

Sibling spillover in educational transitions: Differences between full and half siblings and the role of childhood co-residence

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Abstract

Sibling resemblance in educational outcomes reflects both shared family background and direct influence, yet little is known about how sibling type and childhood co-residence shape critical transitions from secondary to tertiary education, where decisions have lasting consequences. Drawing on social interaction, social conformity, and kin selection theories, we hypothesize that siblings act as role models and sources of behavioral reinforcement, while the strength of resemblance varies by sibling type—full, half, or unknown—and the duration of childhood co-residence. Using Dutch register data covering the entire population, we examine whether having a sibling enrolled in or having completed higher education predicts an individual's transition from secondary to tertiary education, and how these associations differ by sibling type and shared co-residence. The analysis focuses on students in their final year of HAVO (grade 5) and VWO (grade 6) secondary-school tracks between 2013 and 2017 and follows them for two years to observe their transition to tertiary education ($N = 217,268$ sibling dyads). Binary logistic regressions show that siblings' higher education enrollment or completion significantly predicts an individual's own transition. Full siblings generally exert stronger associations than half siblings, but half siblings with extended co-residence show comparable influence. These preliminary findings highlight how sibling type and shared upbringing jointly shape educational pathways, with sibling resemblance operating through direct interaction, potential genetic relatedness, and childhood proximity. As the first study to disentangle the roles of sibling type and co-residence history in educational transitions, it offers novel insights into the mechanisms of intragenerational transmission.

Introduction

Upon completing compulsory education, students face critical decisions regarding their post-secondary education pathways. These choices have long-term consequences, shaping future employment opportunities and earnings throughout their careers, potentially reinforcing social inequalities across the life course (Anders & Dorsett, 2017; Pelikh & Rowe, 2024). At the same time, students do not always make optimal *educational transitions* (Pistolesi, 2022). A substantial body of research has shown that educational decisions are strongly influenced by family background, social and peer networks (Pistolesi, 2022; Rosenqvist, 2018a, 2018b). Parental education and income are well-established predictors of children's educational and occupational success (Billari et al., 2019; Björklund & Jäntti, 2012), whereas peers play an important role as agents of socialization and influence. Siblings, interestingly, function as both family and peer influences.

A growing number of studies indicate that siblings tend to resemble each other more closely than unrelated peers in various domains, including education, reflecting both shared environments and potential direct influence (Her et al., 2022; Karhula et al., 2019; Pelikh & Henderson, 2025; Raab et al., 2014). Researchers have also increasingly turned to examining cross-sibling effects in siblings' life-course trajectories (Buyukkececi & Leopold, 2020; de Vuijst et al., 2017; Her et al., 2024; Lyngstad & Prskawetz, 2010; Mulder et al., 2020), showing that older siblings often pave the way while younger siblings tend to follow in their footsteps. These findings suggest that siblings behave similarly either due to shared intergenerational transmission or via mutual learning (Her, 2024). To date, however, while sibling correlations in educational outcomes have been documented, showing that siblings are similar in terms of grades, test scores (Lindahl, 2011), school and employment trajectories (Karhula et al., 2019; Pelikh & Henderson, 2025), and educational attainment (Sieben et al., 2001), most studies focused on educational attainment and aspirations rather than on educational transitions, and have primarily used sibling resemblance to estimate family background effects. We tracked only a handful of studies that zoomed in on educational transitions (Aguirre & Matta, 2021; Altmejd et al., 2021; Goodman et al., 2015). For example, Goodman et al. (2015) found that younger siblings were more likely to enroll in a four-year or competitive college when their older siblings had done so, suggesting a possible modeling or guidance effect. Examining educational transitions offer unique insights into the process underlying educational inequalities and family resemblance (Altmejd et al., 2021).

The degree of sibling similarity and influence can be linked to several factors, such as age gap, gender composition, birth order, and relationship closeness (Her et al., 2021). What remains underexplored, however, is the potential variation by sibling type (e.g., full or half siblings), which may reflect underlying genetic and family background differences (Slomkowski et al., 2005; Steinbach & Hank, 2018). Given this gap in the literature and the increased family complexity, with more children are growing up now with non-biological siblings (Thomson, 2014), this study aims to understand the extent to which sibling similarity in the transition to tertiary education is affected by sibling type. It is important to note that childhood co-residence plays a crucial role in shaping sibling relationship quality (Pollet, 2007; Tanskanen & Danielsbacka, 2019), which in turn affects the degree of sibling resemblance or influence (Her & Kalmijn, 2024; Slomkowski et al., 2005). Half siblings who spend a substantial part of their childhood living together tend to have stronger

relationships than those who do not, and their relationship quality may even be similar to that of full siblings.

In this study, the goal is not to establish causal influence, but rather to examine the extent to which siblings' educational transitions from secondary to tertiary education are associated. Importantly, we aim to explore the conditions under which siblings behave more (or less) similarly by focusing on how the association varies by sibling type and duration of childhood co-residence. We utilize Dutch register data from the System of Social and Statistical Datasets (SSD) provided by Statistics Netherlands. We focus on individuals who were in the final year of secondary education between 2013 and 2017 and follow them for two years to observe whether their transition to tertiary education. In total, our sample consists of 217,268 sibling dyads. The Dutch context provides a particularly suitable setting for this study, as students are generally free to choose their post-secondary educational programs. This institutional openness allows for a clearer assessment of sibling similarity beyond formal access constraints. To our knowledge, this study is the first to disentangle whether and how sibling type and shared co-residence history shape the degree of sibling resemblance, in educational transitions and beyond, thereby offering novel insights into the mechanisms of intragenerational transmission.

Theoretical background

Sibling and family influence

As the most enduring, egalitarian, and peer-like family ties, siblings may influence each other in various domains of behavior, such as smoking (Slomkowski et al., 2005), school dropout (Dupéré et al., 2021), and delinquent behaviors (Whiteman et al., 2014), as well as in major life-course transitions, including *educational transition* (Goodman et al., 2015), leaving the parental home (Her et al., 2022), and family formation (Buyukkececi & Leopold, 2020; Lyngstad & Prskawetz, 2010). Two main theoretical foundations have been used to explain such sibling similarity, or potential sibling influence. The first is *social interaction theory* (Bandura, 1977; Bernardi, 2003; Rossier & Bernardi, 2009), which suggests that siblings actively shape each other's attitudes and behaviors through shared experiences, communication, and observation—a process also known as the “spillover” effect. Because they spend a significant amount of time together during childhood and adolescence, they serve as salient role models and sources of behavioral reinforcement. Such effect may be further reinforced by several moderators, including siblings' age spacing, gender composition, and relationship quality (Her et al., 2021)—likely because siblings who are closer in age or of the same gender tend to share stronger emotional bonds and interact more frequently (Burger et al., 2004; Killoren & Roach, 2014). The second is *social conformity theory* (Abrams & Hogg, 1990; Cialdini & Goldstein, 2004; Kelley, 1952), which posits that individuals tend to align their behaviors and decisions with those of close others, such as siblings and peers, to maintain social harmony, gain approval, or avoid conflict. Both perspectives emphasize that siblings can mutually influence one another's choices and trajectories, especially in periods of uncertainty or transition, resulting in their life paths frequently converging. Educational transitions, representing key decision points in the life course, is a good example where individuals actively choose among available options, often under uncertainties. This, in turn, makes them more likely to turn to information, advice, and behavioral models provided by their siblings (Cialdini & Goldstein, 2004).

Family background is another important theoretical perspective explaining sibling similarity. Because siblings grow up in the same household and social environment, it is often difficult to determine whether their behavioral similarities arise from direct mutual influence or from shared contextual factors related to their upbringing (Her, 2024; Manski, 1993). Extensive research has established that parental characteristics, such as education, income, values, and parenting style, strongly shape children's educational and life-course outcomes (Billari et al., 2019; Björklund & Jäntti, 2012). For instance, parents with higher education levels tend to invest more time and resources in their children's learning, provide stronger academic support, and foster higher educational aspirations, which can lead siblings to achieve similar outcomes even in the absence of direct influence between them (Björklund et al., 2010). Moreover, birth order and number of siblings are also important in shaping one's educational trajectories (Bu, 2016; Conley & Glauber, 2008; Jæger, 2009; Kalmijn & van de Werfhorst, 2016; van Eijck & de Graaf, 1995). Findings generally indicate that first-born children tend to achieve more favorable outcomes than later-born siblings, a pattern commonly explained by the *resource dilution hypothesis* (Blake, 1981; Downey, 1995). According to resource dilution theory, as the number of siblings increases, parental resources—such as time, attention, and financial support—are divided among more children, leaving later-born siblings with fewer resources and, consequently, lower educational attainment (Jæger, 2009).

Full vs half siblings and childhood co-residence

Although a growing number of studies have documented sibling influence on life course transitions, most have focused exclusively on full siblings (de Vuijst et al., 2017; Lyngstad & Prskawetz, 2010; Pelikh & Henderson, 2025), leaving the influence of other sibling types largely unexplored. At the same time, since the 1960s, Europe has observed a rise in parental separation and re-partnering, leading to increasingly complex family structures and more diverse sibling constellations (Thomson, 2014). As a result, an increasing number of children now grow up with half or step siblings.

On average, individuals share 50% of their genes with full siblings, 25% with half siblings, and none with step or adopted siblings. According to the *kin selection theory* (Hamilton, 1964), individuals are expected to invest more in relationships with full siblings than in other types of sibling relationships, including half, step, or adopted siblings, due to higher genetic relatedness. In line with kin selection theory, studies concerning genetic relatedness and sibling relationship have demonstrated that full siblings generally have closer sibling relationships than half siblings (Pollet & Hoben, 2011; Tanskanen & Danielsbacka, 2014). Similarly, White and Riedmann (1992) showed that U.S. adults tend to contact their full siblings more frequently than half siblings, while Pollet and Nettle (2009) found that people are more likely to know whether their full siblings, compared to their half siblings, were deceased.

As much as genetic relatedness matters, *childhood co-residence* between siblings also serves as an important kin detection indicator from an evolutionary point of view (Bressan et al., 2009; Tanskanen & Danielsbacka, 2019). Human do not identify someone as kin or a close relative solely on the grounds of shared genes but also based on social and spatial cues (Bressan & Kramer, 2015; Lieberman et al., 2007). The greater involvement observed among maternal half-siblings, compared to paternal half-siblings, has often been

attributed to differences in childhood co-residence (Pollet, 2007; Tanskanen & Danielsbacka, 2014). In many Western societies, children typically live with their mothers following parental separation, resulting in maternal half-siblings spending, on average, more years growing up together (Gyuris et al., 2020). However, this pattern is not universal: some maternal half-siblings may not be raised together, while certain paternal half-siblings may share long periods of co-residence. Therefore, the actual duration of co-residence provides a more accurate indicator of childhood proximity than the sibling type alone.

Consistent with evolutionary perspectives, childhood co-residence shapes the quality of sibling relationships, implying that those who grow up together tend to maintain closer relationships in adulthood (Gyuris et al., 2020). Childhood co-residence has also been identified as a strong predictor of sibling altruism (Bressan et al., 2009). Studies suggest that individuals report higher relationship quality with half siblings they have co-resided with compared to those with whom they did not share a household (Tanskanen & Danielsbacka, 2019). Nevertheless, with “all else being equal”, it has been argued that individuals have the inclination to bond more closely with more closely related kin than with more distant relatives (Hamilton, 1964). For example, after controlling for childhood proximity, Dutch adults still reported more face-to-face contact and better relationship quality with their full than with their half siblings (Pollet, 2007). By contrast, Tanskanen and Rotkirch (2019) detected no difference in relationship quality between full and half siblings when they had co-resided with both.

Drawing on the theories of social interaction, social conformity, and kin selection, and prior literature suggesting that closer sibling relationships are associated with stronger influence (Her & Kalmijn, 2024; Whiteman et al., 2007), it is plausible that sibling type interacts with childhood co-residence in explaining the degree of sibling resemblance in educational transitions. Although no study has yet examined this interaction in the context of education, related evidence supports its plausibility. Examining smoking frequency, Slomkowski et al. (2005) found that both shared environmental factors and genetics contribute to sibling similarity in smoking behaviors. However, even when full and half siblings reported the same levels of social connectedness (in terms of time spent together, affection, and shared friends), full siblings remained more strongly correlated in their smoking behavior. This suggests that genetic relatedness continues to play a role beyond social proximity, either because of shared genes or the kin selection mechanism. Building on the theoretical and empirical foundation, we propose the following hypotheses:

H1: Individuals’ educational transitions resemble those of their siblings; specifically, they are more likely to transition to higher education if a sibling has done so.

H2: The association between full siblings’ educational transitions is stronger than that between half siblings.

H3: For half siblings, a longer duration of childhood co-residence strengthens the association in educational transitions, making it comparable to that of full siblings.

According to the kin selection theory (Hamilton, 1964), when individuals have both full and half siblings, the full sibling relationship may be prioritized, despite comparable co-residence duration, leading to stronger behavioral resemblance and influence. Accordingly, we form additionally a complementary hypothesis about relative salience of influence when both sibling types coexist:

H4: When individuals have both full and half siblings, the association between half siblings' educational transitions is weaker than that of full siblings, even when they share a considerable duration of childhood co-residence.

The Dutch education context

In the Netherlands, students are tracked into different types of secondary education based on their academic performance and teacher recommendations at the end of primary school. VMBO programs last four years and primarily prepare students for middle vocational education (MBO), though some students continue to HAVO. HAVO programs last five years and prepare students for higher vocational education, also known as university of applied science (HBO), while VWO programs last six years and provide direct access to university (WO). In 2014, about 45% of students in the Netherlands were placed in the VMBO track following primary education, whereas roughly 20% entered HAVO and 20% entered VWO (Ministry of Education Culture and Science, 2016). Upon completing VMBO, HAVO, or VWO, students face a key transition, choosing whether to continue their education, enter the labor market, or pursue alternative pathways such as a gap year or other types of training. Over the past decade, more Dutch people have obtained higher education degrees, with the share rising from 28% in 2013 to 36% in 2023 (Statistics Netherlands, 2024). In the current study, we focus on students in their final year of HAVO (grade 5) and VWO (grade 6), excluding VMBO students, whose pathways primarily lead to vocational training rather than tertiary study.

Educational transitions in the Dutch context, as in many other countries, reflect broader social inequalities, with parental background and school environment playing decisive roles in shaping students' post-secondary choices (Kuyvenhoven & Boterman, 2021). Three school-related characteristics are generally known to influence students' college decisions: the cost of attendance and availability of financial aid (Avery & Hoxby, 2004; Ovink et al., 2018), the proximity of higher education institutions (Turley, 2009), and the quality of those institutions (Long, 2004). However, unlike in countries such as the United States, the Netherlands' higher education system is publicly funded, making tuition fees relatively affordable and minimizing disparities in school quality. As a result, Dutch students face fewer financial or quality-based constraints when making educational choices, making the Netherlands a particularly suitable context to study educational transitions and sibling spillover. Nevertheless, geographical proximity remains a relevant factor (Sá et al., 2006). For instance, students living in or near major cities such as Amsterdam can often access HBO or WO without relocating, whereas those from more remote regions must consider additional costs and practical challenges related to moving, accommodation, and commuting.

Method

Data and sample

The study draws on Dutch register data from the System of Social and Statistical Datasets (SSD) provided by Statistics Netherlands (Bakker et al., 2014). The SSD covers the entire Dutch population and includes detailed yearly information on educational enrollment (at both secondary and tertiary levels), household characteristics, and family network

linkages, which allow for the identification of individuals' family members, including siblings. These linkages make it possible to connect individuals' educational transitions to those of their siblings.

It is important to note that the SSD distinguishes three sibling types: full, half, and unknown. Full siblings share the same registered parents, which most likely indicates biological relatedness, although this is not always the case (e.g., adopted siblings are also included if they have the same registered parents; sensitivity checks for this will be conducted as outlined in the further steps section). Half siblings share one registered parent, while unknown siblings are cases where individuals share one registered parent but lack information on the other. Upon closer inspection, most "unknown" cases involve individuals with a migration background where the father did not migrate to the Netherlands.

The analytical sample was derived through several selection steps: First, we identified our focal observations—referred to as egos—defined as individuals who were enrolled for the first time in HAVO grade 5 (HAVO 5) or VWO grade 6 (VWO 6) between 2013 and 2017 (t). We then followed their education enrollments in the next two years ($t + 2$). In a few cases, egos were enrolled in more than one higher education program or institution; in such cases, one enrollment was randomly selected. Because the transition from HAVO and VWO to higher education involves distinct educational pathways, we effectively analyze two samples; however, all subsequent selection criteria are applicable to both samples.

Second, egos were included only if they had at least one older sibling. We focus on the influence of older siblings because educational transitions typically follow a strict chronological order, which is far less common for them to complete a higher-education transition first (with few exceptions). This focus aligns with prior research emphasizing the role model mechanism (Altmejd et al., 2021; Bandura, 1977; Bernardi, 2003). Third, we restricted our sample to sibling dyads with an age gap of maximum 8 years, as previous research has shown that sibling effects diminish with larger age differences and are nearly absent beyond seven years (Bernardi, 2003; Her et al., 2022). This restriction, however, has one limitation: it results in the exclusion of some half- and unknown-sibling cases, as these sibling types tend to have wider age gaps.

Finally, when egos or their siblings were no longer registered in the Netherlands as of $t + 1$, they were considered censored, as this most likely indicates death or emigration. After these selection steps, our final samples consist of 129,549 sibling dyads for HAVO 5 and 87,719 sibling dyads for VWO 6.

Measures

Outcome variables

To account for the possibility of repeating a grade or taking a gap year, we followed students' educational enrollments for two years after their first enrollment in either HAVO grade 5 or VWO grade 6. For HAVO 5 students, the possible outcomes in the first year after were: (1) enrollment in HBO, (2) enrollment in MBO, (3) enrollment in VWO grade 5, (4) repeating HAVO grade 5, or (5) not continuing education (e.g., gap year or vocational training). Two years after HAVO 5, outcomes included: (1) HBO, (2) MBO, (3) VWO grade 5 (if the level was repeated), (4) VWO grade 6, or (5) no continuing education. For VWO grade 6 students, first-year outcomes were: (1) enrollment in WO, (2) HBO, (3) MBO, (4) repeating

grade 6, or (5) no continuing education. Two years after, possible outcomes were: (1) WO, (2) HBO, (3) MBO, or (4) not continuing education. It is uncommon for students to repeat a secondary school grade twice.

Some students lacked enrollment data for one or both years, because of a gap year or not continuing education. Therefore, we selected the highest level of enrollment within the two-year period to create a lagged binary outcome indicating whether the student transitioned to higher education in $t + 1$ or $t + 2$. For example, if a HAVO 5 student was not enrolled in the first year but enrolled in HBO in the second year, they were coded as having transitioned to HBO. The binary outcome for HAVO 5 students was coded as 1 if the highest enrollment corresponded to the transition to HBO, and 0 for all other outcomes. For VWO 6 students, the outcome was coded as 1 if the highest enrollment was transition to WO, and 0 otherwise.

Independent variables

Siblings' educational status was coded in the same binary format as the ego's outcome. For HAVO 5 egos, a sibling's educational status was coded as 1 if enrolled in HBO and 0 otherwise. If the sibling had already completed their education, we used their highest educational attainment at the relevant year, coded similarly as 1 for HBO or above and 0 otherwise. For VWO 6 egos, a sibling was coded as 1 if enrolled in WO and 0 otherwise, using their highest attained education if they were no longer enrolled. In essence, we used the sibling's enrollment status at time t —or their highest attained education if not currently enrolled—to predict the ego's educational transition at $t + 1$ or $t + 2$.

As mentioned, Statistics Netherlands distinguishes three types of siblings: full, half, and unknown. We included this as a categorical variable named sibling type in our analysis. For childhood co-residence, we first calculated the percentage ($100 * \text{years together} / \text{years total}$) egos and their siblings lived together up until egos turned 16 years old. Based on this measure, we constructed a categorical variable combining sibling type and co-residence: full siblings (0–50% shared years), full siblings (51–100% shared years), half siblings (0–50% shared years), half siblings (51–100% shared years), unknown sibling type. The “unknown” category was retained in the models for completeness but was not subdivided by co-residence percentage, as this group might reflect ambiguity (e.g., cases where one parent's information is missing) rather than meaningful variation in sibling relationship exposure.

Control variables

We included a set of control variables known to be associated with educational transitions and family dynamics. Parental education was measured using the highest completed level of education among the registered legal parents, categorized as: primary or below/VMBO, MBO/HAVO/VWO, HBO, WO, and missing. When information for one parent was missing, the available parent's education was used; when both were present, the higher level was taken. Parental income was measured as the standardized household income percentile at age 15, based on the distribution of income across the Dutch population. Household structure distinguishes between egos living with both registered parents and those not living with both parents. Urbanity captures the degree of urbanization of the

household's residential area, classified as very urban, moderately urban, and hardly or non-urban. Number of siblings refers to the total count of identified siblings linked to the ego through the population register. Sex was included as a binary indicator. We also controlled for whether egos were enrolled in HAVO 5 or VWO 6 on time or with delay (0 = on time, 1 = late). Finally, we accounted for school year to adjust for temporal variation between 2013 and 2017.

Analytical strategy

We employed binary logistic regression models to estimate the likelihood that egos transitioned from secondary to tertiary education, conducted separately for HAVO 5 and VWO 6 students. The dependent variable was coded as 1 if the ego enrolled in tertiary education (HBO or WO, respectively) within two years after completing secondary education, and 0 otherwise. The analytical approach proceeded in several steps. Model 1 included all control variables to establish baseline predictors of tertiary transition and added the sibling's education to test whether having a sibling enrolled in or having completed tertiary education was associated with the ego's transition. Model 2 introduced sibling type (full, half, or unknown) and its interaction with the sibling's education to assess whether this association differed between full, half, and unknown sibling pairs. Model 3 further incorporated childhood co-residence, examining whether the combination of sibling type relatedness and shared upbringing moderated sibling resemblance in educational transitions. Robust standard errors were used to account for clustering at the ego level, as some egos were linked to multiple sibling dyads.

Preliminary results

Table 1 presents descriptive statistics for students in HAVO 5 and VWO 6. The majority of students in both tracks transitioned to tertiary education, HBO and WO, respectively, within two years, with 83.9% of HAVO 5 and 83.6% of VWO 6 students making this transition. Regarding family background, parental education levels were generally higher among VWO 6 students, with 32.2% having at least one parent holding a scientific university degree compared to 16.0% among HAVO 5 students. Parental income was also higher for VWO 6 households on average. Most students lived with both registered parents (81.6% of HAVO 5 and 85.7% of VWO 6 students), and roughly half of both groups resided in highly urban areas.

On average, HAVO 5 students had slightly more siblings ($M = 2.14$, $SD = 1.36$) than VWO 6 students ($M = 2.01$, $SD = 1.15$). The gender distribution was balanced across both groups, with a slight female majority. A larger share of HAVO 5 students were enrolled in their final year for the first time later than expected (15.0%) compared with VWO 6 students (3.8%). In terms of sibling characteristics, around 60% of HAVO 5 students and 47% of VWO 6 students had siblings who were enrolled in tertiary education or had completed it. Regarding sibling type, most students had full siblings (96.8% among HAVO 5 and 97.9% among VWO 6 students). Half siblings were relatively rare, comprising about 2% and 1.3% of the HAVO 5 and VWO 6 samples, respectively. When co-residence during childhood was considered, nearly all full siblings had lived together for more than half of childhood years,

whereas co-residence among half siblings was more evenly distributed between short (0–50%) and long (51–100%) durations.

Table 1. Descriptive statistics of the relevant variables

| Variable | HAVO 5 (N = 129,549) | VWO 6 (N = 87,719) |
|--|----------------------|--------------------|
| Outcome | | |
| 0 = Otherwise | 20,880 (16.1%) | 14,406 (16.4%) |
| 1 = Transition to tertiary education | 108,669 (83.9%) | 73,313 (83.6%) |
| Parental education | | |
| Primary or below/VMBO | 9,241 (7.1%) | 3,247 (3.7%) |
| MBO/HAVO/VWO | 32,741 (25.3%) | 14,943 (17.0%) |
| HBO | 33,490 (25.9%) | 22,635 (25.8%) |
| WO | 20,708 (16.0%) | 28,250 (32.2%) |
| Missing | 33,369 (25.8%) | 18,644 (21.3%) |
| Parental income | 61.225 (25.951) | 69.085 (25.645) |
| Household structure | | |
| Living with both registered parents | 105,750 (81.6%) | 75,175 (85.7%) |
| Not living with both parents | 23,799 (18.4%) | 12,544 (14.3%) |
| Urbanity | | |
| Very urban | 59,810 (46.2%) | 44,757 (51.0%) |
| Moderately urban | 23,479 (18.1%) | 16,123 (18.4%) |
| Hardly or non-urban | 46,260 (35.7%) | 26,839 (30.6%) |
| Number of siblings | 2.135 (1.358) | 2.014 (1.148) |
| Sex | | |
| Male | 62,116 (47.9%) | 40,887 (46.6%) |
| Female | 67,433 (52.1%) | 46,832 (53.4%) |
| Timing of HAVO 5/VWO 6 enrollment | | |
| On time | 110,138 (85.0%) | 84,376 (96.2%) |
| Late | 19,411 (15.0%) | 3,343 (3.8%) |
| Sibling's education | | |
| 0 = Otherwise | 50,851 (40.0%) | 45,806 (53.0%) |
| 1 = Enrolled in/completed tertiary education | 76,155 (60.0%) | 40,652 (47.0%) |
| Sibling type | | |
| Full | 125,382 (96.8%) | 85,909 (97.9%) |
| Half | 2,612 (2.0%) | 1,131 (1.3%) |
| Unknown | 1,555 (1.2%) | 679 (0.8%) |
| Sibling type x co-residence | | |
| Full (51–100%) | 124,523 (96.1%) | 85,384 (97.3%) |
| Full (0–50%) | 859 (0.7%) | 525 (0.6%) |
| Half (0–50%) | 1,563 (1.2%) | 680 (0.8%) |
| Half (51–100%) | 1,049 (0.8%) | 451 (0.5%) |
| Unknown | 1,555 (1.2%) | 679 (0.8%) |

Note: The table displays frequencies and percentages (in parentheses) for categorical variables and means (*M*) and standard deviations (*SD*, in parentheses) for continuous variables.

The descriptive results are currently based on available cases. In the final version, results will be presented for completed cases only.

Source: Statistics Netherlands, calculation by authors.

Table 2 displays binary logistic regression models predicting egos' transitions to tertiary education within two years after completing HAVO 5 or VWO 6. Models 1a–3a refer to HAVO students, and Models 1b–3b to VWO students. Regarding background characteristics, parental education was particularly relevant for VWO 6 students: those with university-educated parents were significantly more likely to enter university ($b = 0.374, p < 0.001$), while the association was negative among HAVO students. Higher parental income increased the likelihood of transitioning to tertiary education in both groups. For HAVO 5 students, living with both registered parents was negatively related to transitions to tertiary education, while living in moderately or less urban areas was positively associated. The opposite patterns were observed among VWO 6 students. The number of siblings had a modest but consistently negative effect across models, suggesting that students with more siblings were slightly less likely to continue to higher education. Female students were significantly less likely to transition compared to males in both groups, with a larger gender gap among VWO students. Students enrolled in HAVO 5 or VWO 6 later than expected also showed lower transition probabilities, consistent with prior research linking educational delay to weaker academic progression (Bozick & DeLuca, 2005).

As shown in Models 1a and 1b, siblings' education was a strong and consistent predictor of egos' own transitions. HAVO 5 students with a sibling enrolled in or having completed tertiary education were significantly more likely to continue to HBO ($b = 0.325, p < 0.001$), and this effect was even stronger among VWO 6 students transitioning to university ($b = 0.491, p < 0.001$). These results support Hypothesis 1, indicating that siblings may exert a meaningful social influence on educational trajectories. In Models 2a and 2b, we introduced the interaction between sibling type and sibling's education. As shown in the models and in Figure 1, the association between egos' and siblings' educational transitions did not vary by sibling type for VWO 6 students. Among HAVO 5 students, however, the sibling's transition to higher education was more positively associated with the ego's transition for full siblings than for half or unknown siblings. This suggests that sibling effects in higher educational tracks may be less contingent on biological relatedness or sibling structure. Nevertheless, we found some support for Hypothesis 2.

Finally, when both sibling type and co-residence were considered (Models 3a and 3b; Figure 2), further differences emerged. Among full siblings, the influence on educational transitions did not differ substantially between those who lived together for 0–50% versus 51–100% of childhood. In contrast, the influence of half and unknown siblings was weaker, particularly among half siblings who shared a shorter duration of co-residence. Half siblings who lived together for more than half of their childhood, however, appeared to exert an influence comparable to that of full siblings, especially among VWO 6 egos. This partially confirms Hypothesis 3. Overall, the results indicate that sibling influence on educational

transitions is robust and positive but somewhat conditioned by sibling type and the extent of shared childhood residence.

Table 2. Unstandardized coefficients of binary logistic regression models predicting egos' transition to tertiary education

| Variable | HAVO 5 → HBO or otherwise | | | VWO 6 → WO or otherwise | | |
|--|---------------------------|-------------------------|-------------------------|--------------------------|--------------------------|--------------------------|
| | Model 1a | Model 2a | Model 3a | Model 1b | Model 2b | Model 3b |
| Year of first HAVO5/VWO6 enrollment (ref = 2013) | | | | | | |
| 2014 | -0.0886** (0.0298) | -0.0870** (0.0298) | -0.0868** (0.0298) | 0.0674* (0.0342) | 0.0676* (0.0342) | 0.0673* (0.0342) |
| 2015 | -0.286*** (0.0287) | -0.283*** (0.0287) | -0.283*** (0.0287) | 0.128*** (0.0345) | 0.127*** (0.0345) | 0.127*** (0.0345) |
| 2016 | -0.304*** (0.0284) | -0.299*** (0.0284) | -0.299*** (0.0284) | 0.113*** (0.0343) | 0.112** (0.0343) | 0.112** (0.0343) |
| 2017 | -0.290*** (0.0330) | -0.284*** (0.0331) | -0.283*** (0.0331) | 0.135*** (0.0343) | 0.133*** (0.0343) | 0.134*** (0.0343) |
| Parental education (ref = primary/VMBO) | | | | | | |
| MBO/HAVO/VWO | -0.00295 (0.0388) | -0.00851 (0.0389) | -0.00907 (0.0389) | -0.0923 (0.0577) | -0.0906 (0.0577) | -0.0908 (0.0577) |
| HBO | 0.0843* (0.0401) | 0.0762 (0.0402) | 0.0762 (0.0402) | 0.0269 (0.0573) | 0.0292 (0.0574) | 0.0285 (0.0574) |
| WO | -0.215*** (0.0422) | -0.224*** (0.0423) | -0.224*** (0.0423) | 0.374*** (0.0589) | 0.376*** (0.0590) | 0.376*** (0.0590) |
| Missing | -0.0574 (0.0395) | -0.0644 (0.0395) | -0.0647 (0.0395) | -0.0871 (0.0576) | -0.0852 (0.0577) | -0.0850 (0.0577) |
| Parental income | 0.000972* (0.000405) | 0.000911* (0.000406) | 0.000921* (0.000406) | 0.00415*** (0.000453) | 0.00417*** (0.000453) | 0.00416*** (0.000453) |
| Household structure (ref = living without legal parents) | -0.166*** (0.0236) | -0.144*** (0.0241) | -0.141*** (0.0244) | 0.122*** (0.0322) | 0.117*** (0.0327) | 0.110*** (0.0330) |
| Urbanity (ref = very urban) | | | | | | |
| Moderately urban | 0.141*** (0.0254) | 0.137*** (0.0254) | 0.137*** (0.0254) | -0.0472 (0.0299) | -0.0467 (0.0299) | -0.0456 (0.0299) |
| Little or non-urban | 0.227*** (0.0210) | 0.222*** (0.0210) | 0.222*** (0.0210) | -0.171*** (0.0247) | -0.170*** (0.0247) | -0.169*** (0.0247) |

| | | | | | | |
|--|-------------------------|-------------------------|-------------------------|------------------------|------------------------|------------------------|
| Number of siblings | -0.0447*** (0.00839) | -0.0431*** (0.00845) | -0.0432*** (0.00845) | -0.0641*** (0.0111) | -0.0646*** (0.0111) | -0.0646*** (0.0111) |
| Sex (ref = male) | -0.103*** (0.0184) | -0.102*** (0.0184) | -0.102*** (0.0184) | -0.345*** (0.0221) | -0.345*** (0.0221) | -0.345*** (0.0221) |
| Timing of HAVO 5/VWO 6 enrollment (ref = on time) | -0.115*** (0.0246) | -0.115*** (0.0246) | -0.115*** (0.0246) | -0.254*** (0.0515) | -0.255*** (0.0515) | -0.255*** (0.0515) |
| Sibling's education (ref = no higher education) | 0.325*** (0.0163) | 0.334*** (0.0167) | 0.332*** (0.0167) | 0.491*** (0.0204) | 0.494*** (0.0205) | 0.495*** (0.0206) |
| Sibling type (ref = full) | | | | | | |
| Half | | -0.135 (0.0726) | | | 0.121 (0.101) | |
| Unknown | | -0.0882 (0.0925) | | | 0.0720 (0.133) | |
| Sibling type x co-residence (ref = full co-residing 51–100%) | | | | | | |
| Full (0–50%) | | | -0.206 (0.137) | | | 0.331 (0.196) |
| Half (0–50%) | | | -0.0681 (0.0922) | | | 0.183 (0.127) |
| Half (51–100%) | | | -0.248* (0.109) | | | 0.0366 (0.153) |
| Unknown | | | -0.0917 (0.0925) | | | 0.0783 (0.133) |
| <i>Interaction with sibling's education = 1 (enrolled in/completed tertiary education)</i> | | | | | | |
| Sibling type (ref = full) | | | | | | |
| Half | | -0.242* (0.104) | | | -0.268 (0.219) | |
| Unknown | | -0.390** (0.128) | | | 0.0395 (0.248) | |

Sibling type x co-residence (ref = full co-residing 51–100%)

| | | | | | | |
|-----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| Full (0–50%) | | | 0.201 (0.188) | | | -0.337 (0.292) |
| Half (0–50%) | | | -0.279* (0.137) | | | -0.680* (0.265) |
| Half (51–100%) | | | -0.172 (0.155) | | | 0.492 (0.392) |
| Unknown | | | -0.389** (0.128) | | | 0.0379 (0.248) |
| Constant | 1.747*** (0.0515) | 1.753*** (0.0517) | 1.754*** (0.0517) | 1.362*** (0.0693) | 1.359*** (0.0694) | 1.358*** (0.0694) |
| <i>N</i> observations | 127,006 | 127,006 | 127,006 | 86,458 | 86,458 | 86,458 |

Note: Robust standard errors in parentheses. *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.

Source: Statistics Netherlands, calculation by authors.

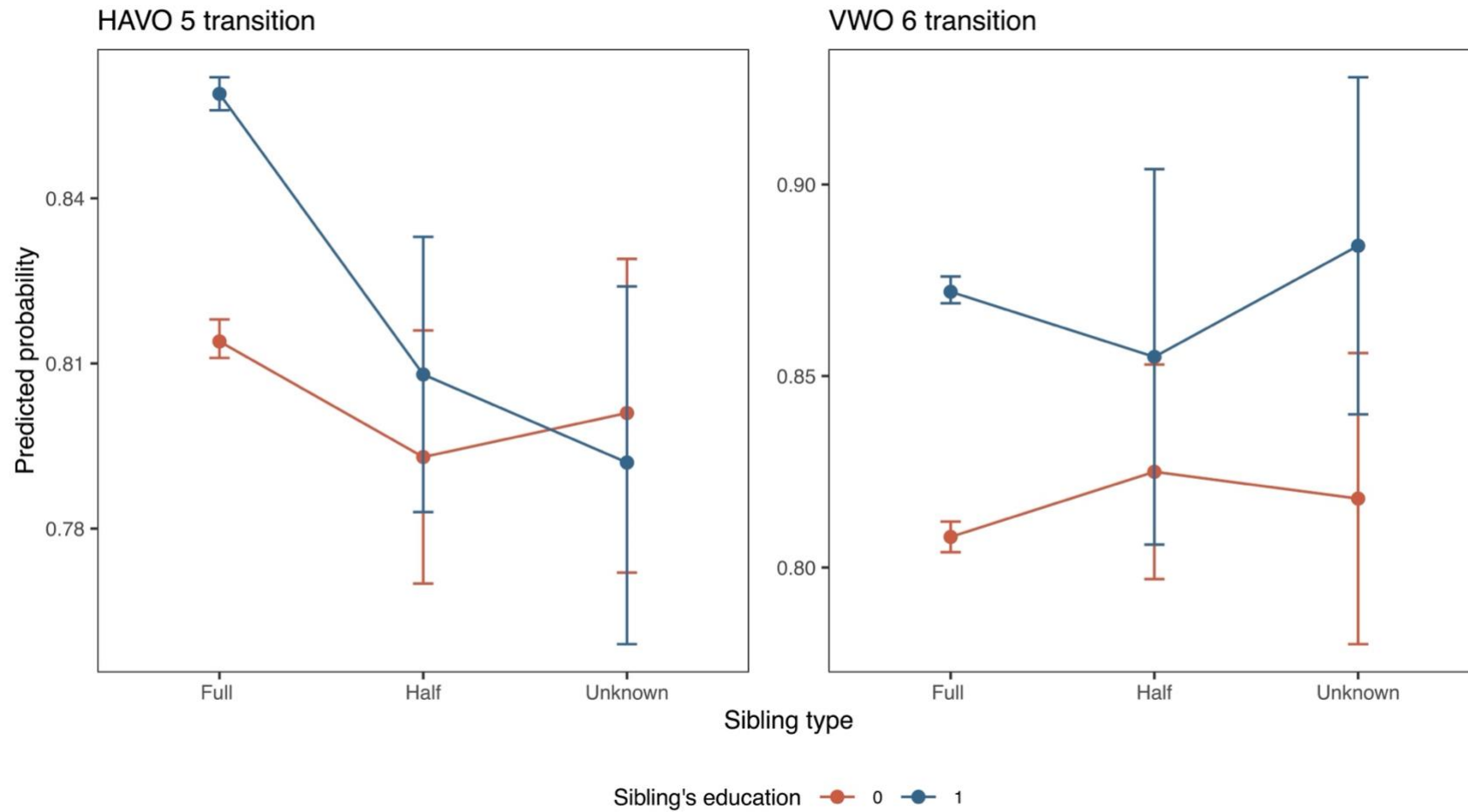


Fig 1. Predicted probability of ego's transition to tertiary education by sibling's education, moderated by sibling type. Estimates are plotted with 95% confidence intervals.

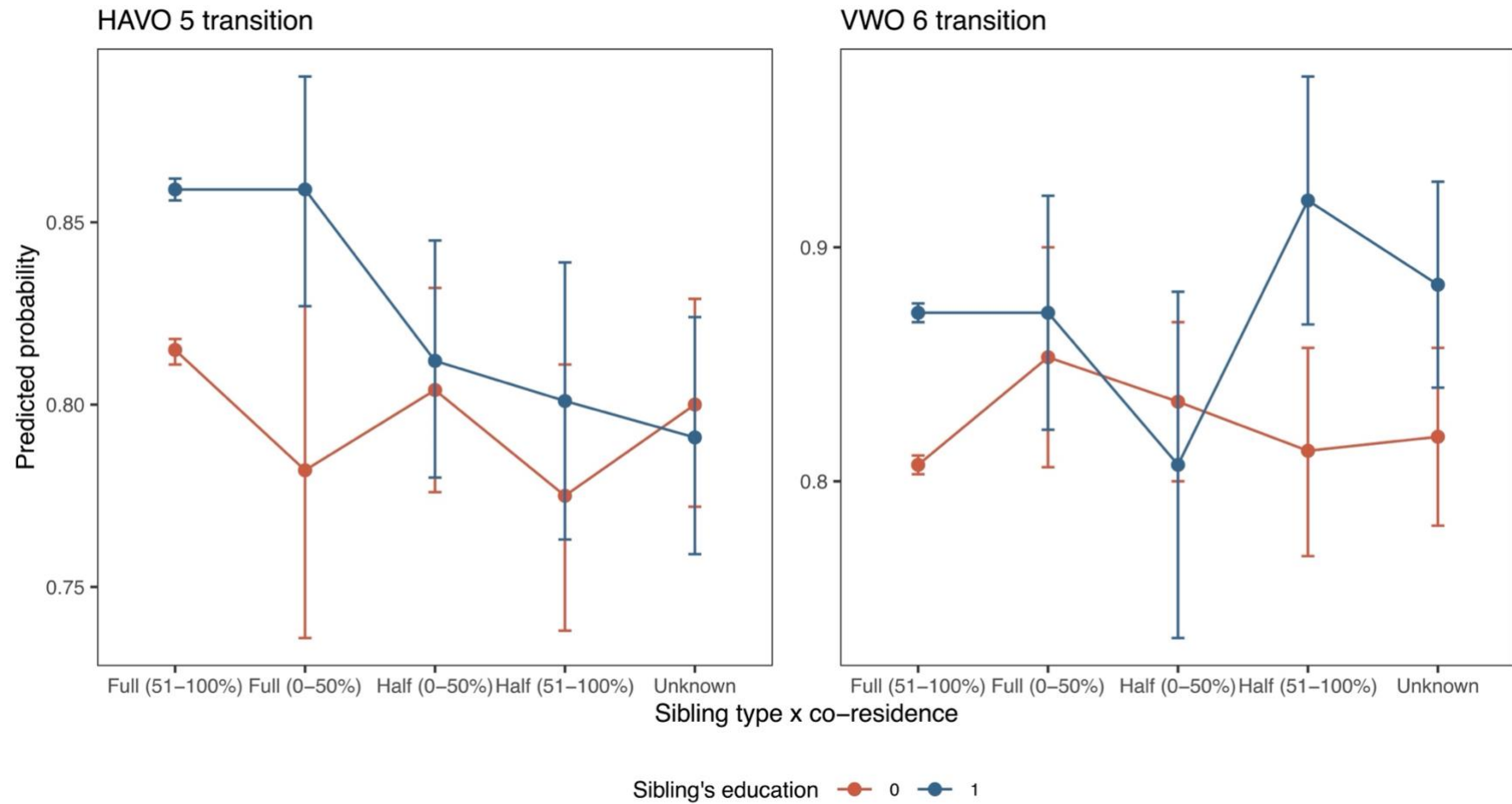


Fig 2. Predicted probability of ego's transition to tertiary education by sibling's education, moderated by sibling type and co-residence. Estimates are plotted with 95% confidence intervals.

Further steps

Several refinements and additional analyses are planned to strengthen the current study. First, the current models do not adjust standard errors for the clustering of observations at the family level. Because an individual can appear as both an ego and a sibling in different dyads, we will account for this non-independence of observations. To do so, we will explore both clustering standard errors at the family level and estimating multilevel models with individuals nested within families. Identifying the appropriate family clusters is not straightforward, as family identifiers are not pre-established in the data; therefore, we will construct potential family-level groupings using parent IDs or sibling linkage structures.

Second, the “unknown” sibling type largely reflects cases where one parent is not registered, often due to migration or absence from the Netherlands. Future work may utilize the adoption file available to distinguish biological siblings from non-biological ones, which would allow a more precise assessment of the role of genetic relatedness in sibling resemblance. Third, to test Hypothesis 4 more rigorously, we plan to include a control indicating whether half siblings also have full siblings. This will allow us to examine whether the presence of full siblings modifies the influence of half siblings. We may also restrict some analyses to half-sibling dyads only to compare the effects of having only half siblings versus having both full and half siblings.

Fourth, it is important to note that in the Netherlands there are almost no formal admission exams for higher education. Most students can freely choose their next educational track, with the exception of a few lottery-based programs. We will consider this when interpreting transitions and may explore ways to account for the rare cases where selection mechanisms exist. Because HAVO 5 students were followed for only two years, the highest observable transition was to VWO 6. Consequently, we cannot determine whether these students eventually entered WO, and enrollment in VWO 6 should not be interpreted as guaranteed progression to university. To address this, we plan to explore multinomial logistic regression models that include the VWO 6 pathway for HAVO 5 students, and/or extend the observation window to three years to capture subsequent transitions to WO.

Finally, our study focuses primarily on second-born or later-born siblings, which may have implications for the generalizability of our findings. Prior studies have not consistently discussed this restriction. Future models could also include additional sibling configuration controls, such as birth order and age gap which are known to influence sibling resemblance in educational transitions.

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