transmitted disease diagnosis (Kugler et al., 2017; Ma et al., 2009). For example, in the Nordic context, the probability of being diagnosed with gonorrhea and chlamydia is higher among individuals who had their sexual debut earlier rather than later in their life course (Faber et al.,

2011). Additionally, an early sexual debut is linked to a higher risk of unplanned pregnancy (Ma et al., 2009; Shu et al., 2016).

Many studies have examined various determinants of the timing of sexual debut (Lee et al., 2018), including personal (Allen & Walter, 2018; Longmore et al., 2004; Zimmer-Gembeck & Helfand, 2008), family (Boislard P. & Poulin, 2011; Gilliam et al., 2007; Sieving et al., 2000), and peer factors (Laflin et al., 2008; Sennott & Mollborn, 2011). Only a few studies have also looked at behavioral indicators, such as internalizing, externalizing, or prosocial behavior measured using the Strengths and Difficulties Questionnaire (SDQ) as determinants for sexual debut in adolescence. Previous research has reported mixed findings regarding internalizing behavior (Boislard et al., 2013; Gambadauro et al., 2018; McLeod & Knight, 2010), and has generally found positive associations between externalizing behavior and early sexual debut (Caminis et al., 2007; McLeod & Knight, 2010). To the best of our knowledge, the third component of the SDQ, prosocial behavior, has not previously been considered as a potential determinant of sexual debut, although measures of antisocial behavior have been linked with early sexual onset (Boislard P. & Poulin, 2011; Ramrakha et al., 2007).

The current study examined the association between childhood behaviors, measured at age 11, and age at sexual debut up to age 18 using data from the Danish National Birth Cohort (DNBC), one the largest birth cohorts with offspring in this age range.

Theoretical background

We base our study on the problem behavior theory (Jessor & Jessor, 1977), which has been a prominent theoretical foundation for studies on the association between behavioral factors and sexual behavior (Boislard et al., 2013; Schofield et al., 2008; Siebenbruner et al., 2007). Problem behavior relates to a set of behavioral facets (Albakova et al., 2020) that may include antisocial behavior or early sexual debut (Boislard P. & Poulin, 2011). Antisocial or problem behavior may mean different things at different stages of the life course: e.g., it may refer to

criminal behavior in adulthood and to delinquency in adolescents (Calkins & Keane, 2009). Behavioral problems in childhood have been linked to a higher risk of engaging in antisocial behavior in adolescence (Dishion & Patterson, 2015). Thus, having behavioral problems in childhood represents one important predictor – in addition to other risk factors such as social surroundings or family background – of having behavioral problems in adolescence, or even in adulthood, as behavioral problems may accumulate together with other problems over the life course (Calkins & Keane, 2009). These findings align with other empirical evidence suggesting that one type of problem behavior predicts another type of problem behavior (Jessor et al., 2003).

According to problem behavior theory, behavioral problems in childhood may be associated with more risky sexual behavior in adolescence, such as earlier sexual debut. Antisocial behavior in childhood may be associated with sexual behavior in adolescence, including having unprotected sex, a larger number of sex partners, or an early sexual debut. While antisocial behavior in childhood may be related to different forms of antisocial behavior in adulthood (e.g., lying, cheating), we avoid calling such behaviors “problematic” or “deviant” in the present study because we do not want to stigmatize individuals with higher or lower scores on behavioral scales. Instead, we use the terms “behavior” or “factor.”

Internalizing behaviors

Internalizing behaviors are related to the internal states of an individual, such as fearfulness or social withdrawal, which may result in depression and poor mental health (Hansen & Jordan, 2020). Girls are usually more prone to internalizing behavior than boys (Matos et al., 2017; Ormel et al., 2005).

Shyness and withdrawal from social interactions may lead to postponed sexual debut for various reasons, such as a lack of self-esteem or unhappiness with one’s body (Hansen & Laursen, 2024). Additionally, internalizing behaviors may prevent individuals from engaging in

sexual activity in adolescence, as being afraid of contracting sexually transmitted diseases or having an unwanted pregnancy, or feeling concerned about being ready for sex, may be important reasons to remain sexually abstinent (BlinnPike et al., 2004). Empirical evidence on this association is mixed, however. For instance, research on a representative longitudinal sample from the United States (U.S.) found that internalizing factors were associated with early sexual debut in adolescence (i.e., first sexual intercourse before age 15), although this correlation vanished once externalizing behavior was included in the analyses (McLeod & Knight, 2010).

Other studies reported a negative or no association between internalizing factors and age at sexual debut. For instance, internalizing factors were found to be negatively associated with sexual initiation for both genders in Europe (Gambadauro et al., 2018) and the U.S. (Caminis et al., 2007). Furthermore, a study from the Netherlands showed that internalizing factors were not linked with early sexual debut among either gender (Udell et al., 2010). These findings align with a study by Boislard and colleagues (2013) that is of particular interest for our analyses, as their work linked internalizing factors with early sexual debut (by age 15) among French-Canadian children who were observed from kindergarten up until age 15. The authors found that internalizing behavior was not associated with age at early sexual debut (Boislard et al., 2013). However, their small sample of 343 children came with relatively high statistical uncertainty.

Externalizing behaviors

Externalizing behavior describes a behavior that often violates social norms (Keil & Price, 2006), and that may involve things or other persons (Kauten & Barry, 2020). Examples of externalizing behavior are aggression, substance use, or risky sexual behavior (MemmottElison et al., 2020). On average, boys score higher on externalizing behavior than

girls (Keiley et al., 2000; Ormel et al., 2005). However, some evidence indicates that there are no gender differences in externalizing factors (Matos et al., 2017).

Previous studies have examined the association between externalizing factors and sexual behavior. For instance, research from the U.S. has found that externalizing factors are positively associated with risky sexual behavior (>5 sex partners by age 16, or inconsistent use of contraceptives in adolescence) (Siebenbruner et al., 2007), and with the probability of having first sexual intercourse before age 15 (McLeod & Knight, 2010). Furthermore, externalizing factors at age 16 have been linked with risky sexual behavior at age 27 (Lansford et al., 2014). These results are supported by research conducted in the European context, which showed that externalizing factors are positively linked with sexual initiation and risky sexual initiation (e.g., infrequent condom use) for both genders in early adolescence (around age 15) (Gambadauro et al., 2018).

Another study reported that having friends with externalizing factors in childhood (ages 11/12) is associated with risky sexual behavior at age 27 in the U.S., but only via own externalizing indicators at age 16 (Lansford et al., 2014). By contrast, research from the Netherlands found no association between externalizing factors and early sexual initiation, at least among girls (Udell et al., 2010). These results are in line with findings from a study for Canada showing no association between externalizing behavior and age at sexual debut (Boislard et al., 2013).

Prosocial behaviors

The “prosocial behavior” dimension of the SDQ refers to the child’s ability to socialize and behave in ways that benefit others (Silva et al., 2015). Previous research has focused on the associations between internalizing and externalizing factors and sexual behavior in adolescence (Boislard et al., 2013; Gambadauro et al., 2018), while neglecting the role of prosocial behavior. It is possible that prosocial behavior has been considered less relevant in this context, as it is related to social resources rather than to difficulties (Silva et al., 2015).

Some studies have examined the association between its opposite, antisocial behavior, and sexual behavior, finding higher probabilities of early sexual debut among individuals with higher antisocial behavior scores (Caminis et al., 2007; McLeod & Knight, 2010; Ramrakha et al., 2007). Other studies have found that prosocial activities such as school or church engagement were associated with lower probabilities of engaging in risky sexual behavior (Doljanac & Zimmerman, 1998; Ramirez-Valles et al., 1998). However, the association between prosocial behavior scores from the SDQ and sexual behavior in adolescence remains unexplored.

Despite the lack of empirical evidence, it may be assumed that prosocial behavior shapes sexual behavior in adolescence. Having good social skills can help adolescents generate social networks (Schmitt & Shackelford, 2008) and deepen their social relationships (Neyer & Asendorpf, 2001), which may in turn increase their chances of finding a (sex) partner. These findings are in line with previous research showing that social networks have a large impact on early sexual debut. For instance, having a social network that includes more members of the opposite sex has been associated with an earlier sexual debut (Billari & Mencarini, 2004). Additionally, having many friends from higher grades has been linked with an earlier sexual debut in adolescence (Cooksey et al., 2002). Therefore, children and adolescents may have more opportunities to engage in sexual intercourse by connecting with peers through their social capacities.

However, prosocial behavior may also delay sexual debut, as prosocial behavior is negatively associated with risky sexual behavior (Memmott-Elison et al., 2020). An early sexual debut may be considered a risky behavior because adolescents have less sexual knowledge and higher chances of having unprotected sex (Shu et al., 2016). Children or adolescents with higher levels of prosocial behavior may prefer to adhere to social norms, and thus to avoid having sex too early.

Gender differences

The relationship between internalizing and externalizing behaviors on the one hand, and the timing of sexual debut on the other, may differ between girls and boys. Such gender differences may emerge from differences in levels of pubertal and emotional maturity between boys and girls. For instance, girls start and end puberty earlier than boys, on average (Fechner, 2002; Kane & Ismail, 2017), which suggests that girls may feel ready for sex at an earlier point in their life course than boys. Additionally, boys and girls may differ in their internalizing and externalizing behaviors, and in how they are perceived among their peers. For instance, previous research has shown that boys who spend more time in the company of same-sex peers are the most skilled at managing their emotions (e.g., not crying, not looking unhappy) (Perry-Parrish & Zeman, 2011). Consequently, boys who show negative emotions are less likely to be evaluated as enjoyable companions in activities. This difference does not emerge among girls (Perry-Parrish & Zeman, 2011). Thus, girls who show emotions among peers may expect to experience fewer social consequences for engaging in internalizing behaviors, which may allow them to express a desire for social withdrawal or a fear of intimacy, potentially contributing to a delay in their sexual debut. Furthermore, social popularity and attractiveness may play a role, which may be larger for boys with externalizing rather than internalizing factors (Rodkin et al., 2000). These gender differences are supported by empirical evidence. A study on French children and juveniles, for instance, has shown that internalizing indicators are linked with later sexual debut among girls, whereas externalizing indicators are positively associated with early sexual debut among boys (Galéra et al., 2010). Research on French-Canadian children found gender differences in interaction effects between internalizing and externalizing behaviors for the age at sexual debut: while no interaction effects were observed for girls, boys with high externalizing but low internalizing factors were shown to be more likely to start having sex relatively early in the life course, i.e., before age 14 (Boislard et al., 2013).

Current study

Based on findings from previous research and the elaborations on gender differences, we formulate the following research hypotheses on internalizing and externalizing behavior:

1) Higher internalizing behavior scores are associated with later sexual debut and a lower probability of experiencing sexual debut early in the life course (before age 15) among both sexes.

2) Higher externalizing behavior scores are associated with earlier sex debut and a higher probability of experiencing sexual debut early in the life course (before age 15), particularly among boys.

It is more difficult to formulate a hypothesis regarding prosocial behavior given the lack of empirical evidence on the association between this SDQ dimension and sexual behavior in adolescence. However, we value the theoretical arguments presented above that indicate that adolescents with higher prosocial behavior scores (larger social networks, closer connections with older adolescents) are less likely to have an early sexual debut (due to a preference for sticking with social norms). Therefore, we hypothesize the following association:

3) Higher prosocial behavior scores are associated with later sexual debut and with a lower probability of experiencing sexual debut early in the life course (before age 15) among both genders.

Previous research has linked internalizing and externalizing behaviors to sexual behavior in adolescence (e.g., Boislard et al., 2013; Gambadauro et al., 2018; McLeod & Knight, 2010). We advance this work by studying prosocial behavior as well as internalizing and externalizing behavior in children followed from age 11 until age 18 in a large sample that gives us high statistical power and allows us to draw conclusions on subgroups. Our sample is larger than the samples in any of the previous studies, as we make use of the large and powerful data set from the Danish National Birth Cohort (DNBC), which enables us to draw more accurate and

statistically secure conclusions than was possible in studies with comparatively small sample sizes (Boislard et al., 2013; McLeod & Knight, 2010; Udell et al., 2010). We have, on average, observations up to age 18, which capture the entire time span in adolescence up until early adulthood, and thus allow us to examine sexual behavior over time. In addition, the DNBC is based on a population-based sample, and thus provides us with the opportunity to examine these research questions in a broad population. Moreover, since the adolescents in our sample have been followed from intrauterine life onward, we have an excellent opportunity to adjust for potential confounding factors in the analyses. Our study is also the first to examine this association in a Nordic country. We study Denmark as representative of the Nordic countries, where psychological and behavioral factors have become increasingly important for fertility outcomes, according to recent research (Skirbekk et al., 2025). As indicated in the introduction, the increasing proportions of girls having first sexual intercourse by ages 14-17 on the one hand, and the persistent median age at sexual debut across cohorts on the other, make Denmark an interesting case study for research on sexual behavior in adolescence.

Data and measures

Data

The present analyses are based on high-quality data from the DNBC. The DNBC contains information on around 100,000 pregnancies (Strandberg-Larsen et al., 2025). The pregnant women were invited to participate in the study between 1996-2002 at their first appointment with their general practitioner in early pregnancy (Olsen et al., 2001). Follow-up questionnaires were sent to the parent and the child when the child was 11 years old, and again when the child had reached age 18 (Strandberg-Larsen et al., 2025). A total of 47,710 parents provided information on their children during the 11-year follow-up, and 44,353 of these children responded to their 11-year follow-up questionnaire (Fig. 1). Of those, 27,456 children participated in the 18-year follow-up questionnaire. Information on internalizing and

externalizing factors in addition to information on prosocial behavior from the SDQ was obtained from the parental 11-year follow-up questionnaire. Family background information was taken from the children's 11-year follow-up, and information on age at first sexual intercourse is obtained from the 18-year questionnaire. We exclude all observations from the sample that reported in the 18-year follow-up that the child had sex before age 11 (n=20) because we use SDQ information from the 11-year follow-up, thereby avoiding reverse causality. Furthermore, we exclude all participants without full information on SDQ items and other covariates. This leaves 27,456 participants (15,793 girls; 11,663 boys) available for the current analyses.

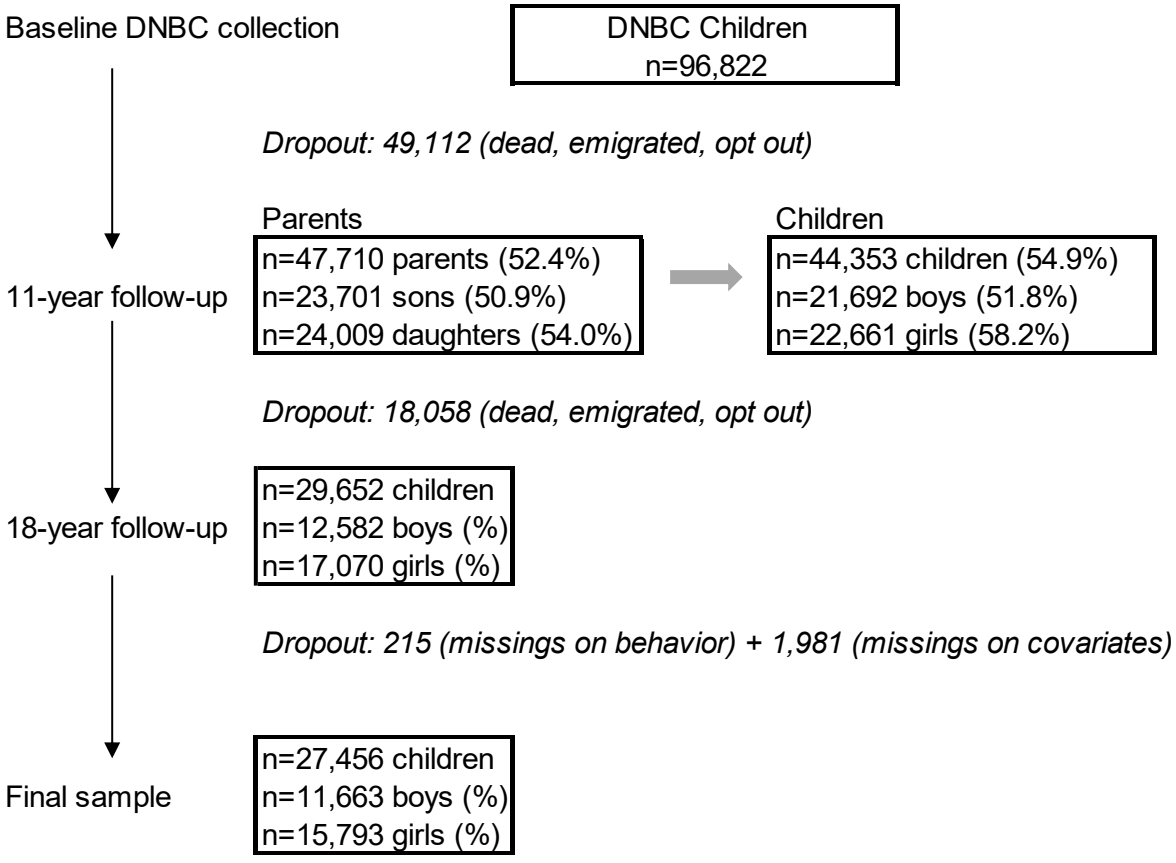

Figure 1: Flow chart showing the development of the analytical sample

Behavioral measures

Mothers evaluated the internalizing, externalizing, and prosocial behavior of their child via the SDQ in the 11-year follow-up. The SDQ is a widely used instrument for evaluating behaviors of children (Goodman, 1997), and previous research has documented its validity and reliability among Danish children (Niclasen et al., 2012). Mothers assessed their children's behavior by responding to 25 items with five subdimensions (answer categories: 0=not true, 1=somewhat true, 2=certainly true): 1) emotional factors (e.g., "Has many fears, is easily scared"), 2) peer behavior (e.g., "Is rather solitary, tends to play alone"), 3) behavioral factors (e.g., "Often has temper tantrums or a hot temper"), 4) hyperactivity behavior (e.g. "Is restless, overactive, cannot stay still for long"), and 5) prosocial behavior (e.g. "Is considerate of other people's feelings"). Emotional and peer factors represent internalizing behavior, and behavioral and hyperactivity factors form externalizing behavior. The full SDQ from the 11-year follow-up is shown in the appendix.

We used the three-factor approach, as it has been shown to have higher validity than the approach with the five subdimensions, particularly within samples with low risks of behavioral problems (Goodman et al., 2010), such as the DNBC (Overgaard et al., 2019). Therefore, we proceeded with the three broader dimensions: internalizing behavior, externalizing behavior, and prosocial behavior. Based on the number of items belonging to these dimensions, all information can be summarized to a score ranging from 0-20 (internalizing/externalizing behavior) or from 0-10 (prosocial behavior). We have calculated percentiles for the analyses with categories capturing the lowest 10%, the middle 80%, and the highest 10% of internalizing and externalizing behavior scores in the sample, separately for boys and girls. This approach allows us to compare two extreme percentiles to a large middle category. As a robustness check, we have conducted analyses that use an alternative approach (80^{th}-10^{th}-10^{th} percentile). Due to the skewed distribution on the scale of prosocial behavior, we have grouped the sample into thirds and have not applied any robustness check. All analyses have been run for boys and girls separately.

Family background as a confounder

The association between behavioral factors in childhood and sexual behavior in adolescence may be confounded by family background. For instance, it has been shown that parenting style and family structure may shape the child's behavior in childhood and adolescence (Carlson, 2012). Moreover, previous research has shown that family background influences sexual behavior (Miller & Olson, 1988; Santelli et al., 2000). For instance, family members are often important contacts to ask about sexual risks and protection types (Rosengard et al., 2012).

Therefore, we include family information as control variables in our models. Parental socioeconomic status was obtained from the first trimester of pregnancy, from the first baseline interview in the DNBC (0 "Highest socioeconomic status among parents," 1 "High grade professional," 2 "Low grade professional," 3 "Skilled worker," 4 "Unskilled worker," 5 "Student," 6 "Unemployed," 7 "Not classified"). Furthermore, we control for the number of biological siblings (0, 1, 2, 3 or more), and the information on whether both parents live in the same household (0 "No," 1 "Yes"). Information on family factors stem from the 11-year follow-up.

Methods

We have conducted parametric accelerated failure time (AFT) models with a generalized gamma distribution on the binary-coded outcome of having experienced sexual debut (0 – No; 1 – Yes) over time, separately for each gender since previous research has found differences between boys and girls in both SDQ behaviors and sexual behavior. Analyses with generalized gamma distribution outperform models based on other distributions using the Akaike information criterion (AIC) and the Bayesian information criterion (BIC) (see Table A1 in the appendix). Models with lognormal distributions are a similarly good fit, and these models are run as robustness checks. The AFT models of our analyses take the following form:

$$Y = \log(T) = \beta_0 + \beta_1 behav + \beta_2 parent_ses + \beta_3 nr_sib + \beta_4 par_in_hh + \sigma\epsilon \quad (1)$$

The outcome *Y* is the logarithm of the time to sexual debut (failure time) *T,* and all individuals who did not have their first sexual intercourse by the end of observation time were right-censored. The explanatory variable of main interest is "*behav*," which represents the category of internalizing, externalizing, or prosocial behavior. We run parallel models with one behavioral indicator only, i.e., behavioral measures are never included altogether in the same model. The covariates relate to parental SES during pregnancy ("*parent_ses*"), number of biological siblings ("*nr_sib*"), and whether both parents still live together in the same household when the child is 11 years old ("*par_in_hh"*), and they are multiplied with the corresponding coefficients *β* ($\beta_1 \ldots \beta_6$). The model intercept is represented by β_0, and *ε* is the error term with the additional scaling parameter *σ*.

Additionally, we examine the association between childhood behavior and early sexual debut, i.e., first sexual intercourse before age 15. For this purpose, we apply linear probability models (LPMs) on the probability of experiencing first sexual intercourse before age 15 for both girls and boys. LPMs allow us to compare coefficients across different models, which is a great advantage compared to logistic regression models (Mood, 2010). Additionally, as coefficients from LPMs and marginal effects from logistic regression models typically produce similar patterns, the LPM represents a reliable approach to examining binary-coded outcomes (Angrist & Pischke, 2009). The LPM for our study takes the following form:

$$Y = \beta_0 + \beta_1 behav + \beta_2 parent_ses + \beta_3 nr_sib + \beta_4 par_in_hh + \epsilon \quad (2)$$

The independent variables are the same as in equation (1) above but the outcome *Y* is an indicator for having had sex before age 15 (0 "No," 1 "Yes"), and the error term *ε* is not penalized with any parameter.

Results

Descriptive statistics

Table 1 below shows univariate statistics of all used variables at baseline (age 11), unless otherwise stated. The analytical sample consists of 15,793 girls and 11,663 boys who were observed during maternal pregnancy (information on parental socioeconomic status) as well as at age 11 (information on SDQ and other covariates) and age 18 (information on sexual debut). On the summarized scale of 0-20, the mean scores of both girls and boys on internalizing (2.6 for both females and males) and externalizing behavior (2.5 for girls and 3.2 for boys) are relatively low. The scale for prosocial behavior (0-10) is reversed, and thus the mean scores for prosocial behavior are relatively high: 8.8 for girls and 8.3 for boys. Small shares of girls (8%) and boys (7%) had their sexual debut before age 15, whereas 62% of girls and 54% of boys had their sexual debut before age 19. This indicates that the age at sexual debut in this analytical sample is slightly higher than the median age at first sexual intercourse for the entire Danish population, which is around 16 years (Hansen et al., 2019).

Variable		Females (%)		Males (%)	
Sex before age 15 (yes)		*8.4*		6.6	
Sex before age 19 (yes)		*62.0*		53.9	
Parental SES	High grade professional	*26.6*		28.4	
(in first pregnancy trimester)	Low grade professional	*35.0*		35.2	
	Skilled worker	*24.7*		23.9	
	Unskilled worker	*11.0*		9.7	
	Student	*2.3*		2.5	
	Unemployed	*0.5*		0.4	
	Non-classified				
Biological siblings	0	*11.2*		11.2	
	1	*53.5*		50.9	
	2	*29.5*		31.7	
	3+	*5.9*		6.2	
Both parents in household (yes)		*78.8*		81.4	
		Mean	*Std. dev.*	*Mean*	*Std. dev.*
Int. Behavior		2.6	2.7	2.6	2.8
Ext. Behavior		2.5	2.5	3.2	2.9
Prosocial behavior		8.8	1.3	8.3	1.6
		15,793		**11,663**	

Table 1: Univariate statistics of all used variables, separated by gender

Figure 2 below shows the mean age at sexual debut among those who reported having engaged in sex in the 18-year questionnaire, separately by behavioral groups and sex. The average age at sexual debut does not vary much across internalizing behavior groups, ranging from around 15.8 (highest 10% of scores among boys) to 15.9 (middle 80% of scores among boys), with standard deviations from 1.1-1.3 years. Larger differences are observed among externalizing behavior groups. Both girls and boys with higher externalizing behavior scores reported having an earlier sexual debut than their peers with lower scores. For instance, on average, the 10% of boys with the lowest scores on this factor reported having their sexual debut at approximately age 16 on average, whereas the 10% of boys with the highest scores reported having their first sexual intercourse around four months earlier. Prosocial behavior scores are not shown to be strongly associated with the age at sexual debut based on Figure 2. If a pattern is found, it rather suggests a later sexual debut among adolescents with higher scores on this factor, in particular among girls.

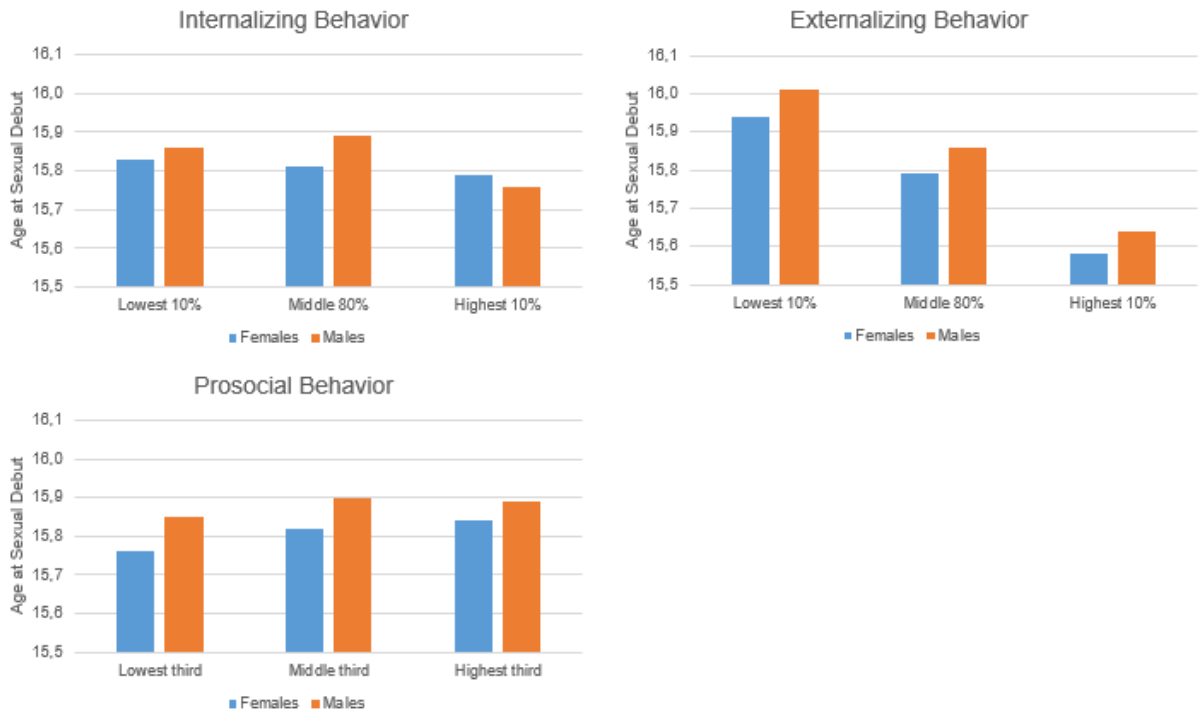

Figure 2: Average age at sexual debut across behavioral measures, separated by sex

Table 2 below includes information on mean scores for behavioral factors according to whether individuals had sexual intercourse before age 19. On average, girls and boys without sexual experience before age 19 scored higher on internalizing factors at age 11 than their same-sex peers with sexual experience. For instance, boys who did not have sex before age 19 had an internalizing score of 2.9, whereas boys who had sexual intercourse before age 19 had a score of 2.3. Girls and boys who had sex before age 19 did not differ much in terms of their externalizing scores in the 11-year follow-up from girls (2.5 vs. 2.4) and boys (3.1 vs. 3.2) who did not. Moreover, having sexual experience before age 19 was linked with slightly higher prosocial behavior scores among both genders (e.g., 8.5 vs. 8.2 for boys).

Internalizing behavior scores did not vary much between girls who did and did not have sex for the first time before age 15 (2.7 and 2.6). By contrast, boys who did not have sex before age 15 had slightly higher internalizing behavior scores (2.6) than boys who did (2.4). In terms of externalizing behavior, both girls and boys who had their first sexual experience before age 15

had higher scores (3.2 for girls; 3.8 for boys) on average than their peers who did not (2.4 for girls; 3.1 for boys). Again, prosocial behavior was not linked to early sexual debut. Girls who did not have sexual intercourse before age 15 had mean scores (8.8) on this scale that were similar to those of girls who did (8.7). An equivalent pattern was observed for boys who did (8.4) and did not have their sexual debut before age 15 (8.3).

		Females			Males		
Mean score of behavioral symptoms by sexual experience before age 19							
	Sex before age 19	*N*	*Mean score*	*Std. dev.*	*N*	*Mean score*	*Std. dev.*
Int. symptoms	No	5.997	2,84	2,80	5.377	2,94	2,94
	Yes	9.796	2,53	2,59	6.286	2,32	2,58
Ext. symptoms	No	5.997	2,41	2,52	5.377	3,24	2,95
	Yes	9.796	2,52	2,51	6.286	3,14	2,87
Prosocial behavior	No	5.997	8,80	1,38	5.377	8,22	1,65
	Yes	9.796	8,85	1,32	6.286	8,45	1,51
Mean score of behavioral symptoms by sexual experience before age 15							
	Sex before age 15	*N*	*Mean score*	*Std. dev.*	*N*	*Mean score*	*Std. dev.*
Int. symptoms	No	14.474	2,64	2,67	10.895	2,62	2,78
	Yes	1.319	2,68	2,74	768	2,36	2,67
Ext. symptoms	No	14.474	2,42	2,48	10.895	3,14	2,88
	Yes	1.319	3,16	2,77	768	3,78	3,14
Prosocial behavior	No	14.474	8,84	1,34	10.895	8,34	1,58
	Yes	1.319	8,72	1,37	768	8,38	1,57

Table 2: Bivariate statistics including age at fist sexual experience and behavioral factors, stratified by sex

Main findings

Figure 3 shows time ratios and corresponding confidence intervals from accelerated failure time models on the association between childhood behavioral scores and sexual debut from age 14 to age 18. The reference groups (middle 80% of internalizing and externalizing behavior scores, middle tertile of prosocial behavior scores) are represented by the vertical dashed lines when the time ratio is 1.

We found that lower internalizing behavior scores were associated with lower time ratios, and higher scores were linked with higher time ratios for having sex for the first time for both sexes. For instance, boys with relatively high scores on internalizing factors had a sexual debut that was 13% later (95% confidence interval: 1.08; 1.17) compared to the reference category

(middle 80% of scores). Externalizing behavior was not strongly associated with sexual debut among Danish adolescents. While girls with the lowest 10% of externalizing behavior scores had 5% higher time ratios (i.e., a sexual debut that was 5% later, 95% confidence interval: 1.03; 1.06) than the reference group, no association emerged among boys. Moreover, prosocial behavior was not associated with the probability of initiating sexual activity over time among girls, but low scores on prosocial behavior delayed the entry into sexual behavior by around 4% among boys (95% confidence interval: 1.02; 1.07). More detailed information on estimates for time ratios and confidence intervals for behavior measures and covariates are shown in Tables A2 (girls) and A3 (boys).

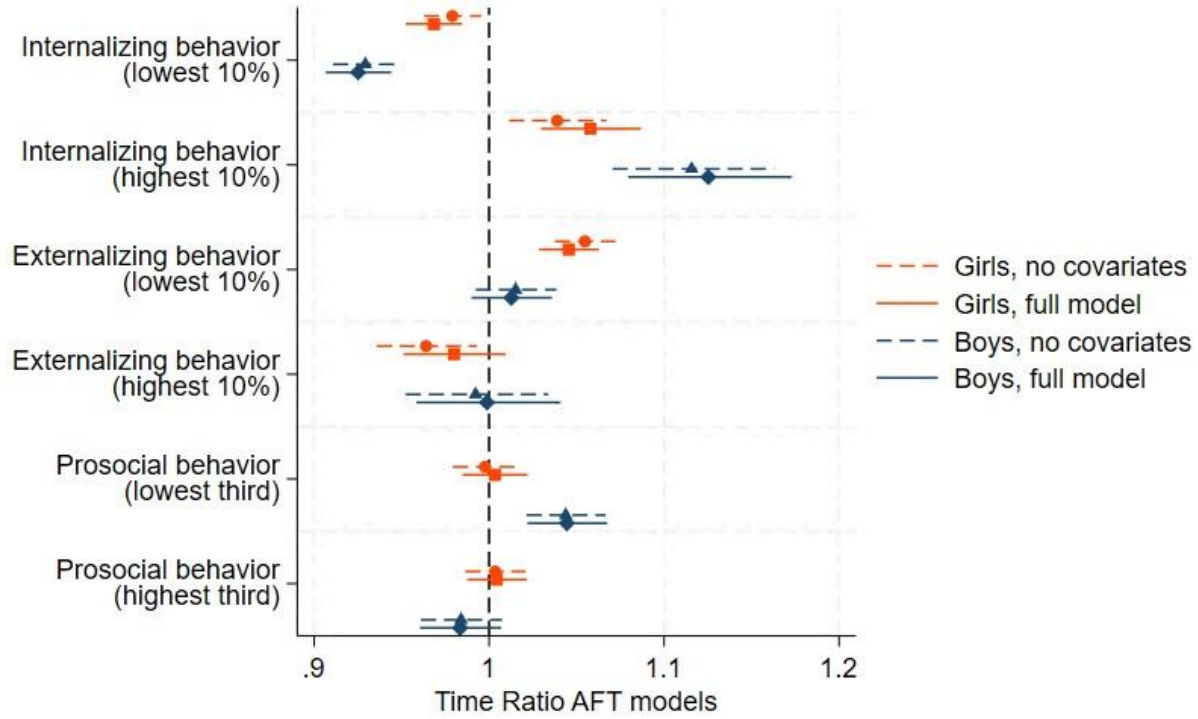

Figure 3: Time ratios from accelerated failure time models on first sexual experience over time, separated by sex (10%-80%-10% approach).
Note: Models without covariates include the single behavioral measure only. Full models additionally control for parental SES status at birth, number of biological siblings, and whether both parents live in the household. A time ratio greater than 1 means deceleration, i.e., the time to event is longer, while a value below 1 indicates a shorter process time (acceleration). Orange lines reflect estimates for girls, while blue lines reflect findings from the models for boys.

Furthermore, we conducted analyses on the probability of having an early sexual debut, defined as having sex for the first time between ages (including) 11 and 14. Coefficients from linear probability models and corresponding confidence intervals are shown in Figure 4 and Tables A4+A5. Internalizing behavior was not associated with the probability of having sex before age 15, apart from a slightly higher probability among boys with low scores on this behavior (compared to the middle 80% of the distribution). Stronger associations with externalizing behavior were found. Both girls and boys were 2-3 percentage points less likely to have had their first sexual experience before age 15 if they scored low on externalizing factors, while higher externalizing behavior scores were associated with a 2-4 percentage point higher probability of having had sex by this age for both sexes. In terms of prosocial behavior, girls with the lowest scores on prosocial behavior were slightly more likely to have had their first sexual experience by age 15 (1 percentage point) than girls with higher scores, whereas no correlations could be detected among boys.

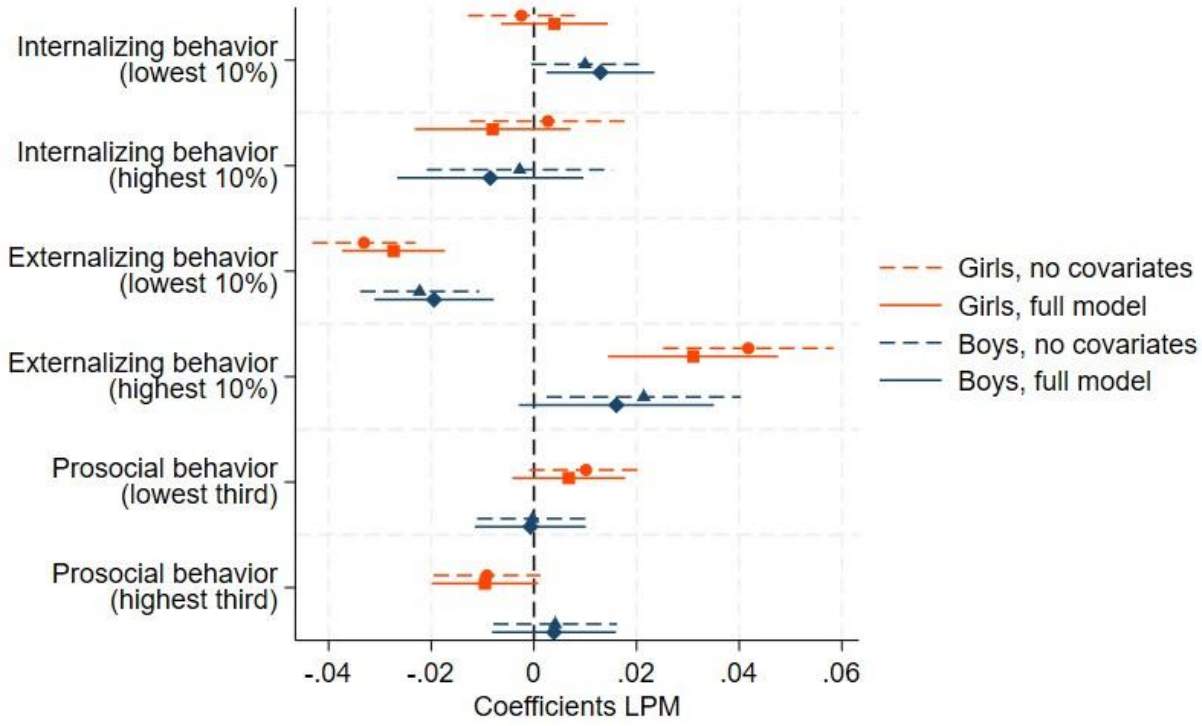

Figure 4: Coefficients from linear probability models on having first sexual experience below age 15, separated by sex (10%-80%-10% approach).
Models without covariates include the single behavioral measure only. Full models additionally control for parental SES status at birth, number of biological siblings, and whether both parents live in the household.

Robustness checks

We conducted several analyses as robustness checks for our study. First, we applied the commonly used approach to categorize childhood behavior (internalizing/externalizing) into 80^{th}-10^{th}-10^{th} percentiles (Fig. A1). Findings related to internalizing factors aligned with the patterns from Figure 2 above, i.e., high scores on this factor were linked to a later sexual debut among both girls and boys. Moreover, patterns for externalizing measures from Figure 2 were strengthened by using the 80^{th}-$10^{th}10^{th}$ percentiles approach in Figure A1. The highest scores were not associated with the transition to first sexual intercourse among boys, but they were associated with an earlier sexual debut among girls. Similarly, analyses on the probability of having ever had sex before age 15 using the 80^{th}-10^{th}-10^{th} percentiles approach produced patterns similar to those shown in Figure 3. While high scores on internalizing behavior were not (strongly) associated with the probability of having sex for the first time before age 15 for either sex, high scores on externalizing measures were linked to a higher probability of having sexual intercourse before age 15, particularly among girls (Fig. A2).

Additionally, we applied models with standardized (mean=0, standard deviation=1) rather than categorized behavioral measures (Fig. A3). This approach allowed us to compare effects across measures and to deal with the skewness in the data, as many individuals scored low on internalizing and externalizing behavior and high on prosocial behavior. Once more, our findings from the analyses above were supported, i.e., higher scores on internalizing measures were associated with later sexual debut among both girls and boys. Furthermore, higher scores on externalizing behavior were linked with earlier sexual debut among girls, but not among boys, in line with the patterns shown in Figure 3 above. Additionally, a higher score on prosocial behavior was not associated with the start of sexual activity among girls or with earlier sexual debut among boys. The patterns regarding the probability of having sex before age 15 based on standardized behavioral measures (Fig. A4) generally aligned with the findings shown in Figure 4 above.

Furthermore, we ran accelerated failure time models with lognormal distribution instead of analyses with generalized gamma distributions (Fig. A5-A7), as the AIC/BIC suggested that both distributions fit the data similarly well and better than other distributions (Table A1). The estimates were very similar to those that emerged from models with generalized gamma distribution. Additionally, we ran logistic regression models on the probability of having sexual intercourse before age 15 (Fig. A8-A10), which found patterns similar to those in the linear probability models. Linear probability and logistic regression models were also applied to the probability of having sex before age 19 (Fig. A11-A16), which generally resulted in conclusions similar to those for the accelerated failure time models. For instance, these models showed that girls and boys with lower internalizing scores started having sex earlier than the reference group (middle 80% of the distribution) (Fig. 3), and were more likely to have their sexual debut before age 19 (Fig. A11+A14).

Moreover, we ran models with the children's own reports on their strengths and difficulties instead of the mothers' ratings (Fig. A17+A18). The analyses revealed differences depending on who evaluated the child's behavior – the mother or the child. Contrary to the findings from the mothers' assessments, the models with the children's measures suggested that internalizing behavior was not associated with sexual debut among girls. The boys with the highest scores on internalizing factors tended to postpone having sex for the first time, which supported findings from the mothers' evaluations. However, externalizing factors played a larger role in the timing of sexual debut among girls based on the children's reports than on the mothers' assessments. In particular, girls with higher externalizing scores had their sexual debut earlier than girls in the middle category, and these results were more distinct than the findings based on maternal reports. With regard to the probability of having sex for the first time before age 15 based on the children's reports (Fig. A18), patterns emerged that were similar to those in shown in Figure 4.

These patterns were further supported by analyses using the more detailed five-factor approach (emotional, peer, conduct, hyperactivity, and prosocial factors). In line with patterns

regarding internalizing behavior, its subdimensions of emotional and peer factors were linked with the timing of sexual debut (higher scores were associated with sexual debut postponement). Correlations between these subdimensions and the probability of having an early sexual debut were weak, however. Similarly, patterns regarding the subdimensions of externalizing behavior (conduct and hyperactivity factors) matched the overall behavior, i.e., no strong associations with the timing of sexual debut across adolescence were observed, but positive correlations with the probability of having an early sexual debut emerged. Corresponding patterns are shown in Figure A19 and Figure A20.

Discussion

The current study has examined the association between behaviors in childhood and the timing of sexual debut among Danish adolescents. Our study has shown that internalizing, externalizing, and prosocial behaviors were associated with age at sexual debut in different ways. Our first hypothesis stated that internalizing behavior is associated with delayed sexual debut and with a lower probability of having sex for the first time before age 15 among both males and females. Our findings support the first part of the hypothesis (timing), but do not support the second part of it (probability of having an early sexual debut). This may suggest that behavioral factors do not play a large role in the probability of having an early sexual debut, but may shape sexual behavior across the entire time span of adolescence.

Our second hypothesis refers to externalizing behaviors and assumes that higher scores on this factor are related to earlier sexual debut and a higher probability of having sex for the first time before age 15, particularly among boys. However, we did not detect associations between externalizing behavior and the timing of sexual debut in adolescence. Only girls with lower scores on this behavior reported having a later sexual debut than other same-sex peers. In line with the second part of hypothesis 2, we have found that higher scores on externalizing

behavior are linked with a higher probability of having sex for the first time before age 15 for both boys and girls.

However, the effect sizes were larger among girls, which is not reflected in hypothesis 2. It is possible that stronger externalizing behavior among girls attracts boys to a larger extent than vice versa in early adolescence. However, the exact mechanisms behind these associations remain unclear, and may be investigated in future research.

The third hypothesis on prosocial behavior and sex debut has, to the best of our knowledge, not been studied in previous research. Therefore, there is no strong theoretical support for our hypothesis on the potential association of the postponement of sexual debut and a lower probability of having sex for the first time before age 15 with higher scores on prosocial behavior among both sexes. We found no association between prosocial behavior and sexual debut in adolescence. If there is a correlation between these two factors, its direction may even be the opposite of the hypothesized direction among boys. Lower scores on prosocial behavior were linked with later sexual debut among boys. In general, the findings from our study suggest that prosocial behavior does not shape sexual behavior in adolescence to a large extent.

Our study further found that it is not only the highest percentiles of childhood behavior distributions that are linked with the timing of sexual debut, but also the lowest percentiles. This observation distinguishes our study from others that emphasize the effects of behavioral factors on sexual behavior (e.g., Gambadauro et al., 2018). Previous research has focused on “negative” behavior by categorizing adolescents based on their internalizing and externalizing scores into a group representing the large majority (80%), a smaller group who are at risk (10%), and the most extreme group (10%). However, the extreme categories at the other end of the scale have been neglected. Therefore, we compared the middle 80% of the study sample to both extreme groups (10% with lower scores and 10% with higher scores). Using this approach, we could show that “positive” behavior (e.g., not being aggressive or unfriendly) also influences the age at sexual debut. This approach aligns with previous research calling for a

greater focus on positive deviance, rather than a sole focus on negative behaviors (Herington & Van De Fliert, 2018).

Our study has further shown that associations may differ depending on who is evaluating childhood behavioral factors. Analyses based on mothers' assessments of the strengths and difficulties of their children show that internalizing behavior is an important predictor for age at sexual debut among both sexes. However, analyses based on children's reports indicate that the effects of higher externalizing behavior scores among girls are larger than those found in analyses based on maternal reports. These differences may emerge from differences in the underlying distributions of the measures. Descriptive statistics reveal that children tend to rate themselves higher on internalizing behavior, and in particular on externalizing behavior, than mothers do (Table A6). Since the mean values of mothers' reports are relatively low (2.5 for girls and 3.2 for boys on externalizing behavior on a scale from 0-20) compared with the children's own reports (5.4 for girls and 5.7 for boys on externalizing behavior on a scale from 0-20), the distribution is skewed toward the lower end of the scale, which impacts the thresholds for the 10^{th} and 90^{th} percentiles. For instance, boys with a score of 1 on the externalizing scale belong to the lowest 10% of the sample when the children's reports are considered, but to the middle 80% of the sample when the maternal reports are used. Therefore, children's strengths and difficulties may be ranked differently in the distribution, with maternal reports potentially underestimating the association between behavioral measures and the probability of experiencing sexual debut.

We may risk some selection bias in the current study due to the use of survey data. Although the DNBC approaches all parents and children who were observed in the first wave (Strandberg-Larsen et al., 2025), there may still be a selection effect in terms of who actually participated in all of the waves relevant for our analyses (pregnancy interview, 11-year follow-up, and 18-year follow-up). Non-observed individuals may belong to very specific population groups, e.g., disadvantaged people who do not participate in surveys but also exhibit different sexual behavior than the survey participants.

However, our study also has some strengths. First, we considered both ends of the SDQ dimension distributions, which has been neglected in previous studies (e.g., Niclasen et al., 2012). Second, we included prosocial behavior in our analyses, which is a dimension of SDQ that has been ignored as a potential predictor of sexual behavior in adolescence in previous analyses. Third, we captured the entire period of adolescence, investigating behavioral factors from late childhood until age 18 using powerful and high-quality longitudinal data from Denmark. Fourth, we examined both the timing of sexual debut in adolescence and the probability of having an early sexual debut (before age 15) in order to provide a clearer picture of the association between childhood behavior and the probability of having sex for the first time later in the life course.

Implications and outlook

Our findings help us better understand the link between behaviors in childhood and sexual behavior in adolescence. We have identified adolescents at higher risk of having an early sexual debut, which could have an impact on the number of cases of sexually transmitted disease and unplanned pregnancy in adolescence and young adulthood. In particular, we found that adolescents with low internalizing and high externalizing scores are more likely to experience an early sexual debut. Offering these adolescents guidance and education may help to reduce the risk of negative consequences, such as negative emotions or unwanted health or fertility consequences. Thus, our findings may be useful for clinical psychologists or high school nurses who work with adolescents directly and consider their mental health, sexual behavior, and later life outcomes.

Further research may examine whether there are reversal points in the association between childhood behavior and sexual behavior in adolescence. Different ages at sexual debut may be considered as “too early,” “expected,” or “too late,” and (the effects of) behavioral factors may change with age. Additionally, potential mechanisms and causal effects for the association

between behavior and age at sexual debut might be explored, including attitudes, other behaviors, or perceptions by the social network.

Furthermore, we have focused on the Danish context, even though the risk of experiencing mental health problems in adolescence and young adulthood is lower in Denmark than it is in many other countries (Niclasen et al., 2013; Overgaard et al., 2019). Patterns may be different in other cultural settings where scores on the SDQ subdimensions are higher. For instance, higher average scores and larger variation may result in larger effects, which implies that some of our null findings may turn into statistically significant associations in other cultural contexts.

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Appendix

Items from the Strengths and Difficulties Questionnaire (DNBC, 11-year follow-up survey)

Externalizing behavior

Conduct problems

Often has temper tantrums or a hot temper

Generally obedient, usually does what adults request (rev.)

Often fights with other children or bullies them

Often lies or cheats

Steals from home, day care center, school, or elsewhere

Hyperactivity

Is restless, overactive, cannot stay still for long

Is constantly fidgeting or squirming

Is easily distracted, concentration wanders

Thinks things out before acting (rev.)

Sees tasks through to the end, good attention span (rev.)

Internalizing behavior

Emotional problems

Often complains of headaches, stomachaches, or sickness

Has many worries, often seems worried

Is often unhappy, downhearted, or tearful

Is nervous or clingy in new situations, easily loses confidence

Has many fears, is easily scared

Peer problems

Is rather solitary, tends to play alone

Has at least one good friend (rev.)

Is generally liked by other children (rev.)

Is picked on or bullied by other children

Gets on better with adults than with other children

Prosocial behavior

Is considerate of other people's feelings

Shares readily with other children (treats, toys, pencils, etc.)

Is helpful if someone is hurt, upset, or feeling ill

Is kind to younger children

Often volunteers to help others (parents, teachers, other children)

Tables

AIC/BIC

Model	AIC	BIC
Generalized gamma	27711.01	27946.38
Lognormal	27754.40	27981.37
Loglogistic	28059.27	28286.24
Weibull	28614.42	28841.39
Exponential	37347.43	37565.99

Table A1: Akaike information criterion (AIC) and Bayesian information criterion (BIC) values for evaluation of model fit across models with different distributions

Variable	Int. M1	Int. M2	Ext. M1	Ext. M2	Pro. M1	Pro. M2
Int. symptoms						
Lowest 10%	0,98 *(0.96; 1.00)*	0,97 *(0.95; 0.98)*				
Middle 80%	1 (ref.)	1 (ref.)				
Highest 10%	1,04 *(1.01; 1.07)*	1,06 *(1.03; 1.09)*				
Ext. symptoms						
Lowest 10%			1,05 *(1.04; 1.07)*	1,05 *(1.03; 1.06)*		
Middle 80%			1 (ref.)	1 (ref.)		
Highest 10%			0,96 *(0.94; 0.99)*	0,98 *(0.95; 1.01)*		
Prosocial behavior						
Lowest Tertile					1,00 *(0.98; 1.02)*	1,00 *(0.98; 1.02)*
Middle Tertile					1 (ref.)	1 (ref.)
Highest Tertile					1,00 *(0.99; 1.02)*	1,00 *(0.99; 1.02)*
Parental SES						
1		1,04 *(1.02; 1.06)*		1,03 *(1.01; 1.05)*		1,03 *(1.01; 1.05)*
2		1,04 *(1.02; 1.06)*		1,03 *(1.01; 1.05)*		1,04 *(1.02; 1.06)*
3		1 (ref.)		1 (ref.)		1 (ref.)
4		0,98 *(0.95; 1.00)*		0,98 *(0.95; 1.01)*		0,98 *(0.95; 1.00)*
5		0,99 *(0.94; 1.04)*		0,98 *(0.94; 1.03)*		0,98 *(0.94; 1.03)*
6		0,99 *(0.88; 1.11)*		0,99 *(0.88; 1.11)*		0,99 *(0.88; 1.11)*
7						
Number biological siblings						
0		1 (ref.)		1 (ref.)		1 (ref.)
1		1,04 *(1.01; 1.07)*		1,04 *(1.01; 1.06)*		1,04 *(1.01; 1.06)*
2		1,07 *(1.04; 1.10)*		1,06 *(1.03; 1.09)*		1,06 *(1.03; 1.09)*
3		1,10 *(1.06; 1.14)*		1,09 *(1.05; 1.13)*		1,09 *(1.05; 1.14)*
Both parents in household						
No		0,90 *(0.89; 0.92)*		0,91 *(0.89; 0.93)*		0,91 *(0.89; 0.92)*
Yes		1 (ref.)		1 (ref.)		1 (ref.)
Model intercept	6,20 *(6.10; 6.29)*	5,89 *(5.71; 6.08)*	6,09 *(6.00; 6.18)*	5,83 *(5.65; 6.02)*	6,17 *(6.06; 6.28)*	5,87 *(5.68; 6.01)*

A2: Time ratios from accelerated failure time models on first sexual experience over time between ages 14 and 18, girls (10%-80%-10% approach)

Variable	Int. M1	Int. M2	Ext. M1	Ext. M2	Pro. M1	Pro. M2
Int. symptoms						
Lowest 10%	0,93 *(0.91; 0.95)*	0,93 *(0.91; 0.94)*				
Middle 80%	1 (ref.)	1 (ref.)				
Highest 10%	1,12 *(1.07; 1.16)*	1,13 *(1.08; 1.17)*				
Ext. symptoms						
Lowest 10%			1,02 *(0.99; 1.04)*	1,01 *(0.99; 1.04)*		
Middle 80%			1 (ref.)	1 (ref.)		
Highest 10%			0,99 *(0.95; 1.03)*	1,00 *(0.96; 1.04)*		
Prosocial behavior						
Lowest Tertile					1,04 *(1.02; 1.07)*	1,04 *(1.02; 1.07)*
Middle Tertile					1 (ref.)	1 (ref.)
Highest Tertile					0,98 *(0.96; 1.01)*	0,98 *(0.96; 1.01)*
Parental SES						
1		1,01 *(0.98; 1.03)*		1,00 *(0.98; 1.03)*		1,00 *(0.98; 1.03)*
2		1,00 *(0.97; 1.02)*		0,99 *(0.97; 1.02)*		0,99 *(0.97; 1.02)*
3		1 (ref.)		1 (ref.)		1 (ref.)
4		1,00 *(0.96; 1.03)*		1,00 *(0.96; 1.04)*		1,00 *(0.97; 1.04)*
5		0,97 *(0.92; 1.03)*		0,97 *(0.91; 1.03)*		0,97 *(0.91; 1.03)*
6		0,97 *(0.83; 1.13)*		0,97 *(0.83; 1.13)*		0,97 *(0.83; 1.14)*
7						
Number biological siblings						
0		1 (ref.)		1 (ref.)		1 (ref.)
1		0,99 *(0.96; 1.02)*		0,99 *(0.96; 1.02)*		0,99 *(0.96; 1.02)*
2		0,98 *(0.95; 1.01)*		0,98 *(0.94; 1.01)*		0,97 *(0.94; 1.01)*
3		1,01 *(0.96; 1.06)*		1,00 *(0.96; 1.05)*		1,00 *(0.96; 1.05)*
Both parents in household						
No		0,92 *(0.90; 0.94)*		0,93 *(0.90; 0.95)*		0,93 *(0.90; 0.95)*
Yes		1 (ref.)		1 (ref.)		1 (ref.)
Model intercept	7,03 *(6.91; 7.15)*	7,19 *(6.92; 7.46)*	6,89 *(6.78; 7.01)*	7,09 *'6.83; 737.84)*	6,83 *(6.69; 6.97)*	7,03 *(6.75; 7.31)*

A3: Time ratios from accelerated failure time models on first sexual experience over time between ages 14 and 18, boys (10%-80%-10% approach)

Variable	Int. M1	Int. M2	Ext. M1	Ext. M2	Pro. M1	Pro. M2
Int. symptoms						
Lowest 10%	0,00 *(-0.01; 0.01)*	0,00 *(-0.01; 0.01)*				
Middle 80%	1 (ref.)	1 (ref.)				
Highest 10%	0,00 *(-0.01; 0.02)*	-0,01 *(-0.02; 0.01)*				
Ext. symptoms						
Lowest 10%			-0,03 *(-0.04; -0.02)*	-0,03 *(-0.04; -0.02)*		
Middle 80%			1 (ref.)	1 (ref.)		
Highest 10%			0,04 *(0.03; 0.06)*	0,03 *(0.01; 0.05)*		
Prosocial behavior						
Lowest Tertile					0,01 *(0.00; 0.02)*	0,01 *(-0.00; 0.02)*
Middle Tertile					1 (ref.)	1 (ref.)
Highest Tertile					-0,01 *(-0.02; 0.00)*	-0,01 *(-0.02; 0.00)*
Parental SES						
1		-0,03 *(-0.04; -0.01)*		-0,02 *(-0.03; -0.01)*		-0,03 *(-0.04; -0.01)*
2		-0,02 *(-0.03; -0.01)*		-0,02 *(-0.03; -0.01)*		-0,02 *(-0.03; -0.01)*
3		1 (ref.)		1 (ref.)		1 (ref.)
4		0,02 *(0.01; 0.04)*		0,02 *(0.01; 0.04)*		0,02 *(0.01; 0.04)*
5		-0,01 *(-0.04; 0.02)*		-0,01 *(-0.04; 0.02)*		-0,01 *(-0.04; 0.02)*
6		0,01 *(-0.05; 0.07)*		0,01 *(-0.05; 0.07)*		0,01 *(-0.05; 0.07)*
7						
Number biological siblings						
0		1 (ref.)		1 (ref.)		1 (ref.)
1		-0,03 *(-0.04; -0.01)*		-0,03 *(-0.04; -0.01)*		-0,03 *(-0.04; -0.01)*
2		-0,04 *(-0.06; -0.02)*		-0,04 *(-0.05; -0.02)*		-0,04 *(-0.05; -0.02)*
3		-0,04 *(-0.06; -0.02)*		-0,04 *(-0.06; -0.01)*		-0,04 *(-0.06; -0.02)*
Both parents in household						
No		0,05 *(0.04; 0.06)*		0,05 *(0.04; 0.06)*		0,05 *(0.04; 0.06)*
Yes		1 (ref.)		1 (ref.)		1 (ref.)
Model intercept	0,08 *(0.08; 0.09)*	0,11 *(0.10; 0.13)*	0,09 *(0.08; 0.09)*	0,12 *(0.10; 0.13)*	0,08 *(0.08; 0.09)*	0,12 *(0.10; 0.13)*

A4: Coefficients from linear probability models on having first sexual experience below age 15, girls (10%-80%-10% approach)

Variable	Int. M1	Int. M2	Ext. M1	Ext. M2	Pro. M1	Pro. M2
Int. symptoms						
Lowest 10%	0,01	0,01				
	(-0.00; 0.02)	*(0.00; 0.02)*				
Middle 80%	1 (ref.)	1 (ref.)				
Highest 10%	0,00	-0,01				
	(-0.02; 0.02)	*(-0.03; 0.01)*				
Ext. symptoms						
Lowest 10%			-0,02	-0,02		
			(-0.03; -0.01)	*(-0.03; -0.02)*		
Middle 80%			1 (ref.)	1 (ref.)		
Highest 10%			0,02	0,02		
			(0.00; 0.04)	*(-0.00; 0.04)*		
Prosocial behavior						
Lowest Tertile					0,00	0,00
					(-0.01; 0.01)	*(-0.01; 0.01)*
Middle Tertile					1 (ref.)	1 (ref.)
Highest Tertile					0,00	0,00
					(-0.01; 0.02)	*(-0.01; 0.02)*
Parental SES						
1		-0,01		-0,01		-0,01
		(-0.02; 0.00)		*(-0.02; 0.00)*		*(-0.02; 0.00)*
2		-0,01		-0,01		-0,01
		(-0.02; 0.00)		*(-0.02; 0.01)*		*(-0.02; 0.01)*
3		1 (ref.)		1 (ref.)		1 (ref.)
4		0,01		0,01		0,01
		(-0.00; 0.03)		*(-0.00; 0.03)*		*(-0.00; 0.03)*
5		0,02		0,02		0,02
		(-0.01; 0.05)		*(-0.01; 0.05)*		*(-0.01; 0.05)*
6		0,04		0,04		0,04
		(-0.04; 0.11)		*(-0.04; 0.11)*		*(-0.04; 0.11)*
7						
Number biological siblings						
0		1 (ref.)		1 (ref.)		1 (ref.)
1		-0,01		-0,01		-0,01
		(-0.03; 0.00)		*(-0.03; 0.01)*		*(-0.03; 0.01)*
2		-0,01		-0,01		-0,01
		(-0.02; 0.01)		*(-0.02; 0.01)*		*(-0.02; 0.01)*
3		-0,01		-0,01		-0,01
		(-0.04; 0.01)		*(-0.03; 0.01)*		*(-0.03; 0.01)*
Both parents in household						
No		0,03		0,03		0,03
		(0.02; 0.05)		*(0.02; 0.04)*		*(0.02; 0.05)*
Yes		1 (ref.)		1 (ref.)		1 (ref.)
Model intercept	0,06	0,07	0,07	0,07	0,06	0,07
	(0.06; 0.07)	*(0.05; 0.09)*	*(0.06; 0.07)*	*(0.06; 0.09)*	*(0.06; 0.07)*	*(0.05; 0.09)*

A5: Coefficients from linear probability models on having first sexual experience below age 15, boys (10%-80%-10% approach)

Variable	Females (%)		Males (%)	
Mother's reports				
	Mean	*Std. dev.*	*Mean*	*Std. dev.*
Int. symptoms	2.6	2.7	2.6	2.8
Ext. symptoms	2.5	2.5	3.2	2.9
Prosocial behavior	8.8	1.3	8.3	1.6
	15,793		**11,663**	
Children's reports				
	Mean	*Std. dev.*	*Mean*	*Std. dev.*
Int. symptoms	3.4	2.8	3.0	2.7
Ext. symptoms	5.4	2.7	5.7	2.9
Prosocial behavior	8.2	1.5	7.8	1.7
	14,303		**10,429**	

Table A6: Comparison of univariate statistics for behavioral indicators (mothers' vs. children's reports)

Figures

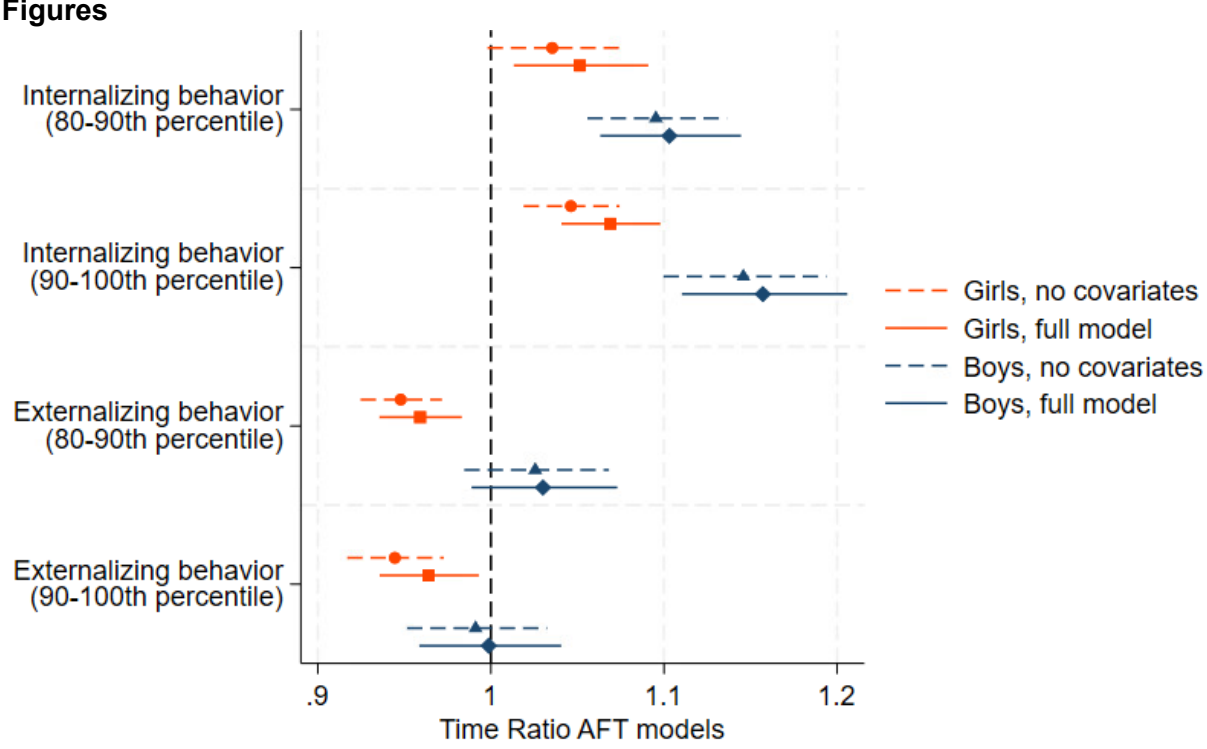

Figure A1: Time ratios from accelerated failure time models on first sexual experience over time between age 14 and 18, separated by gender (80%-10%-10% approach).
Models without covariates include the single behavioral measure only. Full models additionally control for parental SES status at birth, number of biological siblings, and whether both parents live in the household.

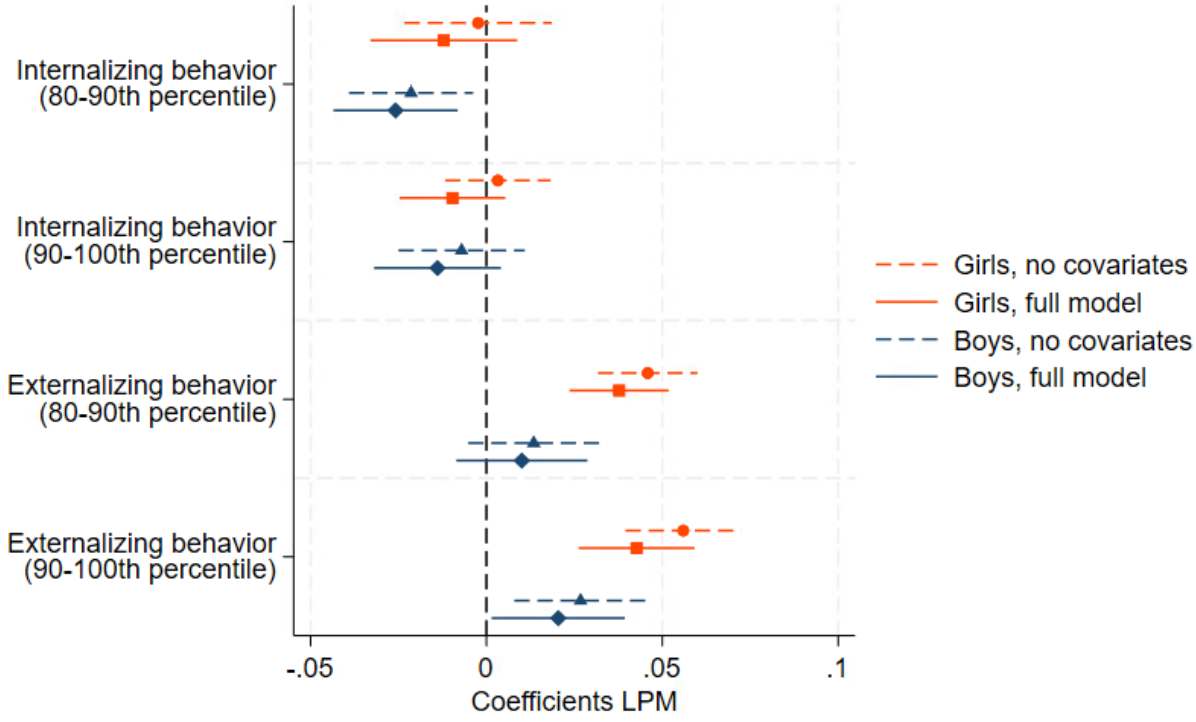

Figure A2: Coefficients from linear probability models on first sexual experience below age 15, separated by gender (80%-10%-10% approach).
Models without covariates include the single behavioral measure only. Full models additionally control for parental SES status at birth, number of biological siblings, and whether both parents live in the household.

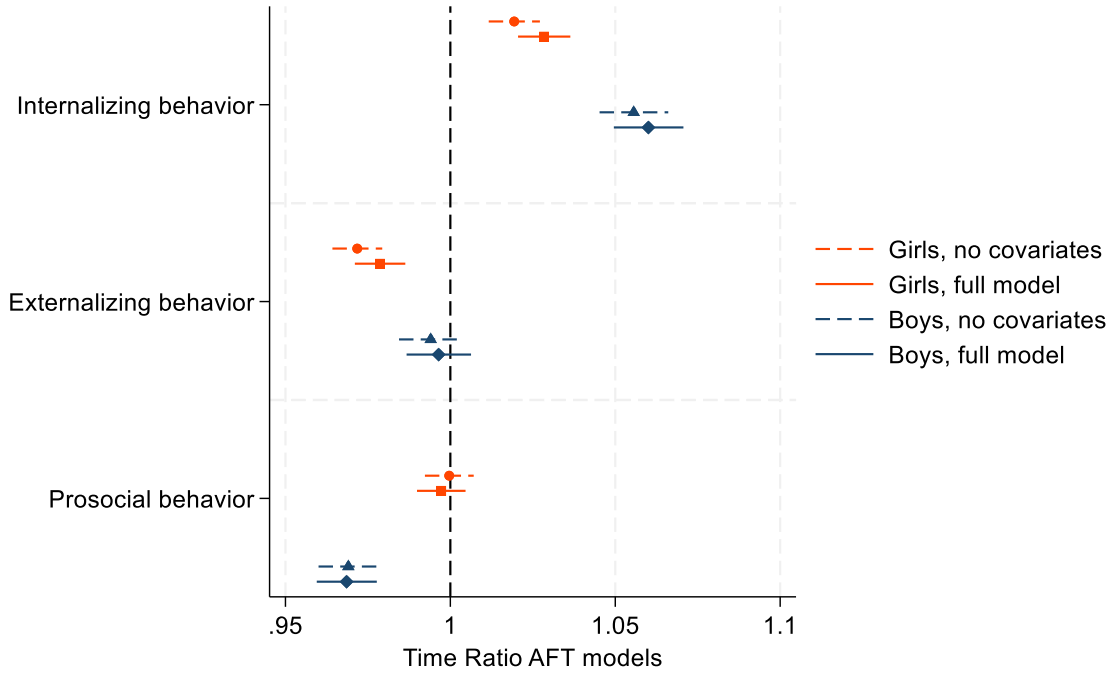

Figure A3: Time ratios from accelerated failure time models on first sexual experience over time between age 14 and 18, separated by gender (using standardized measures).
Models without covariates include the single behavioral measure only. Full models additionally control for parental SES status at birth, number of biological siblings, and whether both parents live in the household.

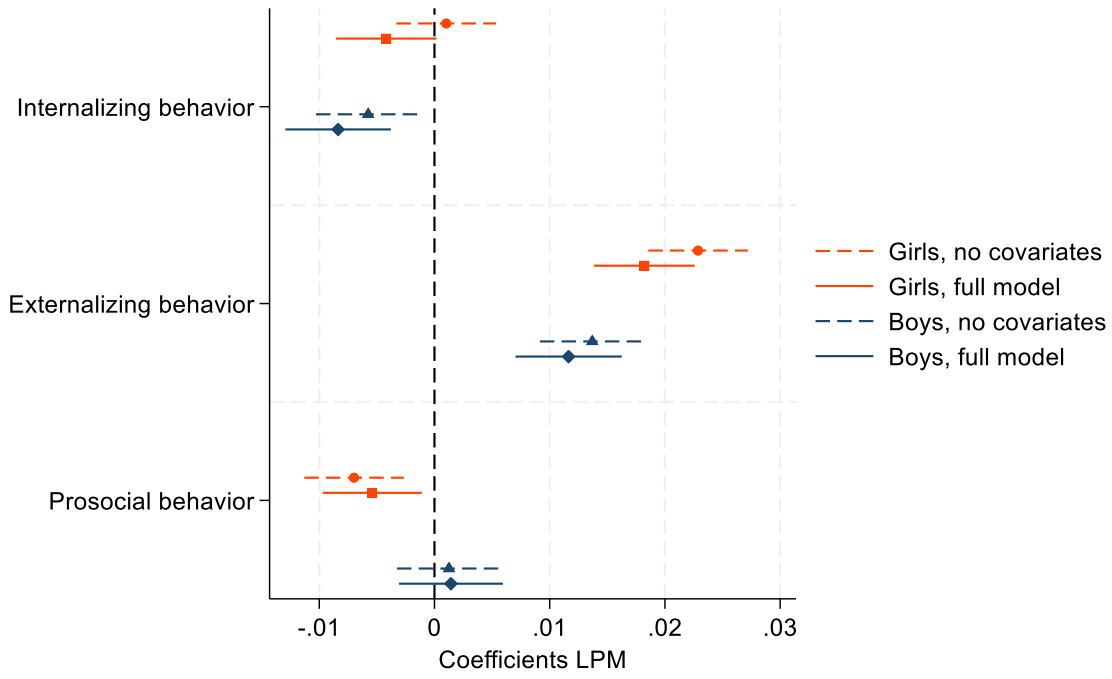

Figure A4: Coefficients from linear probability models on first sexual experience below age 15, separated by gender (using standardized measures).
Models without covariates include the single behavioral measure only. Full models additionally control for parental SES status at birth, number of biological siblings, and whether both parents live in the household.

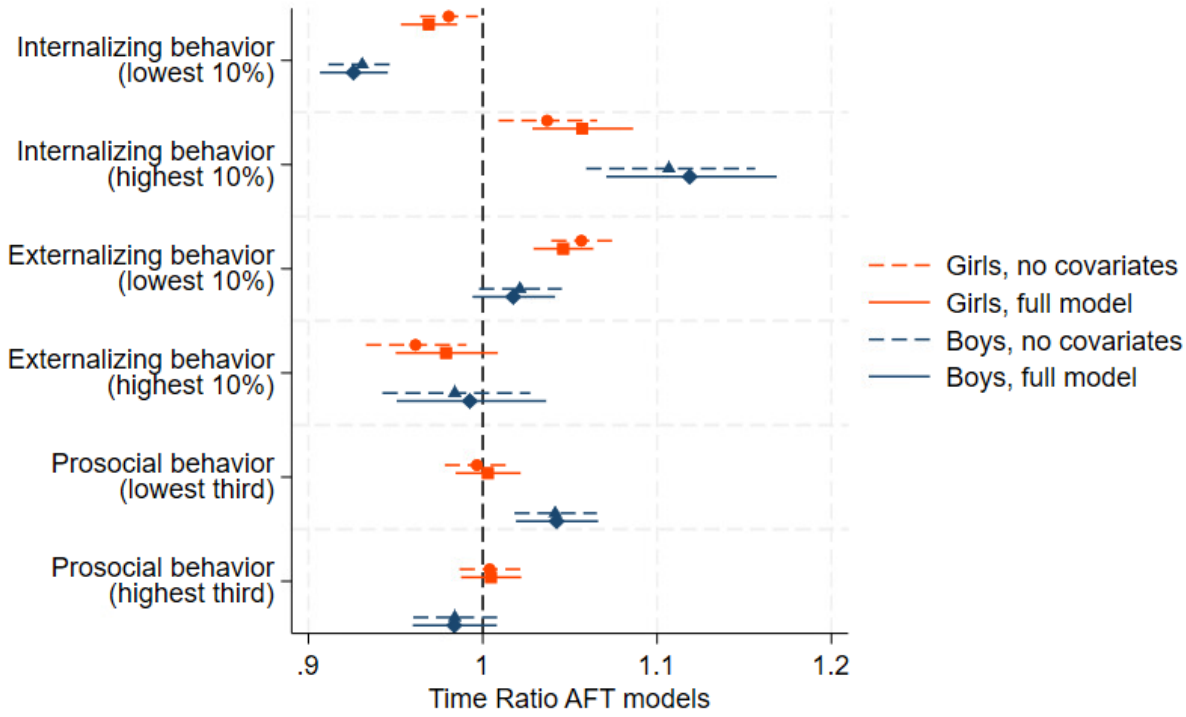

Figure A5: Time ratios from accelerated failure time models on first sexual experience over time between age 14 and 18, separated by gender (10%-80%-10% approach, lognormal distribution).
Models without covariates include the single behavioral measure only. Full models additionally control for parental SES status at birth, number of biological siblings, and whether both parents live in the household.

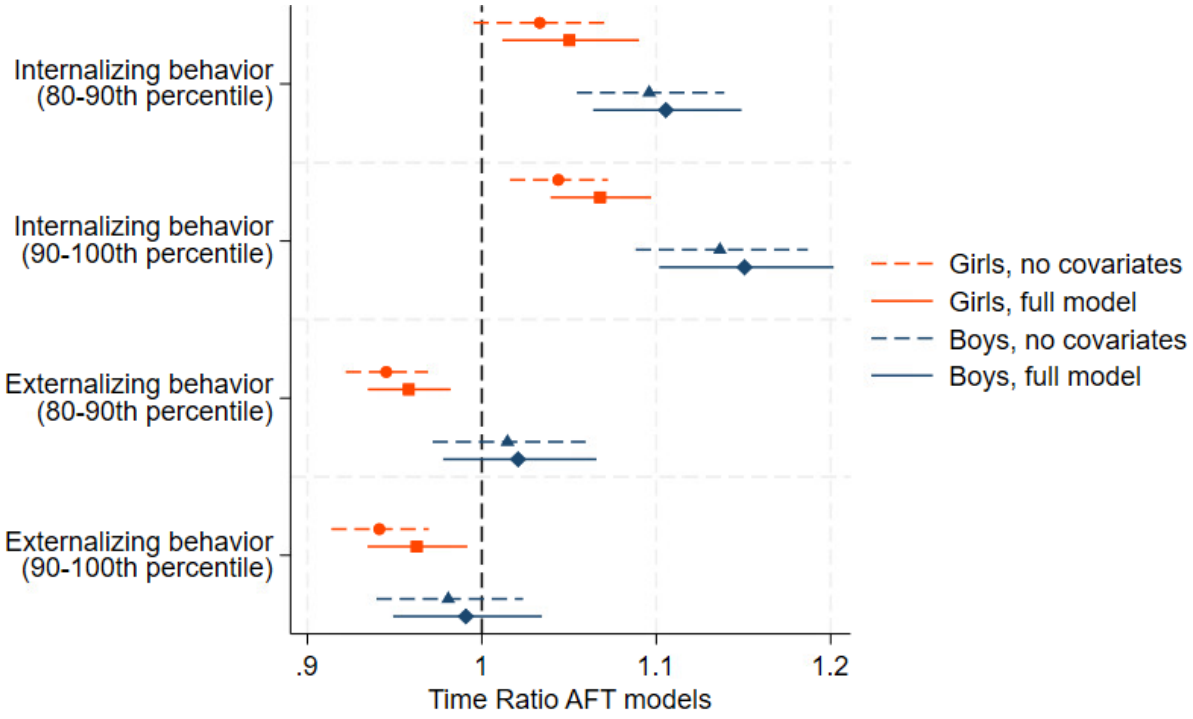

Figure A6: Time ratios from accelerated failure time models on first sexual experience over time between age 14 and 18, separated by gender (80%-10%-10% approach, lognormal distribution).
Models without covariates include the single behavioral measure only. Full models additionally control for parental SES status at birth, number of biological siblings, and whether both parents live in the household.

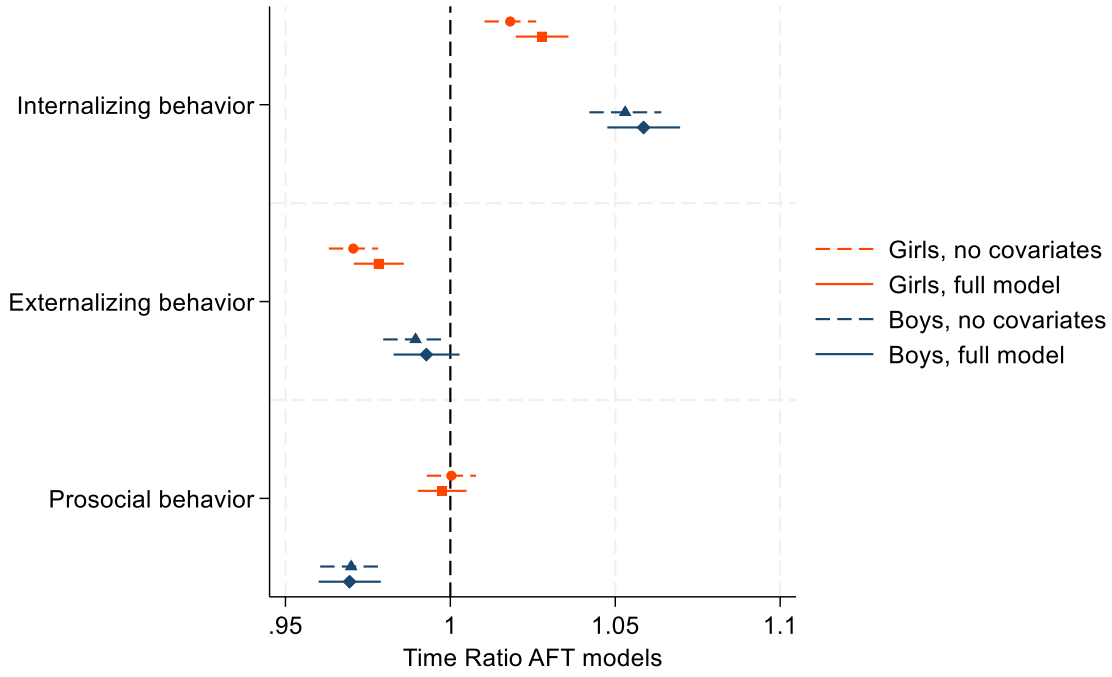

Figure A7: Time ratios from accelerated failure time models on first sexual experience over time between age 14 and 18, separated by gender (using standardized measures, lognormal distribution).
Models without covariates include the single behavioral measure only. Full models additionally control for parental SES status at birth, number of biological siblings, and whether both parents live in the household.

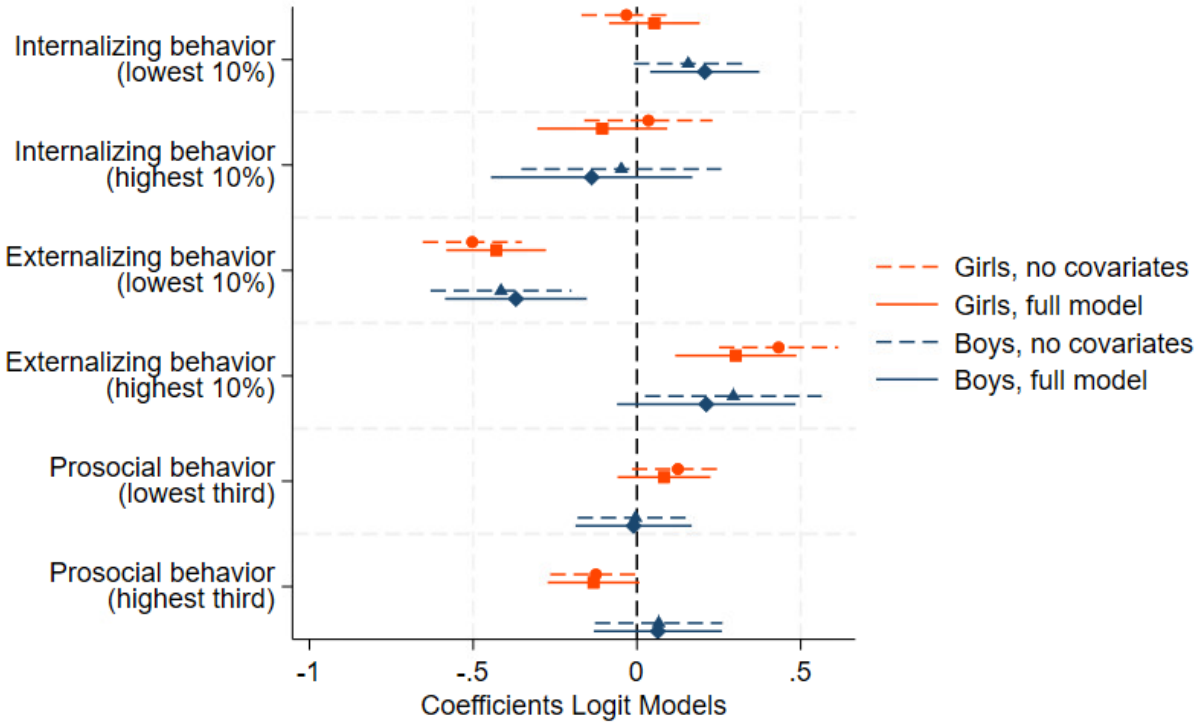

Figure A8: Coefficients from logistic regression models on first sexual experience below age 15, separated by gender (10%-80%-10% approach).
Models without covariates include the single behavioral measure only. Full models additionally control for parental SES status at birth, number of biological siblings, and whether both parents live in the household.

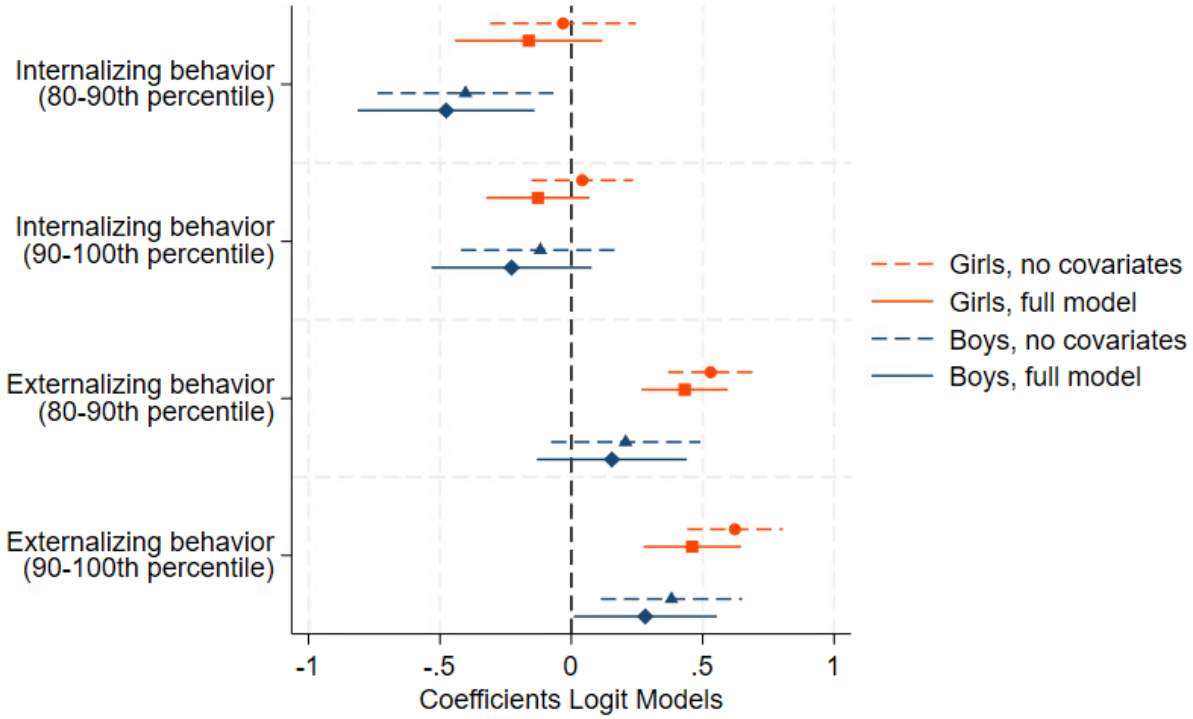

Figure A9: Coefficients from logistic regression models on first sexual experience below age 15, separated by gender (80%-10%-10% approach).
Models without covariates include the single behavioral measure only. Full models additionally control for parental SES status at birth, number of biological siblings, and whether both parents live in the household.

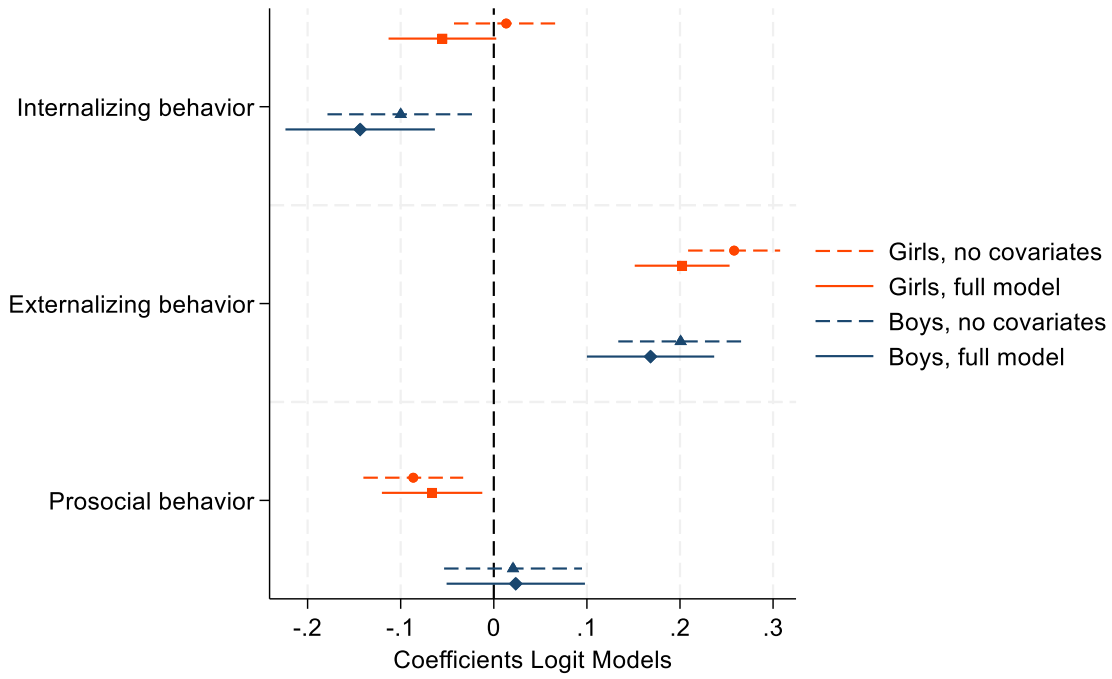

Figure A10: Coefficients from logistic regression models on first sexual experience below age 15, separated by gender (using standardized measures).
Models without covariates include the single behavioral measure only. Full models additionally control for parental SES status at birth, number of biological siblings, and whether both parents live in the household.

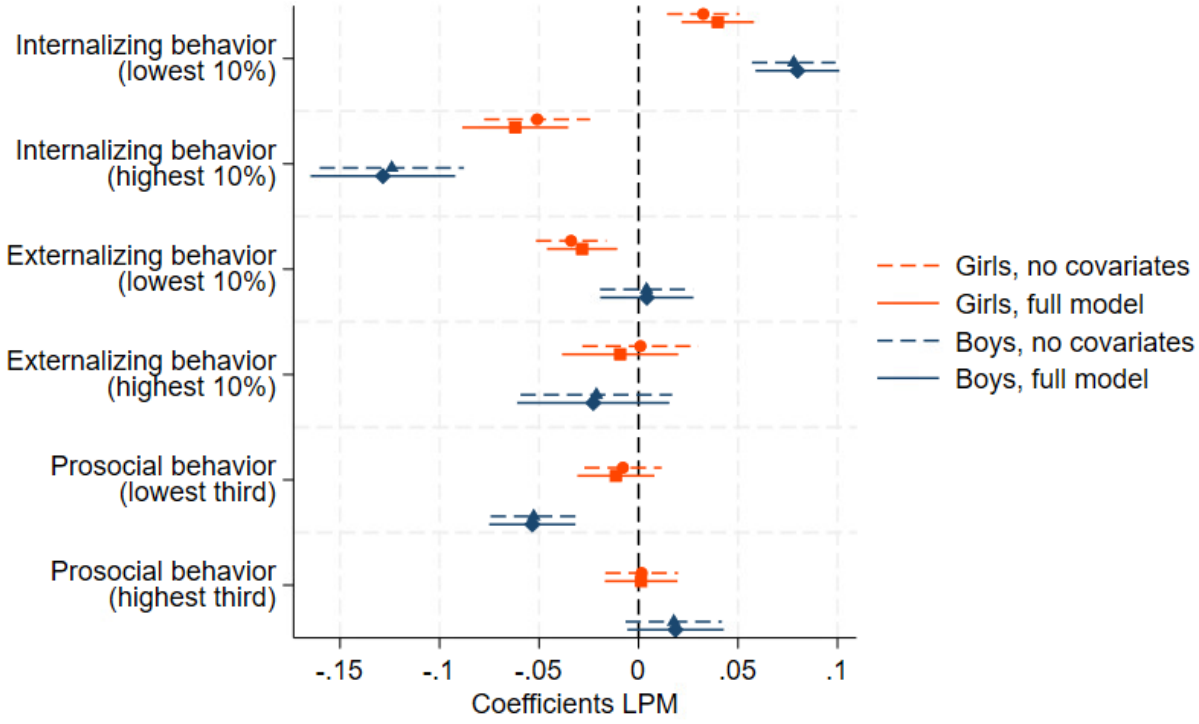

Figure A11: Coefficients from linear probability models on first sexual experience below age 19, separated by gender (10%-80%-10% approach).
Models without covariates include the single behavioral measure only. Full models additionally control for parental SES status at birth, number of biological siblings, and whether both parents live in the household.

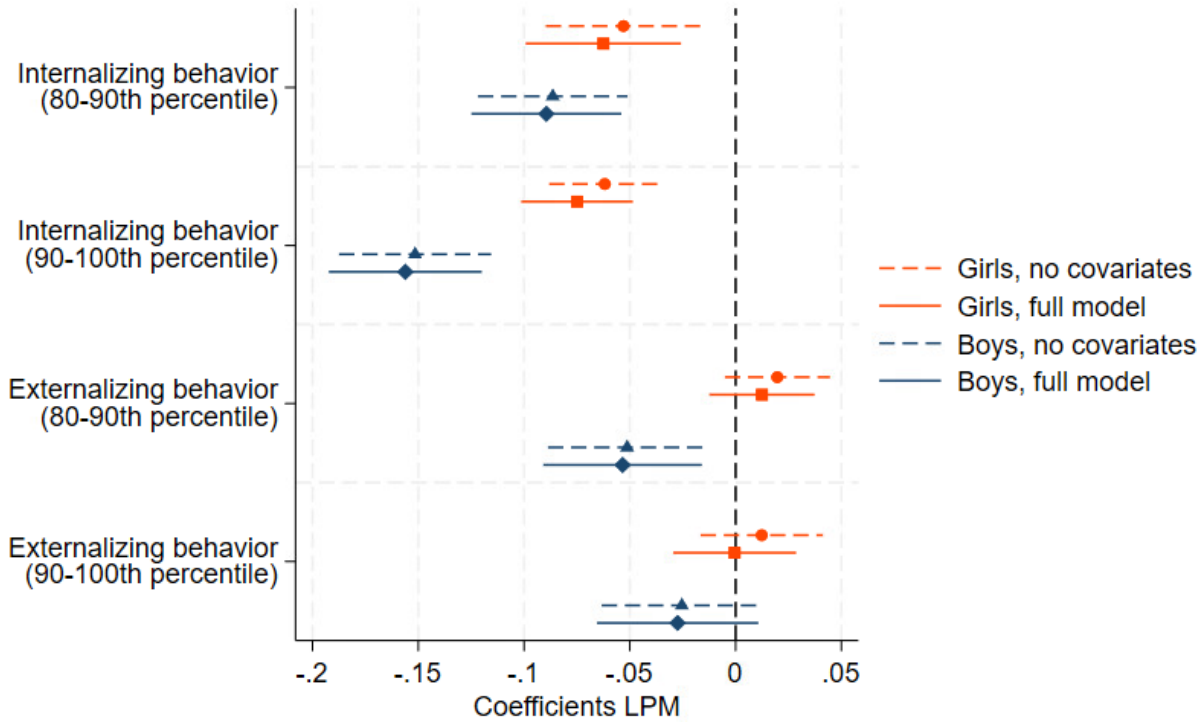

Figure A12: Coefficients from linear probability models on first sexual experience below age 19, separated by gender (80%-10%-10% approach).
Models without covariates include the single behavioral measure only. Full models additionally control for parental SES status at birth, number of biological siblings, and whether both parents live in the household.

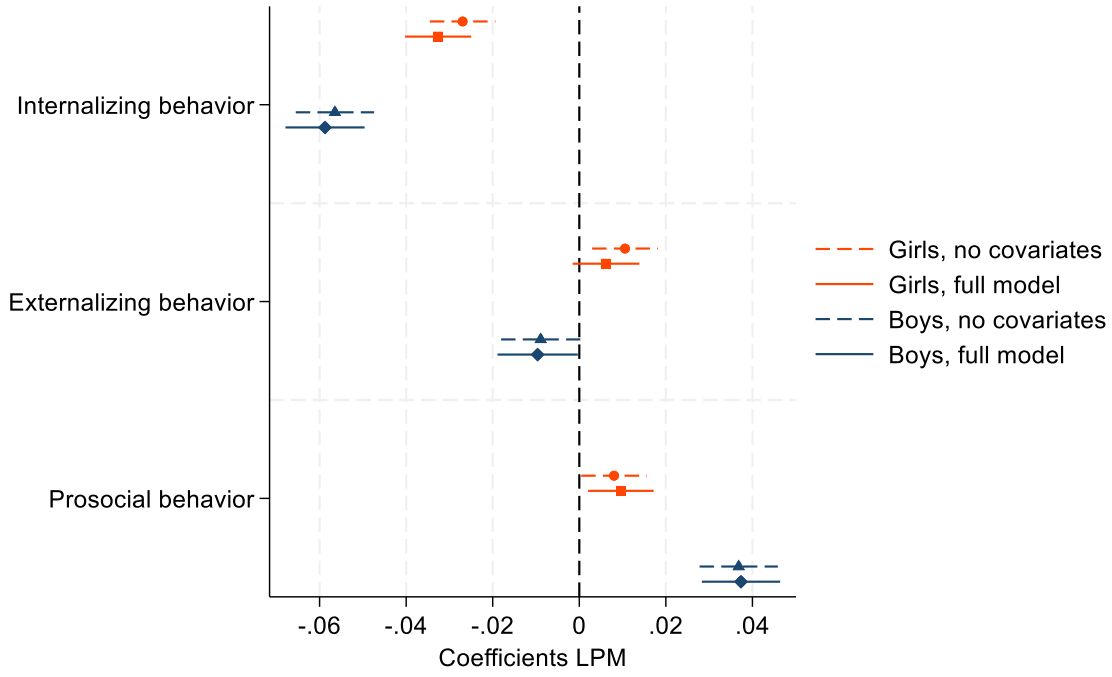

Figure A13: Coefficients from linear probability models on first sexual experience below age 19, separated by gender (using standardized measures).
Models without covariates include the single behavioral measure only. Full models additionally control for parental SES status at birth, number of biological siblings, and whether both parents live in the household.

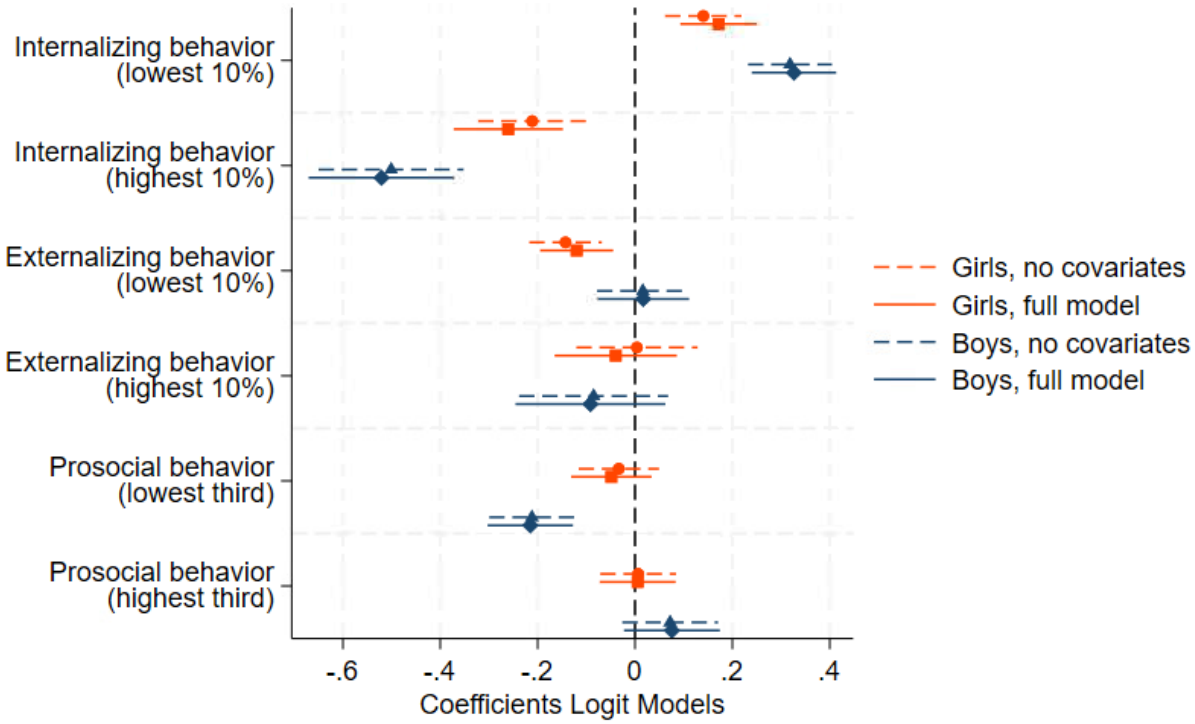

Figure A14: Coefficients from logistic regression models on first sexual experience below age 19, separated by gender (10%-80%-10% approach).
Models without covariates include the single behavioral measure only. Full models additionally control for parental SES status at birth, number of biological siblings, and whether both parents live in the household.

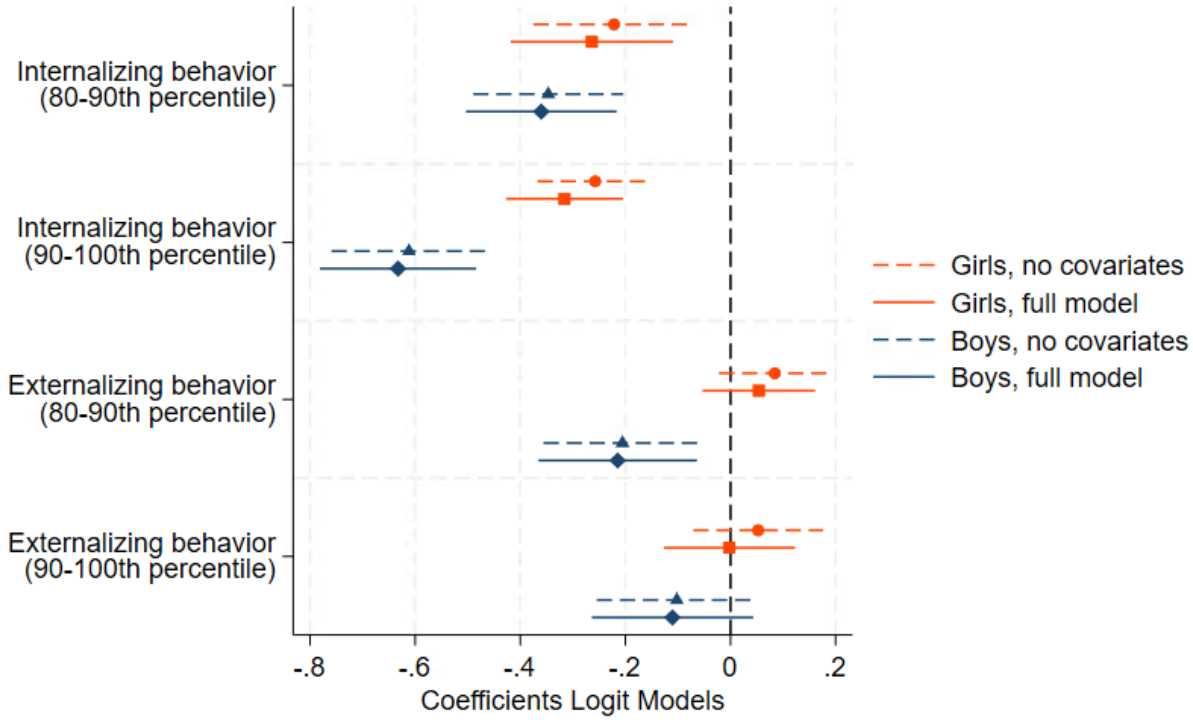

Figure A15: Coefficients from logistic regression models on first sexual experience below age 19, separated by gender (80%-10%-10% approach).
Models without covariates include the single behavioral measure only. Full models additionally control for parental SES status at birth, number of biological siblings, and whether both parents live in the household.

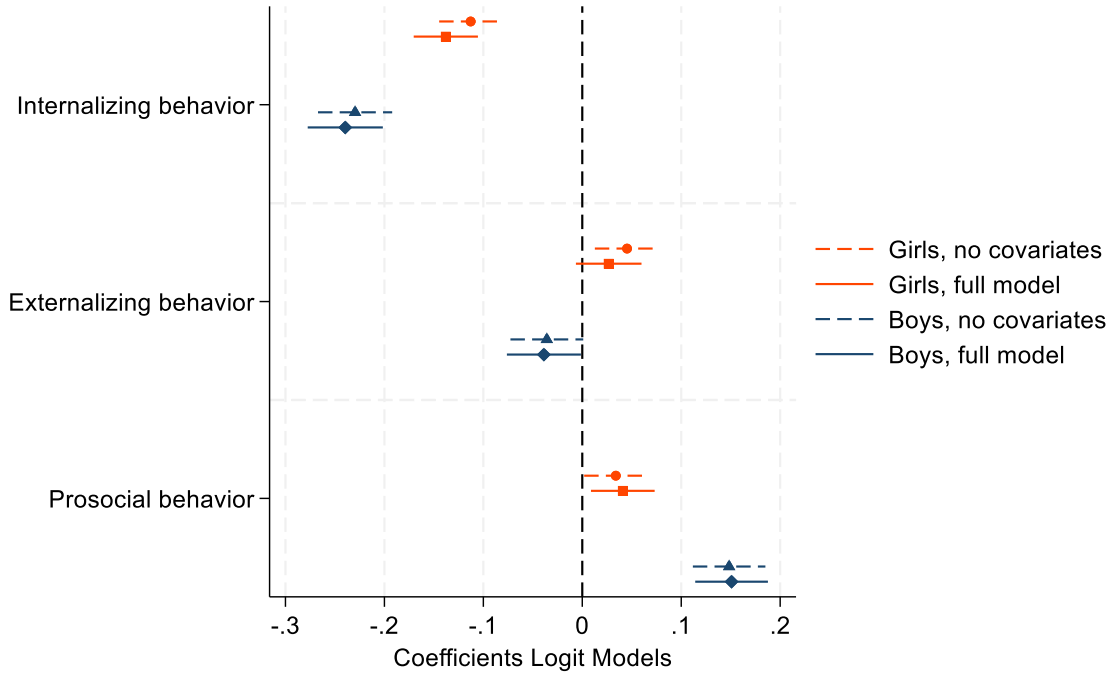

Figure A16: Coefficients from logistic regression models on first sexual experience below age 19, separated by gender (using standardized measures).
Models without covariates include the single behavioral measure only. Full models additionally control for parental SES status at birth, number of biological siblings, and whether both parents live in the household.

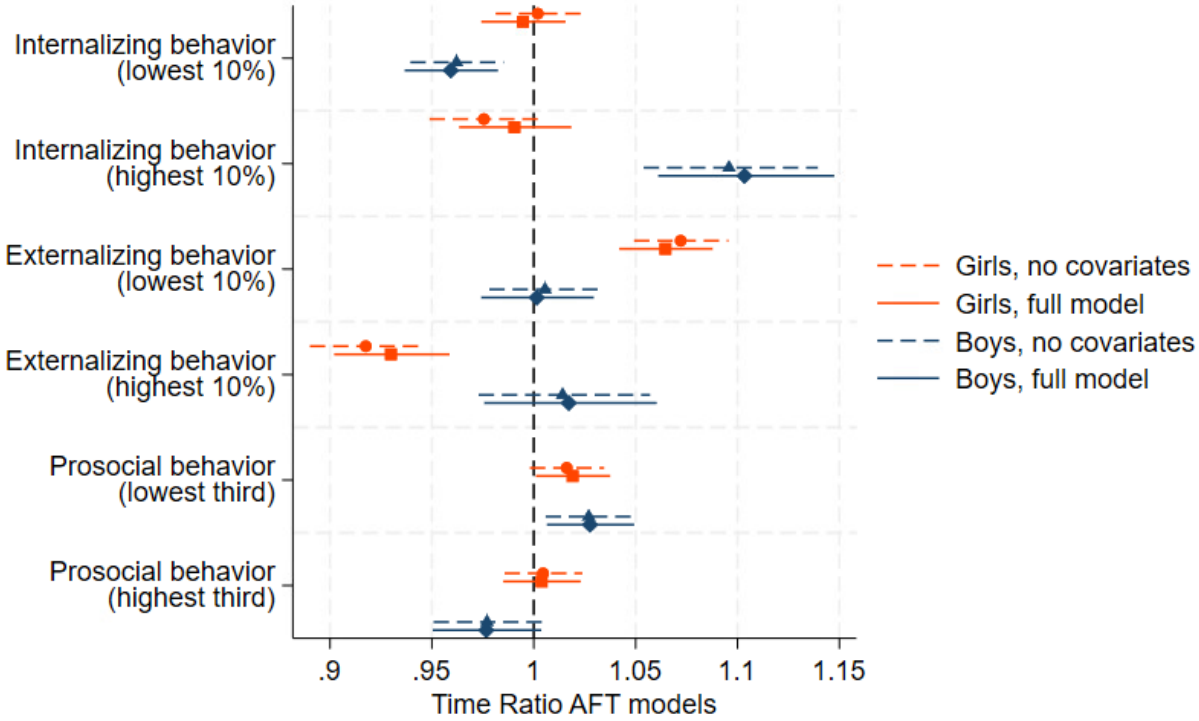

Figure A17: Time ratios from accelerated failure time models on first sexual experience over time between age 14 and 18, separated by gender (10%-80%-10% approach, children's reports).
Models without covariates include the single behavioral measure only. Full models additionally control for parental SES status at birth, number of biological siblings, and whether both parents live in the household.

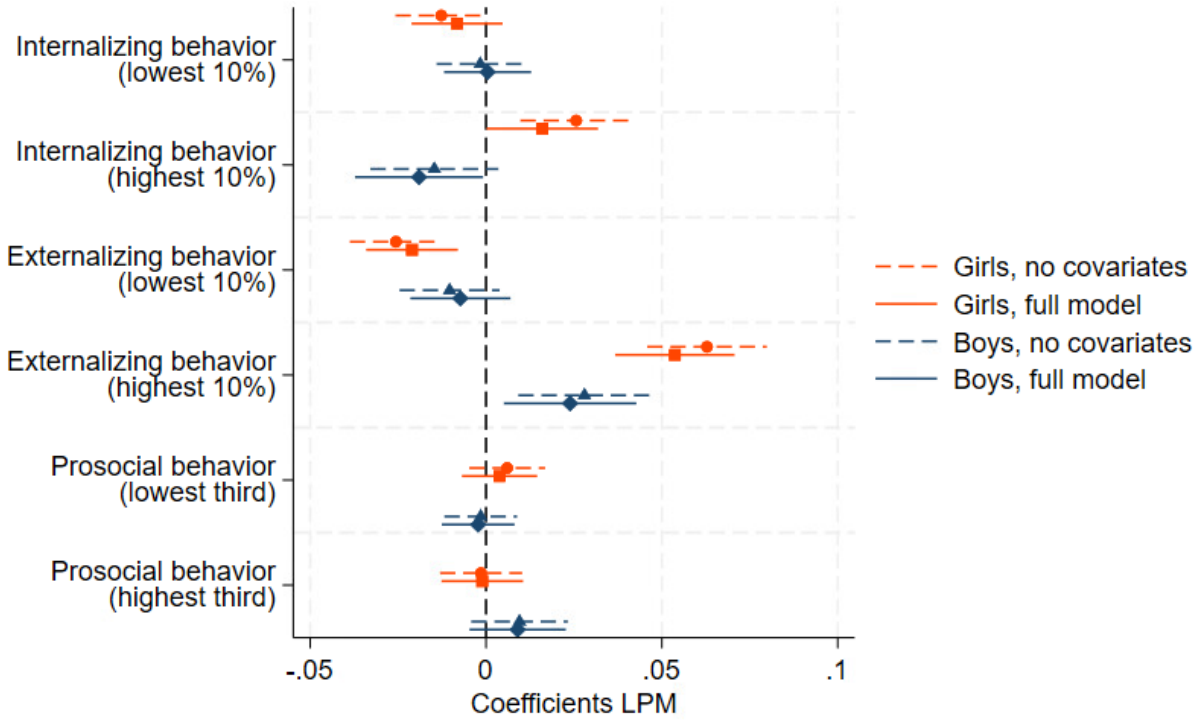

Figure A18: Coefficients from linear probability models on first sexual experience below age 15, separated by gender (10%-80%-10% approach, children's reports).
Models without covariates include the single behavioral measure only. Full models additionally control for parental SES status at birth, number of biological siblings, and whether both parents live in the household.

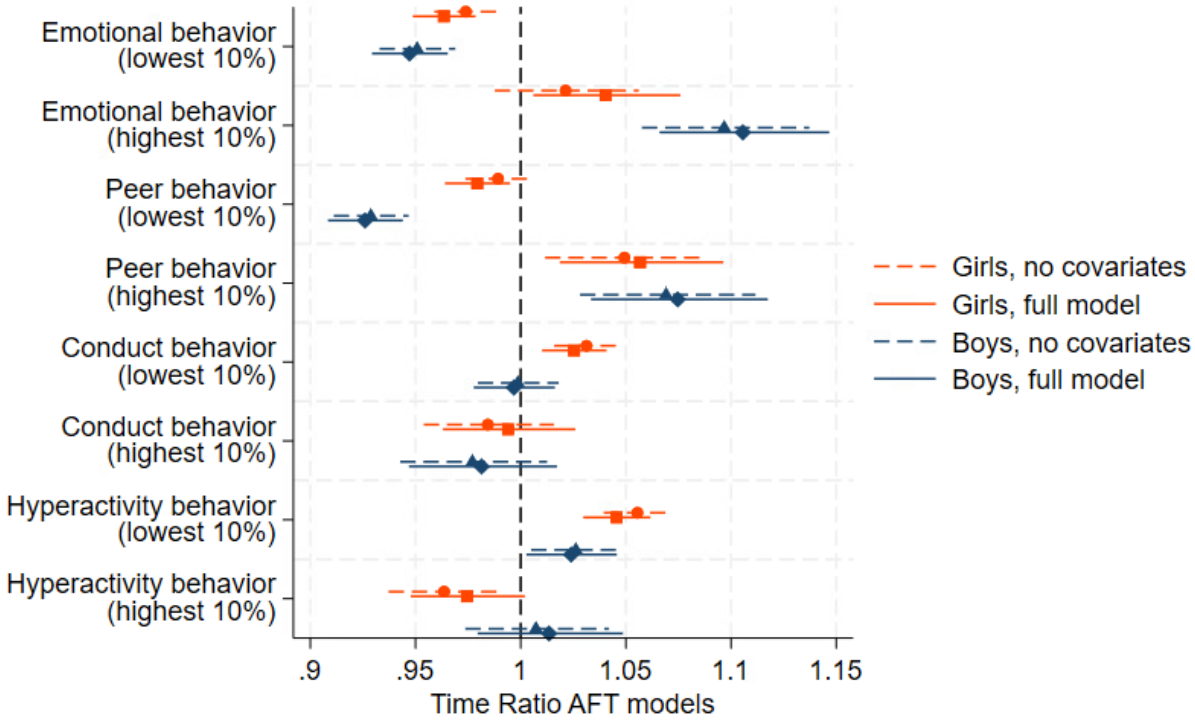

Figure A19: Time ratios from accelerated failure time models on first sexual experience over time between age 14 and 18, separated by gender (10%-80%-10% approach, behavior subdimensions).
Models without covariates include the single behavioral measure only. Full models additionally control for parental SES status at birth, number of biological siblings, and whether both parents live in the household.

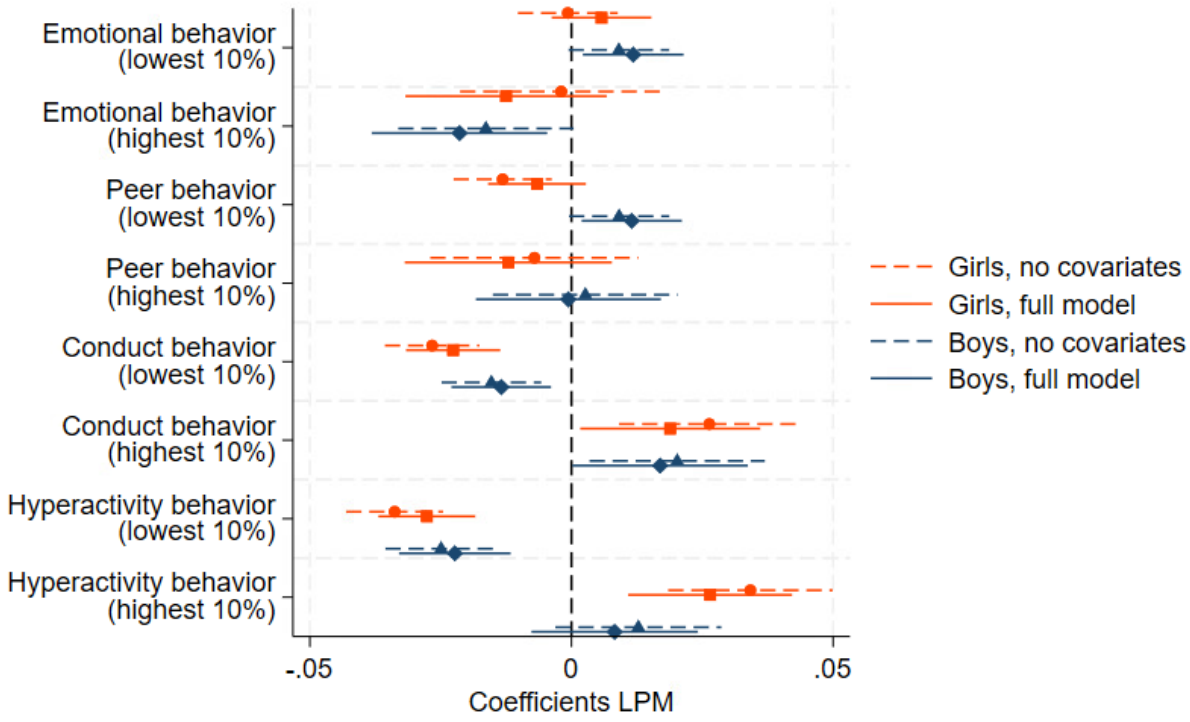

Figure A20: Coefficients from linear probability models on first sexual experience below age 15, separated by gender (10%-80%-10% approach, behavior subdimensions).
Models without covariates include the single behavioral measure only. Full models additionally control for parental SES status at birth, number of biological siblings, and whether both parents live in the household.