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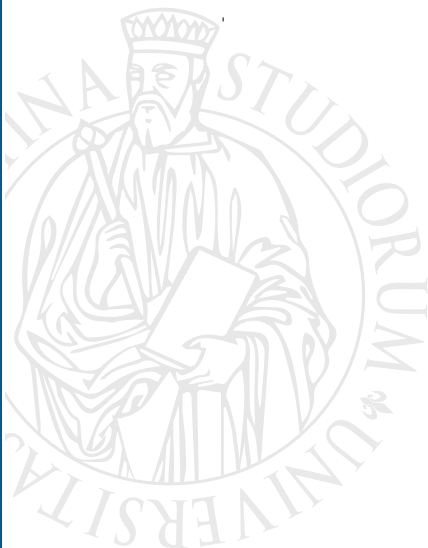
When things do not change: non-intact families and adolescents' risks of substance use across 30 European countries and two decades

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Abstract

Substantial evidence indicates that children in non-intact families experience higher risks of substance use compared to those living with both parents. The 'institutionalization hypothesis' suggests that this penalty for children living in non-intact families should weaken–or even vanish–as new family behaviors become more prevalent and socially accepted. Our study tests the institutionalization hypothesis by examining the relationship between family arrangements and adolescents' susceptibility to using cannabis, alcohol, and tobacco, utilizing a unique dataset that spans 21 years across 30 European countries. We measure the diffusion of new family behaviors with a comprehensive country-year index encompassing the rise in divorces and extra-marital births, and the decline in marriages, distinguishing its between-country and within-country components. Our findings indicate that adolescents from non-intact families, either in single-parent families, stepfamilies, or no-parent families, are more likely to engage in the use of cannabis, alcohol, and tobacco. Importantly, their higher risks of substance use appear to be strikingly persistent regardless of the between-country and within-country diffusion of new family behaviors. Thus, the paper provides robust evidence against the institutionalization hypothesis.

1. Introduction

Whether parental union dissolution and different types of post-separation family constellations bring about negative consequences for children is increasingly debated in the literature in light of an upward trend in family instability that continued over several decades in post-WWII Europe (Wagner *et al.* 2020). These changes are described as part of the Second Demographic Transition (SDT), which postulates that the emerging patterns of cohabitation replacing marriage, out-of-wedlock childbearing, and increasing union instability are rooted in broader sociocultural shifts, notably the proliferation of post-materialist values and the secularization of Western societies (Lesthaeghe 2020). Empirical evidence suggests that children from single-parent and stepfamilies, collectively referred to as 'non-intact families' in this paper, tend to have worse outcomes compared to those living in 'intact families' (i.e., with both biological or adoptive parents), including more behavioral problems and higher risks of substance use (Chapple 2009; Amato 2010; Härkönen *et al.* 2017). Nonetheless, the 'institutionalization hypothesis' suggests that as new family behaviors associated with the SDT spread through society, the negative consequences of living in non-intact families should diminish due to the increased normative acceptance of divorce and the greater awareness of the importance of both parents sharing custody of children following separation (Cherlin 2004; Lacey *et al.* 2012)[1]. The diffusion of the SDT would thus 'spontaneously' reduce the penalties associated with non-intact families by attenuating some of their main underlying mechanisms, such as increased stress and reduced parental supervision.

The present paper addresses the institutionalization hypothesis by examining the relationship between family structure and adolescents' susceptibility to using cannabis, alcohol, and tobacco, exploiting a unique dataset that spans 21 years across 30 European countries. To our knowledge, only one cross-national study has explicitly examined whether the proportion of single-parent families in

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[1] In the following we use the terms divorce and separation as synonyms, to indicate both marital and non-marital dissolutions.

a country mitigates the relationship between living in single-parent families and youth substance use (Hoffmann 2017).

We contribute to the existing literature in several ways. First, the breadth of our comparative data, which spans 1999-2019 across a variety of sociocultural contexts, enables us to draw robust conclusions regarding the institutionalization hypothesis. We rely on a comprehensive index of SDT diffusion encompassing trends in divorces, marriages, and extra-marital births; this multidimensional approach proves particularly pertinent because single-parent families or stepfamilies increasingly arise not solely from marital break-ups but also from the dissolution of cohabiting unions (Lesthaeghe 2020). Second, we disentangle how between-country and within-country (over time) variation in the diffusion of new family behaviors moderates the association between non-intact families and adolescents' substance use. Several studies have recently found a stronger negative impact of parental separation on children's educational outcomes in those contexts where divorce is more prevalent (Bernardi & Radl 2014; Kreidl *et al.* 2017; Guetto *et al.* 2022), while the above-mentioned study by Hoffmann (2017) found no moderating effects. These cross-national studies may be biased by unobserved confounding factors as countries with varying divorce rates or proportions of single-parent families may also differ in other economic, cultural, and institutional aspects. Instead, we focus on between-country and within-country variation, the latter allowing us to net out the influence of time-constant country-level unobserved characteristics. Third, while research commonly oversimplifies the classification of households into intact/two-parent or non-intact/single-parent categories, our study goes beyond this by also incorporating stepfamilies and children residing without parents.

2. Background

2.1 *Non-intact families and adolescents' substance use: underlying mechanisms*

Experiencing parental separation and being raised without one of the biological or adoptive parents for a substantial part of childhood and adolescence can adversely affect the emotional, cognitive, and

behavioral development of children (Härkönen *et al.* 2017). One primary mechanism underlying this negative impact is the socioeconomic disadvantage typically associated with non-intact families. This is partly due to selection, as non-intact families are increasingly prevalent among the lowest educational groups (Härkönen & Dronkers 2006; Matysiak *et al.* 2014) and social classes (Bastianelli *et al.* 2024). In addition, union dissolution and the transition to single parenthood often lead to substantial income and wealth losses, especially for single mothers (Aassve *et al.* 2007; Nieuwenhuis & Maldonado 2018; Boertien & Lersch 2021). The negative educational composition and higher economic hardship faced by non-intact families may increase adolescents' substance use, as parental socioeconomic status (SES) has been found to significantly impact children's well-being and health behavior during adolescence and early adulthood (Huurre *et al.* 2003). On the other hand, a higher parental SES may provide adolescents with more economic resources to afford the consumption of substances such as tobacco, alcohol, and cannabis. Beyond this 'income effect', high-SES adults are often found to drink alcohol more often than their low-SES counterparts because alcohol consumption is an integral part of social life in certain work environments (e.g., during business dinners, meetings, or conferences) and during cultural activities (Huerta & Borgonovi 2010; Oncini & Guetto 2018). This may lead them to adopt a more permissive stance toward their children. Empirical evidence demonstrates that young adults from high-SES families exhibit more pronounced alcohol and cannabis use, although there is no corresponding increase in smoking (Patrick *et al.* 2012).

Even when accounting for parental SES, living in a non-intact family may lead to higher risks of substance use through two additional channels that are of particular interest to the institutionalization hypothesis: increased stress and reduced parental supervision. The dissolution of the parental union can be a stressful event whose potential negative effects on children's emotional state may start well before the actual separation, as the family environment deteriorates, and parental conflict intensifies. While children may derive benefits from parental separation in cases of severely compromised relationships (Morrison & Coiro 1999), the period surrounding the break-up can be notably stressful, as it often involves disruptive life events such as changes in residence and school.

Adolescents facing psychological distress, depression, and anxiety have been found to more often engage in substance use, also as a means to alleviate these symptoms (Patrick *et al.* 2012). Higher exposure to risk behaviors may also arise from reduced adult supervision following the dissolution of the parental union. Children are usually found to have a reduced frequency of contact with the non-custodial parent, usually the father (Amato 2010; Zilincikova & Albertini 2022; Tosi & Guetto 2024). The decrease in the quantity and quality of contact with the non-resident parent may reduce parental support and supervision and, in turn, increase children's exposure to risk behaviors, including higher substance use. In general, single parents tend to have less time than partnered parents to be with their children or to supervise their activities when they are not at home, and adolescents who engage in more unsupervised activities and spend more time with friends tend to be more involved in substance use (Tomcikova *et al.* 2015; Hoffmann 2017).

Different types of post-separation family arrangements may have varying implications for adolescents' substance use. Stepfamilies, due to the presence of another adult in the house, may increase both the economic well-being and the level of monitoring of children's activities compared to single-parent households, thereby playing a beneficial role in reducing children's exposure to risk behavior. However, the evidence indicates that children in stepfamilies face similar challenges to those living with a single parent, and sometimes even a stronger disadvantage (Amato 2000; Martin 2012; Hoffmann 2017). Step-parents often adopt a more relaxed approach to discipline (Amato 1987) and may be less involved with non-biological children (Sweeney 2010), resulting in lower supervision than biological parents (Ganong & Coleman 2017). Following a 'multiple-transition' perspective (Amato 2010), the arrival of a step-parent into the household can introduce additional sources of stress, complicating the child's adjustment compared to children who live stably with a single parent from birth or following parental separation.

2.2 *The institutionalization hypothesis*

Differences across time and space in the association between non-intact families and adolescents' substance use may exist to the extent that the influence of the underlying mechanisms discussed above depends on contextual characteristics. According to the institutionalization hypothesis, there are theoretical reasons to expect that the negative consequences of non-intact families should diminish in countries where the diffusion of new family behaviors is higher (Cherlin 2004; Lacey 2012).

In the early stages of the SDT diffusion process, parental separation is inhibited by lengthy and challenging legal procedures as well as social norms defining the first-marriage nuclear family as the 'family model' (Coontz 1992). In this context, typical of virtually all European countries until the early '70s, the increased stress mechanism is likely to be particularly cogent, as parents who decide to separate are confronted with both institutional stigma and societal disapproval. Higher parental stress is likely to negatively affect the family environment and, in turn, the children's psychological well-being, which may be further dampened by stigmatization from their peers. In contexts where the first-marriage nuclear family is the 'natural' way of being a family, post-separation family arrangements are not only considered 'deviant' but are also characterized by a lack of clear guidelines and norms for role performance. For instance, it is unclear, from both a legal and a cultural point of view, how fathers should perform their parental role without co-residing with their children and having a romantic relationship with their children's mother.

Along with the losing centrality of marriage and the diffusion of new family behaviors, single-parent households and stepfamilies tend to be more ingrained in the social fabric. Marriage stops being perceived as the only legitimate way of being a family, leading to higher acceptance and reduced stigmatization (Cherlin 2004; Lacey *et al.* 2012; Pirani & Vignoli 2023) and, thus, lower stress for parents and children in non-intact families. In addition, post-separation family arrangements become increasingly institutionalized. In recent decades, legal reforms have made the procedures to obtain a divorce easier and less stressful, and regulated and facilitated the joint legal and physical

custody of children in post-divorce arrangements. This implies that an increasing number of fathers maintain strong ties with their children even after the union dissolution (van Spijker *et al.* 2022), partly co-residing with them in case of joint physical custody. As a result of these societal changes, the institutionalization hypothesis predicts that in societies with a higher prevalence of non-intact families, the experience of living in a single-parent or a stepfamily should be less associated with adolescents' substance use via reduced stress and increased parental supervision following the family disruption. The one domain where non-intact families remain persistently disadvantaged despite their growing prevalence is the socioeconomic one. This is due to the increasingly negative educational gradient in separation (Härkönen & Dronkers 2006; Matysiak *et al.* 2014) and the persistent poverty risks single-parent households face (Nieuwenhuis & Maldonado 2018). However, this does not alter the overall prediction of the institutionalization hypothesis that higher levels of diffusion of new family behaviors should correspond with fewer negative consequences for children of non-intact families, including lower risks of substance use.

So far, the existing literature does not seem to support the institutionalization hypothesis. Several studies focusing on children's educational outcomes have found an even stronger negative impact of parental separation in those contexts where divorce is more prevalent (Bernardi & Radl 2014; Kreidl *et al.* 2017; Guetto *et al.* 2022) or no changes across cohorts (Kalmijn 2024). As regards the literature on adolescents' substance use, there is a bulk of empirical evidence showing that living in any type of non-intact family significantly increases the risk of smoking for European adolescents both in multi-country analyses (Bjarnason *et al.* 2003; Griesbach *et al.* 2003) and within specific national contexts characterized by different cultural and institutional settings such as Scotland (Glendinning *et al.* 1997) and Lithuania (Zaborskis & Sirvyte 2015). The same penalty was observed for frequent alcohol consumption and episodes of drunkenness, notably in Slovakia (Tomcikova *et al.* 2015) and the Netherlands (Vanassche *et al.* 2014). The separation of a child from one biological parent stands out as the most influential socio-demographic factor shaping the time of onset and the frequency of alcohol consumption in a study on Finnish adolescents (Seljamo *et al.* 2006).

Adolescents not living with both biological parents tend to use cigarettes, alcohol, and cannabis more frequently compared to their counterparts residing with both biological parents also in France (Ledoux *et al.* 2002; Khlat *et al.* 2020) and the UK (Ledoux *et al.* 2002). On a global scale, a meta-analysis synthesizing findings from 29 studies conducted across various nations (including the U.S., European countries, and Australia) underscores that living in any type of non-intact family increases adolescents' vulnerability to alcohol (Pourmovahed *et al.* 2022). The evidence of higher risks of alcohol, tobacco, and cannabis consumption among adolescents in non-intact families across various countries and periods appears to contradict the prediction of the institutionalization hypothesis.

To the best of our knowledge, however, only one cross-national study explicitly assessed whether the proportion of single-parent families in a country attenuates the association between living in single-parent families and youth substance use (Hoffmann 2017), finding no moderation effects.

2.3 *Research hypotheses*

This study examines the relationship between family arrangements and adolescents' susceptibility to using cannabis, alcohol, and tobacco. Additionally, it examines whether and how this association is moderated by the diffusion of SDT-related family behaviors to test the institutionalization hypothesis.

Our first hypothesis is that *adolescents living in different types of non-intact families are at higher risk of cannabis, alcohol, and tobacco use compared to adolescents living in intact families* (H1). Whereas many studies only distinguish between intact/two-parent or non-intact/single-parent households, we distinguish between single-parent and stepfamilies within the group of non-intact families. In addition, we consider children not living with either of the biological or adoptive parents. Formulating specific hypotheses about differences between various types of non-intact families is challenging due to the contrasting mechanisms involved. As mentioned, parental supervision may be lower in single-parent households than in stepfamilies, and it may be virtually absent in cases where children live without (step-)parents; on the other hand, step-parents may be less involved in the care of non-biological children and exert limited supervision. Also, the increased stress mechanism may

be exacerbated for children in stepfamilies compared to those living in stably single-parent households, to the extent that the number of family transitions rather than the separation itself may hurt children (Amato 2010).

Our second hypothesis refers to the cross-country heterogeneity in the association between non-intact families and adolescents' substance use. Based on the institutionalization hypothesis, we expect that the negative association between non-intact families and adolescents' use of cannabis, alcohol, and tobacco reduces with the diffusion of the SDT. This hypothesis can be divided into two parts. First, we test a between-country hypothesis that *the negative association between non-intact families and adolescents' use of cannabis, alcohol, and tobacco is weaker in countries with higher divorce rates, lower marriage rates, and higher percentages of extra-marital births* (H2a). Second, we test a within-country hypothesis that *this negative association weakens as SDT-related family behaviors become more common within a country* (H2b). The between-country hypothesis tests the possible moderating role of long-term differences in family behaviors across the selected countries, although it is exposed to the issue of unobserved heterogeneity. In contrast, the within-country hypothesis focuses on changes in family behaviors occurring within our observational window, which has the advantage of netting out the influence of time-constant, country-level unobserved characteristics.

3. Data and Methods

3.1 *The ESPAD data*

We use the repeated cross-sectional dataset of the European School Survey Project on Alcohol and Other Drugs (hereafter ESPAD) on the consumption of various substances among adolescents aged 15-16 (ESPAD Group 2020). Surveys are conducted at four-year intervals, starting from 1995, on nationally representative samples from 47 European countries according to a standardized methodological protocol (European Monitoring Centre for Drugs and Drug Addiction (EMCDDA) *et al.* 2021). Most national samples are created using a two-stage sampling procedure, where schools

serve as the primary units and classes as the final sampling units. All students in the sampled classes are interviewed by self-completing the questionnaire anonymously at school. We select six waves of ESPAD (1999, 2003, 2007, 2011, 2015, and 2019) based on the availability of core information. We exclude countries that participated in the survey for less than two years (or for which the core variables of the analysis are available for less than two years). The final sample consists of 419,927 adolescents from 30 countries in 136 country-years (**Table A1** in the Supplementary Materials), with Ireland excluded from the analysis on alcohol usage. After excluding missing values for each outcome, the analytical sample sizes are 416,658 for cannabis use, 395,530 for binge drinking, and 418,808 for tobacco use.

The ESPAD data has been widely utilized in scientific studies examining adolescents' use of cannabis, alcohol, and tobacco (Choquet *et al.* 2008; Tamson *et al.* 2021; Cerrai *et al.* 2022). We select three items from the questionnaire to construct the categorical outcomes 'Cannabis user,' 'Binge drinker,' and 'Tobacco user', each of which has three levels (no, occasional, and regular) as reported in **Table A2** in the Supplementary Materials. For assessing the use of cannabis, we employ the question: '*On how many occasions (if any) have you used cannabis in the last 30 days?.*' Following Morgan *et al.* (1999), we aggregate the item's categories to create three groups (**Table A3** in the Supplementary Materials): participants reporting no use of cannabis (*no users*), those using cannabis on 1 or 2 occasions (*occasional users*), and those using cannabis on more than 2 occasions (*regular users*). For binge drinking, we consider the following question: '*Think back again over the last 30 days. How many times (if any) have you had five or more drinks on one occasion?.*' The consumption of five or more drinks on a single occasion aligns with the definition of binge drinking endorsed by government agencies such as the Center for Disease Control and Prevention[2] and the National Institute on Alcohol Abuse and Alcoholism.[3] We choose to utilize the question regarding binge drinking instead of alcohol use because the latter lacks discriminative power due to the

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[2] https://www.cdc.gov/alcohol/fact-sheets/binge-drinking.htm
[3] https://www.niaaa.nih.gov/alcohol-health/overview-alcohol-consumption/moderate-binge-drinking

widespread prevalence of alcohol use. In the 27-member European Union, in 2019, Eurostat data show that only 5.2% of individuals aged 15 to 29 reported abstaining from alcohol in the past year. In contrast, data collected between 2017 and 2022 shows that 84.5% of people aged 15 to 34 did not use cannabis in the previous year (EMCDDA 2023). As done in previous studies (Ledoux *et al.* 2002; Khlat *et al.* 2020), we categorize participants into those who never practiced binge drinking in the last 30 days (*no users*), those who have had 1 or 2 episodes of binge drinking (*occasional users*), and those who have had 3 or more episodes (*regular users*) as shown in **Table A4** in the Supplementary Materials.[4] For tobacco use, we focus on conventional cigarettes, which are still much more widespread than e-cigarettes (in 2019, 18.4% of the population in the European Union were daily consumers of cigarettes, compared to 1.7% who used e-cigarettes, according to Eurostat data), by considering the following question: '*How often have you smoked cigarettes (excluding e-cigarettes) during the last 30 days?*.' We distinguish participants not smoking cigarettes (*no users*), adolescents smoking cigarettes less than daily (*occasional users*), or those smoking daily (*regular users*), regardless of the intensity of cigarette consumption (**Table A5** in the Supplementary Materials). This categorization aligns with those adopted by Griesbach *et al.* (2003) and Khlat *et al.* (2020).

Respondents are asked to indicate their household composition by selecting one or more options among father, stepfather, mother, stepmother, and others. The *Family* variable we construct distinguishes two-parent families (if the adolescent lives with both biological/adoptive parents), single-parent families (if the adolescent lives only with one of the biological/adoptive parents), stepfamilies (if the adolescent lives with one biological/adoptive parent and a stepmother or stepfather), and no-parent families (if the adolescent lives without any (step)parental figure).[5] We cannot distinguish between biological or adoptive parents, nor whether parental absence is due to

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[4] In this paper, the term 'use' is often employed indiscriminately for the three outcomes to simplify the exposition. However, in the case of alcohol, it would be appropriate to refer to 'binge drinking,' 'heavy drinking,' or 'alcohol abuse'.
[5] Adolescents who did not report any answer (1.2%), and cases where there was not enough information to uniquely assign a family type (0.3%) are classified as missing values. We drop adolescents declaring to live with both parents' partners (0.6%). In few cases of stepfamilies, the only parent in the household is the step-parent (5.6% of adolescents in stepfamilies).

parental union dissolution or death. This is problematic because the institutionalization hypothesis specifically addresses family disruptions resulting from the dissolution of parental unions—whether through marriage or cohabitation. However, given that the analysis concerns adolescents aged 15-16, parental deaths are likely to represent a minority of cases.[6] **Figure A1** in the Supplementary Materials shows the probabilities of belonging to each type of non-intact family and their changes over time, controlling for the different country compositions of each wave. Single-parent families increase from 12% in 1999 to 16% in 2019, while the shares of respondents in stepfamilies and no-parent families remain quite stable at approximately 8% and 3%, respectively. On average, we verified that the levels and trends of intact and non-intact families from ESPAD align with those from the European Union Labor Force Survey.

We consider as control variables the biological sex of the adolescent, the presence of siblings and grandparents in the household, the mother's and father's education (*completed primary school or less*, *some secondary school*, *completed secondary school*, *some college/university*, or *completed college/university*), and the perceived SES of the family (distinguishing between adolescents who perceive that their family SES is *much better off*, *better off*, *almost the same*, *less well off* than that of other families in the country). Parental SES may both act as a confounder and a mediator in the association between family arrangements and children's substance use (Mejías-Leiva & Moreno Mínguez 2024), but we decided to include it among control variables to ensure more conservative estimates. Summary statistics on all models' variables are reported in **Table A2**.

To operationalize the institutionalization hypothesis, we construct a country-year index measuring the diffusion of SDT-related family behaviors based on Eurostat sources: an indicator of divorce prevalence, measured as the ratio between the number of divorces and marriages; the percentage of births outside marriage on total births; the total first marriage rate for women. The latter is calculated by summing the age-specific first marriage rates, which represent the ratios between the

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[6] Data from the 2nd Round of the European Social Survey (2004-2006), covering 25 European countries, show that 2.9% of adolescents aged 15 or 16 have experienced the death of their father, and only 0.9% have experienced the death of their mother.

number of women marrying for the first time at a specific age and the average population of that age. We transform the female total first marriage rate by taking its one's complement, ensuring that its values align with the direction of the other indicators. We then normalize the indicators by subtracting their minimum values and dividing by their range. For each country-year combination, we compute the index as the arithmetic mean of the normalized indicators, multiplying the result by 10 to range between 0 and 10.[7] Summary statistics on the index and its components (not normalized) are provided in **Table A6** in the Supplementary Materials.

3.2 *Methods*

Our first aim is to relate adolescents' use of cannabis, alcohol, and tobacco to their family arrangements (H1). We employ multinomial logistic regressions with two-way clustering at both the country and country-year levels. The model is presented below:

$$\ln\left(\frac{P(Y_{ijt}=k)}{P(Y_{ijt}=ref)}\right) = Family_{ijt} + Country_j + Year_t + X_{ijt} + \varepsilon_{ijt}$$

$$(1)$$

where i refers to the individual, j to the country, and t to the year. The model includes the main independent variable on family arrangements ($Family_{ijt}$), a vector of individual-level control variables (X_{ijt}), the country and year fixed effects ($Country_j$ and $Year_t$), and the error term (ε_{ijt}). Y_{ijt} indicates the categorical response variable (cannabis user, binge drinker, and tobacco user) with three levels (no, occasional, and regular). We assume 'occasional' as the reference category (ref). The relative risk ratios (RRRs) associated with the levels 'no' and 'regular' (k) should be interpreted relative to both the reference category of the dependent variable and the reference category of the categorical independent variables. For a more accessible interpretation, in the following section, the models' results will be presented in the form of predicted probabilities of not being a user and being a regular user, which are the quantities of greatest interest. The predicted probabilities of being an

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[7] The Pearson correlation coefficients among the indicators hover around 0.5.

occasional user are provided in **Figure A2** in the Supplementary Materials. Full models with RRRs

are available in the Supplementary Materials (**Table A7**, **Table A8**, and **Table A9**).

Our second hypothesis tests whether the diffusion of the SDT at the societal level shapes the

relationship under study. To this aim, we augment the previous model with the index of SDT-related

family behaviors, decomposed into a country-mean $(\overline{SDT}_j)$ and a de-meaned component $(\widetilde{SDT}_{jt})$,

obtained by subtracting the country mean from the time-varying index (Fairbrother 2014). The model

includes the two components in interaction with the family arrangement.[8] The augmented model

looks as follows:

$$\ln\left(\frac{P(Y_{ijt}=k)}{P(Y_{ijt}=K)}\right) = Family_{ijt} + \overline{SDT}_j + Family_{ijt} \times \overline{SDT}_j + \widetilde{SDT}_{jt} + Family_{ijt} \times \widetilde{SDT}_{jt} + \quad (2)$$
$$+ Year_t + X_{ijt} + \varepsilon_{ijt}$$

The $Family_{ijt} \times \overline{SDT}_j$ element of equation (2) captures possible changes in the association

between family arrangements and substance use at different levels of diffusion of SDT-related family

behaviors across the selected countries (between-country hypothesis, H2a). It is crucial to note that

the between-country analysis may be influenced by other enduring characteristics of the countries,

such as cultural values, economic conditions, and regulations about substance use that show limited

change over time. On the other hand, the $Family_{ijt} \times \widetilde{SDT}_{jt}$ element of equation (2) explores changes

in the relationship under study as the diffusion of unconventional family practices evolves *within* the

country (within-country hypothesis, H2b).

4. Results

4.1 Non-intact families and adolescents' risks of substance use

The first model analyzes whether adolescents living in non-intact families experience higher risks of

cannabis, alcohol, and tobacco use compared to those living with both parents, net of control

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[8] The SDT components are included linearly in the model, but results remain virtually unchanged when included in a
quadratic form.

variables. **Figure 1** shows 83.4%[9] confidence intervals around predicted probabilities of being a regular user (top panels) and not being a user (bottom panels) of each substance for each family arrangement (full models are presented in **Table A7**, **Table A8**, and **Table A9** in the Supplementary Materials).

Living in any type of non-intact family significantly increases the risk of either cannabis, alcohol, or tobacco use. Absolute differences in tobacco use across family arrangements are the most pronounced, followed by differences in binge drinking and cannabis use. These disparities depend on the prevalence of each substance use. The likelihood of regular tobacco use is higher compared to that of being a regular binge drinker, and the use of cannabis is less widespread than binge drinking. This leaves limited 'room' to observe large differences across family types in the probability of cannabis use compared to tobacco and alcohol use. Still, adolescents living in a no-parent family exhibit the highest probability of being regular users of cannabis (7.0%), followed by those living in a stepfamily (5.9%), single-parent family (5.2%), and, lastly, two-parent family (3.1%). The predicted probabilities of regular binge drinking range from 18.6% (for adolescents in stepfamilies) to 13.0% (for those living in two-parent families). Regarding the use of tobacco, the likelihood of being a regular user is substantially higher for adolescents living in a stepfamily (27.4%) compared to those living with both parents (15.7%), with adolescents living in single-parent and no-parent households in between these two groups. The higher risks of substance use for children in non-intact vs. intact families are statistically significant at the 5% level for all outcomes. The probabilities of not being users are rather symmetrical with those of being regular users. As a result, the gaps between adolescents in intact and non-intact families in the likelihood of being occasional substance users are rather small (**Figure A2** in Supplementary Materials). In fact, differences in the probabilities of not using substances between family types are slightly more pronounced, particularly for tobacco use,

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[9] The use of 83.4% confidence intervals allows for a 5% probability of Type I error in pair-wise comparisons (Goldstein & Healy, 1995; Knol *et al.* 2011). That is, non-overlapping 83.4% confidence intervals indicate a statistically significant probability difference at the 5% level.

where the gap between adolescents in two-parent families and those in stepfamilies reaches 15 percentage points (pp).
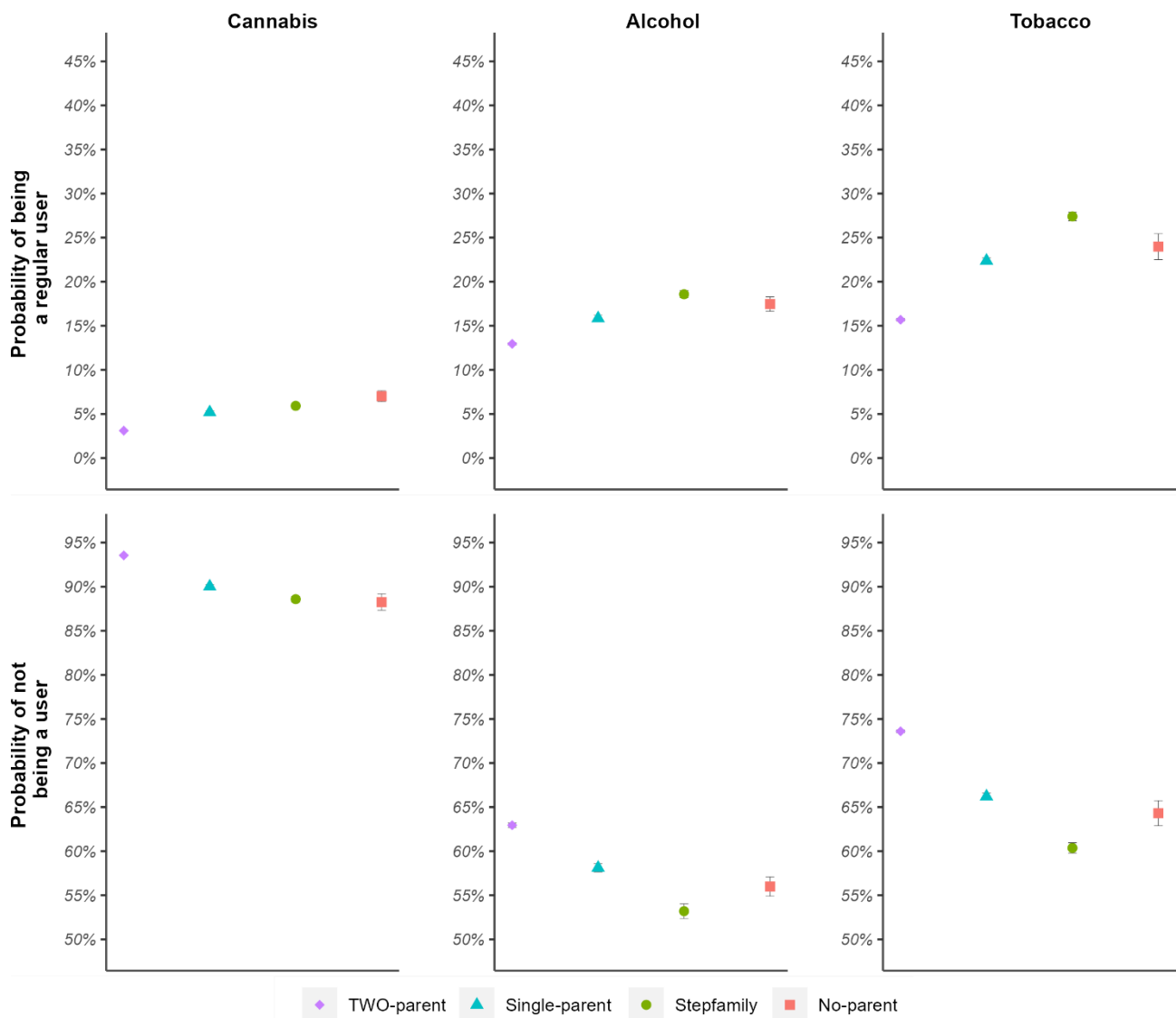
Figure 1 Predicted probabilities of being a regular user (top panels) and not being a user (bottom panels) of cannabis, alcohol, and tobacco according to the family arrangement.

Note: Estimates from a multinomial logistic regression (Model 1). 83.4% confidence intervals based on two-way clustered standard errors.

In a nutshell, for adolescents living in a non-intact family, the probabilities of regularly using cannabis, alcohol, and tobacco are systematically higher than for those living with both parents. Adolescents in stepfamilies are at the highest risk of substance use, followed by those in no-parent families and then single-parent families.

4.2 Testing the institutionalization hypothesis

By applying equation (1), we verified our hypothesis H1 that adolescents from non-intact families are more likely to engage in the use of cannabis, alcohol, and tobacco compared to their peers living with both parents. Our analysis encompassed countries at very different stages of the SDT, observed across 21 years marked by substantial demographic and behavioral transformations. Despite controlling for the wave years and countries of residence, equation (1) does not allow us to assess whether the diffusion of SDT-related family behaviors has mitigated the higher risks of substance use for children in non-intact families, in line with the institutionalization hypothesis. To address this point, we employ equation (2), which includes the country means of the SDT index, its yearly deviations, and their interactions with family arrangements. Results are presented as predicted probabilities of regularly using and not using cannabis, alcohol, and tobacco for adolescents in each family arrangement at equidistant percentiles of the between-country (**Figure 2**) and the within-country components (**Figure 3**) of the index.[10]

       Figure 2 shows that in most instances, as the level of diffusion of SDT-related family behaviors increases, adolescents are slightly *more* at risk of using substances, while the likelihood of not being a user reduces. This is particularly true for adolescents in non-intact families, a result that directly contradicts our hypothesis H2a. Children living with both parents are less likely to engage in the regular use of all substances, irrespective of the level of SDT diffusion (top panels). Similarly, the probabilities of not being a substance user (bottom panels) for adolescents in intact families consistently stand above those of adolescents in non-intact families. In countries with low (average) levels of the SDT index ($\overline{SDT_j}$ at the 17th percentile), the probability of regular cannabis use for children in no-parent families (6.2%) exceeds that for children in two-parent families (2.8%) with a difference of 3.4 pp. The penalty gap is slightly more pronounced (4.0 pp) in countries with high

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[10] Percentiles of the country-mean component ($\overline{SDT_j}$) are 3.7 (17th), 4.1 (33rd), 6.2 (50th), 6.6 (67th), and 7.0 (83rd). Percentiles of the de-meaned component ($\widetilde{SDT_{jt}}$) are -0.7 (17th), -0.3 (33rd), 0.1 (50th), 0.3 (67th), and 0.7 (83rd).

levels of the SDT index (83rd percentile). Regarding the probability of being a regular alcohol user, the penalty of adolescents in stepfamilies, compared to children in two-parent families, is only 2.9 pp and not statistically significant in cases of low levels of the SDT index but increases to 6.8 pp (statistically significant at the 5% level) in cases of high levels. Adolescents in stepfamilies are also those at the highest risk of regular tobacco use. Their penalty compared to adolescents living with both parents is stable at around 12.0 pp across different levels of diffusion of SDT-related family behaviors. Children in no-parent families are, instead, more penalized in their susceptibility to tobacco in countries with higher levels of the SDT index (gap of 10.5 pp) compared to countries with lower levels (8.1 pp).

The gaps in the probability of not being a substance user confirm that the disadvantage of children in non-intact families does not reduce in countries with a high level of diffusion of SDT-related family behaviors (**Figure 2**, bottom panels). In fact, at higher levels of diffusion the gaps in the probabilities of not being a substance user slightly intensify, especially in terms of alcohol consumption among adolescents in stepfamilies. While these results contradict the institutionalization hypothesis, at least when tested from a between-country perspective, they align with existing literature on changes in the non-intact penalties in children's educational outcomes.

Results concerning the moderating role of within-country variations in the SDT diffusion are shown in **Figure 3**. Adolescents in two-parent families consistently exhibit the lowest risks of regularly using all substances, while those in no-parent families face the highest risk of regular cannabis use and those in stepfamilies are the most at risk of regular binge drinking and tobacco use (top panels). Differently from what emerged from the between-country analysis, the penalties show virtually no changes at varying degrees of diffusion of new family behaviors. Similarly, the non-intact penalties in the probabilities of not using substances (**Figure 3**, bottom panels) show remarkable stability at different stages of SDT diffusion.
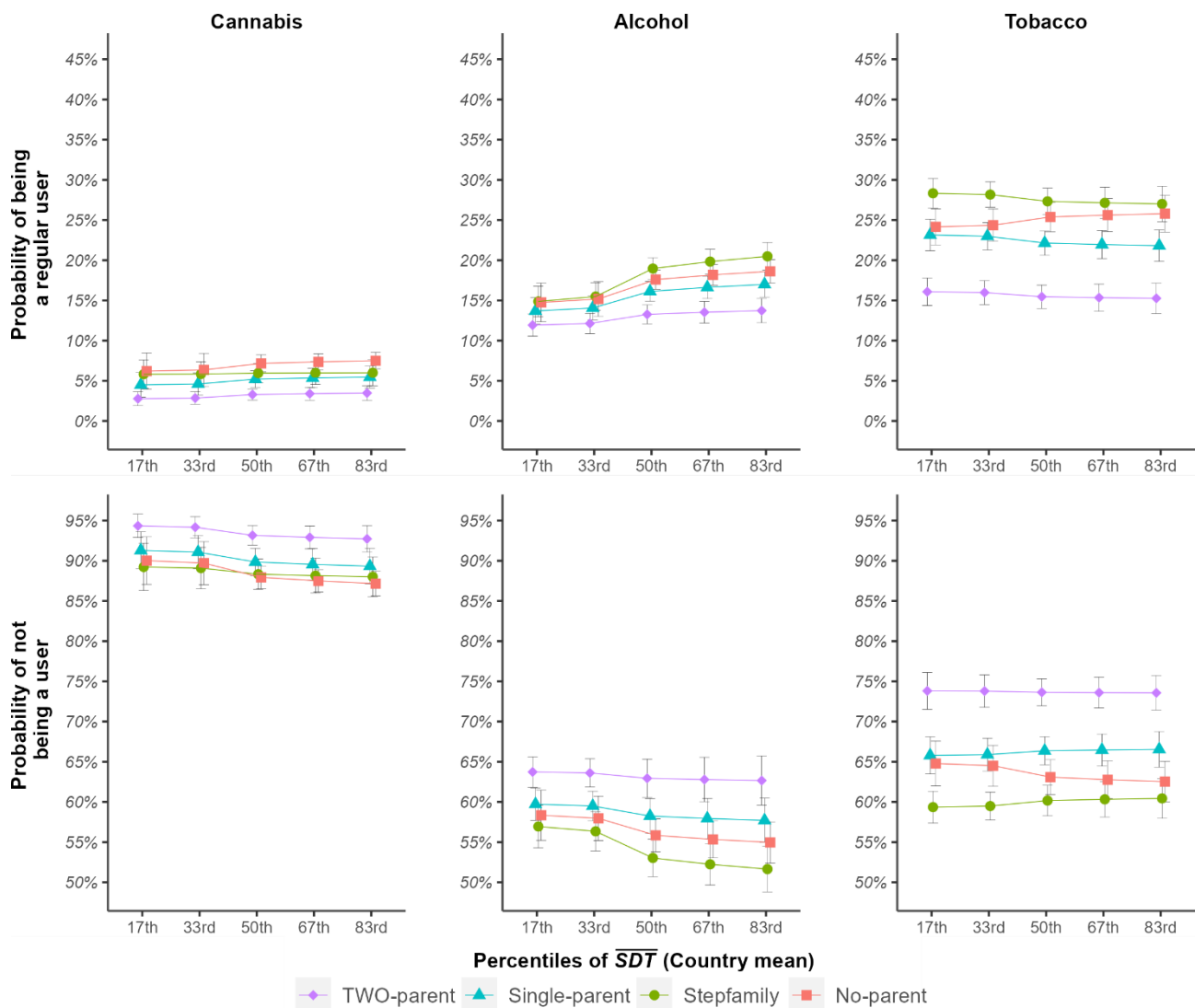
Figure 2 Predicted probabilities of being a regular user (top panels) and not being a user (bottom panels) of cannabis, alcohol, and tobacco for different family arrangements at equidistant percentiles of the between-country component of the SDT index (30 countries).

Note: Estimates from a multinomial logistic regression (Model 2). 83.4% confidence intervals based on two-way clustered standard errors.

Our findings indicate that in countries with a higher average level of diffusion of new family behaviors, i.e., where the SDT is at its most advanced stages, adolescents in non-intact families experience slightly higher risks of substance use. Conversely, within-country variations in the diffusion of the SDT, not influenced by unobserved time-constant country characteristics, do not significantly alter the penalties for non-intact families. This implies that our within-country hypothesis H2b is not confirmed, as the negative association between non-intact families and

adolescents' substance use does not weaken as SDT-related family behaviors become more common within a country.
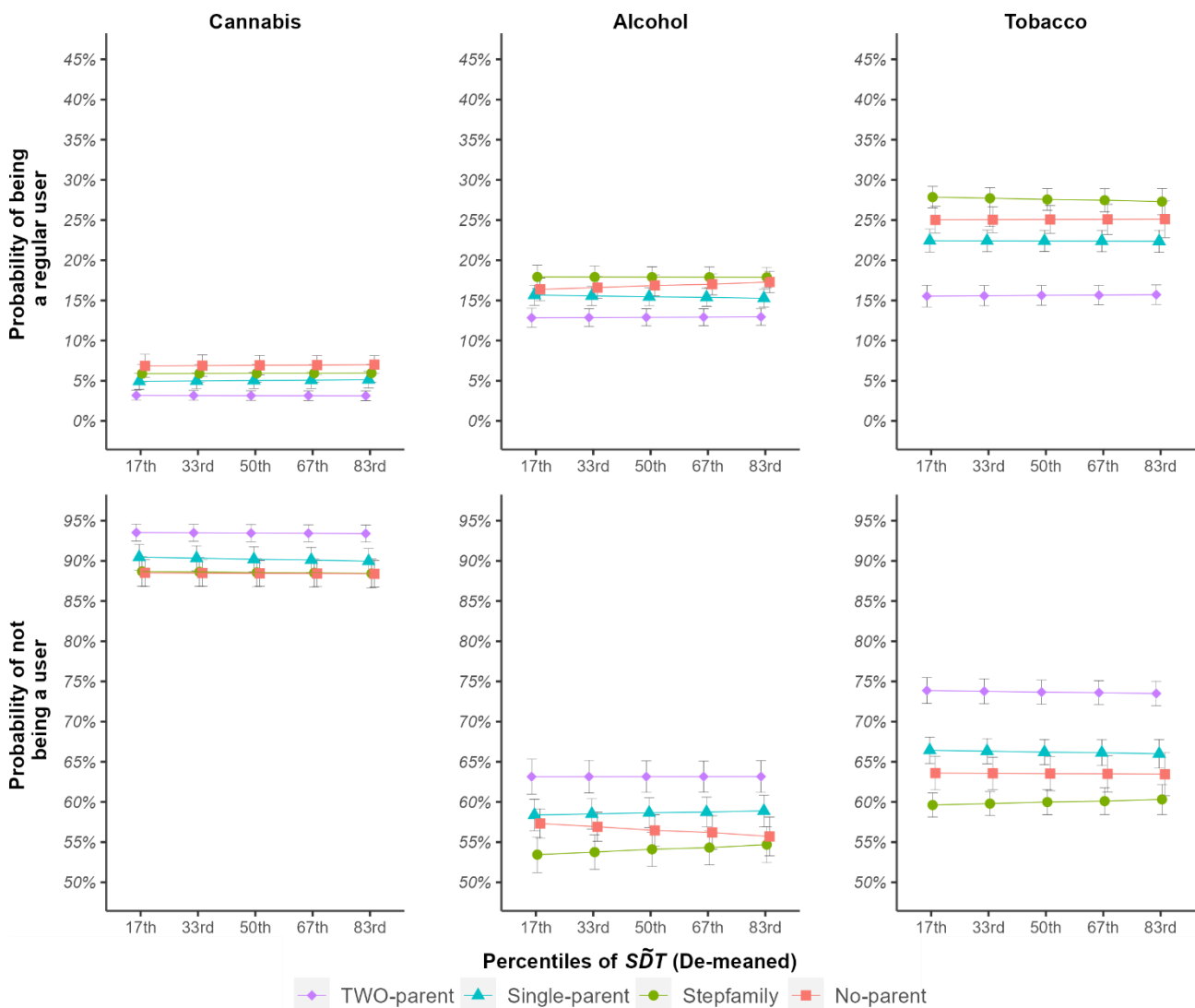

Figure 3 Predicted probabilities of being a regular user (top panels) and not being a user (bottom panels) of cannabis, alcohol, and tobacco for different family arrangements at equidistant percentiles of the within-country component of the SDT index.

Note: Estimates from a multinomial logistic regression (Model 2). 83.4% confidence intervals based on two-way clustered standard errors.

4.3 Robustness checks

There is no standard definition for occasional and regular consumption of cannabis, alcohol, and tobacco among adolescents, with many studies only distinguishing between consumers and non-consumers. Although our definitions are somewhat arbitrary, we try to adhere to definitions already

used in previous studies (Morgan *et al.* 1999; Ledoux *et al.* 2002; Griesbach *et al.* 2003; Khlat *et al.* 2020). Potentially critical is the definition of regular binge drinking as the consumption of five or more drinks on a single occasion *more than twice* in the last month. Consequently, we implemented additional models defining binge drinking as regular if the adolescent consumed five or more drinks on a single occasion *more than once* in the last month.[11] With this operationalization, the overall probability of being a regular binge drinker increases by approximately 10 pp. However, our main conclusions do not change: adolescents in stepfamilies are still found to be the most at risk of regular binge drinking, with an 8 pp higher probability than children in two-parent families, followed by those in no-parent families and then single-parent families. These non-intact penalties are slightly greater in countries where the SDT is at more advanced stages and remain stable at different within-country levels of SDT diffusion.

The diffusion of SDT-related family behaviors is often traced back to ideational changes, including a detachment from traditional religious beliefs (Surkyn & Lesthaeghe 2004). Our SDT index may thus capture between-country and within-country differences in cultural factors, most importantly the level of secularization. This may introduce a bias since societies with higher levels of secularization may be more permissive toward adolescents' use of cannabis, alcohol, and tobacco. We implemented additional models including the proportion of people attending religious events less than once a week in each country and year (Brzozowska 2021), based on data from the European Social Survey (ESS). We assigned to each country-year combination the national level of church attendance in the preceding year, when available, and that of the subsequent year otherwise (the ESS and ESPAD are conducted in different years). The variable is then split into three classes based on terciles (including a category for country-year combinations with missing information) and included in equation (2) in interaction with family arrangements. Our results concerning the interactions

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[11] The results of all the robustness checks discussed in this paragraph are available upon request to the authors.

between family arrangements and the between- and within-components of the SDT index remain unchanged.

Finally, while the results of the within-country analysis are not affected by time-constant unobserved heterogeneity at the country level, they may still be influenced by time-varying unobserved heterogeneity. For this reason, we augmented equation (2) by incorporating an interaction between family arrangements and the survey year to control for potential changes over time in non-intact penalties unrelated to changes in the SDT diffusion process: the results remain virtually unchanged.

5. Conclusion and discussion

Substantial evidence indicates that children in non-intact families tend to experience higher risks of substance use compared to those living with both parents. The institutionalization hypothesis suggests that the penalty for children living in non-intact families should weaken–or even vanish–as family behaviors typical of the SDT become more prevalent and socially accepted. Very few studies adopted a comparative approach to explore how societal characteristics moderate the association between family arrangements and adolescents' outcomes, and particularly scant is the evidence about substance use. Cross-national studies often use relatively coarse indicators, such as the crude divorce rate, to measure the diffusion of SDT-related family behaviors. Most importantly, cross-national studies may be biased by unobserved confounding as countries with varying divorce rates or proportions of single-parent families may also differ in other economic, cultural, and institutional aspects. In this paper, we contribute to the literature by exploiting a unique dataset that spans 21 years across 30 European countries. Unlike most cross-national studies, we focus on between-country and within-country (over time) variation, the latter allowing for a more robust test of the institutionalization hypothesis as within-country changes in the diffusion of SDT-related family behaviors are not influenced by time-constant unobserved characteristics of the countries.

Our results show that adolescents living in any type of non-intact family are more likely to regularly use cannabis, alcohol (binge drinking), and tobacco compared to their peers living with both parents. This is likely due to the increased stress and reduced parental supervision associated with family disruptions. Adolescents living in a stepfamily are more at risk of substance use than those in a single-parent family. This finding is not new in the literature (e.g., Conway *et al.* 2013) and can be interpreted in light of a multiple-transition perspective. The arrival of a step-parent into the household can introduce additional sources of stress, thereby complicating the child's adjustment compared to children who live stably with a single parent from birth or following parental separation (Amato 2010). Also, step-parents are generally less involved in their partner's children than their biological children (Arat *et al.* 2022), which may result in lower supervision.

The penalties associated with non-intact families in substance use do not depend on the level of diffusion of SDT-related family behaviors. While the between-country analysis replicates the cross-national findings of increasing non-intact penalties in educational outcomes in countries with higher divorce rates (Bernardi & Radl 2014; Kreidl *et al.* 2017; Guetto *et al.* 2022), the within-country analysis shows virtually no changes. One potential interpretation for the lack of support for the institutionalization hypothesis is that it might overestimate the influence of cultural and regulatory changes associated with the spread of SDT-related family behaviors in mitigating the non-intact penalties. For example, factors such as the inter-parental conflict that typically accompany the separation process or the diminished frequency and quality of post-separation parent-child interactions may outweigh the significance of social stigma in this context. The regulation of post-divorce family arrangements (e.g., the increase in shared custody) and the normative acceptance of union dissolutions may thus not mitigate the increased stress and reduced parental supervision induced by parental separation.

Another reason could be related to how we operationalize the institutionalization of divorce and post-separation families, which highlights the limitations of our analytical framework. Like virtually all existing studies on the issue, we do not explicitly incorporate measures of societal

acceptance of union dissolutions and family diversity. Unfortunately, we are unaware of any harmonized data on attitudes toward divorce and family diversity across all selected countries during the two decades under study. While this concern is valid, we emphasize that divorce rates show a strong and positive correlation with permissiveness toward divorce, both at the individual (Sieben & Verbakel 2013) and country level (Toth & Kemmelmeier 2009). Therefore, it is unlikely that the lack of support for the institutionalization hypothesis can be solely or predominantly attributed to the selected contextual indicators. An additional major limitation concerns the lack of information on the timing of parental separation or re-partnering and, more generally, the lack of longitudinal data at the individual level.

These limitations notwithstanding, our findings suggest that the detrimental impacts of non-intact families on adolescents' substance use are likely to require specific attention even in contexts where parental union dissolutions have become institutionalized. In sum, by demonstrating that the higher risks of substance use for adolescents in non-intact families persist regardless of the diffusion of new family behaviors, our study provides robust evidence against the institutionalization hypothesis across 30 European countries and two decades.

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Supplementary Materials

Table A1 Country and years included in the analyses.

Country	1999	2003	2007	2011	2015	2019	Total
Austria		2,348	2,568		3,684	4,360	12,960
Belgium		2,263	1,888				4,151
Bulgaria		2,665	2,352	2,214	2,918	2,863	13,012
Croatia		2,850	3,003	3,000	2,554	2,772	14,179
Czechia	3,534	3,143	3,897	3,909	2,722	2,768	19,973
Denmark	1,542	2,496	875	2,177	1,667	2,483	11,240
Estonia		2,429	2,367	2,455	2,448		9,699
Finland	2,997	3,215	4,976	3,741	4,045	4,588	23,562
France	2,263	2,276	2,912	2,571	2,710		12,732
Georgia					1,959	3,062	5,021
Germany		4,216	5,004	2,793	862		12,875
Greece	2,195	1,890	3,059	5,907	3,201		16,252
Hungary	2,719	3,096	2,792	3,039	2,721	2,406	16,773
Iceland	3,444	3,301	3,503	3,312			13,560
Ireland			2,216		1,467		3,683
Italy	2,885	4,815	9,932	4,829		2,538	24,999
Latvia		2,805	2,268	2,615	1,117	2,735	11,540
Lithuania		5,024	2,401	2,470	2,567	2,384	14,846
Netherlands	2,613		2,090	2,037	1,683	1,288	9,711
North Macedonia			2,447			2,925	5,372
Norway	3,749		3,477	2,934	2,577	4,309	17,046
Poland	3,265	5,835	2,116	5,926	11,801	5,038	33,981
Portugal	3,576	2,918	3,140	1,965	3,456	4,364	19,419
Romania	2,365	4,312	2,287	2,764	3,493	3,749	18,970
Serbia			6,152	6,081		3,525	15,758
Slovakia	2,430	2,120	2,443		2,206	2,247	11,446
Slovenia	2,345	2,755	3,079	3,183	3,480	3,411	18,253
Sweden	3,264	3,199		2,566	2,547	2,542	14,118
Switzerland		2,568	2,498				5,066
Ukraine			2,445	2,210	2,349	2,726	9,730
Total	45,186	72,539	88,187	74,698	70,234	69,083	419,927

Table A2 Descriptive statistics on all models' variables (N=419,927).

Variables	N	%
Cannabis user		
No	385,307	91.76
Occasional	15,708	3.74
Regular	15,643	3.73
Missing	3,269	0.78
Binge drinker		
No	244,740	58.28
Occasional	97,921	23.32
Regular	55,333	13.18
Missing	21,933	5.22
Tobacco user		
No	297,853	70.93
Occasional	46,043	10.96
Regular	74,912	17.84
Missing	1,119	0.27
Family type		
Two-parent family	308,992	73.58
Single-parent family	58,676	13.97
Stepfamily	32,959	7.85
No-parent family	12,916	3.08
Missing	6,384	1.52
Year of ESPAD		
1999	45,186	10.76
2003	72,539	17.27
2007	88,187	21.00
2011	74,698	17.79
2015	70,234	16.73
2019	69,083	16.45
Biological sex		
Male	204,243	48.64
Female	215,684	51.36
Father's education		
Completed primary school or less	34,015	8.10
Some secondary school	51,370	12.23
Completed secondary school	112,322	26.75
Some college/university	42,158	10.04
Completed college/university	96,556	22.99
Unknown, does not apply	63,611	15.15
Missing	19,895	4.74
Mother's education		
Completed primary school or less	31,460	7.49
Some secondary school	43,837	10.44
Completed secondary school	117,409	27.96
Some college/university	48,974	11.66
Completed college/university	110,456	26.30

Unknown, does not apply	49,882	11.88
Missing	17,909	4.26
Perceived socio-economic status of the family		
Much better than that of other families	61,577	14.66
Better off	98,378	23.43
About the same	203,258	48.40
Less well off	39,446	9.39
Missing	17,268	4.11
Presence of grandparent(s)		
No	346,668	82.55
Yes	63,534	15.13
Missing	9,725	2.32
Presence of sibling(s)		
No	97,390	23.19
Yes	295,312	70.32
Missing	27,225	6.48

Table A3 Categorization and distribution of the 'Cannabis user' variable.

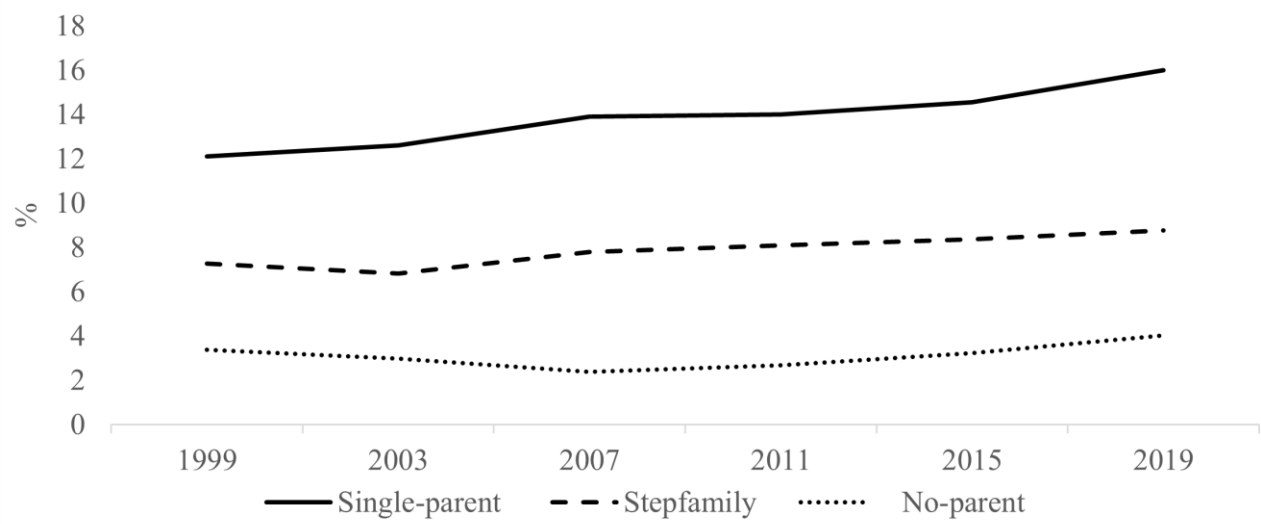| Recategorized variable: Cannabis user (%)	ESPAD question: **On how many occasions (if any) have you used cannabis in the last 30 days? (%)**								
	No answer	0	1-2	3-5	6-9	10-19	20-39	40+	Total
Missing	0.78								0.78
No		91.76							91.76
Occasional			3.74						3.74
Regular				1.38	0.82	0.69	0.37	0.46	3.72
Total	0.78	91.76	3.74	1.38	0.82	0.69	0.37	0.46	100.00

Table A4 Categorization and distribution of the 'Binge drinker' variable.

Recategorized variable: Binge drinker (%)	ESPAD question: **Think back again over the last 30 days. How many times (if any) have you had five or more drinks on one occasion? (%)**								
	Not included	No answer	None	1	2	3-5	6-9	10+	Total
Missing	4.63	0.59							5.22
No			58.28						58.28
Occasional				13.97	9.35				23.32
Regular						8.24	2.82	2.12	13.18
Total	4.63	0.59	58.28	13.97	9.35	8.24	2.82	2.12	100.00

Table A5 Categorization and distribution of the 'Tobacco user' variable.

Recategorized variable: Tobacco user (%)	ESPAD question: **How often have you smoked cigarettes (excluding e-cigarettes) during the last 30 days? (%)**								
	No answer	Not at all	Less than 1 cigar. Per week	Less than 1 cigar. Per day	1-5 cigar. Per day	6-10 cigar. Per day	11-20 cigar. Per day	More than 20 cigar. Per day	Total
Missing	0.26								0.27
No		70.93							70.93
Occasional			7.15	3.82					10.96
Regular					7.68	5.24	3.24	1.68	17.84
Total	0.26	70.93	7.15	3.82	7.68	5.24	3.24	1.68	100.00

Figure A1 Shares of non-intact families over time controlling for the different country compositions of each wave.

Table A6 Summary statistics on the index of SDT-related family behaviors and its components.

Country	Divorce rate			% births outside marriage			Total 1st marriage rate (women)			SDT index		
	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max
Austria	45.10	35.40	57.00	39.06	35.27	42.09	0.56	0.49	0.62	6.19	5.52	7.02
Belgium	70.55	66.00	75.10	38.97	34.73	43.22	0.48	0.47	0.49	7.75	7.72	7.78
Bulgaria	43.74	37.20	55.20	53.88	46.13	58.60	0.52	0.40	0.66	7.09	6.39	8.04
Croatia	26.22	20.70	30.30	15.06	10.15	21.52	0.69	0.64	0.73	3.39	2.82	3.82
Czechia	56.40	44.00	79.30	36.90	20.59	48.20	0.52	0.45	0.65	6.77	5.49	7.73
Denmark	44.33	34.40	56.60	48.79	44.86	54.09	0.67	0.59	0.78	6.17	5.23	7.29
Estonia	57.47	49.60	69.70	57.82	55.94	59.67	0.47	0.41	0.54	8.19	7.40	9.01
Finland	53.08	44.80	59.90	41.65	38.69	45.44	0.59	0.45	0.69	6.55	5.64	7.73
France	48.68	40.70	56.10	51.10	42.74	59.07	0.52	0.46	0.58	7.18	6.07	8.07
Georgia	39.70	31.30	48.10	33.04	32.45	33.64	0.98	0.86	1.11	3.62	2.61	4.63
Germany	49.27	40.80	55.90	31.67	26.98	34.97	0.57	0.54	0.61	5.93	5.51	6.08
Greece	21.76	15.70	29.10	6.13	3.87	8.77	0.69	0.68	0.71	2.66	2.26	3.07
Hungary	51.55	27.00	65.20	37.77	27.96	47.93	0.54	0.39	0.89	6.50	3.77	8.09
Iceland	32.92	30.00	36.00	63.70	62.41	65.03	0.60	0.53	0.66	6.73	6.34	7.27
Ireland	15.55	14.90	16.20	34.83	33.11	36.56	0.58	0.58	0.59	4.42	4.38	4.46
Italy	24.36	12.30	46.40	19.71	8.71	35.41	0.56	0.48	0.62	4.12	2.73	6.41
Latvia	51.50	37.80	77.20	42.39	38.37	44.57	0.63	0.45	0.75	6.34	5.08	8.04
Lithuania	50.48	42.60	62.40	27.91	26.82	29.49	0.76	0.56	0.91	4.89	3.82	6.47
Netherlands	46.04	37.50	53.20	41.95	22.74	52.43	0.51	0.43	0.61	6.61	4.69	7.61
North Macedonia	11.75	9.10	14.40	12.47	12.37	12.57	0.91	0.91	0.91	1.52	1.40	1.64
Norway	43.44	38.90	47.80	54.42	49.07	57.63	0.48	0.40	0.53	7.30	6.61	8.05
Poland	28.90	19.20	35.60	19.69	11.70	25.38	0.64	0.58	0.72	3.99	2.94	4.70
Portugal	55.07	25.70	74.20	38.61	20.85	56.76	0.54	0.39	0.82	6.72	3.06	8.74
Romania	25.17	19.20	33.90	28.58	24.08	31.55	0.82	0.58	1.10	3.44	2.09	5.06
Serbia	24.87	21.00	30.60	24.38	22.31	26.88	0.71	0.67	0.74	3.70	3.33	3.99
Slovakia	37.36	31.90	44.40	29.66	16.86	40.11	0.58	0.51	0.71	5.18	4.73	5.67
Slovenia	35.60	26.90	41.10	50.16	35.38	57.86	0.45	0.40	0.49	6.84	5.48	7.36
Sweden	52.56	47.60	58.90	54.95	54.26	56.00	0.54	0.47	0.63	7.47	6.90	8.13
Switzerland	45.60	41.90	49.30	14.30	12.42	16.17	0.64	0.64	0.64	4.48	4.20	4.76
Ukraine	40.37	17.40	58.00	21.09	20.52	21.88	0.80	0.70	0.89	3.84	2.72	5.13
Total	41.71	9.10	79.30	36.71	3.86	65.03	0.61	0.39	1.11	5.67	1.40	9.01
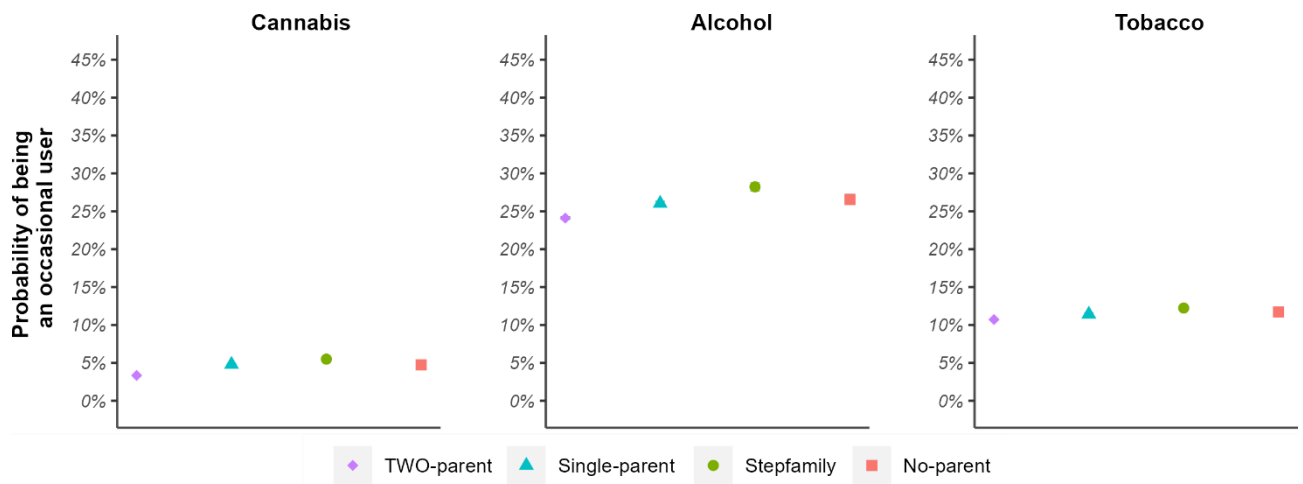
Figure A2 Predicted probabilities of being an occasional user of cannabis, alcohol, and tobacco according to the family arrangement.

Note: Estimates from a multinomial logistic regression (Model 1). 83.4% confidence intervals based on two-way clustered standard errors.

Table A7 Multinomial logistic regression predicting the probability of being a cannabis user.

Variable	Cannabis user	
	Relative Risk Ratios (ref: Occasional user)	
	No	**Regular**
Family type (ref: Two-parent family)		
Single-parent family	0.661*** (0.020)	1.179*** (0.041)
Stepfamily	0.563*** (0.019)	1.178*** (0.050)
No-parent family	0.649*** (0.051)	1.624*** (0.098)
Year of ESPAD (ref:1999)		
2003	0.945 (0.060)	1.091 (0.086)
2007	1.048 (0.074)	0.981 (0.052)
2011	0.944 (0.084)	1.020 (0.066)
2015	0.997 (0.078)	0.993 (0.074)
2019	0.930 (0.061)	0.975 (0.080)
Biological sex (ref: Male)		
Female	1.315*** (0.055)	0.674*** (0.015)
Father's education (ref: Completed primary school or less)		
Some secondary school	1.001 (0.045)	0.953 (0.058)
Completed secondary school	1.040 (0.052)	0.962 (0.059)
Some college/university	0.910** (0.042)	0.924 (0.056)
Completed college/university	0.933 (0.047)	0.922 (0.052)
Unknown, does not apply	1.114** (0.061)	1.069 (0.070)
Mother's education (ref: Completed primary school or less)		
Some secondary school	0.878** (0.052)	1.010 (0.051)
Completed secondary school	0.900** (0.040)	0.952 (0.054)
Some college/university	0.815*** (0.056)	1.023 (0.082)
Completed college/university	0.798*** (0.045)	0.956 (0.063)
Unknown, does not apply	0.896** (0.047)	1.030 (0.060)
Perceived socio-economic status of the family (ref: Much better than that of other families)		
Better off	1.004 (0.047)	0.815*** (0.041)
About the same	1.144*** (0.052)	0.783*** (0.034)
Less well off	0.948 (0.056)	0.902* (0.056)
Presence of grandparent(s) (ref: No)		
Yes	1.144*** (0.033)	0.943* (0.033)
Presence of sibling(s) (ref: No)		
Yes	1.140*** (0.030)	0.905*** (0.029)
Constant	19.481*** (1.906)	1.516*** (0.121)
Individuals	416,658	

Note: Robust standard errors in parentheses. Flags for missing information are included. We do not report estimates of country fixed effects due to space constraints. *p<.10; **p<.05; ***p<.01

Table A8 Multinomial logistic regression predicting the probability of being a binge drinker.

Variable	Bing drinker	
	Relative Risk Ratios (ref: Occasional user)	
	No	**Regular**
Family type (ref: Two-parent family)		
Single-parent family	0.847*** (0.014)	1.139*** (0.023)
Stepfamily	0.710*** (0.021)	1.238*** (0.022)
No-parent family	0.798** (0.028)	1.234*** (0.053)
Year of ESPAD (ref:1999)		
2003	1.062 (0.107)	1.003 (0.061)
2007	0.968 (0.111)	1.122** (0.065)
2011	0.948 (0.116)	1.024 (0.078)
2015	1.153 (0.159)	0.819** (0.064)
2019	1.230 (0.187)	0.924 (0.075)
Biological sex (ref: Male)		
Female	1.254*** (0.050)	0.729*** (0.016)
Father's education (ref: Completed primary school or less)		
Some secondary school	0.952** (0.022)	0.925** (0.032)
Completed secondary school	1.036 (0.025)	0.893*** (0.025)
Some college/university	1.032 (0.038)	0.952 (0.032)
Completed college/university	1.184*** (0.032)	0.900*** (0.026)
Unknown, does not apply	1.160*** (0.030)	0.935** (0.025)
Mother's education (ref: Completed primary school or less)		
Some secondary school	0.889*** (0.032)	0.987 (0.030)
Completed secondary school	0.959 (0.036)	0.966 (0.035)
Some college/university	0.915* (0.046)	0.956 (0.040)
Completed college/university	1.061 (0.052)	0.982 (0.033)
Unknown, does not apply	1.012 (0.039)	1.061* (0.034)
Perceived socio-economic status of the family (ref: Much better than that of other families)		
Better off	1.048*** (0.018)	0.864*** (0.018)
About the same	1.169*** (0.022)	0.827*** (0.020)
Less well off	1.175*** (0.038)	0.891*** (0.027)
Presence of grandparent(s) (ref: No)		
Yes	0.985 (0.022)	1.010 (0.024)
Presence of sibling(s) (ref: No)		
Yes	1.069*** (0.016)	0.990 (0.016)
Constant	0.991 (0.131)	1.183** (0.095)
Individuals	395,530	

Note: Robust standard errors in parentheses. Flags for missing information are included. We do not report estimates of country fixed effects due to space constraints. *p<.10; **p<.05; ***p<.01

Table A9 Multinomial logistic regression predicting the probability of being a tobacco user.

	Tobacco user	
	Relative Risk Ratios (ref: Occasional user)	
Variable	**No**	**Regular**
Family type (ref: Two-parent family)		
Single-parent family	0.837*** (0.014)	1.355*** (0.025)
Stepfamily	0.706*** (0.020)	1.561*** (0.044)
No-parent family	0.791*** (0.025)	1.419*** (0.089)
Year of ESPAD (ref:1999)		
2003	1.260*** (0.089)	1.070 (0.058)
2007	1.471*** (0.116)	0.963 (0.069)
2011	1.287*** (0.118)	0.836** (0.060)
2015	1.709*** (0.172)	0.731*** (0.059)
2019	1.733*** (0.176)	0.579*** (0.059)
Biological sex (ref: Male)		
Female	0.842*** (0.020)	0.793*** (0.028)
Father's education (ref: Completed primary school or less)		
Some secondary school	0.959 (0.035)	0.939 (0.037)
Completed secondary school	1.023 (0.027)	0.903*** (0.035)
Some college/university	1.010 (0.036)	0.876*** (0.042)
Completed college/university	1.068** (0.034)	0.783*** (0.031)
Unknown, does not apply	1.117*** (0.038)	1.019 (0.043)
Mother's education (ref: Completed primary school or less)		
Some secondary school	0.944* (0.032)	1.023 (0.046)
Completed secondary school	0.967 (0.029)	0.893** (0.040)
Some college/university	0.948 (0.039)	0.903* (0.051)
Completed college/university	0.969 (0.033)	0.793*** (0.046)
Unknown, does not apply	1.019 (0.037)	1.030 (0.048)
Perceived socio-economic status of the family (ref: Much better than that of other families)		
Better off	1.007(0.021)	0.854*** (0.020)
About the same	1.082*** (0.018)	0.893*** (0.023)
Less well off	1.032 (0.036)	1.016 (0.034)
Presence of grandparent(s) (ref: No)		
Yes	1.016 (0.020)	0.950*** (0.018)
Presence of sibling(s) (ref: No)		
Yes	1.093*** (0.012)	0.953** (0.020)
Constant	3.685*** (0.352)	3.017*** (0.309)
Individuals	418,808	

Note: Robust standard errors in parentheses. Flags for missing information are included. We do not report estimates of country fixed effects due to space constraints. *p<.10; **p<.05; ***p<.01