Staying Ahead of the Game: Extracurricular Activities and Inequalities in Educational and Occupational Attainment over the Life Course

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1. Introduction

1.1. Background and aim

Educational and occupational attainment remains closely associated with family background, both in terms of the economic resources that families possess and their level of education. In Germany, Neugebauer et al. (2013) find that while about three-quarters of children from highly-educated parental backgrounds attend the highest track of secondary education (*Gymnasium*), less than a third of those from low-educational backgrounds make this transition, thus providing clear evidence for continued high levels of intergenerational reproduction of educational inequality. These patterns are not limited to childhood and adolescence; the influence of family background extends throughout the life course, affecting educational and labor market outcomes in adulthood. For instance, social background impacts educational transitions beyond youth (Hillmert & Jacob, 2010), with those from higher socioeconomic backgrounds more likely to attain a university degree. This also subsequently shapes occupational outcomes, leading to substantial differences for example in occupational status (Hillmert, 2011).

A central focus in sociological research is to understand how such inequalities in key life outcomes, such as educational attainment and income, arise and persist across generations. This includes examining the extent to which these inequalities are shaped by early-life experiences and resources, as well as identifying specific mechanisms that contribute to these disparities.

Research has mainly focused on how children's educational outcomes shape the development of inequality. While the interplay between families and education has been central to explaining unequal outcomes, recent studies stress that schooling along does not sufficiently explain unequal outcomes (Skopek & Passaretta, 2020) and point to the influence of children's lives outside of formal schooling (see for example Mikus et al., 2020b) as important contexts shaping inequalities. While school is a central part of young people's lives, they also spend substantial, formative time outside the structured environment of schooling. Outside of school, young people dedicate a large portion of their days to leisure activities. Importantly, research reveals socioeconomic differences in how this time is allocated: children and adolescents from high socioeconomic backgrounds are more likely to engage in organized

extracurricular activities, such as music lessons or sports (Betthäuser et al., 2024). Moreover, socioeconomic gaps exist in how much parents can spend on these opportunities (Kornrich et al., 2020), further compounding inequalities in access and participation in these extracurricular activities. These findings underscore the importance of examining extracurricular activities as a factor in the development of inequalities.

In this broader context, this dissertation focuses on extracurricular activities as a critical factor for the development of inequalities, offering insights into mechanisms that operate beyond the frequently studied school setting. Extracurricular activities are structured, organized pursuits outside the formal curriculum, such as sports and music, in which adolescents participate during their free time. These activities, which take place outside of formal schooling, may either amplify or compensate for the advantages conferred by family background. Although research consistently shows inequality in participation rates (Snellman et al., 2015), the extent to which these activities translates into enduring inequalities remains unclear.

Previous studies have linked participation in extracurricular activities to various outcomes such as cognitive skill differences (Mikus et al., 2020b) and academic performance (Coulangeon, 2018). This is particularly relevant because of inequalities in participation rates with children and adolescents from more advantaged backgrounds, e.g. in terms of parental education (Mikus et al., 2020b), participating more in these activities. As a result, the advantages of organized activities are unequally distributed, with those from advantaged backgrounds benefiting more due to their higher rates of participation (Bennett et al., 2021). In other words, if participation indeed leads to better outcomes, socially unequal participation rates would be a vehicle of social transmission of inequality.

However, the role that extracurricular activities play for the development of inequalities beyond these differences in participation rates has not been sufficiently explored. This dissertation examines whether extracurricular activities intensify or reduce inequalities by addressing several key questions: first, whether the benefits of participation differ across social backgrounds; second, whether benefits extend beyond adolescence and influence later educational and occupational outcomes; and third, what role do social connections play as a possible mechanism driving unequal outcomes. Through this multifaceted approach, the study aims to contribute to a

deeper understanding of the role extracurricular activities play in the reproduction of inequality.

By addressing these questions, this dissertation contributes to the literature on the reproduction of inequality by exploring the role of extracurricular activities, making key contributions in three ways. First, it broadens the focus beyond formal education by investigating extracurricular activities as an influential context for inequality, thus capturing dynamics that operate outside of the school system. Second, it examines how differences in extracurricular activity participation and their benefits may shape outcomes, offering insights into how these activities impact social inequalities over the life course. Finally, it addresses potential mechanisms, such as social networks and cognitive skills, which may serve both as valuable outcomes of extracurricular engagement and as pathways through which these activities influence broader inequalities.

From a theoretical standpoint, this contributes to our understanding of how inequalities develop. Theoretical accounts of inequality reproduction so far mainly highlight the central roles of education in shaping children's long-term trajectories. The classic status attainment model developed by Blau and Duncan (1967) positions education as the primary predictor of adult socioeconomic outcomes, underscoring how family background indirectly shapes occupational outcomes through its influence on educational achievement. However, family background is also thought to have a direct impact on adult outcomes, independent of educational attainment. In other words, family background impacts education, which affects socioeconomic outcomes in adulthood, but family background also impacts these outcomes directly. Studies have consistently confirmed a strong link between family socioeconomic background and adult outcomes beyond education, an association often referred to as the "direct effect of social origin" (Ballarino & Bernardi, 2016, p. 255).

This framework underscores the critical role of family background in shaping socioeconomic outcomes, both through formal education and beyond, as direct effects of background influence outcomes independently of schooling. To better understand how inequality is reproduced, it is important to examine how childhood and adolescence – critical periods for development – shape future outcomes, both within and beyond the formal school system. These early life stages are especially formative, establishing inequalities that can persist throughout the life course. Therefore, it is essential to explore how variations in childhood and adolescence

contribute to young people's educational outcomes and how these formative influences drive broader inequalities over time.

Childhood and adolescence are particularly pivotal periods in which the foundation for inequality in later life is established. During this early phase of the life course, family resources, educational inputs, and social experiences play a critical role in transmitting socioeconomic advantages from one generation to the next. We know that the social contexts that young people encounter and engage in impact their outcomes (Bennett et al., 2021). These may include contexts such as the home environment, peer groups, school settings, or extracurricular activities outside of home or school contexts.

This is also connected to changes in adolescents' time use patterns. Children's and adolescents' leisure time has become increasingly structured, with organized enrichment activities outside formal education playing a more central role (Nordbakke, 2019, Holloway & Pimlott-Wilson, 2014). Time-use studies of adolescents show a trend towards more organized activities. For Germany, Hille et al. (2014) describe a significant increase in young people's participation in organized extracurricular activities such as sports and music lessons over the last few decades. Complementing this, the range of activities available to young people has expanded, offering them an increased supply and greater variety for extracurricular activities (Wheeler & Green, 2019). These activities thus have become central elements of contemporary adolescence.

Overall, this dissertation aims to deepen our understanding of how inequalities in childhood and adolescence shape inequalities over the life course, specifically through the lens of extracurricular activities. While inequalities in this early phase of the life course are important in their own right, reflecting unequal opportunities for young people from different backgrounds to pursue their interest and enjoy fulfilling childhoods (Gheaus, 2015), it is essential to examine how these early differences extend into educational and occupational outcomes over the life course. By investigating extracurricular activities as a context in which inequalities may be reinforced or mitigated, this dissertation contributes to understanding the long-term impacts of early-life opportunities, thereby illuminating broader processes of social inequality across the life course.

The dissertation is organized as follows: the following section reviews the theoretical background of inequality reproduction and the role of childhood and

adolescence in this process, examining how extracurricular activities might fit into existing theoretical frameworks, and introducing the case of Germany in this context. In Chapter 2-4, I will empirically address the research questions through three empirical studies. Finally, in Chapter 5, I will conclude the dissertation by summarizing its findings and discussing its central contributions.

1.1 Theoretical background

Theories on the intergenerational reproduction of inequality offer key perspectives on how socioeconomic status and resources are transmitted across generations, shaping life trajectories and outcomes. This chapter begins with a discussion of the status attainment model (1.2.1), examining how extracurricular activities can be situated within this framework. Following this, the focus shifts to reinforcing versus compensating dynamics (1.2.2), exploring how the impact of extracurricular activities might vary by social background. The life course approach (1.2.3) is then explored as a framework that situates childhood and adolescent experiences within the broader trajectory of life stages, highlighting their long-term impacts. The mechanisms through which extracurricular activities may influence outcomes (1.2.4) are then outlined, considering aspects such as skill development and social networks. Finally, the German context (1.2.5) is addressed to show specific context shapes the theoretical expectations.

1.1.1 Status attainment model

Blau and Duncan's (1967) status attainment model provides a framework for understanding how family background, education, and occupational outcomes are connected. Their origin-education-destination (OED) triangle emphasizes the role of family background in shaping children's educational attainment, which in turn influences their occupational outcomes, positing education as a key mechanism of inequality transmission. Accordingly, education is a central driver of inequality. This model illustrates how inequalities are generated through three pathways (see Figure 1): the origin-education arrow reflects the influence of family background on children's educational attainment; the education-destination arrow represents the role of education in determining occupational outcomes; and the origin-destination arrow captures how family background may impact occupational outcomes directly, independent of educational attainment.

Beyond formal education, extracurricular activities represent an additional channel that can shape educational and occupational outcomes. Differences in participation may impact educational outcomes (Mikus et al., 2020a), yet such activities may also offer benefits that extend beyond schooling itself. When these

benefits go beyond the effects of unequal participation rates, extracurricular activities may reinforce or mitigate existing disparities, affecting long-term educational and occupational inequalities. This dissertation thus positions extracurricular activities within the framework of the status attainment model as a mechanism to further understand the connections between family background, education, and socioeconomic outcomes in adulthood.

There are several ways in which extracurricular activities extend our understanding of these pathways (see Figure 1 for a visualization). First, extracurricular activities offer insights into the connection between social origin and educational outcomes. Research consistently shows that family background influences adolescents' likelihood of participating in these activities (Hjalmarsson, 2022), and that this unequal participation is linked to unequal educational outcomes (Carbonaro & Maloney, 2019). This association highlights how family background shapes educational trajectories through extracurricular activities, reinforcing the origin-education pathway. These findings align with broader literature showing how family background influences educational outcomes through factors such as parenting styles and varying levels of parental support (e.g., Duncan et al., 2022). Thus, existing research already positions extracurricular activities within this framework of the origin-education link.

Secondly, extracurricular activities may also clarify the origin-destination link by highlighting potential influences on occupational outcomes. This connects to research that highlights the strong link between family socioeconomic background and adult outcomes beyond education in contemporary societies, which has been regarded as the “direct effect of social origin” (Ballarino & Bernardi, 2016, p. 255). If extracurricular activities influence occupational outcomes beyond educational achievement, this would reveal a mechanism outside formal education that shape adult inequalities. While this suggests their potential impact on occupational outcomes, so far, less is known about these long-term effects of participation in extracurricular activities.

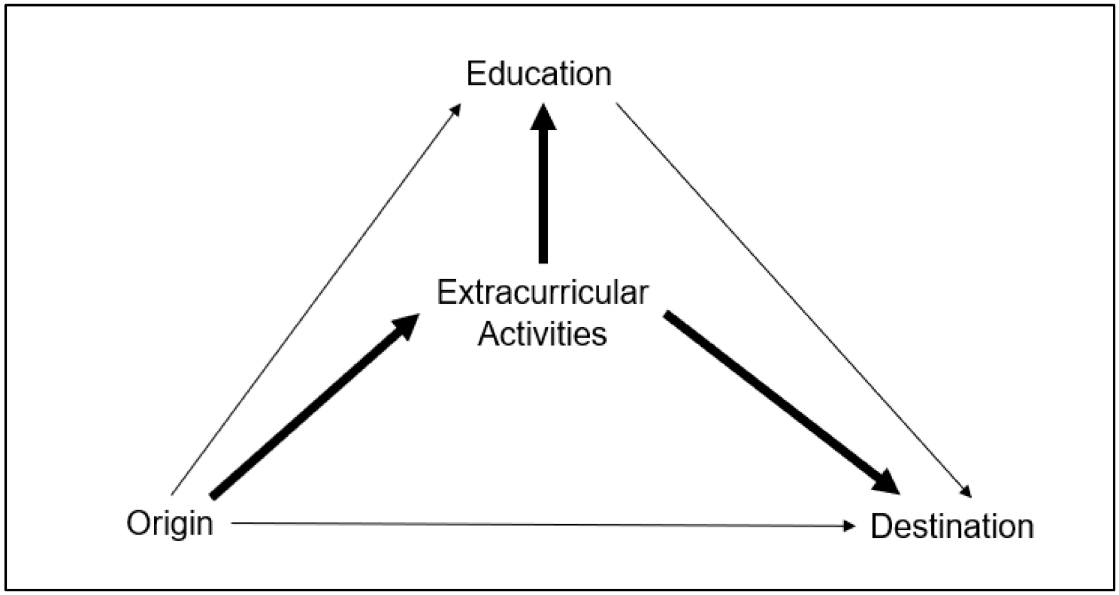

Figure 1: Conceptual framing of extracurricular activities within the OED-triangle

Further, examining how social background shapes the relationship between extracurricular activities and educational outcomes can illuminate whether the link between these activities and education varies by social origin. This approach parallels research on unequal returns to education, where educational attainment often benefits individuals from advantaged backgrounds more (see for example Wildhagen, 2014). Often, those from higher socioeconomic backgrounds can leverage similar opportunities more effectively, a phenomenon Lucas (2001, p. 1652) describes as "effectively maintained inequality," where advantaged families secure further advantages wherever possible. Applied to extracurricular activities, this perspective suggests that individuals from more advantaged social backgrounds may derive greater benefits from participation than their less advantaged peers.

This theoretical framing of extracurricular activities within the origin-education-destination (OED) triangle shapes the three empirical studies of the dissertation in multiple ways. The first study (Chapter 2) examines how extracurricular activities relate to educational outcomes, particularly through their impact on adolescents' cognitive skills. This chapter addresses heterogeneous effects of participation, exploring whether the benefits of extracurricular engagement might differ by family background. Such dynamics suggest that extracurricular activities could either serve as compensatory mechanisms that benefit mostly less advantaged adolescents or, alternatively, could offer greater advantages to those from higher socioeconomic backgrounds, thereby reinforcing existing inequalities. Extracurricular activities could

thus be a case of effectively maintained inequality, as advantaged families may better leverage these opportunities to amplify educational benefits for their children. In the second study (Chapter 3), the long-term effects of extracurricular activities are investigated, linking these activities to educational and labor market outcomes in adulthood in a life course perspective. This study directly evaluates the determinants of occupational outcomes within the OED framework, focusing on how unequal experiences in youth may contribute to cumulative advantages over the life course, affecting outcomes both within and beyond formal educational attainment. Finally, the third study (Chapter 4) delves into a potential mechanism, specifically examining how social connections formed through extracurricular activities contribute to unequal educational outcomes.

The interplay between social background, extracurricular participation, and outcomes also causes methodological challenges. A key challenge is to account for the social background effects on the likelihood of participating in extracurricular activities, as adolescents from more advantaged backgrounds are often more likely to engage in these activities. Importantly, the effects of extracurricular activities must be understood as potentially distinct from background effects, meaning that the impact of participation should not simply reflect the social background of those who participate.

To address this, Studies I and II (Chapter 2 and 3) employ propensity score weighting, a method that adjusts for selection bias by balancing the observed characteristics of participants and non-participants, allowing for a more accurate estimation of the effects of extracurricular activities on educational and occupational outcomes. In Study III (Chapter 4), fixed-effects models are employed to account for unobserved individual characteristics that might otherwise confound the relationship between extracurricular participation and peer characteristics. This approach isolates the impact of co-participation in these activities on friends' educational characteristics. By employing these methods, this dissertation aims to account for social background influences, offering a clearer understanding of how extracurricular activities contribute to the reproduction of inequality across the life course.

1.1.2 Reinforcing vs compensating dynamics

A key question in understanding the role of extracurricular activities in for inequalities is how the benefits of participation vary according to adolescents' social backgrounds. Principally, two possible, opposing dynamics emerge: on one hand, some theories suggest that extracurricular activities may help reduce inequalities by primarily benefiting disadvantaged children, thereby potentially compensating for inequalities between families. On the other hand, other theories propose that extracurricular activities could reinforce inequalities by disproportionately benefiting already advantaged children, creating multiplication effects based on social origin. Within this reinforcing perspective, the theory of effectively maintained inequality (Lucas, 2001) provides a framework for understanding how reinforcing effects might operate. In the following section, I will explore these dynamics, which that are further empirically tested in Study I (Chapter 2).

Generally, compensation theories suggest that additional inputs from extracurricular activities can help offset a lack of family resources, supporting children from less advantaged backgrounds in overcoming disadvantages they are facing (Morris, 2016). While children from less advantaged backgrounds may benefit from extracurricular activities because of various beneficial features of extracurricular activities, for example in terms of cognitive or non-cognitive skill development, children from more advantaged families often already have opportunities to develop such skills through their upbringing and home environments. Furthermore, interactions with educated adults and high-achieving peers within extracurricular activities are thought to promote skill development for children from less advantaged backgrounds. In contrast, children from high-resource backgrounds are typically exposed to such influences even outside of extracurricular settings (Covay & Carbonaro, 2010). This perspective assumes a ceiling effect, meaning that children from high-resource backgrounds do not benefit from these additional resources to the same degree, as they are already equipped with the necessary resources through their family (Erola & Kilpi-Jakonen, 2017).

Reinforcing, or multiplication, theories suggest that while children from more advantaged backgrounds are not only more likely to participate in extracurricular activities, they also gain greater benefits from this participation than their less advantaged peers. This view posits that children from more advantaged families can leverage extracurricular experiences more effectively, reinforcing their already favorable developmental environments. Here, the basic idea is that additional inputs

act as multipliers of the resources provided by the family, further amplifying existing advantages (Erola & Kilpi-Jakonen, 2017). For these children, participation in extracurricular activities may thus serve to reinforce the advantages they receive at home. This dynamic can result in a widening gap in outcomes between children from different backgrounds, as those from more advantaged families are able to transform these additional opportunities into further advantages.

Another perspective that aligns with these reinforcing dynamics is the theory of effectively maintained inequality (Lucas, 2001; Lucas, 2017), which suggests that more advantaged families consistently seek to secure benefits for their children in any area where opportunities for gaining an edge exist. As Lucas (2001) puts it, these families obtain advantages "wherever advantages are commonly possible" (p. 1652). This suggests that advantaged families mobilize their resources to ensure advantages for their children, both through boosting benefits and compensating for disadvantages (Ballarino & Bernardi, 2016).

The central notion of this framework of effectively maintained inequality is that within educational and social systems, advantaged parents can leverage their resources to maximize the benefits their children receive from available opportunities. Lucas (2001) illustrates this with a sports metaphor, noting that while all parents can *cheer* for their children, only those with specific knowledge, resources, and tools can effectively *coach* them. This metaphor highlights that while encouragement is universal, access to resources is not. Consequently, family resources become essential to fully capitalize on educational opportunities, allowing more advantaged parents to secure and amplify advantages for their children.

For extracurricular activities, this reinforcing dynamic could mean that more advantaged families possess the informational, motivational, or financial resources that allow them to maximize the benefits of their children's participation in extracurricular activities. These parents would thus be better positioned to select high-quality activities, understand the long-term payoffs of participation (Wheeler & Green, 2019), and actively encourage their children's involvement, thereby enhancing skill development. Thus, parental background might shape the impact of activity participation by enabling families to select beneficial activities and boost outcomes through targeted support and motivation.

This argument follows research that suggests that differences in parenting and childhood investments play an important role for children's unequal outcomes.

Research on differences in parenting highlights how advantaged families employ specific strategies to support their children's development. Lareau's (2011) work on "concerted cultivation" has been seminal in describing class-based parenting attitudes and the effects these have on inequalities in childhood. Her central claim is that middle-class parents differ from working-class parents in their respective parenting styles, with middle-class parents being more actively engaged in their children's learning and activities in order to purposefully nurture the children's skills and talents ("concerted cultivation") (Lareau, 2011). Related concepts, such as "intensive mothering" and "involved fathering" (Trussell & Shaw, 2012) and "parenting for cognitive development" (Schaub, 2010), capture similar parenting styles in which parents are heavily and strategically involved in their children's lives, which has becoming particularly prevalent among more advantaged families.

Pivotal to the described parenting strategies is the aim to support children's cognitive skill development. Research suggests that the home environment and particularly parenting style plays an important role in this process, underscoring the importance of parenting in children's skill-building (Anger & Heineck, 2010). For example, parents may engage their children in activities like reading together, discussing current events, or encouraging them to ask questions (see Lareau, 2011; Kalil, 2015). These practices promote skill development, and contribute to the transmission of cognitive abilities across generations. The central notion here is parents influence their children's cognitive skill development by providing environments that enable their children to develop pertinent skills (Erola et al., 2020) In connection to extracurricular activities, it might be the case that such home environments enable the benefits of participation.

Importantly, such family behavior and environment has been framed in research as parental or family investments into children. Analogous to financial investments that potentially pay off in the long run, such investments have been defined as

> "a diversion of current resources, such as time or money, from use for immediate consumption of goods and services we value, to activities that pay off in the future in terms of additional resources, including those that benefit our children." (Ermisch et al., 2012, p. 3)

In particular, parenting behavior and the possibility for childhood investments vary by social background. Because more advantaged families have more resources and

make greater use of certain parenting practices, they are more able to invest in skill development activities during childhood and youth, creating long-term advantages for their children (Bennett et al., 2021). For example, parents with higher education levels are more likely to engage in enriching activities with their children, such as reading books or playing instruments (Gracia, 2015). These differences in parental resources and behaviors create disparities in children's developmental opportunities. Because of these disparities, advantaged children may benefit more from participation in extracurricular activities, as these experiences complement and reinforce the developmental opportunities they already receive at home.

Parents invest in their children's development both within and outside the formal education system. Within the formal schooling system, parents often engage in activities such as helping with homework and ensuring their children make the desired school transitions (see for example F. Bernardi, 2012). Such actions are complemented by investments in school-adjacent support, such as private tutoring and "shadow education" (Zwier et al., 2021). Families with higher SES tend to engage more in these kinds of activities (see for example Zwier et al., 2021). In this context, extracurricular activities can be regarded as critical investments outside the education system that potentially shape children's development and contribute to inequalities. More advantaged families might have more resources to support their children's participation in these activities, whereas families with fewer resources may lack the time or money to facilitate such extracurricular engagements (Weininger et al., 2015). If these activities serve as tools for fostering positive outcomes, such as cognitive and non-cognitive skills or social networks, differences in families' abilities to invest in such activities would be related to unequal opportunities to benefit from the advantages they provide. As a result, extracurricular activities become another mechanism of how childhood investment shape inequalities.

Notably, extracurricular activities are a context outside formal schooling that enables childhood investments. In this capacity, they connect to the concept of rising "opportunity markets" (Grusky et al., 2019), which describes the emergence of opportunities for parental investments into their children's development, often outside the formal education system. These markets represent environments where parental investments are transformed into children's higher chances for educational and occupational success. Grusky et al. (2019) emphasize that while beneficial outcomes, such as high educational achievement, cannot be directly purchased, access to the

activities and resources that foster such outcomes is heavily influenced by families' varying capacities to afford and access them.

Beyond the interplay with home environments and unequal childhood investments, differences in qualitative aspects of extracurricular activities might also play a role in whether they lead to compensating or reinforcing dynamics. Lucas (2017) highlights how more advantaged parents might secure an advantage for their children by seeking qualitative advantages. Thus, beyond quantitative differentiation in terms of more participation in these activities, qualitative differences could be channeled through choice of specific, advantageous activities.

Generally, parents who have greater resources at their disposal often have more flexibility in activities for their children, allowing them to strategically tailor investments that align with each child's unique needs and developmental stages (Bennett et al., 2021). They thus may gain an advantage by choosing high-quality activities that particularly support cognitive skill development. Moreover, financial resources might enable access to these beneficial activities, particularly if activities that are more beneficial are also more expensive.

However, this depends on the scope of qualitative differences possible for extracurricular activities. If activities are fairly uniform in quality, then there is little opportunity to secure a qualitative advantage. This would mean that differences in the benefits of activities are less likely. Thus, when quality is relatively consistent across different activities, the potential for gaining an edge by selecting specific activities is reduced. This motivates an examination of differences between types of activities—such as music and sports—which may vary in the extent of qualitative advantages they offer.

Overall, this subchapter has explored how the benefits of extracurricular participation might vary by social backgrounds, highlighting two primary dynamics: compensating effects, where extracurriculars help disadvantaged children offset a lack of family resources, and reinforcing effects, where these activities disproportionately benefit advantaged children, widening existing inequalities. The theory of effectively maintained inequality offers a framework for understanding how reinforcing effects operate, suggesting that advantaged families can leverage their resources to maximize the benefits their children receive from extracurricular participation. This potential for unequal benefits is also linked to differential parenting behaviors, as well as through strategic investments, both within and outside formal

education. Furthermore, these dynamics are shaped not only by the quantity but also by the quality of extracurricular activities selected, with more advantaged families potentially securing qualitative advantages for their children. Together, these points motivate the empirical analyses in Study I, which will examine the extent to which extracurricular participation contributes to compensating or reinforcing dynamics in the transmission of social inequalities.

1.1.3 Life course approach

The life course approach is a central building block of this dissertation, providing a framework through which to understand how early experiences and investments impact long-term outcomes. This is particularly relevant in connection to the second research question, which focuses on the long-term relationship between extracurricular activities and educational and labor market outcomes in adulthood. In particular, this dissertation engages with key paradigms of the life course approach, including the interconnectedness of life stages and the significance of social linkages. These dimensions help to contextualize how participation in extracurricular activities might shape the pathways from adolescence into adulthood.

Life course theory emphasizes the interdependence of different life stages, suggesting that each stage is influenced by those preceding and following it (L. Bernardi et al., 2019). Adolescence, situated between childhood and entry to adulthood, is an important phase where, on one hand, childhood experiences culminate and unequal trajectories already manifest for example in unequal educational outcomes, and on the other hand, the path for the transition into adulthood is paved. This interconnectedness of life stages in references to the development of inequalities can be framed through the concept of cumulative advantage. Cumulative advantage (DiPrete & Eirich, 2006) underscores the compounding nature of early advantages and disadvantages, suggesting that these disparities may increase over time. This “systemic tendency for interindividual divergence in a given characteristic to increase with the passage of time” (Dannefer, 2020, p. 1249) highlights how initial advantages, such as family resources or supportive environments, can lead to expanding inequalities as these benefits accumulate over the life course. In this way, cumulative advantage provides a life

course perspective on how inequalities manifest and intensify across interconnected life stages.

Thus, a cumulative advantage perspective informs a longitudinal approach to the benefits of extracurricular activities. Participation in extracurricular activities might not just provide benefits in adolescence but these benefits might also accumulate over time, leading to widening advantages as individuals progress through their educational and occupational careers. Over time, as individuals move through different life stages, these early benefits may compound. Thus, from a longitudinal perspective, the initial benefits of extracurricular activities in adolescence may expand over time, leading to growing disparities between those who participated in these activities and those who did not. This longitudinal perspective is applied to the second study (Chapter 3).

Another core principle of the life course tenet is the notion of linked lives (Settersten, 2015). It emphasizes the social interdependence of individuals and how relationships shape behaviors and decisions. This principle underscores that individual trajectories are not isolated but rather influenced by the lives of those around them, particularly through family and peer relationships. Research on peer networks illustrates this idea: peer academic aspirations, for example, often influence individual performance (e.g., Shen & French, 2023).

Applying the notion of linked lives to extracurricular activities suggests that it matters not only whether or not young people participate in these activities, but also *who* they do these activities with. The benefits of participation may depend on social connections formed within these activities. As adolescents engage in organized activities, their interactions with peers may reinforce aspirations, encourage skill-building, and foster relationships that contribute to future outcomes. In the third empirical study of this dissertation (Chapter 4), the aspect of social connection in extracurricular activities is studied.

Extracurricular activities represent a context outside of family, education, and labor market that is largely specific to the life phase of adolescence. While participation in sports clubs or other leisure activities analogous to extracurricular activities is also found among adults, it is not nearly as common as for adolescents (see for example Dederichs & Kruse, 2023). Many of the institutions of extracurricular activities are mainly geared towards young people. Music schools or sports clubs, for

example, are mostly aimed in their organizational structure to children and adolescents.

In choosing to participate in extracurricular activities – and also in which particular activity – adolescents exert individual agency. This agency is greater than their control of other contexts, such as school or family contexts (Schaefer et al., 2024). In extracurricular activities, adolescents typically have more of a say in how and with whom to engage. This is especially meaningful in comparison to formal educational contexts, such as sorting into school tracks or classes, over which adolescents only have a very limited influence. Thus, these activities offer adolescents environments to explore their interests by making decisions about participation based on personal preference rather than mandatory curricula. However, family influences also play a role, as parents may encourage or provide resources that shape the range of activities accessible to them (Wheeler & Green, 2019). Consequently, extracurricular activities serve as a unique environment where adolescents exercise personal choice within the boundaries set by family resources and support.

Participation in most activities is generally open to all adolescents, i.e. there are rarely strict selection rules, but this general openness is contradicted by various constraints and barriers that can limit access. Factors such as costs, location, or lack of available information might deter some adolescents from participation (Weininger et al., 2015). For example, activities that require costly equipment might be hard to afford for adolescents from less advantaged families. Beyond financial constraints, the location of activities might also be a defining factor in which adolescents participate. Although adolescents are more mobile and independent from parental supervision than younger children, choice of activities is still connected to local availability. Additionally, information about what different extracurricular activities are available and desirable might also dependent on the social networks of adolescents and their families (Schaefer et al., 2024). This also connects back to differences in parenting behavior and family investments.

These material and cultural barriers to participation manifest in unequal participation rates in extracurricular activities. Studies in various countries (e.g. Covay & Carbonaro, 2010, for US, Matsuoka et al., 2015, for Japan) find clear disparities in extracurricular involvement based on social background (see O'Flaherty et al., 2022, for a comprehensive review). For example, in Germany, Betthäuser et al. (2024) find

that adolescents from high-income families are more likely than their peers in low-income families to spend afterschool time in sports or cultural activities. Similarly, Mikus et al. (2020b) show those from highly educated backgrounds are more likely than less advantaged children to participate in all extracurricular activities that were studied, with the largest divergence in engagement in musical activities. The setting that extracurricular activities take place in also seems to have an impact on who is most likely to participate in terms of children's socioeconomic background. Coulangeon (2018) finds that disparities in participation rates are lower for activities that take place in connection to school settings, whereas extracurricular activities outside and independent from schools exhibit the largest social disparities. In summary, research has shown a general socioeconomic gap in the extent of adolescents' participation in extracurricular participation, which tends to be more pronounced in certain types and settings of activities.

Overall, the life course approach and its related theoretical concepts are fundamental to this dissertation as they provide a framework to understand how early experiences, such as participation in extracurricular activities, influence long-term outcomes. By emphasizing the interconnectedness of different life stages, the life course perspective allows for the analysis of how initial advantages or disadvantages accumulate over time, contributing to lasting inequalities. This cumulative process is explored empirically in Study II (Chapter 3), which examines how participation in extracurricular activities impacts later educational and occupational outcomes, shedding light on the long-term effects of these experiences.

1.1.4 Mechanisms linking extracurricular activities to outcomes

In the previous subchapters, I discussed the potential of extracurricular activities to reinforce or compensate for inequalities based on family background, and the life course perspective of extracurricular activities. Building on this, I now turn to the specific mechanisms through which extracurricular activities may influence educational and occupational outcomes. This subchapter describes multiple pathways proposed in the literature, such as skill development, social networks, and cultural capital, to explain how participation in extracurricular activities may impact outcomes. This provides a foundation for Study III (Chapter 4), where I will take a closer look at social networks within extracurricular activities as a key pathway.

A human capital framework suggests that extracurricular activities enhance cognitive abilities by provident environments that stimulate skill development (Coleman, 1988). Research has shown that these activities can improve various cognitive skills, including language, mathematics, and spatial reasoning (Taatgen, 2021). Both neurological and psychological processes have been described in this context. Neurological research on brain plasticity suggests that such activity participation can lead to physical changes in the brain that support cognitive development (for example, see Schlaug et al., 2005 for music). Psychological studies, on the other hand, focus on how these activities enhance executive functions, which include skills like planning, multitasking, and self-control abilities. For instance, musical activities have been linked to improved executive functions like inhibition and planning (Jaschke et al., 2018), as well as enhanced motivation, discipline, and self-regulation in adolescents (Guhn et al., 2020). Similarly, participation in organized sports can contribute to the development of emotional regulation and self-awareness (Hansen et al., 2003). These processes serve as pathways through which extracurricular activities might stimulate the development of cognitive and non-cognitive skills.

Another mechanism might be the social connections formed through extracurricular activities. Engagement in extracurricular activities provides adolescents with opportunities to build relationships with peers, fostering social networks that extend beyond their immediate family or school environment (Schaefer et al., 2011). These relationships can connect adolescents with people outside their usual social circles, which can play a pivotal role in influencing future outcomes, such as facilitating transitions to higher education or entry into the labor market. Further, adolescents are particularly influenced by the social norms prevalent within their peer groups, which extends to educational attitudes and behaviors. Research indicates that adolescents adapt their academic expectations to align with those of their friends, impacting their own educational efforts (Kretschmer & Roth, 2021). Consequently, peer relationships developed through extracurricular activities may reinforce norms that promote educational achievement.

Extracurricular activities have also been discussed in the context of cultural capital (see for example Jæger, 2011; Jæger & Karlson, 2018). The concept of cultural capital, coined particularly by Bourdieu (1986), posits the cultural acquisitions, such as for example knowledge or education, as a form of capital that is transmitted

from parents to children. This cultural capital is converted into educational achievement, and thus a factor in intergenerational reproduction (Andersen & Jæger, 2015).

Two interpretation of this concept have been prevalent in the literature. Firstly, the notion of cultural capital as familiarity with and knowledge of high-brow culture, which impacts educational outcomes primarily through signaling (Breinholt & Jæger, 2020). For example, adolescents' participation in music would be interpreted by teachers as familiarity with high-status culture and academic ability and thus leads to better academic assessments. This is also connected to notions of credentialism (Spence, 1973), whereas credentials act as signalers of abilities net of the actual skill level. The second interpretation regards cultural capital as factor that aid the development of relevant skills and competencies (DiMaggio, 1982).

Because of the overlapping definitions and conceptualizations of human capital and cultural capital, I will primarily refer to human capital throughout this dissertation. This choice is not meant to diminish the significance of cultural capital or its substantial body of literature in understanding the intergenerational reproduction of inequality. Rather, it reflects a more focused analytical lens that aligns with the specific mechanisms examined in this work, particularly those relating to skill development. While cultural capital, with its emphasis on non-financial social assets and cultural competencies, remains an important framework for exploring social reproduction, this dissertation's emphasis aims to provide a more focused approach for evaluating how childhood investments influence long-term outcomes and life trajectories.

These insights into possible mechanisms linking participation in extracurricular activities to educational and occupational outcomes helps us understand their role in the intergenerational reproduction of inequality. If unequal investments manifest through these socially stratified patterns of participation, and these activities are linked to better outcomes, such as higher educational achievement, then extracurricular participation becomes a pathway through which inequality is reproduced across generations. Two of the empirical studies of this dissertation explicitly explore these mechanisms. Study I (Chapter 2) focuses on cognitive skills and their link to extracurricular participation, whereas Study III (Chapter 4) looks more closely at social networks developed through these activities and how these might positively impact academic outcomes.

1.1.5 Case of Germany

Most research so far on extracurricular activities has been focused on the United States (see for example Carbonaro & Maloney, 2019, Gardner et al., 2020). One reason for this is that in the US context, extracurricular activities are mostly integrated into the educational system, with activities mainly taking place within schools. Thus, these activities are directly linked to education. Because of this connection to education, research has suggested that one of the main mechanisms behind the relationship between activity participation and positive youth outcomes is school attachment and belonging (Bouchard et al., 2023).

However, the pathways through which extracurricular activities impact inequality in outcomes may differ depending on the context. Research has repeatedly shown that the way educational systems are structured plays a role in how intergenerational reproduction occurs (van de Werfhorst & Mijs, 2010). Therefore, I argue that the impacts of extracurricular activities may also be dependent on the ways that these activities are organized, as well as the broader mechanisms of social reproduction inherent in the given context.

Since the mechanisms of social reproduction and educational systems are context-dependent, this dissertation examines Germany to understand how extracurricular activities contribute to inequality in this particular setting. In Germany, extracurricular activities are generally not structurally integrated into school life. Instead, they are organized outside the formal educational system mainly through sports clubs (*Vereine*) and music schools, which are mostly non-profit and partially publicly-funded, as well as through private offerings for classes, teaching, and coaching. This is an established system of civic-society institutions, which provides the setting of adolescents' organized extracurricular activities. This structure is connected to the prevalence of half-day schooling in Germany. All-day schooling is relatively uncommon, and even in cases where it exists, extracurricular activities are often run in partnership with external clubs and organizations (Arnoldt, 2022). In this setting of half-day schooling, adolescents spent a considerable share of their weekday time outside the school environment (Betthäuser et al., 2024).

This creates opportunities for unequal parental investments to manifest in the form of differing time-use pattern, such as inequalities in extracurricular activity participation, as described in a previous chapter. The structure of schooling thus might

impact how much room there is for family background to influence adolescents' outcome through investments like extracurricular activities. While most research has focused how education systems reproduces inequalities, for example through the impact of early ability tracking (van de Werfhorst, 2019), this dissertation contributes to these findings by shifting the attention to what happens outside of school.

Analyzing extracurricular activities in the context of Germany is particularly interesting because of the high levels of intergenerational reproduction in education through the highly stratified school system. Children are separated into school tracks at an relatively young age in comparison to other countries, with the tracking based on academic abilities, but highly influenced by social background (van de Werfhorst & Mijs, 2010; van de Werfhorst, 2019). Understanding the role of extracurricular activities within this stratified context is important to assess whether they provide opportunities to offset these structural disparities or reinforce them.

Because of the institutional setup of activities outside of the formal education system in Germany, questions of integration or segregation through extracurricular activities become relevant. While mechanisms such as school belonging, which have been proposed in the American context (Eccles et al., 2003), would not be in play, it remains open how extracurricular activities might connect adolescents from different backgrounds. Participation in extracurricular activities could thus be an integrating context, bringing adolescents from different social or educational backgrounds together, or be related to a segregating dynamic, in case that these activities mainly connect adolescents that are similar to each other.

This is connected to the additional selection processes involved when activities take place outside of schools: adolescents not only have the choice to participate or not, but they may also choose between different activity offerings. For example, adolescents interested in soccer might have multiple soccer clubs to choose from, each with a distinct social composition. Thus, extracurricular activities might lead to more social segregation in case that these activities are more socially segregated than school context, or lead to integrating dynamics in case that adolescents meet peers that they would otherwise not meet in school.

In terms of the research questions of this dissertation, studying extracurricular activities in the context of German thus provides an empirical application in a setting that is on one hand marked by high levels of educational and social stratification, on the other hand a system of extracurricular activities that are distinct from the education

system. This allows for an examination of whether extracurricular activities have an impact on educational outcomes even when not organizationally connected to schooling – both in terms of the cognitive skill benefits (Chapter 2) and the long-term educational and occupational benefits (Chapter 3). Further, in the third study (Chapter 4), the role of social connections in these activities is explored. This analysis examines whether these activities separate from schools provide contexts further segregating or integrating social contexts in adolescents' lives, and what impact these social connections might have. This dissertation thus provides a nuanced look at how extracurricular activities, as a form of childhood investments, may contribute to unequal outcomes over the life course within Germany's stratified context, ultimately shaping unequal pathways of status attainment.

1.2. Summary of the three studies

In the following, I will briefly present the three empirical studies that make up this cumulative dissertation. Each of the three studies in this dissertation addresses different aspects of the relation between extracurricular activities in adolescence and inequality in outcomes. A general overview of the studies can also be found in Table 1.

Study I: Can Sports and Music Level the Playing Field? Adolescents' Extracurricular Activities and the Reproduction of Social Inequalities in Cognitive Skills

The first study, co-authored with Wiebke Schulz, focuses on the relationship between participation in extracurricular activities and adolescents' cognitive skills. Particularly, we explore whether participation equalizes or reinforces inequalities in cognitive skills between adolescents from families with less or more education. The central question of the first study is whether there are heterogeneities by parental education in the benefits of extracurricular activities for cognitive skills. Specifically, the study investigates whether gaps in cognitive skills between adolescents from different education backgrounds are reduced or exacerbated through participation in extracurricular activities.

The study uses data from the German Socioeconomic Panel (SOEP). Propensity score techniques are employed in order to address dynamics of selection into activities. Findings show that participation in extracurricular activities is linked to higher cognitive test scores, particularly for participation in both music and sports combined. The link between participation in both activities combined and cognitive test scores is stronger for adolescents from more educated families than those from less educated backgrounds. While results are similar for sports, no variation by parental education is found for the link between cognitive test scores and music activities. Hence, participation in extracurricular activities does not reduce socioeconomic gaps in cognitive skills, but rather has the potential to increase them.

These findings emphasize that extracurricular activities play a complex role in shaping educational inequalities, beyond mere differences in participation rates. Specifically, the results show that even when adolescents from different backgrounds participate in these activities, their outcomes may differ. This suggests that

extracurricular engagement primarily reinforces existing disparities tied to parental education, rather than serving as an equalizing force. Consequently, the study highlights how extracurricular activities contribute to the intergenerational transmission of inequality, supporting the notion that parental background influences not only access to but also the benefits derived from such investments.

Study II: Extracurricular Activities in Adolescence and their Link to Educational Attainment and Labor Market Outcomes

In the second study, I examine whether the benefits of extracurricular activities in adolescence extend into adulthood, potentially contributing to long-term inequalities in educational and labor market outcomes. Building on prior research that has linked extracurricular activities to improved skills and academic performance during youth, this study explores whether this adolescent participation impacts tertiary degree attainment, labor market income, and unemployment experience in adulthood. Specifically, I look at how outcomes develop over time in the labor market. This relates to the theory of cumulative advantage (DiPrete & Eirich, 2006), which proposes that benefits may accumulate, widening outcome gaps as time progresses. This addresses the question of whether extracurricular activities continue to impact outcomes in adulthood, and if these benefits accumulate over time.

These questions are addressed with data from the German Socioeconomic Panel (SOEP), using propensity-score weighting with both logistic and mixed-effects models. I estimate the impact of participation in extracurricular activities in adolescence on tertiary degree attainment, labor market income, and time spent in unemployment, accounting for unequal selection into these activities. For labor market outcomes, the development of these impact over time is modeled. This study thus makes use of the longitudinal design of the SOEP, tracing the connection between activities in youth to outcomes in adulthood.

The results show a lasting relationship between extracurricular participation and both educational and labor market outcomes. Adolescents involved in extracurricular activities were more likely to attain a tertiary degree, even when unequal selection into these activities and other factors such as cognitive skills are accounted for. For labor market outcomes, the results indicate a cumulative effect,

with the gap between those who participated and those who did not increasing over time in the labor market, leading to higher income and less time spent in unemployment for those who participated.

These findings suggest that the impact of extracurricular activities is not limited to immediate educational benefits in adolescence, but also contributes to sustained inequalities in adulthood. Thus, unequal investments in childhood and adolescence such as extracurricular activities play a role in shaping long-term outcomes. This contributes to our understanding of how early inequalities expand into broader adult outcomes.

Study III: Joining the A-Team: Friendships in Extracurricular Activities and Their Impact on Educational Achievement

The third study explores the role of social connections formed through extracurricular activities. It asked how these social connections extracurricular activities contribute to inequalities in adolescents' social networks and whether these connections may help explain why involvement in extracurricular activities is linked to better educational achievement. By explicitly exploring the mechanism of peer effects in extracurricular activities, the study seeks to clarify why participation in these activities might be associated with better academic performance.

German panel data from the Children of Immigrants Longitudinal Survey in Four European Countries (CILS4EU) is used to examine these mechanisms. I employ multilevel and fixed-effects models as well as mediation analysis to explore the relationship between participation in these activities, characteristics of friends, and educational outcomes. This analytical approach allows for a better understanding of the differences between and within individuals regarding their social connections in extracurricular activities and how these are associated with educational achievement.

The findings reveal that adolescents involved in extracurricular activities tend to have more friends with higher academic achievements than their non-participating peers. Moreover, the positive association between extracurricular participation and educational outcomes is partially mediated by these high-achieving social connections, suggesting that the peer networks developed through such activities play a role in supporting academic success. This is particularly the case for

adolescents who attend lower school tracks, suggesting that extracurricular activities might help bridge divides that exist in the stratified German school system by enabling peer contact across school types.

This study advances our understanding of the mechanisms behind the observed benefits of extracurricular participation, by focusing on the social connections formed through these activities. By examining the role of peer characteristics, this research highlights how extracurricular activities foster social networks that may influence educational outcomes and contribute to broader patterns of inequality. This underscores the importance of extracurricular activities as contexts that can bridge academic divides and impact educational outcomes through peer networks, particularly for students who might not otherwise have access to such high-achieving peers. The findings contribute to a broader understanding of how non-school environments can play a pivotal role in influencing adolescents' social networks and educational inequalities within stratified systems.

Table 1: Overview of studies

	Study 1	Study 2	Study 3
Title	Can Sports and Music Level the Playing Field? Adolescents' Extracurricular Activities and the Reproduction of Social Inequalities in Cognitive Skills	Extracurricular Activities in Adolescence and their Link to Educational Attainment and Labor Market Outcomes	Joining the A-Team: Social Connections in Extracurricular Activities and Their Influence on Educational Outcomes
Research questions	1) What level of cognitive skill could be expected of adolescents who did not participate in extracurricular activities had they participated in either music or sports activities, or in both activities combined? 2) How does parental education condition the links between the different activities and cognitive skills? 3) Do different types of extracurricular activities lead to an equalization or reinforcement of cognitive skill gaps by parental education?	1) Is participation in extracurricular activities during adolescence linked to tertiary degree attainment? 2) Do labor market outcomes in terms of income and unemployment differ between participants and non-participants? 3) How do these differences develop over time?	1) How are extracurricular activities linked to the academic characteristics of adolescents' friends? 2) Do these friendships have an impact on grades?
Analytical approach	Propensity score weighted linear regression models	1) Propensity score weighted logistic regression models 2) Propensity score weighted mixed growth models	1) Multilevel models 2) Fixed-effects models 3) Mediation analysis
Data	SOEP Youth Survey	SOEP Youth Survey	CILS4EU
Author(s)	Henriette Bering & Wiebke Schulz	Henriette Bering	Henriette Bering
Publication	Published in *Research in Social Stratification and Mobility* (2024, 10.1016/j.rssm.2024.100895)		

2. Can Sports and Music Level the Playing Field? Adolescents' Extracurricular Activities and the Reproduction of Social Inequalities in Cognitive Skills

2.1. Abstract

Extracurricular activities in adolescence are associated with adolescents' cognitive skills. While participation in extracurricular activities is stratified, it is unclear whether all adolescents benefit from such activities to the same extent. This study explores whether participation in extracurricular activities functions as an equalizer or reinforcer of inequalities by examining how different types of activities (music, sports, or both combined) are associated with cognitive skills in adolescents from families with less or more education. We use data from the German SOEP household panel study and employ propensity score techniques to address differential selection into activities. Our results show that participation in both activities combined is most strongly related to cognitive test scores, followed by music activities and sports. Further, the results show that adolescents with more educated parents show a stronger link between participation in both activities combined and cognitive test scores than adolescents from less educated families. The same pattern holds for sports, although estimates are less clear. In contrast, the link between participation in music and cognitive test scores shows no variation by parental background. Our findings indicate that the participation in extracurricular activities does not diminish the gap in cognitive skills between children from less and more educated families; in fact, involvement in both activities combined further widens this disparity. Hence, even if adolescents from different socioeconomic backgrounds participated in activities to the same extent, gaps in cognitive skills by parental education are not reduced, and extracurricular activities thus have the potential to reinforce social inequalities.

2.2. Introduction

Extracurricular activities are associated with cognitive skills (Covay & Carbonaro, 2010; Hallam, 2010; Hille & Schupp, 2015), and children with a higher socioeconomic status (SES) are more likely to participate (Mikus et al., 2020b), rendering them a possible mechanism underlying the intergenerational transmission of advantages (Breen & Jonsson, 2005). Research indicates that the benefits of participation are also unequal, yet the findings are mixed. Some studies found larger benefits for lower

SES children (Crosnoe et al., 2015), suggesting that extracurricular activities could equalize inequalities. Others suggest that participation in extracurricular activities might be more beneficial to higher SES children (Covay & Carbonaro, 2010), and hence reinforce inequalities even if participation rates were equal. Thus, understanding the heterogeneities in the association between extracurricular activities and cognitive skills is crucial for examining the role of these activities in the formation of cognitive skill disparities among adolescents from different socioeconomic backgrounds.

The aim of this study is to investigate how participation in extracurricular activities may reproduce intergenerational inequalities in cognitive skills by drawing on differences between music and sports activities, which are the most prevalent organized extracurricular activities (Dederichs & Kruse, 2023). Based on the literature on intergenerational reproduction of advantages, we develop differential hypotheses on the associations between music, sports, and cognitive skills, as well as the combined effects of both activities, and the role of socioeconomic background, particularly parental education, in shaping these. The central argument of this study is that both equalizing and reinforcing dynamics could be at work, depending on the type of activity and whether adolescents undertake one type of extracurricular activity or both. Germany is a particularly interesting case to study this relationship as extracurricular activities mainly take place outside the formal education system and there is a strong relationship between socioeconomic background, cognitive skills, and educational success (Linberg et al., 2019). Importantly, sports and music differ in set-up and content: sports activities are typically organized by amateurs in clubs (Vereine); music classes are offered predominantly by professional musicians, either at music schools or through private lessons. Hence, the extent to which the benefits of participation vary based on the level of education of the parents may differ depending on the specific activity.

We analyze heterogeneous links between the most common extracurricular activities and cognitive skills measured at age 17 based on data from the German SOEP Youth Survey, which assesses adolescents' participation in extracurricular organized sports and music activities. While some studies treat extracurricular activities as one facet of cultural capital (see for example Mikus et al., 2020a) and include organized activities within broader measures of cultural engagement and

leisure-time activities, we are interested in the skill-generating aspect of organized extracurricular activities that take place outside school and families. We address sources of stratified participation in extracurricular activities by employing a propensity score weighting approach. If family characteristics that cause adolescents to participate in extracurricular activities are also positively related to cognitive skills, conventional approaches may overestimate the benefits of these activities and differentials therein. Based on the detailed family information available in the SOEP data, we use propensity score weighting to control for the differences in participation likelihood between adolescents from different socioeconomic backgrounds. Propensity score weighting—with the unit of reference being those not engaged in extracurricular activities—allows us to answer the following questions: What level of cognitive skill could be expected of adolescents who did not participate in extracurricular activities had they participated in either music or sports activities, or in both activities combined? How does parental education condition the links between the different activities and cognitive skills, i.e., do children from families with less or more education benefit more (less)—and vice versa—depending on the type of activity? Do different types of extracurricular activities lead to an equalization or reinforcement of cognitive skill gaps by parental education?

2.3. Background and hypotheses

2.3.1. Extracurricular activities and cognitive skills

A human capital perspective argues that extracurricular activities foster cognitive skills by providing skill-stimulating environments (Coleman, 1988). Specifically, research indicates that benefits of extracurricular activities translate into cognitive skills such as language, math, and figural skills (Taatgen, 2021). There are two ways in which extracurricular activities might stimulate cognitive skills. Neurological research suggests that extracurricular activities are related to changes in the brain itself (see, for sports, Tomporowski et al., 2008; for music Schlaug et al., 2005). Psychological research focuses on the stimulation of executive functioning, such as skills that allow for planning, multitasking, and self-control. Specifically, music activities were found to be associated with better executive functions, such as

inhibition and planning (Jaschke et al., 2018), and to support adolescents' motivation, discipline, and self-regulation (Guhn et al., 2020). Similarly, participation in organized sports may benefit the development of skills such as emotional regulation and self-knowledge (Hansen et al., 2003). These neurological and psychological mechanisms are thus channels through which extracurricular activities provide skill-stimulation and promote cognitive skills.[1]

Direct comparisons between sports and music activities are scarce, but existing studies indicate that music activities tend to be more strongly linked to cognitive skills (Cabane et al., 2016, Mikus et al., 2020b). It is possible that because music lessons take place one-on-one or in a small group, cognitive skills are acquired more efficiently. In contrast, sports activities are more often carried out in group settings. This context may emphasize social interaction and cooperation, which improves executive functioning. Indeed, studies consistently show a link between sports activities and educational attainment, health, and measures of behavior (Felfe et al., 2016; Gorry, 2016). Both activities combined tend to be most beneficial (Cabane et al., 2016; Linver et al., 2009), possibly due to spillover effects between activities and a wider range of learning experiences (Bohnert et al., 2010). These considerations lead to the following hypothesis about the general association between extracurricular activities and cognitive skills:

H1: *All types of extracurricular activities (music, sports, and both activities combined) are positively related to cognitive skills, with both activities combined and music being more strongly related to cognitive skills than sports.*

2.3.2. Parental education's impact on benefits of extracurricular activities

The link between extracurricular activities and cognitive skills might vary by parental education because education is associated with socio-economic resources and behaviors that can condition the benefits of activities (Erola & Kilpi-Jakonen, 2017). In the following, we argue that whether parental education lessens or

[1] While most research shows positive impact on adolescents' development, potentially harmful behaviors connected to extracurricular activities have also been discussed, especially the relationship between sports and alcohol and substance usage (Farb and Matjasko (2012) and overscheduling due to overly time-consuming engagement (Fredricks (2012)).

intensifies the link between activities and cognitive skills of adolescents depends on the type of activity, i.e., sports, music, or a combination of both. The more activity types vary in quality within the broader activity category and the more they provide room for involvement of parents, the more likely are differential benefits for adolescents with different levels of parental education. Subsequently, we discuss how differential links between activities and cognitive skills can lead to equalization and reinforcement of cognitive skill gaps by parental education.

2.3.2.1. Larger effects of sports activities for adolescents from more educated families

According to the theory of effectively maintained inequality (Lucas, 2017), more advantaged families secure advantages for their children “wherever advantages are commonly possible” (Lucas, 2001, p. 1652). Like all goods, extracurricular activities have quantitative and qualitative dimensions. Unequal participation rates in extracurricular activities have been established by previous research, with those from more educated families more often enrolled in activities (Mikus et al., 2020b). Beyond participation differences, qualitative differentiation in participation might play a role in enabling advantages for adolescents with more educated parents.

More educated families are more likely to have access to informational, motivational, and financial resources, that enable them to reap larger benefits from their engagement in activities. For instance, more educated parents might be more familiar with the potential payoffs of participation in specific activities (Wheeler, 2012; Wheeler & Green, 2014); they might secure an advantage by selecting high-quality activities that are especially beneficial for cognitive skills. Additionally, financial resources might play a role in conditioning access to activities that are beneficial for cognitive skills, e.g., in cases where activities that are more beneficial are also more expensive. More educated parents are also more likely to see activities as an educational investment and therefore might actively encourage their children’s involvement in those activities (Wheeler & Green, 2019), potentially resulting in a larger skill gain because of increased motivation. In sum, parental education would play a role in determining the benefits of participation in activities even when adolescents from different backgrounds are engaged in seemingly similar activities,

by boosting the benefits of activities through being able to select high-quality activities and active encouragement and support, or through a combination of both.

Following this line of reasoning, for sports we expect larger benefits for adolescents from more educated families. Sports activities vary in their set-up and quality, thus potentially providing a qualitative advantage and hence larger benefits to adolescents with more educated parents. In Germany, the well-established system of sports clubs (Vereine) offers a diverse landscape of sports and teams, with clubs typically being non-profit and non-professional. Despite low overall barriers to entry, the quality of instruction in sports clubs varies, ranging from non-professional amateurs who have completed training courses to more professionalized offers (Breuer & Feiler, 2019). Moreover, more highly educated parents might be better equipped to identify the type of sports best suited to their children's developmental needs. Theories of concerted cultivation also suggest that highly educated parents may be more inclined to see their children's sports participation as an educational investment (Lareau, 2011), leading to higher levels of active support for sports activities compared to that received by adolescents with less educated parents (Stefansen et al., 2018). This encouragement could translate into larger benefits, as a more motivated involvement in sports might lead to an enhanced learning experience from sports participation, with important benefits being realized especially when parents moderate and support these experiences at home as well (Lareau, 2011). Furthermore, educated parents might be more adapt at strategically choosing sports activities, resulting in a social selectivity between types of sport; e.g., participation in racket sports is more socially selective than soccer (Mutz & Müller, 2021). Consequently, adolescents from families with more education who participate in sports are more likely to interact with highly motivated and high-achieving peers than those from less educated families. More educated families are also more likely to be able to access high-quality instruction, as they are for example more likely to be able to afford individual or small group trainings in sports like tennis. Moreover, they are more likely to live in neighborhoods with a better supply of activities (Kähler & Rohkohl, 2023). In sum, we expect:

H2: *Sports activities are more strongly related to cognitive skills for adolescents from more educated families than for adolescents from less educated families.*

2.3.2.2. Larger effects of music and both activities for adolescents from less educated families

If, however, there is limited scope to gain a qualitative advantage, differential benefits of activities should be less likely. This would be the case if the supply of activities is fairly homogeneous in quality, and parental education did not influence how beneficial these activities are. If quality is relatively homogenous, there should be less scope for qualitative advantages by choosing among activities; also, parental encouragement should be less likely to influence whether benefits are realized. Moreover, if specific skill-stimulating activities are already common for adolescents from highly educated families, they might benefit less from activities than adolescents from less educated families (ceiling effect). This would lead to a stronger impact of activities on the cognitive skills of adolescents from less educated families, than for those with more educated parents.

Following this perspective, for music activities we expect larger benefits for adolescents from less educated families because of the setup of music activities and the unique benefits they offer for skill development, along with potential ceiling effects. Music activities are often provided in music schools or through lessons taught by professional music teachers (Dartsch, 2019), putting adolescents in regular contact with highly educated and professional adults. In addition, participation in music facilitates interaction with high-achieving peers, as adolescents from educated families participate in music more frequently (Elpus & Abril, 2019). Furthermore, music activities involve constant repetition and resemble the kind of abstract thinking and pattern recognition that were shown to be related to performance in math (Schlaug et al., 2005). Parental influence on the choice between options available among music activities, e.g., violin instead of guitar, would thus not matter for cognitive benefits. The central notion here is that the benefits of music activities are more directly transferable to cognitive skills, and less dependent on parental resources or parental involvement. For example, learning to read music could be an acquired skill that transfers to other educational benefits, regardless of whether one acquires it by learning the guitar or the violin. Additionally, as skill-stimulating experiences are often already ingrained in the upbringing of adolescents from

educated families, additional benefits through music are less likely (a ceiling effect). Gains in cognitive skills can be expected for those with less educated parents, who have more scope for improvement. For adolescents from less educated families, extracurricular activities might compensate for the lack of parental resources – i.e., participation is more beneficial for adolescents from less educated families. Based on this combination of a more homogenous supply with cognitive benefits independent of parental education and potential ceiling effects, we expect a stronger impact of music participation on cognitive skills for adolescents from less educated families.

> H3. Music activities are more strongly related to cognitive skills for adolescents from less educated families than for adolescents from more educated families.

If the argument that adolescents with less educated parents have more scope for skill improvement holds true, then the combination of both activities should provide more opportunity for them to do so (learning begets learning). Benefits gained from music activities may also facilitate benefits from sports activities (spillover effect), possibly due to learning experiences or via a network effect that influences the choice of type of sports activities. In addition, the sheer structuring of free time through participation in both activities combined may come as an advantage to adolescents with less educated parents more so than to those from more educated families, who are more likely to be engaged in beneficial, active leisure activities even in non-organized contexts (Laidley & Conley, 2018). Engaging in multiple activities could thus yield larger payoffs for adolescents from less educated families than for those with higher levels of parental education. To sum up we anticipate:

> H4. Both activities combined are more strongly related to cognitive skills for adolescents from less educated families than for adolescents from more educated families.

2.3.3. Equalizing and reinforcing dynamics of extracurricular activities

Based on the discussion above, different types of activities can be expected to either equalize or reinforce skill gaps between adolescents from higher and lower educated families (Erola & Kilpi-Jakonen, 2017). Participation in sports should reinforce the existing cognitive skill gap between adolescents from families with different levels of parental education, further widening the skill gap between adolescents from more and less educated families. In contrast, for participation in music activities and both activities combined, equalizing dynamics can be expected. The reduction of the cognitive skill gaps would result from stronger effects for adolescents from less educated families, combined with negligible effects for adolescents from families with a high level of education.

2.4. Data and methods

2.4.1. Data

This study is based on data from the German Socioeconomic Panel (SOEP). SOEP is a nationally representative annual panel survey of households in Germany. Specifically, we draw on data from the SOEP Youth Survey, which is conducted among all SOEP household members in the year they turn 17 (Naujoks et al., 2018). The Youth Survey contains youth-specific questions related to experiences of growing up, schooling, leisure, and organized activities. The survey has been carried out since 2000 and has thus far collected responses from more than 8,000 individuals (N=8,381). Since 2006, participants' fluid cognitive skills have also been recorded through a cognitive skills test. This test is an addition to the Youth Survey and measures numeric, verbal, and figural skills through three modules (Schupp & Hermann, 2009). The inclusion of this test enables us to examine the relationship between extracurricular activities and cognitive skills.

We exclude cases based on non-response to questions about extracurricular activities (N excluded = 465) and those who did not complete the cognitive test (N excluded = 4719). Because the cognitive skills test was not part of the SOEP Youth Survey before 2006, this limits the number of cases. We further exclude cases where parents received their schooling outside Germany and those with missing

sociodemographic information (N excluded = 507). The sample consists of 2960 individual adolescents (see Table 2), nested within 1985 households.

Table 2: Sample selection

Step	Remaining number of observations
All adolescents who answered the SOEP Youth Questionnaire (2000-2018)	8,381
Drop cases who were not asked about extracurricular activities or who did not answer the relevant question	7,916
Drop cases for which there was no information on cognitive skills	3,197
Drop cases whose parents were educated outside Germany & those with missing sociodemographic information	2,690

2.4.2. Variables

2.4.2.1. Extracurricular activities

The SOEP Youth Survey contains questions about respondents' participation in extracurricular activities. Respondents were asked "Do you actively make music, meaning singing or playing an instrument?" and "Do you play any sports?" Binary "yes/no" answers were recorded (Naujoks et al., 2018). Those who answered "yes" to either question were asked the following follow-up questions: "Do you or did you take paid music lessons (outside of school)?" and "Do you take part in sports competitions?" (Naujoks et al., 2018). As we are interested in organized activities (in contrast to more casual leisure-time activities), we focus on adolescents who indicated participation in extracurricular activities in an organized setting through lessons and competitions. Based on the responses to these questions, we code dummy variables that indicate whether respondents took paid music lessons, participated in competitive sports, engaged in both activities through paid lessons and competitions, or engaged in neither activity in an organized form. The SOEP Youth Survey records only the duration of the most recent extracurricular activity, e.g., the

sport they currently play. Since adolescents also switch between specific activities during childhood and adolescences, this measure likely underestimates the duration of participation. For this reason, information on duration was used only in robustness checks (see Table A1, Table A2, Table A3 in the appendix).

In our sample, around 48% of respondents participated in organized extracurricular activities, while 52% either did not participate or engaged in activities only for leisure purposes (see Table 3 for descriptive statistics). Sports are the most common organized activity for adolescents, with about 26% indicating their participation, followed by music with 14%. Approximately 8% of respondents reported participation in both music through paid lessons and in sports through competitions.

2.4.2.2. Cognitive skills

The results of a cognitive test included in the SOEP Youth Survey serve as the dependent variable. The test measures cognitive skills at age 17 and is composed of three modules measuring three different dimensions of fluid cognitive skills: numeric, verbal, and figural skills (Schupp & Hermann, 2009). This cognitive test has been shown to reliably and robustly measure skills in a way similar to more comprehensive tests of cognitive abilities (Lang et al., 2007). For our main analyses, we use a sum score reflecting the overall performance on all cognitive tests. In additional analyses, we also look separately at the associations between extracurricular activities and the particular dimensions of cognitive skills (see robustness checks, Table A4, Table A5, Table A6 in the appendix).

The data lack a measure of cognitive skill level before adolescents started extracurricular activities. To account for earlier skill levels, we included teachers' recommendations for school track in the analyses. Teachers' recommendations are closely linked to school grades (Pietsch & Stubbe, 2007), and school grades are strongly associated with cognitive skills (Boman, 2023). In additional analyses on a smaller subset for which school grades are also available we show that grades, school track recommendations, and cognitive skills are associated (see Table A7 in the appendix). In Germany, decisions about school tracks are usually made before the age of 11, so about six years before the measurement of cognitive skills. School track recommendation was included categorically, differentiating between academic track

(*Gymnasialempfehlung*), intermediate track (*Realschulempfehlung*), lower secondary track (*Hauptschulempfehlung*), or whether the respondents were in a school where no recommendations were given. It is possible that this measure of earlier skills is biased through social stratification in school recommendations, i.e., we systematically overestimate the level of skills for adolescents from more educated families, as they are more likely to be recommended for the academic track than those with less educated parents at the same level of skills (Maaz & Nagy, 2010). This would mean that the propensity score weighting is less efficient in balancing the influence of earlier cognitive skills on the likelihood of participating in extracurricular activities.

2.4.2.3. Individual and parental characteristics

We include family background and individual characteristics that are likely to impact both the propensity to take up certain activities and cognitive skills. Descriptive statistics on these variables are reported in Table 2. For the measurement of parental education, we use the highest level of the parents' schooling through a dummy variable measuring whether or not at least one of the adolescent's parents has an upper secondary school diploma, following the dominance principle. Parental education has been shown to be a crucial indicator of SES in Germany. In additional analyses (see Table A8, Table A9 in the appendix), we also test whether alternative measures of parental SES, particularly occupational class and household income, show the same dynamics. The dominance principle is also applied to the measurement of parental occupational class, so that parental occupational class is operationalized as the highest occupational class between parents, based on the Erikson Goldthorpe Class Categories (EGP). Monthly household net income is measured in the year in which respondents participated in the SOEP Youth Survey at age 17.

Migration background is indicated when adolescents or one of their parents migrated to Germany. In order to control for regional variations in access to activities, we include the size of the communities in which respondents lived until at least age 15, categorized into large city, midsize city, small town, and rural. Because in Germany extracurricular activities take place outside school, context measures of school characteristics such as size are not included. Data on parental leisure participation in athletics, music, and artistic activities is available for a subset of the

sample. We include these in additional analyses (see Table A10, Table A11 in the appendix) as they have been shown to potentially impact adolescents' interest in and access to these activities (see for example Edwardson & Gorely, 2010). We further include gender and whether adolescents were the eldest sibling in their family, to capture first-born effects on the likelihood of participating in different extracurricular activities (Osai & Whiteman, 2017), and the school track attended by the participant. School track is assessed as a dummy variable indicating whether or not participants attend or in the past attended the academic school track (Gymnasium). If participants are still in school, the school track they are currently attending is used; if they had graduated, the track of their leaving certificate is used. In some cases where data were missing, the track of the certificate that participants plan to gain is used instead (n = 91).

Table 3: Descriptive statistics of variables. For dependent and independent variables: frequencies (percent), means, and standard deviations (SD). For numeric variables: minimum and maximum, values found in the sample. N=2,690.

Variable	Percent	Mean	SD	Min	Max
Dependent variables:					
Total test score		31.574	9.166	3	55
Independent variables:					
Activities:					
None	52.230				
Sport (only)	25.762				
Music (only)	14.424				
Both	7.584				
High level of parental education	33.903				
OECD equivalent household income (in EUR 1,000)		1.475	0.833	0.100	17.500
Parental EGP class					
Upper service	23.680				
Lower service	28.587				
Higher routine non-manual	13.680				
Self-employed/farmer	5.874				
Working class	28.178				
Migration background	19.888				
Gender (female)	48.327				
Eldest sibling/only child	62.305				
Childhood community size:					
Large city	19.182				
Midsize city	19.628				

Small town	27.993
Rural	33.197
Academic school track (*Gymnasium*)	41.933
School track recommendation	
Academic	44.387
Intermediate	29.665
General	12.751
None given	13.197

Note: High level of parental education operationalized as at least one parent having an upper secondary school diploma, low level of parental education as neither parent having an upper secondary school diploma. Source: SOEP v35, own calculations.

2.4.3. Analytical strategy

We estimate propensity score weighted linear regression models on the association between extracurricular activities and cognitive skills. Our main interest are variations in the link between extracurricular activities and cognitive skills by parental education.

In a first step, we use propensity score weighting on observables to reduce the bias produced by unequal selection patterns into extracurricular activities. While research has robustly established the associations between extracurricular activities and cognitive skills, selection into these activities is not random. There might be no causal effect of activity participation on cognitive skills, but rather some of the same observed and unobserved individual and family characteristics that cause higher cognitive skills might also lead to participation in extracurricular activities at higher rates. Factors that are related to adolescents' choice of activities also tend to be related to their cognitive skills. As a result, any effect on cognitive skills might in fact be due to these underlying characteristics instead of extracurricular activity participation. Not addressing this would potentially misrepresent the impact of these activities on cognitive scores. The use of propensity score weighting based on observable background variables in our analytical approach reduces this problem (see Hu & Mustillo, 2016). First, we use multinomial logistic models to estimate each participant's propensity score for participating in the different extracurricular activity categories—music, sports, or both activities combined—in reference to no participation, conditional on the background variables described earlier. This generalized propensity score reflects the multi-categorical nature of the different

activities and accounts for observed family and individual characteristics that were shown to greatly impact the likelihood of partaking in extracurricular activities, while also impacting cognitive skills (see for example Mikus et al., 2020b). Propensity score weighting based on multinomial logistic models has been shown to adequately address covariate imbalance generally (Guo et al., 2020). Our additional empirical tests show that, compared to other weighting methods such as generalized boosted models or Bayesian additive regression trees, propensity score weighting performs equally well (see Figure A1 in the appendix). One potential issue with this approach is that it can only account for selection into activities based on observable variables; there might thus be other important influences of extracurricular participation that are not observed in this analysis.

Next, we use the calculated propensity scores as inverse probability weights in our models, balancing the covariates with respect to the different extracurricular activity categories so that those engaged in extracurricular activities resemble those that do not participate in any activities (Harder et al., 2010). We thus calculate the average treatment effect in the control group (ATC), with the control group being those who did not participate in any extracurricular activities. For each type of activity, this answers the following question: Which cognitive skills would adolescents who did not engage in this activity have had if they had participated? We use clustered standard errors at the household level to account for siblings nested within households. Further, we introduce interaction terms between activity participation and parental education in a second model to address the possible variation in the impact by parental level of education, which addresses the next question: Do these links between different extracurricular activities and cognitive skills vary by parental level of education? Since we are particularly interested in equalizing or reinforcing dynamics, we evaluate the potential of extracurricular activities to equalize or reinforce skill gaps between adolescents from more and less educated families based on the group-specific predicted cognitive test scores.

2.5. Results

2.5.1. Descriptive results

Adolescents who do not participate in extracurricular activities tend to have the lowest cognitive skill levels on average, followed first by those who participate in sports and second by musically active adolescents. The highest average scores were measured for adolescents who participate in both sports and music combined (see Table 4 and Table A12 in the appendix for separate averages of different dimensions of cognitive skills). This confirms the expected relationship between these extracurricular activities and cognitive skills (Mikus et al., 2020b). It is evident that selection into activities is linked to parental education: adolescents from families in which at least one parent had an upper secondary school diploma tend to participate more in both activities combined and in music, while the participation rates in sports are only slightly lower for adolescents from families with lower levels of parental education (Table 5). Importantly, a much larger proportion of adolescents from low-educated families do not participate in any extracurricular activity. These unequal participation patterns can be seen as well when we consider other measures of parental SES (see Table A13 for parental occupational status and Table A14 for household income in the appendix). Thus, family background is clearly associated with the likelihood and type of activity participation.

Table 4: Average total cognitive test score by extracurricular activity participation. Total score standardized within sample. N=2,960.

	Mean total score (standardized)
None (%)	-0.225
Sport (%)	0.122
Music (%)	0.376
Both (%)	0.422

Source: SOEP v35, own calculations

Furthermore, adolescents with lower and higher levels of parental education engaged in different types of activities exhibit varying average cognitive test scores (see Table A12 in the appendix). We observe consistent gaps in cognitive scores between adolescents with more and less educated parents overall, with somewhat narrower gaps for those engaged in music and both activities combined than for adolescents engaged in sports.

Table 5: Extracurricular activity participation by parental level of education. N=2,960.

	High level of parental education	Low level of parental education
None (%)	34.868	61.136
Sport (%)	28.070	24.578
Music (%)	23.575	9.730
Both (%)	13.487	4.556

Note: High level of parental education operationalized as at least one parent having an upper secondary school diploma, low level of parental education as neither parent having an upper secondary school diploma. Source: SOEP v35, own calculations.

2.5.2. Propensity score analysis

Covariate balance

In a first step, we use propensity score weighting to balance the described covariates of adolescents engaged in the different extracurricular activities with those not engaged in any activities. We checked how effective the propensity score weighting was by calculating the absolute standardized mean differences between the activity groups. Table 6 shows the standardized mean differences in the sample before and after weighting. A standardized mean difference of 0 would indicate a perfect balance (Im et al., 2016), while a standardized mean difference below .25 is considered adequately balanced. However, some sources recommend a threshold of .1 (Harder et al., 2010). For all covariates the balance is visibly improved. Hence, the propensity weighting effectively reduced the imbalance in covariates between adolescents engaged in different extracurricular activities.

Table 6: Absolute standardized mean difference (SMD) before and after propensity score weighting

Covariates	SMD	
	Before	After
High level of parental education	0.796	0.177
OECD equivalent household income (in EUR 1,000)	0.603	0.044

Parental EGP class		
Upper service	0.499	0.037
Lower service	0.199	0.046
Higher routine non-manual	0.265	0.055
Self-employed/farmer	0.228	0.022
Working class	0.724	0.065
Migration background	0.266	0.100
Gender (female)	0.495	0.058
Eldest sibling/only child	0.066	0.109
Academic school track	0.859	0.036
School track recommendation (ref. category: Academic)		
Intermediate	0.410	0.178
General	0.507	0.077
None given	0.395	0.159
Childhood location type (ref. category: Large city)		
Midsize city	0.063	0.102
Small town	0.081	0.088
Rural	0.072	0.190

2.5.3. Estimation

After covariate balance was achieved, we estimate the links between participation in different extracurricular activities and cognitive skills using the propensity scores as weights. The overall result of the cognitive tests (standardized to reflect the distribution within the sample) is the dependent variable, and adolescents' extracurricular activity is the independent variable. Extracurricular activity is categorized into sports only, music only, and both activities combined. All covariates used in the propensity score estimation were also included in the weighted model (Harder et al., 2010). We first present the results of the main effects of extracurricular activities on cognitive skills and then proceed to analyze the interaction between extracurricular activities and parental level of education. All three categories of extracurricular activity are positively associated with total cognitive test scores (see Table 7, Model 1). Engagement in both activities combined is associated with the highest cognitive score difference compared to the non-active adolescents, with around 25% of a standard deviation, followed by music (0.220 SD). Sports activities are weakly associated with cognitive skills (0.101 SD). In terms of the raw test scale

(0−55), those engaged in both activities combined and music score around two points higher than non-engaged adolescents. Those participating in sports score one point higher than adolescents who do not participate in any activity. The findings thus support our first hypothesis (H1), that extracurricular activities and cognitive skills are positively associated, especially for both activities combined, for music, and to a lesser extent for sports.

Next, we examine whether the relationship between extracurricular activities and cognitive skills varies by parental level of education. For sports, the interaction points to a stronger link to cognitive scores for adolescents from more educated families, however this coefficient does not reach statistical significance (0.172 SD, $p < 0.1$, see Table 7, Model 2). Arguably, equally crucial is the effect size (Firebaugh, 2018), which amounts to 17% of a standard deviation. Hence, this finding does not lend clear support for our second hypothesis (H2) that the link between sports and cognitive skills is stronger for adolescents with more educated parents than those from less educated families, but points into this direction. The interaction of parental education with music activities is neither statistically significant nor substantially meaningful; thus, the results lend no support for the third hypothesis (H3). The association between both activities combined and skill scores is larger for adolescents with more educated parents than for adolescents with less educated parents (0.291 SD, $p < 0.05$, see Table 7, Model 2). This finding is contrary to our expectation that the combined engagement in both activities would be most beneficial for adolescents from less educated families (H4).

Fig. 1 presents the predicted cognitive scores across different levels of parental education and by different types of activities. Among adolescents with more educated parents, those not engaged in any activities show predicted cognitive scores of 0.025; when engaged in both activities combined, they have the highest predicted cognitive score (0.452). If adolescents with more educated parents engage in sports or music, their scores are estimated at 0.239 and 0.262, respectively. For adolescents from less educated families, those not engaged show a predicted score of −0.096; predicted scores vary somewhat less by activity, with scores of 0.113 for music, −0.055 for sports, and 0.039 for both activities combined.

Table 7: Results of propensity score weighted linear regression models predicting total cognitive test score by extracurricular activity participation. N=2,690.

	Model 1			Model 2 (with interactions)		
	b		se	b		se
Activity (ref. category: None)						
Sport	0.101	*	(0.044)	0.042		(0.052)
Music	0.220	***	(0.056)	0.210	**	(0.073)
Both	0.251	***	(0.072)	0.136		(0.092)
High level of parental education	0.249	***	(0.069)	0.121		(0.071)
Activity x High level of parental education						
Sport				0.172		(0.095)
Music				0.028		(0.110)
Both				0.291	*	(0.144)
Gender (female)	-0.188	***	(0.046)	-0.193	***	(0.046)
Eldest sibling/only child	0.002		(0.047)	0.002		(0.046)
OECD equivalent household income (in EUR 1,000)	-0.026		(0.035)	-0.024		(0.034)
Parental EGP class (ref.: Upper service)						
Lower service	-0.069		(0.058)	-0.074		(0.058)
Higher routine non-manual	-0.034		(0.074)	-0.033		(0.074)
Self-employed/farmer	0.010		(0.133)	-0.002		(0.130)
Working class	-0.145		(0.087)	-0.148		(0.086)
Migration background	-0.249	***	(0.066)	-0.250	***	(0.063)
Academic school track	0.458	***	(0.056)	0.463	***	(0.056)
School track recommendation (ref.: Academic)						
Intermediate	-0.239	***	(0.061)	-0.236	***	(0.060)
General	-0.453	***	(0.101)	-0.467	***	(0.098)
None given	-0.384	***	(0.087)	-0.408	***	(0.089)
Childhood location type (ref.: Large city)						
Midsize city	0.169	*	(0.081)	0.173	*	(0.080)

Small town	0.068		(0.068)	0.070		(0.068)
Rural	0.151	*	(0.066)	0.158	*	(0.065)

Note: Standard errors in parenthesis, adjusted for clustering within households. * p<0.05 ** p<0.01 *** p<0.001. Source: SOEP v35, own calculations.

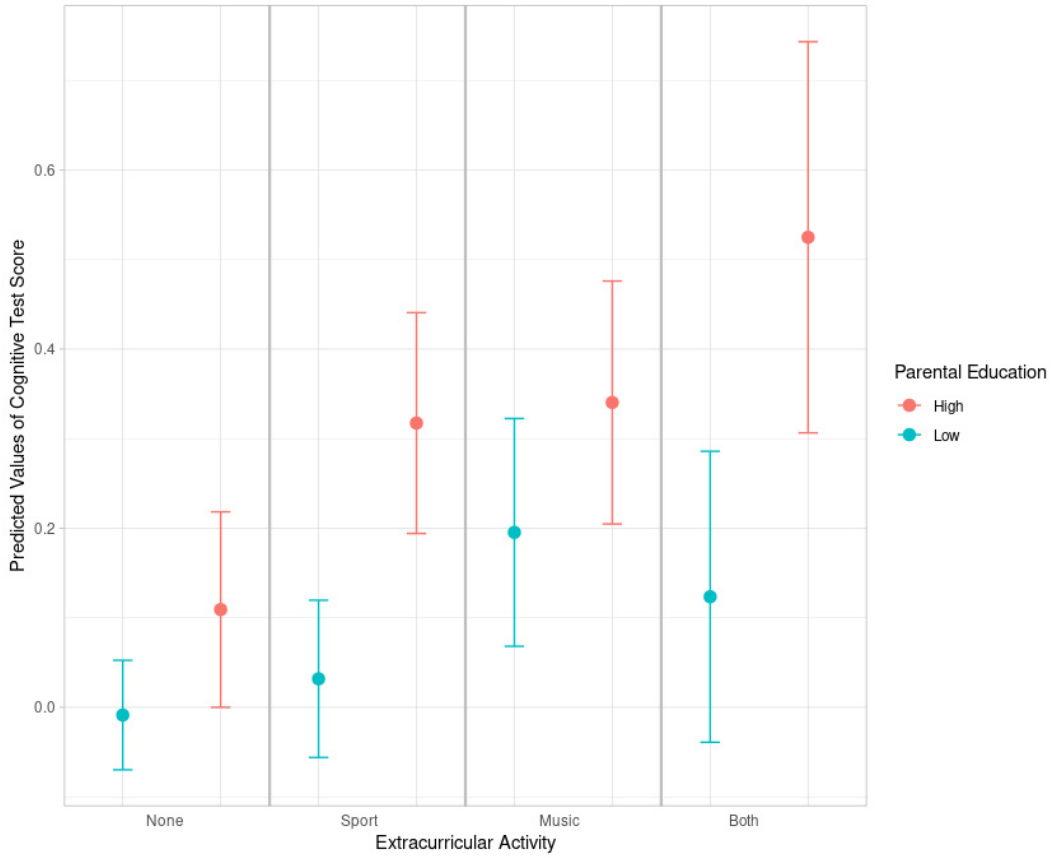

Figure 2: Predicted values of total cognitive test scores by extracurricular activity and parental education, based on propensity score weighted regression models.

Based on Figure 2, we evaluate whether these estimates lead to equalizing or reinforcing patterns for adolescents' cognitive skills, i.e. whether the skill gap between adolescents with more and less educated parents is narrowed or widened by participation in extracurricular activities. Participation in sports and in both activities combined reinforces the skill gap; that is, in comparison to those not engaged in activities the gap by parental education is wider. Engagement in music does not equalize, nor reinforce, cognitive scores between adolescents from more and less educated families. The gap among adolescents engaged in music is similar to those not participating in any activities. In sum, our exceptions regarding the skill gaps are

only partly supported: both activities combined and sports reinforce the gap; in contrast to our expectations neither activity is related to equalizing dynamics.

2.5.4. Robustness checks

We tested the robustness of our results in several ways. First, we looked at any participation in extracurricular activities, regardless of whether or not adolescents engaged in them in an organized setting (see Table A15, Table A16 in the appendix). Here, we used the responses to questions regarding any kind of extracurricular engagement, disregarding whether these activities took place in a formal setting ("Do you actively make music, meaning singing or playing an instrument?" and "Do you play any sports?"). We expected the association between cognitive skills and this broader measure of extracurricular engagement to be weaker, since unorganized musical and athletic activity can be expected to provide fewer benefits and cognitive stimulation than organized, structured activities. In line with the main results, there is a positive association between cognitive skills and music (0.241, $p < 0.01$) as well as with participation in both activities combined (0.157, $p < 0.05$), and no clear association with sports. For adolescents with less educated parents, there is a positive relationship between engagement in informal extracurricular activities and cognitive skills, with music again showing a greater positive relationship than sports. For adolescents with more educated parents, there is no clear association between participation and cognitive skills when extracurricular activities are defined more broadly. For adolescents with more educated parents, associations between participation and cognitive skills are either negative (music) or substantially and statistically insignificant (sports and both activities).

Second, we restricted the analyses to extracurricular activities with a minimum participation duration of at least three years (see Table A1, Table A2 in the appendix). Possibly, prolonged engagement in these activities has a particularly strong impact on cognitive skills (Bohnert et al., 2010). If this were the case, we would expect the effect for prolonged participation to be larger than in our main results. Results from this additional analysis do not differ from the main results, thus the effects of extracurricular activities do not seem to be driven only by adolescents who engage in

them for at least three years (Im et al., 2016). We additionally calculated a model with participation duration as a control variable (Table A3 in the appendix), which also supports this conclusion.

Third, we control for other leisure activities in an additional analysis (see Table A17 in the appendix). Differential links between extracurricular activities and cognitive skills for adolescents whose parents had lower or higher levels of education could be related to differences in their leisure-time behavior beyond organized activities. The SOEP Youth Survey surveys a broad range of leisure-time activities and their frequency (see Table A18 in the appendix), including social activities like meeting friends, media consumption like watching TV or reading, and organized activities beyond music and sports, such as church or youth groups. When we included information about the amount of time spent watching TV, playing computer games, and reading, we find that while some of these activities are indeed related to cognitive skills—positively in the case of regular reading and negatively in the case of frequent TV watching—controlling for them in the analysis did not change the results. This suggests that our findings are not driven by differences in alternative leisure activities.

Fourth, we test whether the observed patterns persisted when parental SES is measured using occupational status or household income instead of level of education (see Table A8, Table A9 in the appendix). Results show no significant variations in the relationship between activities and cognitive skills by occupational status or household income. Parental education seems to be particularly important in shaping the benefits of extracurricular activity. Furthermore, for a subsample data on parental leisure behavior is available. We used this information to re-estimate the propensity scores for participation in extracurricular activities. Here, we considered whether or not parents indicated regular engagement in artistic leisure-time activities (including music) and regular engagement in sports (see Table A10 in the appendix for estimation of propensity score weights). These indicators of parental leisure-time behavior appear to influence selection into extracurricular activities. Taking intergenerational influence on selection into activities into account, the differential benefits of engagement disappear (see Table A11). This indicates that if parents with low levels of education are regularly engaged in arts or sports, their adolescent children will benefit from their engagement in a way similar to adolescents from more

educated families. Hence, parental leisure behavior might be a mechanism underlying unequal benefits of extracurricular activities; we return to this point in the discussion.

Lastly, we tested whether the heterogeneous impact of extracurricular activities varies across the three subscale scores — numeric, verbal, and figural skills (see Table A4, Table A5, Table A6 in the appendix). There are slight variations between the different test scores. The reinforcing role of sports is the largest for figural skills. Both activities combined seem to reinforce the skill gap particularly for numeric skills and much less so for verbal skills. The advantage enjoyed by adolescents from more educated families potentially does not extend to verbal skills to the same degree because these are already part and parcel of their upbringing. For music, participation is related to an equalizing role only for figural and verbal skills, not for numeric skills. These findings suggest that the level of education of parents might also condition what kind of cognitive skills adolescents gain from participation in extracurricular engagement. This might happen through differences in choosing a particular type of sport or music, or through differential parental support surrounding the activities.

2.6. Discussion and conclusion

In this study, we examined the links between extracurricular activities and cognitive skills during adolescence, focusing on variations in the interplay of parental education and extracurricular activities. Numerous previous studies have established that extracurricular activities are positively associated with cognitive skills; however, it remains unclear whether these activities benefit all adolescents in equal measure. Our analysis sought to address this issue by examining whether unequal effects vary based on the type of activity, namely music, sports, or a combination of both, and whether participation in these different types of extracurricular activities either equalizes or reinforces cognitive skill gaps based on parental education.

In a first step we showed that sports and music activities in combination are most strongly related to cognitive skills, followed by music and sports separately. We then showed that parental education conditions the links between both activities combined and cognitive skills; engagement in both activities combined is associated with cognitive skills particularly for adolescents from more educated families.

Adolescents with more educated parents may experience synergy effects (learning begets learning) from the two activities because of higher levels of parental resources and support; those from less educated families have fewer of these resources at their disposal. Alternatively, educated parents might be better informed and better able to determine the most beneficial degree of extracurricular activity for their children. As a result, only those adolescents with more educated parents who are at low risk of overscheduling engage in both activities combined. Hence, these results suggest that in the case of both activities combined more educated parents are better positioned to help their children take advantage of extracurricular activities.

For sports, the results are less clear, but point to a possible advantage of higher parental education for the realization of benefits. More educated parents might steer the choice of sports towards more beneficial activities. Larger benefits might also be due to the higher involvement of educated parents in adolescents' sports activities, supporting skill development from participation. Hence, sports might function as a channel through which more educated families secure an advantage in terms of cognitive skills through qualitative differences in participation. Taken together, our findings provide partial support for the effectively maintained inequality perspective (cf. Lucas, 2001).

Contrary to our hypotheses, music appears to have equal benefits for all adolescents, regardless of parental education. In other words, participation in music seems to provide consistent benefits independent of adolescents' parental level of education. A possible explanation could be that qualitative differences in music instruction do not result in differential benefits, while, at the same time, there are no observed ceiling effects for adolescents from more educated families.

Finally, we examine whether different types of extracurricular activities lead to an equalization or reinforcement of cognitive skill gaps by parental education. Both activities combined – and to a lesser extent sports activities – reinforce existing social inequalities in cognitive skills. Contrary to our expectations, music does not reduce gaps in cognitive test scores, but mainly reproduces them, as the gap between adolescents from more and less educated families does not narrow through participation. Our findings thus provide support for the perspective that activities might reinforce differences between children with different levels of parental education, but

no support for the notion that extracurricular activities may equalize gaps in cognitive skills.

Overall, this study provides new insights into the unequal benefits of extracurricular activities for cognitive skills and extends beyond previous studies that focused on stratified participation patterns. The findings suggest that the increasing importance of extracurricular activities (Hille et al., 2014) and the ongoing trend toward higher parental investments in extracurricular activities (particularly in the US, see Kornrich, 2016, Schneider et al., 2018) may contribute to persistent inequalities in school-related skills through unequal benefits. More generally, this study highlights the role of family background in shaping the interplay between non-school/non-family learning resources and life chances. Extracurricular activities do not compensate for disadvantages based on parental education. On the contrary, more educated parents can potentially reinforce the benefits of sports and particularly both activities combined. This complements previous research on the reproduction of intergenerational inequalities with regard to additional childhood experiences. While studies on the influence of home-learning activities (McMullin et al., 2020) and childcare (Burger, 2010, Ghirardi et al., 2022) indicate that children with lower levels of resources benefit most from these types of additional experiences, our study suggests otherwise for extracurricular activities. For research on social background gaps in cognitive skills, this means that non-school/non-family activities have the potential to reinforce inequalities.

An avenue for future research is to gain a better understanding of the way parents condition the benefits of activities, e.g., how parents support and encourage these activities. Here, parental educational aspirations might be an important moderator (Dräger & Pforr, 2022, Wilder, 2014). Relatedly, as our robustness checks (see pp. 50-52) suggest that some of the heterogeneity in the benefits of extracurricular activities is related to parental leisure activities, it might be promising to further examine how parents' involvement in music and sports conditions adolescents' experiences in these activities. Another issue may be to study how better educated parents may have greater time autonomy at work, allowing them to better support (e.g. through transportation) and supervise activities, especially when children are engaged in multiple activities.

The following limitations warrant discussion. Despite our efforts to address the effect of unequal selection into activities through propensity score weighting, our study is limited by potential unobserved heterogeneity and selection bias. Our approach cannot account for unobserved differences between adolescents that might have impacted both their decision to engage in music or sports and their cognitive skills. These potentially unobserved differences include personality traits and interest in certain activities. Moreover, adolescents from more educated families who do not engage in any activity might be systematically different from their peers who do participate in ways that are not measured in this analytical design. For example, non-engaged adolescents with more educated parents could be negatively selected, which might account for their lower levels of cognitive skill compared to adolescents from similar backgrounds who are active in extracurricular activities. Additionally, while we can differentiate between music and sports and both activities combined, we lack more detailed information on levels of engagement, exposure, and specific types of activities. Although our supplementary analyses suggest that these factors do not systematically influence the results, future research should consider them. Finally, the SOEP data provide only one measurement of cognitive skills. A promising direction for future research lies in combining propensity score approaches with a longitudinal design that accounts for development trajectories of cognitive skills.

To conclude, our analyses highlight that beyond unequal access to extracurricular activities adolescents with more and less educated parents engaged in activities may not benefit from their engagement to the same extent. Extracurricular activities thus mainly act as reinforcers of inequalities based on parental education, and therefore contribute to the intergenerational reproduction of inequality.

3. Extracurricular Activities in Adolescence and their Link to Educational Attainment and Labor Market Outcomes

3.1. Abstract

The impact of extracurricular activities on skills and educational performance during adolescence has been robustly demonstrated. It remains unclear whether this advantage extends into adulthood. This study focuses on extracurricular activities in adolescence and how participation may contribute to long-term inequalities in educational and occupational attainment. Using data from the Youth Survey of the German Socioeconomic Panel (SOEP), this research analyzes a longitudinal sample (N=7,830) to explore how participation at age 17 impacts university degree attainment and labor market trajectories, particularly how occupational outcomes develop over time in the labor market. Using propensity score weighting with both regression models and random-effects growth models, this approach addresses the socially unequal selection into activities. The results indicate a lasting relationship between extracurricular activities and both educational and labor market outcomes. The benefits of adolescent extracurricular participation for income and unemployment increase over time. This shows that extracurricular activities that took place in adolescence have a lasting impact in adulthood, contributing to widening inequalities over the life course.

3.2. Introduction

What role do extracurricular investments in adolescence play for long-term inequalities in adulthood? Social inequalities that arise during childhood and adolescence often persist throughout the life course, and the impact of activities outside of formal schooling contexts, particularly extracurricular activities, on these inequalities has been gaining attention (see for example Vandell et al., 2022). Activities such as music and sports have been linked to improved cognitive and non-cognitive skills (Covay & Carbonaro, 2010; Mikus et al., 2020b; Bering & Schulz, 2024), larger social networks (Fredricks & Simpkins, 2013), and better academic

performance during childhood and adolescence (Dumais, 2006; Carbonaro & Maloney, 2019).

However, it remains unclear whether these benefits extend into adulthood, as most studies have focused on short-term effects during childhood and adolescence. If the benefits gained from extracurricular activities contribute to outcomes in adulthood, they may help explain persistent inequalities in higher education participation and labor market outcomes. For instance, skills or social networks developed through extracurricular participation might help in the transition to higher education or the entry to the labor market, leading to better outcomes for those who participated in these activities in their youth.

These potential long-term impacts of extracurricular activities raise important questions about how benefits play out over the life course. Do these early advantages gained through participation accumulate over time or diminish as individuals progress in the labor market? For example, although extracurricular activities might lead to a more successful initial entry to the labor market because of social connections made through this participation, their influence could fade over time as other factors such as work experience become more relevant. Alternatively, early advantages may accumulate, as those initial advantages set individuals on more successful career trajectories, resulting in greater disparities as careers progress. Thus, this study examines whether the benefits of extracurricular activities accumulate or diminish over time.

These potential long-term impacts of extracurricular activities raise important questions about how benefits play out over the life course. Do these early advantages gained through participation accumulate over time or diminish as individuals progress in the labor market? Extracurricular participation in adolescence may lead to a more successful entry into the labor market due to social connections or gained cognitive and non-cognitive skills. These initial gains could then set individuals on more favorable career trajectories, accumulating over time as those early advantages continue to influence later opportunities and outcomes in line with notions of cumulative advantage. Rather than diminishing as work experience and other factors come into play, these early advantages may create widening inequalities as careers progress.

This study focuses on the link between extracurricular activities in adolescence and subsequent educational and occupational outcomes from a life-course

perspective. First, it examines how participation in extracurricular activities is related to the likelihood of earning a tertiary degree. Following this, it examines the relationship between participation and labor market outcomes, specifically how income and time spent in unemployment develop over the first 15 years after entering the labor market. This analysis addresses key questions including whether participating in extracurricular activities during adolescence is linked to tertiary degree attainment, how labor market outcomes in terms of income and unemployment differ between participants and non-participants, and how these differences develop over time.

Using longitudinal panel data, this study combines propensity score weighting with regression models and mixed-effects growth models. Propensity score weighting addresses unequal selection into participation by taking into account differences between adolescents who participate and those who do not participate prior to participation. The use of mixed-effects growth models captures changes in occupational outcomes over time, accounting for both within-individual variation across time and between-individual variability. This approach enables the analysis of how participation in extracurricular activities during adolescence impacts both educational outcomes and longer-term labor market, highlighting the persistence of advantages or disadvantages over the life course.

Analyses are based on data from the German Socioeconomic Panel (SOEP). So far, the relationship between extracurricular activities and outcomes in adulthood has been explored mainly in the national context of the United States, where schools play a central role in organizing such activities. Germany's clear separation of educational and extracurricular spheres raises the possibility of different links between extracurricular activities and outcomes in adulthood, as extracurricular activities have long been established outside the formal education system. Mechanisms proposed in the US, such as enhanced school attachment (Morris, 2016), may not be at play in the German context, thereby potentially diminishing the educational benefits of participating in extracurricular activities. The argument here is that as activities do not mainly take place in the school context, adolescents' school outcomes are less positively impacted by their participation. Nonetheless, even if extracurricular activities are less integrated with school outcomes in Germany, they may still foster long-term advantages if their benefits extend beyond the school context.

This study contributes to the literature in several ways. First, the use of propensity score techniques addresses unequal selection into activities, thus evaluating the impact of extracurricular activities beyond the underlying inequalities in participation opportunities. Second, looking at whether the labor market benefits of extracurricular activities accumulate over time contributes a longitudinal perspective on the development of labor market outcomes. This means that the study analyzes how income and employment evolve throughout early adulthood, rather than providing a snapshot of a one-time measurement, allowing for a better understanding of the cumulative dynamics of these benefits. Finally, this research contributes to understanding the role of extracurricular activities in shaping long-term outcomes, thereby informing the ongoing conversation about how unequal investments in youth can reinforce social inequalities throughout the life course.

3.3. Theoretical Background

Investments in childhood and adolescence likely have enduring impacts on adulthood because of the interdependence of different life stages (O'Rand, 2006). The life course perspective emphasizes how early experiences influence later outcomes, with educational and occupational trajectories often shaped by early advantages or disadvantages (L. Bernardi et al., 2019). Specifically, extracurricular activities may serve as cumulative investments that shape future inequalities in both education and labor market outcomes. This suggests that the participation in such activities could have an accumulative influence, setting individuals on pathways toward greater or lesser success in adulthood, depending on their adolescent engagement. Thus, extracurricular activities, beyond their impact on outcomes in adolescence, might play a role in shaping inequalities in educational and occupational outcomes in adulthood.

3.3.1. Extracurricular activities and educational outcomes

A number of studies has focused on the relationship between extracurricular activities and educational outcomes in childhood and adolescence. These show that participation in extracurricular activities is associated with better academic abilities (Carbonaro & Maloney, 2019), cognitive and non-cognitive skills (Covay & Carbonaro, 2010; Morris, 2016; Bering & Schulz, 2024), and educational expectations (Morris,

2016). This thus provides evidence of a link between extracurricular activities and educational outcomes in childhood and youth.

So far, research has considered mostly the short-term impacts of adolescent activities, so their relationship to outcomes that take place during or close to the actual period of participation, such as grades or skills in childhood. However, few studies have examined the link between extracurricular activities and long-term educational outcomes. Empirical findings, particularly from the United States, point to long-term associations between extracurricular activities and later educational outcomes, such as university enrollment and graduation. Those engaged in extracurricular activities during their school years are more likely to attend and graduate from university (Gardner et al., 2020; Gardner et al., 2008). This suggests that benefits of extracurricular participation may extend to education in adulthood, but the evidence so far is limited.

To understand how extracurricular activities might influence long-term educational outcomes, it is important to consider the mechanisms that may drive these impacts. From a human capital perspective, extracurricular activities in childhood may boost the development of general cognitive and non-cognitive skills (Carbonaro & Maloney, 2019; Covay & Carbonaro, 2010). In educational settings such as universities, these skills contribute to better achievement and attainment (Solga & van de Werfhorst, 2023). Skills gained through activity participation can transfer to broader abilities that positively impact tertiary education. Theories of skill formation stress the interdependence of skills throughout different life stages (Hernández-Alava & Popli, 2017), with skill accumulation in adulthood being influenced by previous processes of skill formation. The skills gained through extracurricular activities in adolescence may thus lead to a greater capacity for skill formation later, as skills tend to be self-reinforcing and complimentary (Cunha et al., 2006). For example, extracurricular activities may support the development of skills such as self-control in adolescents, which in turn facilitate the development of other cognitive skills beneficial for tertiary education.

Furthermore, involvement in extracurricular activities might increase adolescents' social capital as it allows for interactions with peers and non-family adults outside the home and classroom (Morris, 2016). These social ties are important for short- and long-term educational outcomes, particularly through their informational and motivational aspects (Fujiyama et al., 2021). Extracurricular activities may

provide access to academically motivated peers, information about higher education opportunities, and motivational support from role models. For instance, the contact to peers who are aiming to attend university through extracurricular activities might increase an adolescent's own motivation to attend university (Gibbs et al., 2015).

Taken together, these arguments suggest that extracurricular activities not only impact academic achievement in adolescence, but also have lasting benefits that extend into education in adulthood, which leads to the following hypothesis:

H1: Participation in extracurricular activities is positively associated with the attainment of a tertiary degree.

3.3.2. Extracurricular activities and labor market outcomes

Extracurricular activities during adolescence may also impact labor market outcomes in adulthood. Several mechanisms can help explain the potential relationship between extracurricular activities in adolescence and labor market outcomes, particularly education, cognitive and non-cognitive skills, and social networks.

The first way in which extracurricular activities may impact labor market outcomes is via educational attainment. Educational attainment plays a critical role in labor market success (DiPrete et al., 2017). If participation in extracurricular activities is linked to better educational outcomes, it improves career prospects and potential earnings. In other words, if extracurricular activities in adolescence lead to better school outcomes and a higher likelihood of attending university, those who were active in extracurricular activities in adolescence would have better occupational outcomes, with the impact of participation mediated through educational attainment.

Another channel through which extracurricular activities may impact labor market outcomes is cognitive and non-cognitive skills. The skills acquired through these activities might not only be important in educational settings but could also contribute to abilities that have positive associations with occupational outcomes. For example, extracurricular activities may be contexts in which adolescents can train their teamwork and problem-solving skills, which benefit them in their careers once they enter the labor market (Heckman & Kautz, 2013). Research underscores that

these skills play an important role in shaping labor market outcomes (Farkas, 2003), for instance because employers often consider them in hiring decisions, thereby influencing labor market entry (Protsch & Solga, 2015) and, ultimately, contributing to unequal occupational outcomes.

Further, social networks established through extracurricular activities could extend into adulthood and impact labor market outcomes. Connections made through these activities may assist in job finding, leading to reduced unemployment and access to better-paying job opportunities. Networks have been shown to provide critical information and connections that can help individuals navigate the job market more effectively (Trimble & Kmec, 2011). Social networks developed through participation may provide access to resources, information, and opportunities that contribute to occupational outcomes in adulthood (Verhaeghe et al., 2015). For example, friends and acquaintances made through activities can provide information about job opportunities or, more indirectly, shape job aspirations (Verhaeghe et al., 2015), which lead to better occupational outcomes in the long run (McDonald, 2015).

Supporting these theoretical notions, positive links have been found for employment and income (Lleras, 2008; Kosteas, 2010), particularly for those that were involved in activities at an intensive level (Gardner et al., 2008). Other research also points to a relation between extracurricular participation and job characteristics in adulthood, particularly for sports (Cabane & Clark, 2015). This leads to the following expectation regarding the relationship between extracurricular activities in adolescence and labor market outcomes:

H2: Participation in extracurricular activities is positively associated with occupational outcomes in adulthood, particularly higher income and lower likelihood of unemployment.

3.3.3. Life-course development of benefits

Initial differences between those who were active in extracurricular activities and those who were not might weaken over time or, in line with the notion of cumulative advantage, accumulate. These dynamics could mean that participation translates into lasting benefits in the labor market, or that these initial advantages fade as other factors take precedence. Understanding how the influence of extracurricular

activities develops over time can offer insights into the ways these early experiences shape labor market trajectories.

There are three possible scenarios for how the benefits of extracurricular activities may unfold over the life course (see Figure 3 for a representation of the conceptual model). The first scenario is a stable difference, where the benefits of extracurricular activities manifest upon entry into the labor market and remain stable as both groups progress similarly in their careers. The second scenario is diminishing benefits, in which extracurricular activities provide a better start in the labor market, but their benefits diminish over time as other factors, such as work experience, become more relevant, causing the gap between groups to decline. However, the third and most likely scenario, based on theoretical expectations, is one of accumulating benefits, where the benefits of extracurricular activities increase over time, in line with the theory of cumulative advantage.

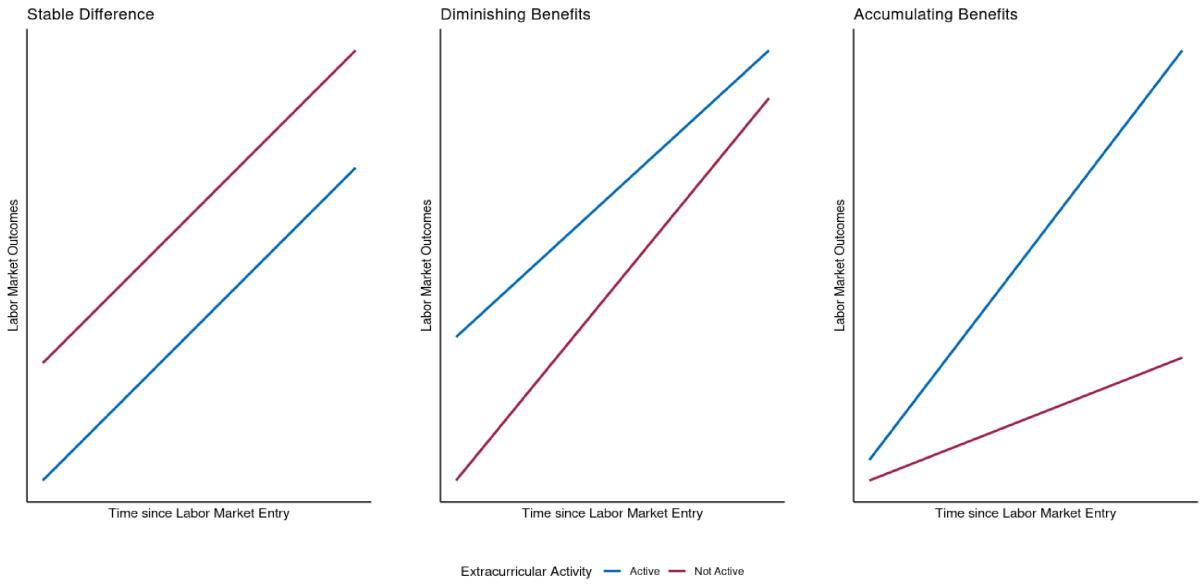

Figure 3: Conceptual model of labor market outcomes by time since labor market entry

The concept of cumulative advantage (DiPrete & Eirich, 2006) proposes that early inequalities can accumulate and have long-lasting effects in subsequent stages of the life course. In the context of extracurricular activities, this framework of cumulative advantage suggests that individuals who participate in these activities in adolescence may gain a head start, for example through acquiring skills and building social networks. This initial advantage sets them on a trajectory of continuous advantage as they are more likely to receive recognition, support, and additional

opportunities as they progress through their educational and occupational careers. The theory of cumulative advantage thus points to the potential for extracurricular activities to lead to accumulating labor market benefits throughout the life course.

Examining the different mechanisms through which extracurricular activities might impact labor market outcomes reveals distinct ways these mechanisms could impact benefits over time. Considering the role of educational attainment, benefits from education should persist throughout the life course, as higher levels of education are linked to better occupational outcomes over time (Hanushek et al., 2017). For cognitive and non-cognitive skills gained through extracurricular participation, the reinforcing dynamics of skill development in line with the notion of the self-productivity of skills (Cunha et al., 2006) suggest that skills developed in youth are vital for learning skills in adulthood. If adolescents who participated in extracurricular activities are better able to learn new skills in adulthood than those who did not participate, they may experience faster career progression and achieve better occupational outcomes, leading to accumulating benefits.

Research also indicates that the influence of social capital on labor market outcomes may evolve over time (McDonald & Elder, 2006). Social connections made in extracurricular activities might be helpful in the job searching process, whether at the point of entering the labor market (Andersson, 2021) or during subsequent job searches (ref. later job transitions). For example, some who participated in extracurricular sport activities may benefit from social connections made through their sports team in their job search, helping them secure their first job. Social connections may also provide access to advantageous job openings that are not publicly advertised (McDonald & Elder, 2006). This could also lead to shorter periods spent in unemployment for those who made these social connections through activity participation. Such initial opportunities can place those who engaged in extracurricular activities on more successful career trajectories, resulting in increasing benefits as they capitalize on these early opportunities.

Thus, in terms of labor market outcomes such as income and unemployment experience, an accumulation perspective suggests that as people progress through their occupational careers, the gap between those who participated in extracurricular activities in their adolescence and those that did not grows over time. For income, this implies a growing disparity, with income levels rising more for those who were active in extracurricular activities. For unemployment, those who participated are expected

to accumulate time spent unemployed more slowly than those who did not participate. This leads to the following hypothesis:

H3: Over time, the gap in income and accumulated time in unemployment widens between those who participated in extracurricular activities and those who did not.

3.4. Data & Methods

3.4.1. Data

This study examines the question whether extracurricular activities impact educational and occupational outcomes in adulthood by estimating propensity score-weighted ordinary least squares models and mixed-effects growth models. It uses data from the German Socioeconomic Panel (SOEP, v38), a representative annual household panel survey conducted in Germany. Specifically, information on adolescent extracurricular activities is obtained from the SOEP Youth Survey, which is administered to household The sample is restricted to respondents who gave information on their extracurricular activities (N = 9,035, see Table 8for sample selection). Additionally, cases with no information on income or employment were excluded for the analysis of labor market outcomes, resulting in a sample of 7,830 individuals, with 45,650 person-year observations and an average of 5.7 person-years per respondent. For the analysis of tertiary degree attainment, the sample is further restricted to respondents that have valid information for at least eight additional survey years after the initial Youth Survey, allowing enough time for possible degree completion (N=1,679).

The SOEP Youth Survey includes questions about respondents' involvement in extracurricular activities. Participants were asked two binary questions: "Do you actively make music, meaning singing or playing an instrument?" and "Do you play any sports?" (Naujoks et al., 2018). If they answered "yes" to either question, follow-up questions were posed: “Do you or did you take paid music lessons (outside of school)?" and "Do you take part in sports competitions?" (Naujoks et al., 2018). To focus specifically on organized activities rather than casual leisure activities, this study concentrates on those who indicated involvement in extracurricular activities within

an organized context through music lessons or competitive sports. Based on their responses, a dummy variable was generated to indicate intensive participation in at least one of the two activities. The respondents' participation captured in this study reflects their engagement at age 17, which, given the tendency for participation to be a continuous activity throughout adolescence, signifies intensive and persistent involvement. As additional analyses, the impacts of less formal activity participation, that is, no lessons or competitions, are also considered, as well as the differences between music and sports (see sensitivity analyses).

Table 8: Sample selection

Step	Remaining number of individuals	Remaining number of person-years
All adolescents who answered the SOEP Youth Questionnaire (2000-2021)	9,737	48,493
Drop cases who were not asked about extracurricular activities or who did not answer the relevant question	9,035	45,650
For analysis of labor market outcomes: drop cases with no valid information for income or employment	7,830	44,384
For analysis of university degree: restrict to cases with valid information available until at least age 25	1,679	

3.4.2. Outcomes

To assess educational attainment in adulthood, the attainment of a tertiary degree (ISCED 6-8, bachelor's degree or higher) is measured. For occupational outcomes, income and unemployment experience are used as measurements. Income measures individual gross labor market income in 1,000€ after labor market entry, adjusted for inflation and log-transformed. Unemployment experience

measures the accumulated time that a person has spent in officially registered unemployment since they have entered the labor force.

3.4.3. Analytical Strategy

The analysis is conducted in two steps. First, propensity scores for extracurricular participation are estimated using general linear models. This addresses adolescents' unequal likelihood to engage in extracurricular activities based on individual and family characteristics. Weighting covariates were selected to account for factors associated with the likelihood of participating in extracurricular activities. Specifically, weights adjust for demographic covariates, including gender, migration background (1st and 2nd-generation vs children without migration background), month of birth (to account for relative age effects, see Wattie et al., 2015), size of childhood community (large vs. medium vs. small city vs. rural), birth order (first-born or only children vs. later-born) and maternal age at birth (to account for resource and parenting differences by maternal age, see Duncan et al., 2018). Family background factors account for parental education (at least one parent upper secondary degree or higher), household income at age 17, and parental EGP class (at least one parent EGP class I or II). Education-related factors include school track recommendation and school enrollment status at the time of the Youth Survey. All of these covariates were measured during respondents' childhood and adolescence (see Table A19 in the appendix for an overview).

Additional tests compare the performance of the propensity score weighting with alternative methods, including Bayesian additive regression trees and generalized boosted models (see Figure A3 in the appendix). Results indicate that propensity score weighting performs comparably to these methods, achieving balanced covariates across participation groups. A key limitation of this approach is its reliance on observable variables. This means that it is only able to consider the selection into activities based on observable covariates, potentially overlooking other factors influencing extracurricular participation not measured in the data.

In a second step, the impact of extracurricular activities on tertiary degree attainment, labor market income, and accumulated unemployment time is estimated, incorporating the calculated propensity scores of engaging in these activities to account for the potential impact of differential selection. Regression models are

calculated to estimate the average treatment effect (ATE) of activity participation with inverse probability weights (IPW) applied using the probability of participation.

For education, logistic regression models with IPW are calculated to estimate the impact of extracurricular activities on tertiary degree attainment. To explore the role of adolescent educational influences, the KHB method (Karlson et al., 2012) is used to compare multiple logistic models that additionally include cognitive skills and math grades. Cognitive skills were assessed through a fluid intelligence test administered as part of the Youth Survey (Schupp & Hermann, 2009). Math grades are based on respondents' last available school grades. This approach assesses whether the relationship between extracurricular activities and tertiary degree attainment mainly reflects the impact of adolescent educational outcomes, like cognitive skills and grades, or also has an impact beyond these factors.

For income and unemployment experience, propensity score weighted mixed-effects models are estimated with observations nested within individuals to account for repeated measures, modelling the development of income and unemployment over the years after labor market entry. For this purpose, extracurricular activity participation is interacted with time since labor market entry. Natural cubic splines are used to flexibly model non-linear effects of years since labor market entry on income and unemployment, allowing for an analysis of how these outcomes evolve over time without imposing a predefined functional form (Marcoulides & Khojasteh, 2018).

3.5. Results

3.5.1. Propensity score weighting

First, the likelihood of participation in extracurricular activities based on observed covariates that have been shown to impact selection into activities is estimated. The results show that particularly whether children have received a recommendation for the academic school track and social background characteristics, specifically parental occupational class (EGP), household income, and parental level of education, are related to the predicted probability of participation in extracurricular activities (see Figure 4).

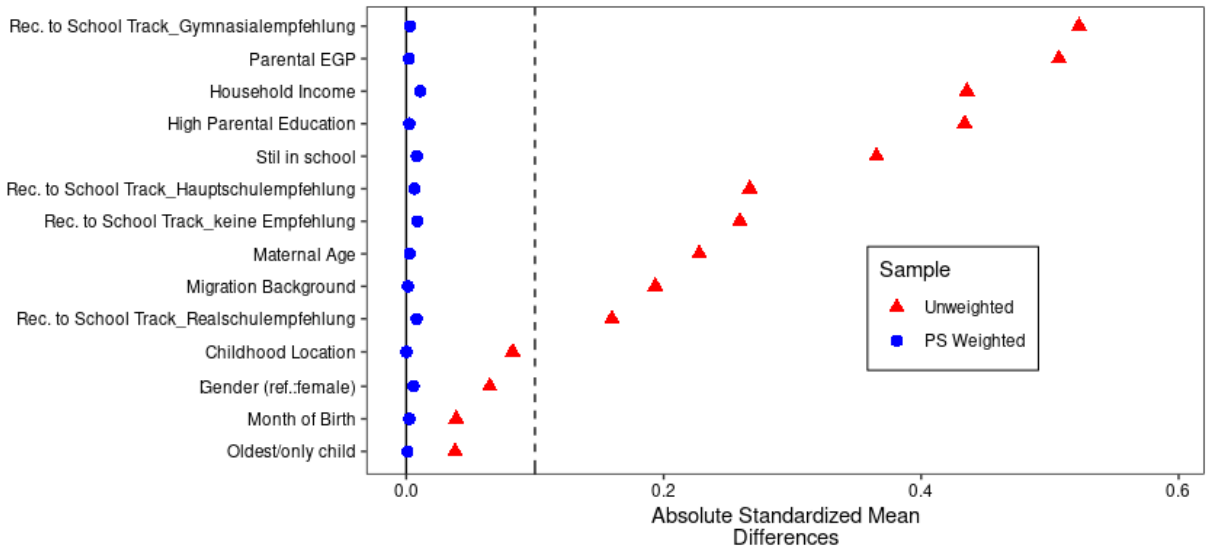

Figure 4: Standardized mean differences before and after weighting by propensity to engage in any extracurricular activity

3.5.2. Estimation

Next, the impact of participation in extracurricular activities on educational and occupational outcomes is analyzed using the propensity scores calculated in the last step as inverse probability weights to reduce the impact of unequal selection into activities on the estimation.

Extracurricular participation & tertiary degree attainment

In order to examine whether extracurricular activities have an influence on education in adulthood, the impact of participation in these activities (either music, sports, or both) on the likelihood to attain a tertiary degree is estimated, with the propensity to participate accounted for through the propensity score. First, the analysis is conducted on the full sample of respondents who are at least eight years post-Youth survey, ensuring sufficient time to potentially complete a degree. Results show a positive association between extracurricular participation and earning a tertiary degree (see

Table 9). Those who participated in extracurricular activities in their adolescence are over ten percent more likely than non-participants to attain a tertiary degree as adults (see Figure 5). The separate analyses by type of activity – music and sports (see Figure A6, Figure A9 and Table A20 in the appendix) – similarly show

a relationship between engagement during adolescence and the attainment of a tertiary degree. These findings support a connection between extracurricular activities and educational outcomes in adulthood.

Table 9: Estimates from propensity-score weighted regression models predicting probability of attaining a tertiary degree by extracurricular participation

	Model 1	
Predictors	*Odds Ratio*	*se*
Extracurricular activities	1.60 ***	(0.12)
Observations	1,679	

Note: Standard errors in parenthesis. * p<0.05 ** p<0.01 *** p<0.001. Source: SOEP v38, own calculations. See Table A19 for full list of covariates used for propensity-score weighting.

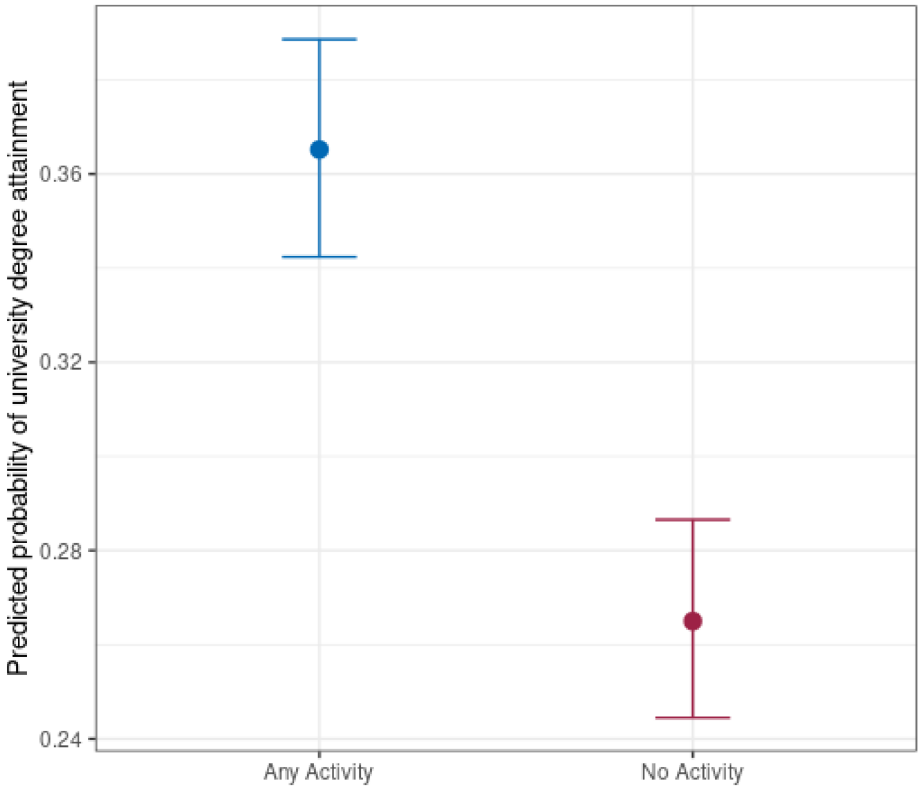

Figure 5: Predicted probability of attaining a university degree by extracurricular participation, based on propensity score weighted regression models

Note: 95%-confidence intervals indicated by error bars. Source: SOEP v38, own calculations. See Table A19 for full list of covariates used for propensity-score weighting.

In a second step, a KHB decomposition is applied to a smaller subsample for which there is data available on math grades and cognitive test scores. This explores whether impact of extracurricular activities persists when these additional factors are considered. Table 10 reports the results of the decomposition, with the reduced model including only the impact of extracurricular activities, weighted by the propensity to participate, and the full model including also math grades and cognitive test scores as mediators, also propensity-score weighted. The results reveal that the impact persists, but is smaller when grades and cognitive test scores are accounted for. The decomposition shows that about 55 percent of the initial effect of extracurricular participation on tertiary degree attainment is accounted for by these cognitive and academic factors (see Table 10).

These findings again point to a connection between extracurricular participation in adolescence and educational attainment in adulthood. While part of this relationship is explained by abilities, as measured through grades and cognitive test scores, a substantive portion persists beyond these early educational outcomes. This suggests that abilities—whether as a selection factor for participation or as skills developed through these activities (or likely both, see Bering & Schulz, 2024)—play an important role in this context, yet extracurricular participation itself further contributes to the attainment of a tertiary degree.

Table 10: KHB decomposition of propensity-score weighted regression models predicting probability of attaining a tertiary degree by extracurricular participation, with and without adjustment for cognitive test scores and math grades

	b		*se*
Reduced model	0.72	***	(0.14)
Full model	0.32	*	(0.14)
Difference	0.40	***	(0.08)
Observations	592		

Note: Standard errors in parenthesis. * p<0.05 ** p<0.01 *** p<0.001. Source: SOEP v38, own calculations. See Table A19 for full list of covariates used for propensity-score weighting. Full model is adjusted for cognitive test scores (standardized) and math grades (standardized) at age 17

Extracurricular participation & occupational outcomes

For occupational outcomes, the relationship between extracurricular participation and both labor market income and accumulated unemployment experience is examined. Propensity-score weighted mixed-effects growth models with time splines are used to track changes in these outcomes over the years since labor market entry. This approach accounts for unequal selection into extracurricular involvement, allowing for an analysis of how occupational outcomes evolve over time in relation to this extracurricular participation in adolescence.

For income, this addresses the question of how adolescent participation in extracurricular activities is linked to gross labor market income over the first 15 years after labor market entry. The findings (see Table 11, Model 1) reveal an initially negative relationships, with participants earning slightly less at the start of their careers compared to non-participants. However, this trend shifts over time, as a gap emerges over time (see Table 11, Model 2Figure 6). Around ten years into the labor market, the income trajectory for those who participated in extracurricular activities starts to surpass that of non-participants, who experience slower income growth (see Figure 6). By this point, the income those who participated in extracurricular activities shows a consistent upward trend, indicating an accumulation of benefits. This positive shift remains even after accounting for educational attainment (see Table 11, Model 3). This highlights that the long-term benefits associated with extracurricular participation develop over time, despite an initially negative impact.

Table 11: Estimates from propensity-score weighted mixed effects models predicting log labor market income by extracurricular participation and years since labor market entry

	Model 1		**Model 2**		**Model 3**	
Predictors	*b*	*se*	*b*	*se*	*b*	*se*
Extracurricular activities	-0.10 ***	(0.02)	-0.11 ***	(0.02)	-0.11 ***	(0.02)
Splines: Years since labor market entry						
1. (>0 to ≤1)	1.29 ***	(0.02)	1.32 ***	(0.03)	1.26 ***	(0.03)

2. (>1 to ≤4)	1.99 ***	(0.03)	1.89 ***	(0.04)	1.79 ***	(0.04)
3. (>4 to ≤15)	1.58 ***	(0.03)	1.39 ***	(0.04)	1.35 ***	(0.04)
Gender (female)	-0.12 ***	(0.02)	-0.12 ***	(0.02)	-0.12 ***	(0.02)
Extracurricular activities * Splines (Years since labor market entry)						
Extracurricular activities * years since labor market entry >0 to ≤1			-0.05	(0.05)	-0.05	(0.05)
Extracurricular activities * years since labor market entry >1 to ≤4			0.18 ***	(0.05)	0.20 ***	(0.05)
Extracurricular activities * years since labor market entry >4 to ≤15			0.35 ***	(0.05)	0.35 ***	(0.05)
Level of education (ref.: secondary or less)						
Vocational degree					0.44 ***	(0.02)
University degree					0.36 ***	(0.03)
N persons	5,622		5,622		5,622	
Observations	20,707		20,707		20,707	

Note: Standard errors in parenthesis. * p<0.05 ** p<0.01 *** p<0.001. Source: SOEP v38, own calculations. Adjusted for clustering in individuals. See Table A19 for full list of covariates used for propensity-score weighting.

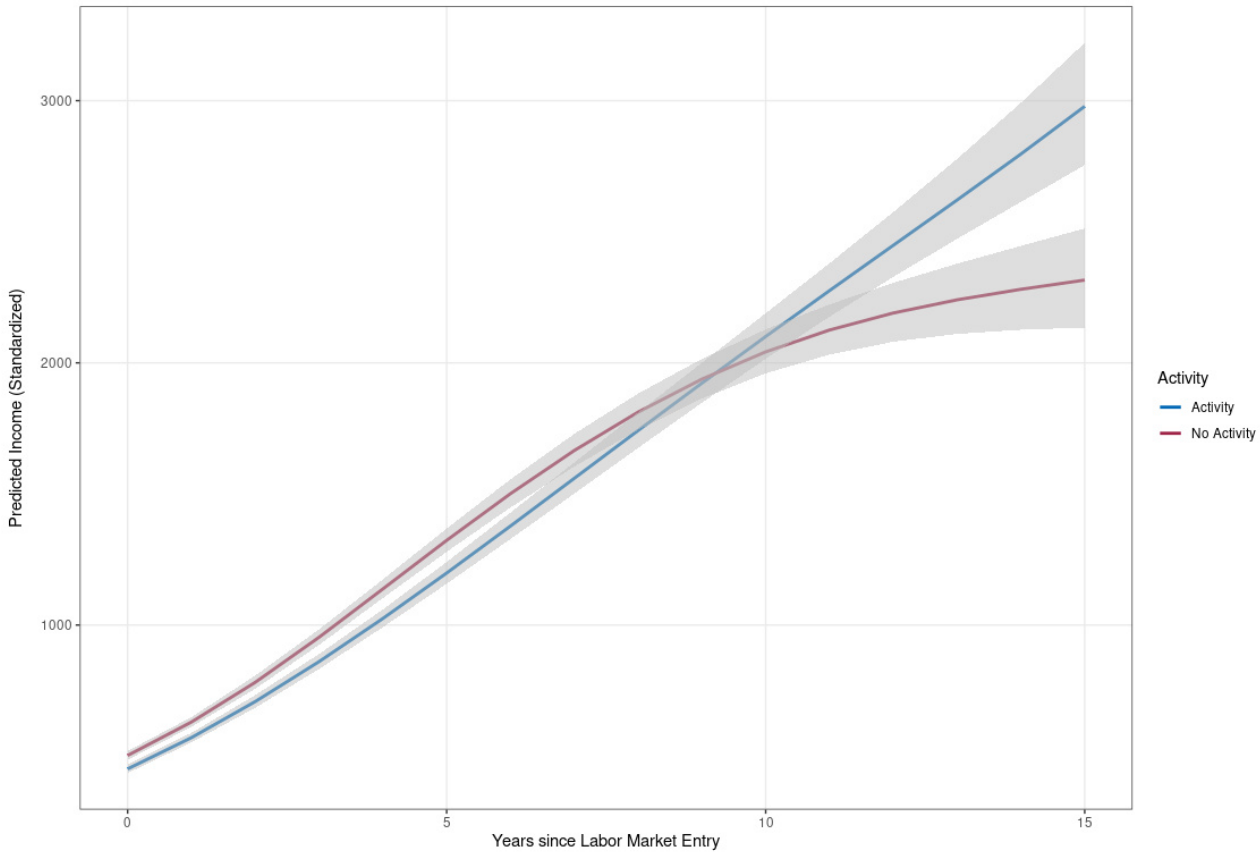

Figure 6: Predicted income by years since labor market entry and extracurricular participation, based on propensity score weighted random growth models, adjusted for gender and education (based on Model 3, Table 11)

Note: 95%-confidence intervals indicated by confidence bands. Source: SOEP v38, own calculations. See Table A19 for full list of covariates used for propensity-score weighting.

For unemployment, the analysis examines the development of accumulated unemployment experience over the first 15 years after career entry, to see whether there are differences between those who participated in extracurricular activities as adolescents and those who did not. The results indicate that extracurricular participation is associated with less time spent in unemployment (see Table 12). Over time, participants show a slower accumulation rate of unemployed years, meaning they spend less overall time in unemployment compared to non-participants (see Table 12, Model 2). This leads to a growing gap in accumulated unemployment experience: by ten years in the labor market, non-participants have accumulated about three more months of unemployment than participants, with the gap widening to approximately six months by year 15 (see Figure 7.). This pattern persists when controlling for educational attainment (see Table 12, Model 3).

Table 12: Estimates from propensity-score weighted mixed-effects models predicting accumulated unemployment experience by extracurricular participation and years since labor market entry

	Model 1		Model 2		Model 3	
Predictors	*b*	*se*	*b*	*se*	*b*	*se*
Extracurricular activities	-0.12 ***	0.01	-0.08 ***	0.02	-0.06 ***	0.02
Splines: Years since labor market entry						
1. (>0 to ≤1)	0.28 ***	0.01	0.30 ***	0.02	0.30 ***	0.02
2. (>1 to ≤4)	0.51 ***	0.01	0.66 ***	0.02	0.67 ***	0.02
3. (>4 to ≤15)	0.58 ***	0.02	0.79 ***	0.02	0.80 ***	0.02
Gender (female)	-0.03 *	0.01	-0.03 *	0.01	-0.03	0.01
Extracurricular activities * Splines (Years since labor market entry)						
Extracurricular activities * years since labor market entry >0 to ≤1			-0.04	0.03	-0.04	0.03
Extracurricular activities * years since labor market entry >1 to ≤4			-0.29 ***	0.03	-0.28 ***	0.03
Extracurricular activities * years since labor market entry >4 to ≤15			-0.40 ***	0.03	-0.39 ***	0.03
Level of education (ref.: secondary or less)						
Vocational degree					-0.07 ***	0.02
University degree					-0.17 ***	0.02
N persons	5,400		5,400		5,400	
Observations	20,446		20,446		20,446	

Note: Standard errors in parenthesis. * p<0.05 ** p<0.01 *** p<0.001. Source: SOEP v38, own calculations. Adjusted for clustering in individuals. See Table A19 for full list of covariates used for propensity-score weighting.

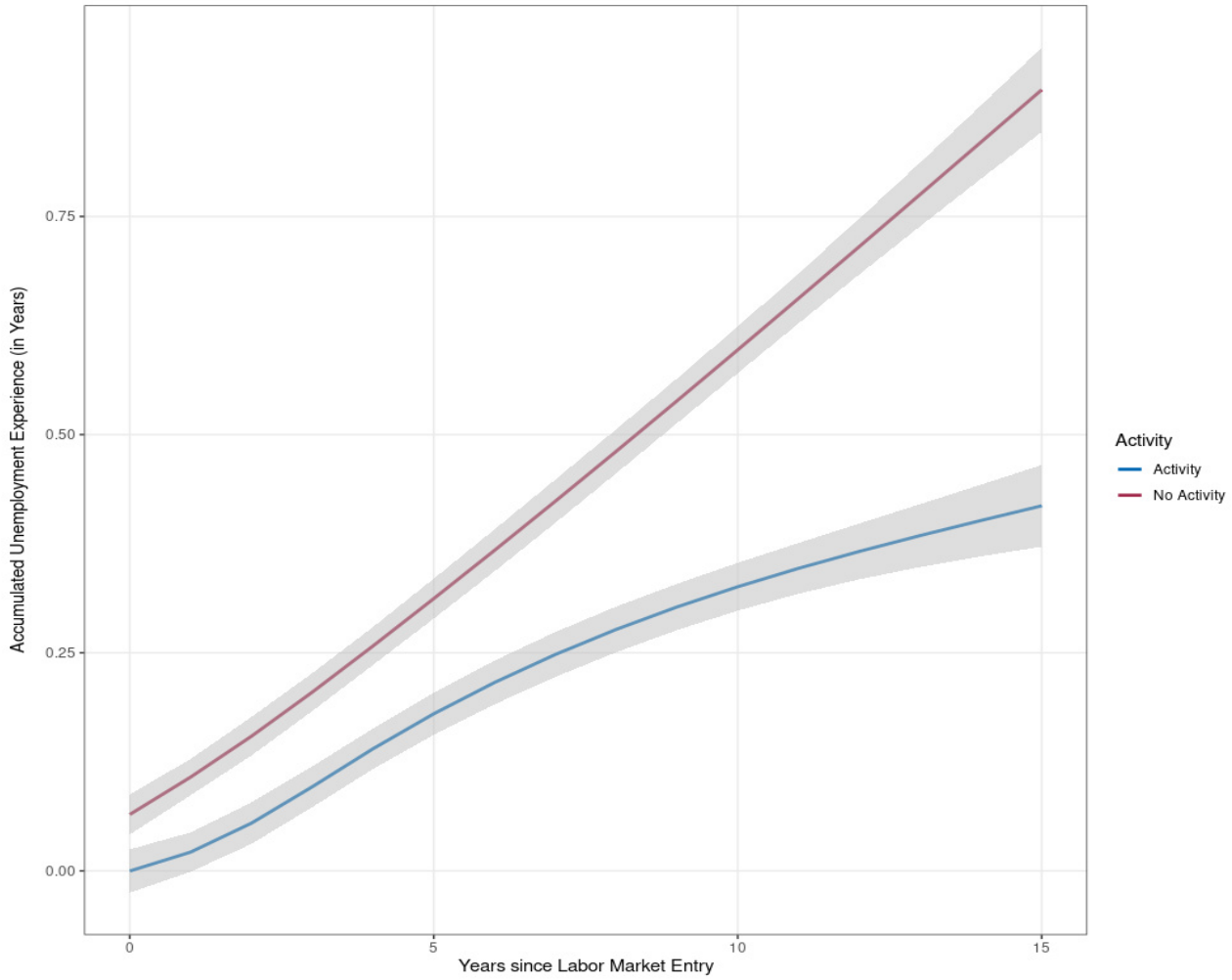

Figure 7: Predicted accumulated unemployment experience by years since labor market entry and extracurricular participation, based on propensity score weighted random growth models, adjusted for gender and education (based on Model 3, Table 12)

Note: 95%-confidence intervals indicated by confidence bands. Source: SOEP v38, own calculations. See Table A19 for full list of covariates used for propensity-score weighting.

Thus, these findings point to a protective character of extracurricular experiences for labor market outcomes later on, with those who participated being more likely to avoid longer spells of unemployment. This is particularly important as unemployment in early career stages is likely connected to scarring impacts on overall labor market outcomes over the life course of individuals (Brandt & Hank, 2014).

Overall, these results show that extracurricular activities in adolescence are linked to educational and labor market outcomes in adulthood, even when the unequal selection into these activities is taken into account. Specifically, the benefits of extracurricular participation on occupational outcomes, such as income and unemployment, seem to increase over time in the labor market. This suggests that these investments during adolescence do not necessarily yield immediate returns at the start of individuals' careers, but rather accumulate over time.

3.5.3. Robustness checks

Additional analyses are conducted to assess the robustness of the results across different types of extracurricular activities and different intensities of engagement, by first performing separate analyses for music and sports activities, and secondly, including less formal activities.

First, to check whether different types of activities differ in their long-term impacts, the analyses are separated by music and sports. The separate estimation of the propensity scores shows that socioeconomic background characteristics, particularly parental education, are more important for the propensity to engage in music than sports (see Figure A4 and Figure A5).

For music, the results are consistent with the main analyses. Engagement in music lessons is associated with a higher likelihood of attaining a tertiary degree (see Figure A9 and Table A20 in the appendix), and, over time, higher labor market income and lower accumulated unemployment (see Figure A10 and Figure A 11 and Table A21-A22 in the appendix). For sports, the results show a similar pattern, except for income. While there is a positive link between sports participation in adolescence and tertiary degree attainment and unemployment experience (see Figure A6 and Figure A7and Table A21 and Table A22 in the appendix), no clear relationship with labor market income was found (see Table A3 and Figure A8 in the appendix). Thus, while both types of activities are linked to educational and occupational outcomes, income seems to be particularly impacted by music.

Further, the impacts of less formal activity participation – those without structured lessons or competitions – are also analyzed. When these informal activities are included alongside organized participation, the association between extracurricular engagement and tertiary degree attainment as well as unemployment

experience remains similar to that of organized activities alone (see Figure A12 and Figure A14 in the appendix). However, no clear impact on income over time is found (see Figure A13 in the appendix). This suggests that for income, the structured nature of organized activities, such as doing sports in clubs and music with lessons, is critical.

3.6. Discussion & Conclusion

This is the first study to extend findings on extracurricular activities by demonstrating not only their impact on educational and labor market outcomes in adulthood but also how these benefits accumulate over time, while also addressing the crucial methodological issue of unequal selection into activities. Using longitudinal data from the German Socioeconomic Panel (SOEP), this study reveals that participation in extracurricular activities increases the likelihood of attaining a tertiary degree and contributes to increasing gaps in income and time in unemployment over the course of individuals' careers. Specifically, the results indicate that the benefits of extracurricular engagement grow over time, with those who participated in these activities experiencing increasing benefits compared to non-participants as they move through the labor market. Moving beyond research that shows the influence of extracurricular participation on educational outcomes in adolescence (Carbonaro & Maloney, 2019; Cabane et al., 2016; Mikus et al., 2020a), this study extends these insights to demonstrate that these effects also reach outcomes in adulthood.

For educational outcomes in adulthood, the results show that engagement in extracurricular activities in adolescence is associated with a higher likelihood of attaining a tertiary degree. This finding persists even when adolescent cognitive skills and grades in school are taken into account, and thus points to benefits beyond the well-established links between these activities and cognitive skills (Bering & Schulz, 2024) and educational outcomes (Im et al., 2016) in adolescence. For instance, social networks formed through co-participation in activities or non-cognitive skills acquired through such activities may also improve an adolescent's likelihood of attaining a tertiary degree.

The findings also show an accumulating relationship between extracurricular activities and occupational outcomes, in terms of higher labor market income and less time spent in unemployment. From a life-course perspective, the results reveal that these labor market benefits unfold over time, with little to no difference between those who participated in activities and those who did not early in their careers, but a gap

developing over time in the labor market. This is in line with the third hypothesis and points to an accumulative impact of investment in childhood and adolescence on outcomes in adulthood.

This suggests that extracurricular activities may serve a dual protective and enhancing function in the labor market, contributing both to higher income levels and to reduced time spent in unemployment over the course of a career. The protective role, particularly in terms of lowering unemployment, is important given the potential scarring effects of early-career unemployment (Brandt & Hank, 2014), where unemployment early in one's career can negatively impact future career outcomes. This points to the importance of viewing extracurricular activities as long-term investments, with the potential to both buffer against adverse labor market experiences and also drive more positive income outcomes over time.

Several limitations should be acknowledged. First, although the analytical design attempts to address unequal selection into activities, only observable covariates can be included. Thus, there may be other unobserved factors that influence both extracurricular engagement in childhood and outcomes in adulthood, which cannot be accounted for in this analysis. Second, the analysis did not consider the intensity or duration of extracurricular activities, which might differ in their relation to long-term outcomes. For example, while adolescents may reap educational benefits from participation in extracurricular activities in general, engagement that is too time intensive might actually distract from educational goals and have a negative impact. Future studies should examine the dose-response relationship between engagement in activities and long-term outcomes.

In conclusion, this study contributes to the literature on adolescent activities and long-term educational and occupational outcomes. The findings highlight that unequal childhood and adolescent experiences not only lead to differences during these early stages of the life course, but also have lasting impacts on outcomes in adulthood, underscoring that the early life course is a crucial element in understanding inequality in later stages of the life course.

4. Joining the A-Team: Friendships in Extracurricular Activities and Their Impact on Educational Achievement

4.1. Abstract

Extracurricular activities have been shown to positively impact educational outcomes, yet the mechanisms behind this relationship remain unclear. This study addresses this by examining the role of social connections formed through extracurricular activities. Using data from the German sample of the CILS4EU panel survey, it analyzes peer relationships formed through these activities and their link to adolescents' grades. The findings reveal that friends met in extracurricular activities are more likely to have higher educational achievement compared to friends of adolescents who are not involved in these activities, and that the positive impact of extracurricular participation on educational outcomes is partially mediated through these social connections. This study contributes to research on the effects of childhood and adolescent activities on educational outcomes by highlighting a central mechanism: the role of peer relationships formed through extracurricular activities.

4.2. Introduction

Adolescents involved in extracurricular activities tend to achieve better in school (Mikus et al., 2020b) The social connections developed through these activities are one proposed explanation for why participation might positively impact educational achievement, potentially linking extracurricular engagement to academic outcomes. The underlying assumptions are that peers met through these activities are often higher-achieving academically and that friendships with such high-achieving peers can positively influence an adolescent's own educational outcomes, including their grades. However, these assumptions have yet to be examined empirically.

While much research has focused on classroom peers and the impact of school-based social networks on academic outcomes (see van Ewijk & Sleegers, 2010), the social interactions that occur outside the classroom – in extracurricular settings like music groups or sports clubs – remain less explored. These activities provide adolescents with unique opportunities to form connections that might not otherwise occur within the structured environment of the classroom, potentially impacting their social networks in ways that benefit their academic development.

This study aims to fill this gap by exploring the characteristics of friendships formed in extracurricular activities and their impact on educational achievement. Specifically, it addresses the following questions: How are extracurricular activities linked to the academic characteristics of adolescents' friends? And do these friendships have an impact on grades? By examining these links, the study explores friendships in extracurricular activities as a potential mechanism linking participation and educational outcomes.

Extracurricular activities represent unique social contexts that may influence educational outcomes by shaping the types of friendships adolescents form. Specifically, if adolescents who participate in these activities are more likely to engage with high-achieving peers, these connections could positively impact their own academic performance. In this way, social networks may serve as a pathway through which extracurricular activities impact academic achievement. Prior research has shown that extracurricular participation can strengthen students' sense of school belonging (e.g., Fredricks & Eccles, 2005), particularly for activities that are school-based. However, in contexts like Germany, where extracurricular activities are organized outside of school, we would expect different dynamics, as these activities could either foster connections across different school tracks or reinforce divisions. This raises questions about whether such activities create opportunities for adolescents to connect with peers from different educational backgrounds or whether they reinforce existing social and academic divides. While extracurricular activities may allow adolescents to interact with peers they might not encounter in the classroom, it remains unclear whether these friendships differ from those formed in other settings, and how they ultimately influence educational outcomes.

To investigate these dynamics, this study draws on data from the CILS4EU, a panel study of adolescents in Germany which provides information educational outcomes and social networks. Using person fixed-effects and multilevel models, the analysis addresses both the impact of extracurricular participation on adolescents' friendships and its effect on grades. Additionally, a mediation analysis explores the extent to which these friendships mediate the relationship between extracurricular activities and educational outcomes.

This study contributes to research on the impacts of activities in childhood and adolescence on educational achievement. By focusing on the role of social connections, it advances our understanding of mechanisms underlying the positive

effects of extracurricular engagement, providing new insights into how these activities are related to educational inequality.

4.3. Theoretical Background

The proposition that extracurricular activities improve educational achievement through the social connections formed in these activities hinges on two implicit assumptions. First, it assumes that the friends adolescents meet in extracurricular activities differ in their educational characteristics from those they encounter in other contexts, such as school or their neighborhood. This would imply that adolescents who participate in these activities have, on average, friends with different characteristics compared to non-participants. The second assumption is that part of the relationship between extracurricular engagement and educational outcomes is mediated by the characteristics of these friends, suggesting that social networks play a critical role in explaining the link between activity participation and academic achievement.

4.3.1. Educational characteristics of friends in extracurricular activities

The educational characteristics of friends made through extracurricular activities may differ from those of friends formed in other contexts, due to both the selective nature of participation in these activities and the opportunities they create for contact between students on different school tracks. This section examines how these factors may shape the educational profiles of friends in extracurricular settings.

The educational characteristics of friends formed through extracurricular activities may be influenced by patterns of selection into these activities. Research consistently shows that participation in extracurricular activities is shaped by socioeconomic background, particularly parental education and adolescents' own educational achievement (Mikus et al., 2020b; Weininger et al., 2015; Bering & Schulz, 2024). Adolescents from higher socioeconomic status (SES) backgrounds are generally more likely to participate in these activities, as are academically high-achieving students (see for example Dederichs & Kruse, 2023; Nobis & El-Kayed, 2019). As a result, high-achieving students may cluster together in extracurricular activities. This clustering means that adolescents who participate in extracurricular

activities are more likely to form friendships with peers who are academically high-achieving, leading to social networks that are mostly homogenous in terms of education. Therefore, the characteristics of friends made in these activities may reflect the unequal selection into participation. This leads to the first hypothesis:

H1: Participation in extracurricular activities is positively associated with the number of high-achieving friends among adolescents.

Additionally, extracurricular activities might also offer contact between adolescents with different characteristics. Extracurricular activities provide a context where adolescents from different backgrounds might interact. Research has demonstrated that extracurricular activities can promote intergroup contact, such as among ethnic and racial groups (Moody, 2001; Schaefer et al., 2018). In activities outside the structured classroom environment, adolescents may encounter peers from different backgrounds, which could apply not only to ethnicity but also to educational characteristics. This exposure to diverse peer groups can offer opportunities for adolescents to connect with others they might not meet in their everyday school context.

Extracurricular activities encourage friendship formation by providing regular, structured opportunities for interaction. They provide settings outside of school contexts for adolescents to meet and interact with their peers, where they both create friendship ties with new peers and deepen existing acquaintances. Regular time spend in extracurricular activities, for example with weekly practices, enables the development and maintenance of friendships (Schaefer et al., 2011). Shared experiences in extracurricular activities, such pursuing goals together as a team or experiencing joyous moments together, can further contribute to bonding between co-participating adolescents. Particularly, the sense of pursuing a common goal together, for example during a match against another team in the case of team sports, may have a positive impact on bonding between adolescents in activities (Schaefer et al., 2018).

The potential for extracurricular activities to foster connections among adolescents from different educational backgrounds is particularly relevant in stratified school systems, where students are often separated into distinct tracks. In such systems, extracurricular activities may provide one of the few settings where

adolescents from different educational paths can meet and interact. For instance, students from both vocational and academic tracks might participate in the same sports team or music group, forming connections that would not typically arise within their separate school environments. This type of interaction could bridge divides created by educational stratification, contributing to more heterogeneous social networks that transcends school track boundaries.

This also hinges on the institutional setup of these activities. Research shows that in contexts with both school-based extracurricular and out-of-school activities, participation in out-of-school activities is more strongly linked to socioeconomic background than school-based options (Bennett et al., 2012). However, the institutional setup of extracurricular activities differs between countries in terms of how connected to schools they are. While for example in the United States, schools typically offer these activities within school environments, in other countries such as Germany, activities are organized independently from schools in clubs and associations (“Vereine”). Thus, in this setting, out-of-school activity participation is the main extracurricular engagement available to adolescents. In the context of Germany’s stratified school system, where social stratification between school tracks is prevalent (van de Werfhorst & Mijs, 2010), these activities might be a rare opportunity for students on different tracks to interact and form friendships. These notions lead to the second hypothesis:

H2: Adolescents who participate in extracurricular activities have more friends who attend a different school track than adolescents who do not participate.

While overall, extracurricular activities could be linked to more opportunities for friendships between adolescents from different school tracks, their impact may vary based on students' own school track. For students on higher academic tracks, participation may largely reinforce connections with similarly high-achieving peers, as they already encounter these individuals within their school environment. In contrast, students on lower tracks may experience extracurricular activities as an opportunity to connect with higher-achieving peers they would not typically encounter in school. This could mean that the impact of participation on the educational characteristics of friends might differ between students who attend different tracks themselves: for those who are themselves high-achieving, it leads to connections to peers that are

similar in terms of their educational achievement; for students on lower tracks, participation might lead to possibilities to engage with students who attend higher tracks than themselves. This leads to the following expectations:

H3: Participation in extracurricular activities is more likely to increase the share of high-achieving friends for students from lower tracks than for those on the academic track.

4.3.2. Friends and Educational Outcomes

A second key assumption in linking extracurricular involvement to educational achievement is that the friends made in these activities play a role in shaping academic outcomes. In other words, adolescents engaged in extracurricular activities do better in school partially because they have friends who do well academically. This assumption presupposes that peers influence students' own academic achievement.

Research has highlighted that peers have a substantial impact on educational outcomes. The average educational achievement of peers in a student's network is an important predictor of their own educational achievement and attainment (Ryabov, 2011). Friends have been found to influence educational outcomes beyond mere selection effects, meaning that while adolescents are more likely to become friends with peers that are similar in their academic expectations, they also become more alike over their friendships as they influence each other (Kretschmer & Roth, 2021).

There are multiple mechanisms that help explain why friends might impact the educational performance of adolescents, particularly social norms and sharing of information and resources. First, adolescents are susceptible to the prevalent social norms in their peer groups, also in regard to educational efforts, as adolescents adapt to some degree the academic expectations of their friends (Kretschmer & Roth, 2021). In connection with notions of social desirability, if students engage in peer groups where academic effort is the norm, they are also likely to be motivated to perform well in school too. Thus, friends who do well in school may model this behavior and influence academic performance (Fredricks & Eccles, 2005). This is also linked to educational motivation and aspiration, as academic aspirations are shaped by those around students, including importantly their peers (Raabe & Wölfer, 2019).

Second, information exchanged about educational opportunities among friends may positively impact students' own academic achievement. Education-related information might be more prevalent in high-achieving peer groups, which could lead to better access to educational opportunities for those with high-achieving friends (Kretschmer & Roth, 2021). Additionally, this also extends to the information and resources shared among parental networks that develop through friendships and the related interactions of parents (Fujiyama et al., 2021).

These arguments about the general impact of peers on educational outcomes lead to the expectation that participation in extracurricular activities, if it results in more high-achieving friends, will be linked to enhanced academic achievement.

H4: The positive impact of extracurricular activities on educational achievement is partially mediated through social connections with high-achieving friends.

However, the direction of contact between friends might be important: adolescents may be affected differently by their peers' academic performance depending on their own educational achievement. While friendships between high- and low-achieving peers could be beneficial for low-achieving students, it might have no effect or negative impacts on educational outcomes for high-achieving peers. For example, research suggests that sitting next to low-achieving peers in class might negatively impact educational outcomes for high-achieving peers, while low-achieving peers benefit from this contact with high-achieving peers (Keller & Elwert, 2023). Thus, having high-achieving peers could have heterogeneous impacts on students' own educational achievement. Particularly with regard to cross-track friendships, students on lower school tracks might benefit from these connections, whereas for students who attend the academic track, having friends from other tracks might not further impact their own educational performance, as they already encounter academic norms and related resources in their school class. This leads to the following expectations regarding possible heterogeneous impacts of having high-achieving friends in extracurricular activities:

H5: Having high-achieving friends in extracurricular activities is more strongly related to the grades of adolescents on lower school tracks than for those on the academic track.

4.4. Data & Methods

4.4.1. Data

This study uses the German data of the Children of Immigrants Longitudinal Survey in Four European Countries (CILS4EU, Kalter et al., 2024). The nationally representative survey includes adolescents first at the age of 14/15 in grade 9 and follows them for up to seven consecutive waves. For the analyses of this study, results from the first four waves are used, covering the school years of grades 9 to 12. All students within randomly chosen school classes were surveyed, with personal questionnaires assessing individual information of the students and parental questionnaires filled out by the students' parents. Additionally, friendship questionnaires provide information on characteristics of the students' friends. The first wave of the German data of the CILS4EU includes more than 5,000 students in 271 classes. Because of missing information on relevant variables, the sample is reduced to 4,960 individual respondents clustered within 271 classes, with a total of 9,723 observations across four waves. Additionally, the friend questionnaire provides information on about 23,510 friends of these students. For some analyses, the sample is further reduced due to missingness in key variables.

4.4.2. Variables

Students' participation in extracurricular activities is measured through their answer to the question: "In your spare time, how often do you spend time in a sports, music, drama or any other club?" Students were categorized as active if they indicated a participation frequency of at least once a week. In additional analyses (see robustness checks), more detailed frequency measures are used as well.

The main outcomes of interest are school grades in German and math. In the German school system, grades range from 1-6, with 1 representing the highest possible grade and 6 the lowest possible grade. The grades were reversed for the analysis so that a higher value indicates better educational achievement, and standardized within classes at each wave. This thus indicates the students' academic performance relative to their classmates. For further analyses, measurements of students' subjective academic performance are used.

Furthermore, the analyses include the students' gender, parental socioeconomic background, and school track as reported in the first wave. Parental socioeconomic background is measured through two measures: parental ISEI (International Socio-Economic Index of Occupational Status, Ganzeboom et al., 1992) and parental education level. Parental ISEI is calculated as the mean ISEI score between both parents. Parental education level is included as a binary variable indicating whether at least one parent has attained a tertiary degree (ISCED 6: bachelor's degree or equivalent), following the dominance principle. Both parental ISEI and parental level of education were reported in wave 1, primarily by parents and supplemented by the responding adolescent when parental responses were missing. On the school level, school track is assessed as a dummy variable indicating whether or not the school of the class sampled is on the academic school track (*Gymnasium*).

Through the friendship questionnaire, respondents provide information about their five best friends, creating a nested structure of friends by respondents (see Figure 8 for a visualization of network structure). Important for this study are questions regarding where they typically see or meet each other. Friends are categorized as co-participating in an extracurricular activity if respondents indicated that they saw each other at sports, music, drama, or other clubs. Further, the survey collected information on the school tracks of each of these friends, their highest level of educational attainment if they were no longer enrolled in school. This provides information about whether students attend the same school track as their friends, with distinctions made between those in academic tracks and those in lower tracks combined, in order to reduce complexity of regional variations in school types. Additionally, respondents were asked about the academic performance of these friends with the question "How many of these friends do well in school?". This gives a subjective measurement of the perceived academic performance of their peer group overall. The questionnaire further collected additional demographic information about the respondents' best friends, including their ages, ethnic backgrounds, gender, and whether they attended the same class or school, another school, or had completed their education. These questions about friends in extracurricular activities are asked in the first wave of the study. While this cross-sectional data limits tracking changes in friendship in these

activities over time, it allows us to link these initial social connections to later outcomes.

4.4.3. Analytical Strategy

The analytical approach consists of three steps. The first analyses examine the link between participation in extracurricular activities and academic outcomes, specifically math and German grades. Multilevel regression models are employed, with observations clustered in students, to assess the overall association between extracurricular engagement and academic outcomes.

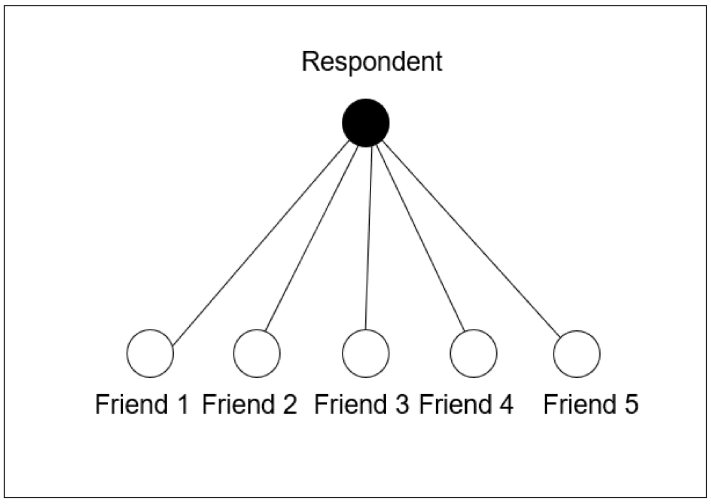

Figure 8: Structure of best friend questionnaire

Second, the educational characteristics of friends are analyzed to explore differences related to extracurricular participation. Friends' education is measured by school track and subjective academic performance. This analysis employs both multilevel and fixed-effects models. The multilevel regression models, with students clustered in classes, assess between-individual differences, analyzing whether the average school track and academic performance of friends differs between adolescents who take part in extracurricular activities and those who do not. In contrast, the fixed-effects models are applied to friendship dyads, focusing on within-individual differences between the respondents' five best friends. This compares the educational characteristics of friends who co-participate in extracurricular activities with those who do not, allowing the examination of whether, for the same respondent, friends met through extracurricular activities are more likely to be on an academic

track than friends met in other contexts. As the characteristics of friends in activities is only measured in the first wave, these are cross-sectional analyses.

Finally, the previous two steps are combined to assess the extent to which friendships mediate the impact of extracurricular activities on grades. is mediation analysis aims to clarify whether the educational characteristics of friends act as pathways linking extracurricular engagement to academic achievement. All reported results are weighted using the survey weights (CILS4EU, 2016).

4.5. Results

4.5.1. Extracurricular activities and educational achievement

In the first step of the analysis, the relationship between participation in extracurricular activities and academic performance is examined. This aims to establish that the link between activity engagement and students' educational outcomes. Multilevel regression models are used, estimating students' grades in math and German by their participation in extracurricular activities, clustered by individuals. Results show that participation in activities is linked to higher educational achievement in terms of higher grades for both subjects (see Table 13, Models 1-2). In additional models, the impact on students' subjective performance in these subjects is examined (see robustness checks).

Table 13: Results of multilevel regression models predicting math/German grade (standardized within class) by extracurricular participation

	Model 1 (math grade)			**Model 2 (German grade)**		
Predictors	*Estimates*		*se*	*Estimates*		*se*
Extracurricular participation	0.08	***	(0.02)	0.08	***	(0.02)
Gender (female)	-0.16	***	(0.03)	0.34	***	(0.03)
Academic school track	-0.07		(0.03)	-0.01		(0.03)
Parental level of education (at least one tertiary degree)	0.15	**	(0.05)	0.02		(0.04)

Parental occupational status (ISEI) (per 10-unit increase)	0.01	(0.01)	0.02	**	(0.01)
No. individuals	4,414		4,406		
Observations	9,723		9,705		

Note: S.E. in parenthesis. * p<0.05 ** p<0.01 *** p<0.001. Adjusted for clustering in individuals. Source: CILS4EU, own calculations.

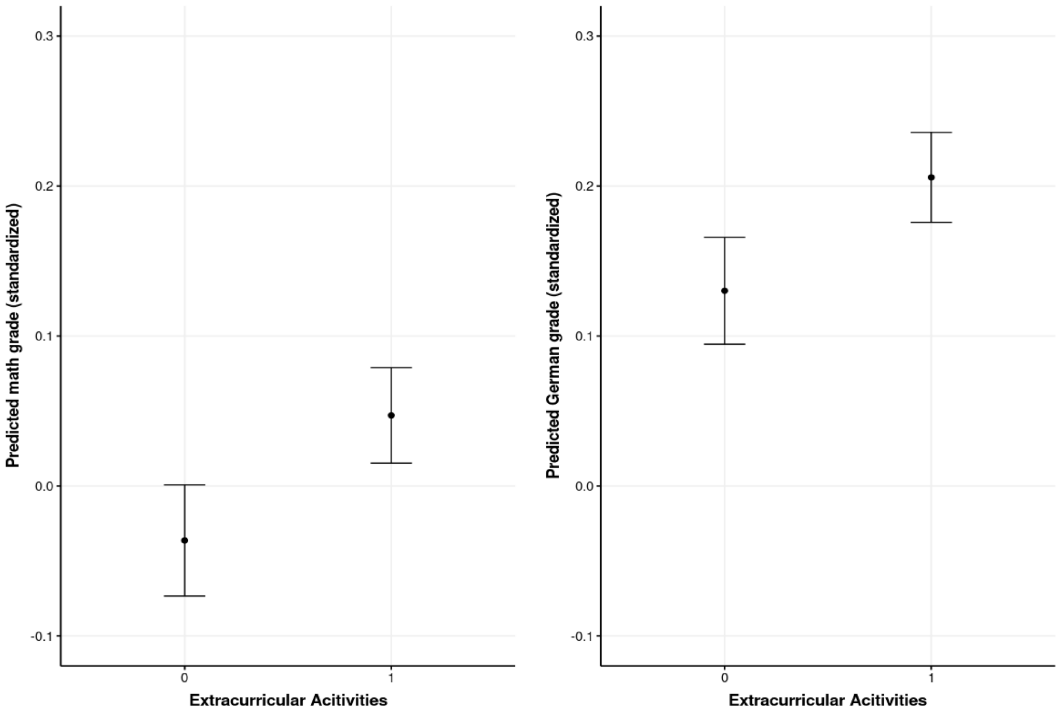

Figure 9: Predicted math/German grades by extracurricular participation (based on Table 13, Model 1-2)

The predicted grades in German and math by a student's extracurricular participation (see Figure 9) show an association between activity engagement and academic performance. For both subjects, students who participate in extracurricular activities tend to achieve higher grades compared to their peers who are not involved in such activities. Students who engage in these activities thus show overall better academic outcomes than their peers who do not participate. By establishing this initial connection between extracurricular involvement and academic success, this analysis sets the foundation for examining the mechanisms behind this link.

4.5.2. Extracurricular activities and characteristics of friends

In a second step, the link between participation in extracurricular activities and the educational characteristics of friends is examined. First, the analysis looks at whether students who regularly participate in extracurricular activities have overall more friends who attend the same track as themselves (see Model 1, Table 14). Multilevel regression models are used, with students clustered in classes, to predict the share of closest five friends that attend the same track by the respondents' participation in extracurricular activities, controlling for individual- and school-level variables.

The results show that participation is negatively linked to the share of friends who attend the same school track, with an overall difference of about 3 percentage points. In other words, students who are engaged in extracurricular activities tend to have more friends on different tracks than students who do not participate. The analysis is further separated by the school track of the respondent, running separate models for students on the academic track (Model 2, Table 14) and students who attend lower tracks (Model 3, Table 14). Here, the results show diverging dynamics. For students on lower school tracks, there is indeed a negative association between taking part in activities and their share of friends attending the same track as them (H3). For this group, participation is linked to a reduction of about 5 percentage points in the share of friends who attend the same track (Model 3 Table 14). However, for students on the academic track, there is no impact of participation (Model 2, Table 14). Thus, for students on lower educational tracks, engagement in extracurricular activities is linked to more friends on the academic track, while for students on the academic track, participation in extracurriculars does not seem to impact their likelihood to have friends on lower tracks. This is also apparent when looking at the predicted share of friends attending the same school track separately by respondents' own track (see Figure 10). For students on lower school tracks, extracurricular engagement is associated with a smaller percentage of friends also attending lower tracks. Specifically, students on lower tracks who do not participate in extracurricular activities have about 90 percent of their friends on the same track, whereas this percentage drops to around 85 percent for those who are engaged in activities. Conversely, for students on the academic track, participation in extracurricular activities shows no clear impact on the percentage of friends attending lower tracks.

Table 14: Results of multilevel regression models predicting total share of friends who attend the same school track by participation in extracurricular activities, separately for students on the academic track and lower tracks

	Model 1		Model 2 (academic track)		Model 3 (lower tracks)	
Predictors	*Estimates*	*se*	*Estimates*	*se*	*Estimates*	*se*
Extracurricular participation	-0.03 ***	(0.01)	0.03	(0.02)	-0.05 ***	(0.01)
Academic school track	-0.03 *	(0.02)				
Parental occupational status (ISEI) (per 10-unit increase)	-0.01 ***	(0.00)	-0.00	(0.00)	-0.02 ***	(0.00)
Parental level of education (at least one tertiary degree)	0.02 *	(0.01)	0.04 *	(0.02)	-0.02	(0.02)
Gender (female)	-0.01	(0.01)	-0.00	(0.02)	-0.02 **	(0.01)
Observations	4145		890		3255	

Note: S.E. in parenthesis. * p<0.05 ** p<0.01 *** p<0.001. Adjusted for clustering in classes. Source: CILS4EU, own calculations.

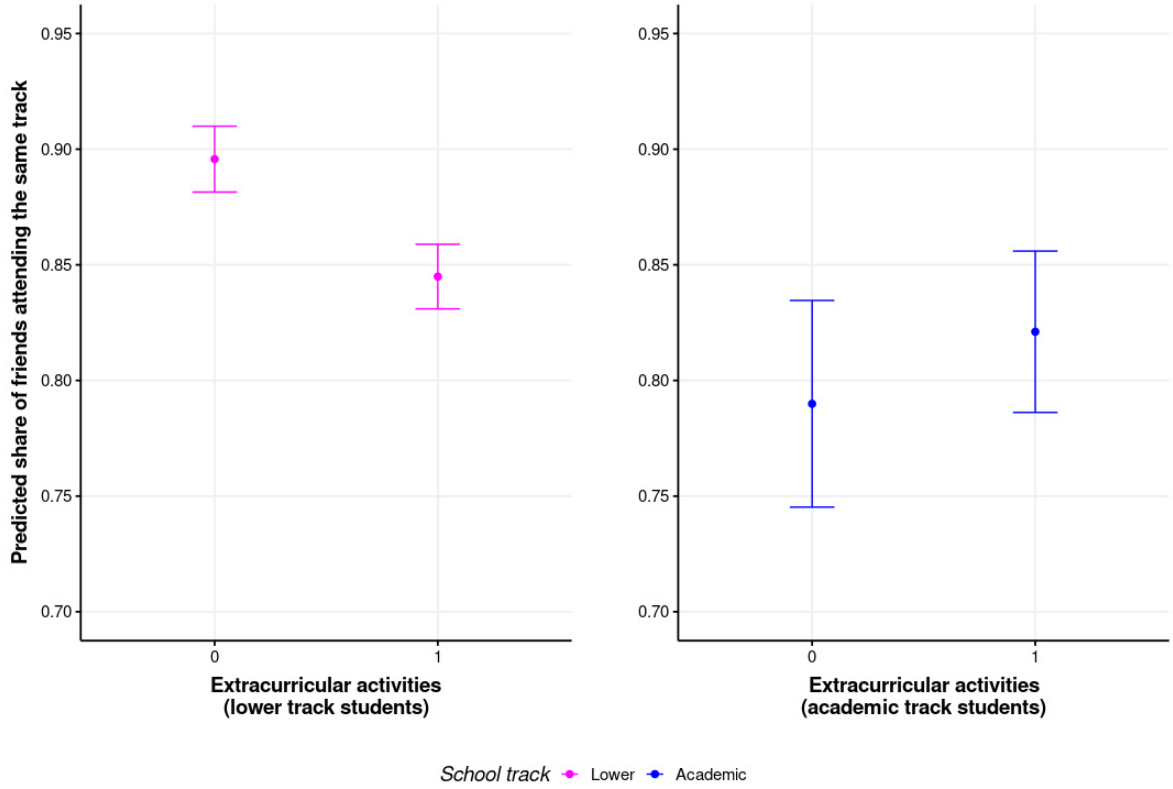

Figure 10: Predicted share of friends attending the same school track by participation in extracurricular activities, separately for students on lower school tracks and students on the academic track (based on Models 2-3, Table 14)

To examine whether, within the set of friends nominated by each respondent, those who co-participate in extracurricular activities are more likely to attend the same track than other friends, a fixed-effects model is applied. This model predicts whether a given friend attends the same school track as the respondent based on their co-participation status (see Table 14). In contrast to the previous models where the focus was on the average education of friends, here, the relationship between co-participation and educational characteristics is assessed within each student's own peer group, consisting of their five best friends. By doing so, it controls for individual characteristics of respondents, allowing us to isolate the effect of co-participation on the likelihood of friends attending the same or another track.

The results show that friends who were met in extracurricular activities are less likely to be on the same track as the respondent (see Table 15). In other words, within the sample of five best friends nominated by each respondent, activity co-participation is associated with this friend being on another academic school track than the respondent, net of individual characteristics of the respondent. Without taking friends'

other characteristics into account, friends who are co-participants are about 14 percentage points more likely to be on a different track (see Table 15, Model 1). This effect decreases when accounting for additional controls (see Table 15 Model 2), particularly whether friends attend the same school, as friends who attend the same school in Germany also usually attend the same track. Nonetheless, even with these controls, co-participation in extracurricular activities is still related to a lower likelihood of a friend attending the same track as the respondent. Thus, extracurricular activities do indeed appear to be a setting in which students meet peers who attend school tracks different from themselves.

Table 15: Results of linear probability fixed-effects models on friendship dyads predicting whether a friend attends the same school track by their co-participation status in extracurricular activities and friend's characteristics

	Model 1 (individual fixed effects)			**Model 2 (individual fixed effects + controls)**		
Predictors	*Estimates*		*se*	*Estimates*		*se*
Co-participation in extracurricular activities	-0.14	***	(0.01)	-0.05	***	(0.01)
Age (in years)				-0.01	***	(0.00)
Ethnic background (ref.: German)						
Italian				0.02		(0.01)
Polish				0.01		(0.01)
Russian				0.00		(0.01)
Turkish				0.01		(0.01)
Other				0.01		0.01)
School Attended (ref.: same class)						
Same school				-0.02	***	(0.01)
Other school				-0.35	***	(0.01)
Finished school				-0.19	***	(0.01)
Same gender				-0.00		(0.01)

No. individuals	4,960	4,939
Observations	23,518	23,079

Note: S.E. in parenthesis. * p<0.05 ** p<0.01 *** p<0.001. Source: CILS4EU, own calculations.

To determine if this effect applies equally across school tracks, the analysis was divided to compare students on the academic track with those on lower tracks. The results reveal that the impact of extracurricular activities on the likelihood of a friend being on the same track is concentrated among students on lower tracks (see Table 16, Model 1-2). For this group, the likelihood of a friend also being on a lower school track is around six percent lower when they meet this friend in extracurricular activities. For students on the academic track, no clear impact of co-participation status is found for the likelihood of a friend being on the same track or not. Interestingly, for academic-track students, having friends who have finished school is associated with a higher likelihood that these friends attended a lower track—possibly reflecting that students from lower tracks may complete their schooling earlier, often before age 18. Thus, it seems like activities provide students who attend lower school tracks with opportunities to interact with peers on the higher school track, but students on the academic track do not meet different peers in these activities than in other contexts.

Table 16: Results of linear probability fixed-effects models on friendship dyads predicting whether a friend attends the same school track by their co-participation status in extracurricular activities and friend's characteristics, separately for students on the academic track and lower tracks

	Model 1 (individual fixed effects + controls)– lower track		**Model 2 (individual fixed effects + controls) – acad. track**	
Predictors	*Estimates*	*se*	*Estimates*	*se*
Co-participation in extracurricular activities	-0.06***	(0.01)	-0.01	(0.01)
Age (in years)	-0.01***	(0.00)	0.01*	(0.01)
Ethnic background (ref.: German)				

Italian	0.04**	(0.01)	-0.08	(0.04)
Polish	0.01	(0.01)	-0.01	(0.03)
Russian	-0.00	(0.01)	0.04	(0.03)
Turkish	0.02**	(0.01)	-0.05*	(0.02)
Other	0.01	(0.01)	-0.03	(0.02)
School Attended (ref.: same class)				
Same school	-0.02*	(0.01)	-0.04*	(0.02)
Other school	-0.30***	(0.01)	-0.50***	(0.01)
Finished school	-0.12***	(0.01)	-0.76***	(0.04)
Same gender	0.01	(0.01)	-0.02	(0.01)
No. individuals	3,943		996	
Observations	18,329		4,750	

Note: S.E. in parenthesis. * p<0.05 ** p<0.01 *** p<0.001. Source: CILS4EU, own calculations.

What does this mean in terms of the educational heterogeneity among friends of students from different school tracks? Examining the predicted probability of a friend being on the same track as the respondent based on their co-participation status (see Figure 11) shows that, for students on the academic track, whether their friends engage in activities with them does not appear to influence the likelihood of being on the same school track. Overall, academic-track students have a lower probability than lower-track students of having friends on the same educational track, irrespective of the context in which these friendships are formed. In contrast, for students on the lower track, the context matters: friends met in extracurricular activities are more likely on a higher track, while friends from other contexts tend to be more homogenous friendships in terms of level of education.

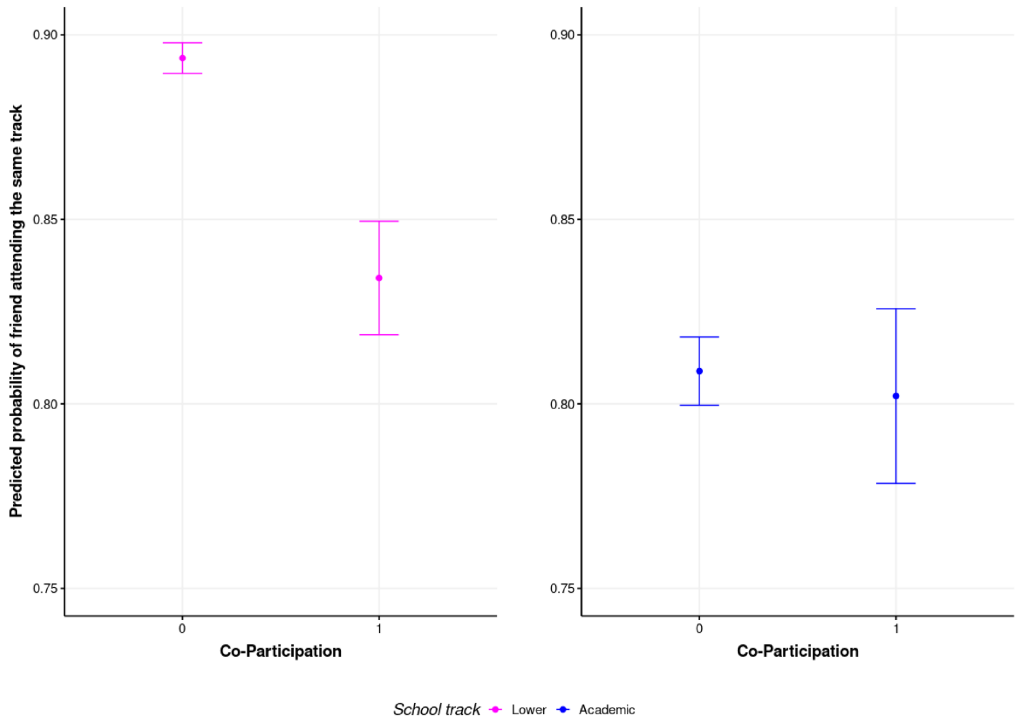

Figure 11: Predicted probability of a friend attending the same track by whether friends co-participate in activities, separated by school track (lower vs academic tracks) (based on fixed-effects models, Table 16)

Next, the relationship between co-participation in activities and friends' academic performance is examined based on the respondents' subjective assessment of their friends' success in school. This measure is derived from a question asking respondents whether they believe that all, some, or none of their best friends do well academically. Using binomial multilevel models, with students clustered in classes, the analysis explores whether having a higher share of co-participating friends is associated with respondents being more likely to report that all of their friends do well in school, rather than just some[2].

The results show that the higher the share of co-participating friends among a student's best friends, the higher the likelihood that they believe all their friends to be doing well academically (see Table 17). An examination of the predicted probabilities reveals that as the percentage of co-participating friends increases, so does the tendency to report that all friends, rather than just some, perform well academically (see Figure 12). Thus, it seems that the more friends a student meets in

[2] Since the answer indicating that none of the friends do well in school was very rarely selected (less than 2 percent), it is excluded from this analysis.

extracurricular activities, the more they believe their friends to be doing well academically. As this is a subjective measurement, we do not know if these friends actually have higher grades than friends met in other contexts, but their perceived performance is higher.

Table 17: Results of multilevel regression models predicting whether all friends do well in school by share of co-participating friends

	Model 1		
Predictors	*Odds Ratios*		*se*
Share of co-participating friends	2.52	***	(0.03)
Parental occupational status (ISEI) (per 10-unit increase)	1.03	***	(0.00)
Gender (female)	1.60	***	(0.01)
Academic school track	1.21		(0.26)
Parental level of education (at least one tertiary degree)	1.06	***	(0.01)
Observations	4,284		

Note: S.E. in parenthesis. * p<0.05 ** p<0.01 *** p<0.001. Adjusted for clustering in classes. Source: CILS4EU, own calculations.

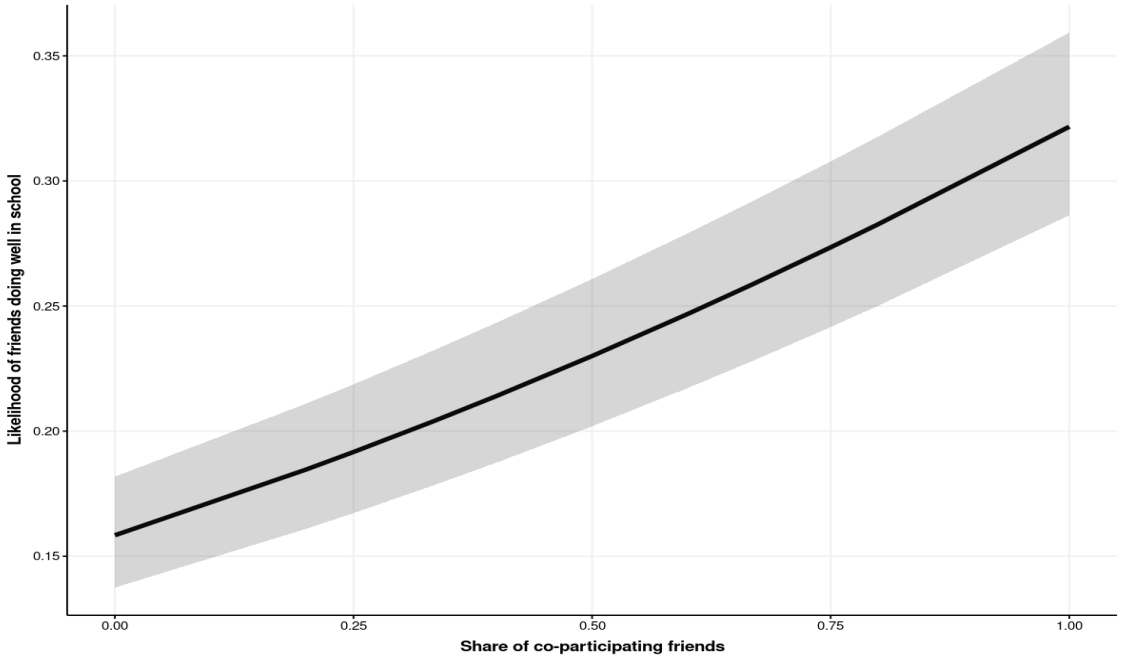

Figure 12: Likelihood of all friends doing well in school (ref: some friends doing well) by share of friends that co-participate in extracurricular activities (based on Table 17)

Overall, these analyses regarding the link between co-participation in extracurricular activities and friends' characteristics show that activities seem to be associated with having friends who are doing well in school and friends who attend higher school tracks, particularly for students who do not themselves attend the academic track. Thus, participation in activities does indeed seem to be linked to social connections to academically high-achieving peers. This is true even when taking person-fixed effects into consideration: friends who are met in activities are more likely than other friends to be performing better academically.

4.5.3. Mediation and moderated mediation

In the final analytic step, the previous two approaches are combined through mediation and moderated mediation analyses. The mediation models analyze the extent to which social connections to peers on the academic track serve as a mediating factor in the relationship between extracurricular activities and academic performance. Additionally, the moderated mediation models examine whether the mediating effect of friends' academic characteristics on the relationship between extracurricular participation and academic outcomes differs based on the students'

own track. Separate models are calculated for the impact on math grades and German grades.

Results of the general mediation analysis (see Table 18) show that extracurricular participation has both a direct effect on grades, as well as an indirect through its impact on social connections to high-achieving peers. For German grade, around 16 percent of the impact of participation is mediated through these friendships, while for math grade, it is around four percent. Thus, this confirms that extracurricular activities contribute the adolescents' educational achievement through social connections.

Table 18: Results from mediation analyses

	Indirect effect of participation via friends' characteristics	**Direct effect of participation**	**Total effect of participation**	**Prop. mediated**
German grade	0.03*** (0.02-0.04)	0.15*** (0.08-0.22)	0.18*** (0.10-0.25)	0.16*** (0.09-0.29)
Math grade	0.01* (0.00-0.01)	0.15*** (0.09-0.22)	0.16*** (0.01-0.22)	0.04* (0.00-0.09)

Note: * p<0.05 ** p<0.01 *** p<0.001; 95%-CI in parentheses; standard errors were obtained through 1,000 bootstrapping estimates and are cluster-corrected at the class level.

Further, the moderated mediation analyses look at these effects separately for students on the academic track and lower tracks. Results show (see Table 19) that for grades in German, the proportion of the effect of activity participation that is mediated through friends' educational characteristics is larger for students who attend the lower track. This is in line with the formulated expectation (H5) that having high-achieving friends should matter for students on the lower tracks. For math grades, the results point in a similar direction, but are less clear. Thus, for grades in German, it seems that having friends on the academic school track because of participation in extracurricular activities can help us explain some of the impact of these activities on academic outcomes, at least for students who are on lower tracks. However, for

students on the academic track, this mechanism is less pronounced, while the overall link between activity participation and grades is actually larger than for students on lower tracks (see Table 19). This suggests that for these high-achieving students, other mechanisms play a more important role than the friends made through these activities.

Table 19: Results from moderated mediation analyses

	Indirect effect of participation via friends' characteristics	**Direct effect of participation**	**Total effect of participation**	**Prop. mediated**
German grade:				
Academic track	0.02* (0.00-0.04)	0.23** (0.09-0.37)	0.25*** (0.11-0.39)	0.08* (0.02-0.20)
Lower tracks	0.03*** (0.02-0.05)	0.12** (0.03-0.20)	0.15** (0.06-0.23)	0.21** (0.11-0.54)
Math grade:				
Academic track	0.00 (0.00-0.01)	0.31*** (0.18-0.44)	0.31*** (0.19-0.44)	0.01 (0.00-0.04)
Lower tracks	0.01* (0.00-0.01)	0.11** (0.03-0.19)	0.16*** (0.08-0.25)	0.06 (0.00-0.19)

Note: * p<0.05 ** p<0.01 *** p<0.001; 95%-CI in parentheses; standard errors were obtained through 1,000 bootstrapping estimates and are cluster-corrected at the class level.

4.5.4. Robustness checks

As robustness checks, additional analyses are performed, looking first at the frequency of participation, secondly, subjective school performance instead of grades, and lastly, the relationship between co-participation and effort in school.

Adolescents who spend more time in extracurricular activities may have a higher likelihood of befriending peers from different school tracks compared to those who participate less. To investigate this, an additional analysis examines the relationship between the share of friends on a different school track and the frequency of participation in these activities. Results from this analysis (see Table A25) suggest

that the frequency of participation does not impact the share of friends from different tracks; rather, simply participating at any level is what matters. Thus, all students who engage in activities, regardless of frequency, tend to have a lower share of friends who attend the same track as themselves (see Figure A15).

Further, the link between extracurricular activities and students' subjective evaluation of their own school performance is examined. This measure is particularly relevant as subjective evaluations may capture students' self-perceptions and motivation, which may be more responsive to social influences and peer dynamics than objective grades. The results (see Table A 23) indicate a similar positive association between extracurricular participation and students' perceived academic performance. This suggests that students engaged in extracurricular activities not only perform better academically in objective terms, as measured through grades, but also feel more confident in their school abilities.

Additionally, the relation between share of friends in extracurricular activities and attitude towards school is explored. This might be a pathway that underlies the relation between having many friends in extracurricular activities might impact students' attitudes towards putting effort into their education. Thus, the relation between share of co-participating friends and students' agreement to the statement "I put a great deal of effort into my school work" is examined. Results show that there indeed is a linked between having friends who do extracurricular activities and agreement to this statement (see Table A24). This indicates that students' attitudes might be a way through which peers influence academic performance.

4.6. Discussion and conclusion

Studies on extracurricular activities suggest that these peer dynamics might be a mechanism behind the positive link between extracurricular activities and educational achievement, but the underlying assumptions underlying this have so far not been addressed. Previous research on peer effects in education shows that friends play a role in shaping educational aspirations and outcomes of adolescents. Despite these insights, the relationship between extracurricular participation, the characteristics of friendships formed in these contexts, and their impact on educational outcomes remains insufficiently explored. This study contributes to addressing this gap by empirically examining the characteristics of friends met in

extracurricular activities and how these friendships potentially influence academic performance.

Overall, the results reveal that students engaged in extracurricular activities indeed have more high-achieving friends, both in terms of average achievement levels and on an individual level. Specifically, students' friends who co-participate in these activities are more likely to be on higher academic tracks. This is particularly the case for students who themselves do not attend the academic track – participation in extracurricular activities leads to more contact to high-achieving peers especially for this group. Furthermore, the analyses indicate a positive association between extracurricular participation and academic performance, and suggest that a part of this relationship can be attributed to the differing educational characteristics of friends, particularly for students on lower school tracks.

These findings highlight the role that extracurricular activities play in shaping the academic characteristics of adolescents' social networks and, consequently, their academic performance. The results indicate that extracurricular involvement provides a context where students, particularly those on lower academic tracks, can form friendships with higher-achieving peers. This suggests that these activities serve as a mechanism for bridging academic divides that exist within the formal school setting, offering students in lower tracks access to peer networks that they might not otherwise encounter. Such connections could expose them to more academically oriented norms and behaviors, which may enhance their educational outcomes. For students on academic tracks, however, the activities appear to reinforce existing social networks without significantly altering their academic peer group.

5. Conclusions

5.1. Main findings

The three empirical studies of this dissertation are an effort to better understand the mechanisms that lead to the intergenerational reproduction of inequality, specifically the role that extracurricular activities might play in this process. Each study investigates distinct facets of how participation in these activities can be associated with unequal outcomes, moving beyond the straightforward observation of unequal access and selection into these activities.

The first study (Chapter 2) highlights how the cognitive skill benefits gained from extracurricular participation are moderated by social background. It demonstrates that while engagement in extracurricular activities can be beneficial, the extent of these benefits varies between adolescents from different backgrounds. Adolescents with more educated parents benefit more from their participation than their peers from less educated families. This suggests that extracurricular activities may act as reinforcers of existing inequalities, contributing to the wider process of social reproduction.

The second study (Chapter 3) shifts focus to the long-term effects of extracurricular participation. It provides evidence that the advantages of participating in extracurricular activities during adolescence can extend into adulthood, impacting both educational and labor market outcomes. The study's findings underscore a cumulative effect of investments in adolescence, with widening disparities over time.

The third study (Chapter 4) explores the social network mechanisms facilitated by extracurricular activities. It examines how friendships and peer characteristics formed through participation differ from friendships formed in other contexts, and how they may contribute to unequal educational. The findings reveal that social connections formed in these activities play a role in shaping academic achievement, particularly for students on lower academic tracks who gain access to higher-achieving peers.

Together, these studies highlight the multifaceted nature of extracurricular activities as both potential mitigators and amplifiers of inequality. This nuanced examination contributes to the broader discourse on social reproduction by showing

that while these activities hold potential for positive developmental outcomes, their impacts are deeply influenced by pre-existing social disparities.

5.2. Implications

What do these results mean for the intergenerational reproduction of inequality? The findings of this dissertation provide insights that extend the theoretical frameworks discussed in the earlier chapters. The dissertation's empirical studies support the notion that investments in adolescence, such as extracurricular activities, are influential not only during youth but have ramifications that extend into adulthood. This highlights how life course concepts like cumulative advantage manifest through specific mechanisms, reinforcing the theoretical understanding that early life stages are deeply interconnected with later outcomes (e.g., L. Bernardi et al., 2019).

Furthermore, by situating extracurricular activities within the status attainment framework, this work elaborates on how non-academic, non-family contexts contribute to the development of unequal outcomes. This supplements existing literature that often focuses narrowly on formal education or parental inputs in the home environment, showing that extracurricular activities can act as a context where social and academic advantages accumulate.

The application of the effectively maintained inequality concept (Lucas, 2001) is also evident in these findings. The first study, which highlights differential returns to extracurricular participation by socioeconomic status, confirms that while participation itself may be broadly beneficial, the gains are not equally distributed. This contributes to our understanding by illustrating that in these extracurricular contexts, such as music or sports clubs, advantaged families find ways to secure and enhance their children's developmental benefits, beyond mere differences in participation rates. This highlights the need to better understand the mechanisms through which these unequal benefits emerge and the possible conditions that might enable more equitable returns for participants from different backgrounds.

In connection to this, the dissertation underscores the importance of considering multiple mechanisms through which inequality is reproduced. The studies collectively show that extracurricular activities contribute to unequal outcomes not just through skill building (Chapter 2), but also through social connections (Chapter 4). Additionally, the longitudinal approach taken in study II (Chapter 3) highlights how these mechanisms may interact over time, illustrating how early advantages gained through extracurricular activities can accumulate and lead to wider disparities in adulthood. This comprehensive view emphasizes the interconnected nature of

cognitive development, social influences, and cumulative processes in understanding how inequalities persist and deepen across life stages.

5.3. Limitations and open questions

While the findings offer important insights, several limitations and questions remain, paving the way for future research. In this section, I will discuss these limitations, and show how they might relate to future research that builds on these findings.

While Chapter 2 examined cognitive skills as a potential channel through which extracurricular activities may impact outcomes, the mechanisms behind this acquisition of skills through these activities remain less explored. Future research should delve deeper into what happens within these activities that lead to skill development, paying particular attention to how family background enables or constrains these benefits. In Chapter 2, I showed how participation is linked to higher cognitive skills in adolescents, with parental background playing a role in moderating the benefits of participation. Since skills have been shown to highly relevant to outcomes in adulthood, the particular ways in which these activities might lead to skill development, i.e. what happens in these activities that lead to these outcomes, deserves more attention, especially in regard to how family background might act in enabling these benefits.

Thus, future research might more closely investigate the interplay between what happens at home and what happens in these activities. What do parents do to enable the benefits of participation? Research has explored important differences in parenting behavior and strategies (Kalil & Ryan, 2024), but we do not clearly understand yet how these differences relate to unequal returns to activity participation. It could be worthwhile to explore the different ways in which the home context supports the realization of the benefits of extracurricular activities.

This is also connected to open questions regarding the potential strategic behaviors of parents around extracurricular activities. While it is known that advantaged parents tailor stimulating home activities to their children's needs (Bennett et al., 2021), it less clear how they integrate extracurricular activities into these strategies. Do parents respond to their children's potential, or do they also react

to challenges as a compensatory mechanism? Investigating these questions could offer deeper insights into how and why participation benefits are distributed unequally.

Further research should also focus on the qualitative differentiations between activities, in line with notions of effectively maintained inequality (Lucas, 2001). If family background impacts not just whether adolescents participate in activities or not, but also in which specific types of activity they engage, this motivates research into how different activities differ both in their social composition and their benefits. For example, are peer dynamics consistent across different types of activities, or do they vary based on the group's specific composition? For instance, a soccer team in a more privileged neighborhood may provide different social and academic peer groups compared to one in a less privileged area. Beyond broad categories like music versus sports, the social makeup of activity groups should be a focal point.

The role of genetic endowments also presents an avenue for future exploration. Exploring the role of gene-environment interactions (Erola et al., 2020) in the context of extracurricular activities might help us better understand the direct and indirect influences of family background on children's development. This is especially pertinent as both music and sports abilities have been shown to be influenced by genetic factors (see for example Tan et al., 2014 for music; Moor et al., 2011 for sports), but less is known about how social background impacts how abilities and interests in these activities translate to regular participation and benefits for educational outcomes.

Lastly, a critical challenge in the study of the role of extracurricular activities for the intergenerational reproduction of inequality is the question of causality. Do the activities that adolescents engage in actually lead to better outcomes, or is it something inherent to those who choose to participate that drives these outcomes? In other words, is the relationship between participation and outcomes a genuine product of engagement, or is it primarily a result of an unequal selection into these activities?

To address the challenge of causality, this dissertation employed methods such as propensity score matching and fixed effects models to address issues of selection into participation. These techniques aimed to isolate the effects of extracurricular participation by controlling for observable differences between participants and non-participants, such as their socioeconomic background. However, despite these efforts, fully disentangling participation from selection is difficult. It

remains possible that unobserved factors—such as intrinsic motivation or family encouragement—contribute to both participation and improved outcomes.

While this limitation warrants caution in interpreting results as strictly causal, it also provides valuable insights. The very fact that participation in extracurricular activities is not random offers a lens through which we can understand broader inequality processes. The reasons that lead certain adolescents to participate – and to benefit from participation – are themselves noteworthy, revealing how family background and other social factors shape both engagement in activities and their potential benefits. These contextual dynamics that enable or limit participation in these activities and their payoffs offer potential insights into broader processes of inequality reproduction.

In conclusion, this dissertation explores the role of extracurricular activities for the development of inequalities in terms of skills, social networks, and long-term outcomes in education and the labor market. It highlights that these activities are not just an issue of inequality of opportunity, in that young people from different backgrounds have different opportunities to participate, but are shaped by and interact with social inequalities in more complex ways.

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Appendix

A2: Appendix to Chapter II

Table A1: ***Absolute standardized mean difference (SMD) before and after propensity score weighting for extracurricular activities, minimum participation duration three years***

Covariates	SMD	
	Before	After
High level of parental education	0.376	0.120
OECD equivalent household income	0.934	0.078
Parental EGP class		
Upper service	0.225	0.020
Lower service	0.099	0.057
Higher routine non-manual	0.092	0.036
Self-employed/farmer	0.049	0.068
Working class	0.292	0.108
Gender (female)	0.252	0.131
Oldest sibling/only child	0.041	0.082
Migration background	0.103	0.071
Academic school track	0.407	0.029
School track recommendation		
Academic	0.434	0.049
Intermediate	0.173	0.191
Lower	0.144	0.147
None given	0.117	0.166
Childhood location type (ref. category: Large city)		
Midsize city	0.015	0.186
Small town	0.008	0.103
Rural	0.045	0.226

Table A2: ***Results of propensity score weighted linear regression models predicting total cognitive test score by extracurricular activities, minimum participation duration three years. N=2,687***

	Model 1			Model 2 (with interactions)		
	b		se	b		se
Activity (ref. category: None)						
Sport	0.106	*	(0.044)	0.044		(0.053)
Music	0.222	***	(0.056)	0.202	**	(0.075)
Both	0.243	**	(0.082)	0.169		(0.113)
High level of parental education	0.228	**	(0.072)	0.119		(0.071)
Activity x High level of parental education						
Sport				0.178		(0.095)
Music				0.057		(0.111)
Both				0.197		(0.173)
Gender (female)	-0.159	**	(0.054)	-0.165	**	(0.055)
Oldest sibling/only child	0.004		(0.050)	0.003		(0.050)
OECD equivalent household income (in EUR 1,000)	-0.012		(0.041)	-0.012		(0.040)
Parental EGP class (ref. category: Upper service)						
Lower service	-0.060		(0.058)	-0.063		(0.059)
Higher routine non-manual	-0.031		(0.081)	-0.033		(0.081)
Self-employed/farmer	0.059		(0.159)	0.055		(0.157)
Working class	-0.136		(0.094)	-0.139		(0.095)
Migration background	-0.292	***	(0.067)	-0.292	***	(0.066)
School track recommendation (ref. category: Academic)						
Intermediate	-0.226	***	(0.067)	-0.224	***	(0.067)
Lower	-0.495	***	(0.097)	-0.500	***	(0.097)
None given	-0.407	***	(0.088)	-0.422	***	(0.090)
Academic school track	0.448	***	(0.059)	0.450	***	(0.059)
Childhood location type (ref. category: Large city)	0.155		(0.093)	0.159		(0.093)
Midsize city	0.025		(0.070)	0.029		(0.070)
Small town	0.126		(0.069)	0.130		(0.069)
Rural	0.155		(0.093)	0.159		(0.093)

Note: S.E. in parenthesis. * p<0.05 ** p<0.01 *** p<0.001. Source: SOEP v35, own calculations.

Table A3: ***Results of propensity score weighted linear regression models predicting total cognitive test score by extracurricular activity participation, with participation duration as control. N=2,687.***

	Model 1			Model 2 (with interactions)		
	b		se	b		se
Activity (ref. category: None)						
Sport	0.084		(0.207)	0.072		(0.210)
Music	0.186		(0.236)	0.225		(0.275)
Both	0.233		(0.241)	0.191		(0.289)
High level of parental education	0.214	***	(0.061)	0.221	**	(0.077)
Activity x High level of parental education						
Sport	0.015		(0.112)	0.015		(0.112)
Music	-0.089		(0.142)	-0.089		(0.142)
Both	0.049		(0.234)	0.049		(0.234)
Long participation	-0.003		(0.215)	0.003		(0.218)
Gender (female)	-0.259	***	(0.046)	-0.259	***	(0.045)
Oldest sibling/only child	0.013		(0.048)	0.012		(0.048)
OECD equivalent household income (in EUR 1,000)	0.010		(0.029)	0.009		(0.029)
Parental EGP class (ref. category: Upper service)						
Lower service	-0.131		(0.072)	-0.134		(0.073)
Higher routine non-manual	-0.039		(0.091)	-0.037		(0.092)
Self-employed/farmer	-0.004		(0.121)	-0.005		(0.120)
Working class	-0.149		(0.085)	-0.150		(0.084)
Migration background	-0.229	***	(0.064)	-0.229	***	(0.064)
School track recommendation (ref. category: Academic)						
Intermediate	-0.193	**	(0.068)	-0.192	**	(0.068)
Lower	-0.570	***	(0.091)	-0.571	***	(0.091)
None given	-0.506	***	(0.093)	-0.506	***	(0.093)
Academic school track	0.449	***	(0.071)	0.450	***	(0.072)
Childhood location type (ref. category: Large city)						
Midsize city	0.054		(0.079)	0.054		(0.079)
Small town	0.082		(0.072)	0.084		(0.071)
Rural	0.132		(0.072)	0.134		(0.070)

Note: S.E. in parenthesis. * p<0.05 ** p<0.01 *** p<0.001. Source: SOEP v35, own calculations.

Table A4: Results of propensity score weighted linear regression models predicting numeric test score by extracurricular activities. N=2,690.

	Model 1			Model 2 (with interactions)		
	b		se	b		se
Activity (ref. category: None)						
Sport	0.138	**	(0.045)	0.117	*	(0.056)
Music	0.078		(0.065)	0.048		(0.087)
Both	0.224	*	(0.091)	0.154		(0.118)
High level of parental education	0.182	*	(0.092)	0.098		(0.082)
Activity x High level of parental education						
Sport				0.061		(0.097)
Music				0.087		(0.123)
Both				0.178		(0.186)
Gender (female)	-0.346	***	(0.055)	-0.350	***	(0.055)
Oldest sibling/only child	0.017		(0.053)	0.017		(0.053)
OECD equivalent household income (in EUR 1,000)	-0.015		(0.036)	-0.014		(0.035)
Parental EGP class (ref. category: Upper service)						
Lower service	-0.007		(0.060)	-0.009		(0.060)
Higher routine non-manual	0.035		(0.097)	0.036		(0.097)
Self-employed/farmer	0.020		(0.159)	0.014		(0.157)
Working class	-0.014		(0.100)	-0.015		(0.100)
Migration background	-0.160	*	(0.080)	-0.163	*	(0.078)
School track recommendation (ref. category: Academic)						
Intermediate	-0.223	**	(0.068)	-0.221	**	(0.068)
Lower	-0.222		(0.137)	-0.228		(0.136)
None given	-0.319	***	(0.089)	-0.334	***	(0.092)
Academic school track	0.275	***	(0.062)	0.279	***	(0.061)
Childhood location type (ref. category: Large city)						
Midsize city	0.149		(0.093)	0.152		(0.092)
Small town	0.156		(0.080)	0.159		(0.081)
Rural	0.215	**	(0.071)	0.221	**	(0.072)

Note: S.E. in parenthesis. * p<0.05 ** p<0.01 *** p<0.001. Source: SOEP v35, own calculations.

Table A5: Results of propensity score weighted linear regression models predicting verbal test score by extracurricular activities. N=2,690.

	Model 1			Model 2 (with interactions)		
	b		se	b		se
Activity (ref. category: None)						
Sport	-0.008		(0.042)	-0.039		(0.047)
Music	0.283	***	(0.061)	0.298	***	(0.081)
Both	0.165	*	(0.083)	0.086		(0.121)
High level of parental education	0.233	***	(0.057)	0.170	*	(0.071)
Activity x High level of parental education						
Sport				0.088		(0.096)
Music				-0.045		(0.120)
Both				0.193		(0.158)
Gender (female)	-0.104	*	(0.051)	-0.107	*	(0.051)
Oldest sibling/only child	0.037		(0.051)	0.037		(0.051)
OECD equivalent household income (in EUR 1,000)	-0.014		(0.035)	-0.012		(0.035)
Parental EGP class (ref. category: Upper service)						
Lower service	-0.075		(0.062)	-0.078		(0.062)
Higher routine non-manual	-0.121		(0.083)	-0.121		(0.083)
Self-employed/farmer	-0.014		(0.113)	-0.024		(0.112)
Working class	-0.167		(0.092)	-0.170		(0.092)
Migration background	-0.218	**	(0.069)	-0.219	**	(0.068)
School track recommendation (ref. category: Academic)						
Intermediate	-0.207	**	(0.075)	-0.203	**	(0.075)
Lower	-0.564	***	(0.093)	-0.574	***	(0.091)
None given	-0.259	**	(0.090)	-0.276	**	(0.090)
Academic school track	0.518	***	(0.068)	0.522	***	(0.068)
Childhood location type (ref. category: Large city)						
Midsize city	0.137		(0.087)	0.140		(0.086)
Small town	-0.064		(0.074)	-0.062		(0.073)
Rural	0.055		(0.068)	0.060		(0.068)

Note: S.E. in parenthesis. * p<0.05 ** p<0.01 *** p<0.001. Source: SOEP v35, own calculations.

Table A6: Results of propensity score weighted linear regression models predicting figural test score by extracurricular activities. N=2,690.

	Model 1			Model 2 (with interactions)		
	b		se	b		se
Activity (ref. category: None)						
Sport	0.091		(0.048)	-0.010		(0.057)
Music	0.189	**	(0.062)	0.187	*	(0.080)
Both	0.195	*	(0.084)	0.062		(0.109)
High level of parental education	0.176	**	(0.067)	0.012		(0.077)
Activity x High level of parental education						
Sport				0.292	**	(0.104)
Music				0.002		(0.123)
Both				0.339	*	(0.163)
Gender (female)	0.087		(0.053)	0.081		(0.053)
Oldest sibling/only child	-0.057		(0.053)	-0.057		(0.053)
OECD equivalent household income (in EUR 1,000)	-0.036		(0.042)	-0.034		(0.041)
Parental EGP class (ref. category: Upper service)						
Lower service	-0.100		(0.070)	-0.106		(0.071)
Higher routine non-manual	-0.011		(0.089)	-0.012		(0.090)
Self-employed/farmer	0.015		(0.150)	0.000		(0.150)
Working class	-0.198	*	(0.093)	-0.203	*	(0.093)
Migration background	-0.222	**	(0.078)	-0.221	**	(0.076)
School track recommendation (ref. category: Academic)						
Intermediate	-0.118		(0.068)	-0.115		(0.067)
Lower	-0.325	**	(0.123)	-0.344	**	(0.122)
None given	-0.325	**	(0.105)	-0.352	***	(0.104)
Academic school track	0.311	***	(0.065)	0.315	***	(0.065)
Childhood location type (ref. category: Large city)						
Midsize city	0.106		(0.088)	0.110		(0.087)
Small town	0.033		(0.079)	0.034		(0.079)
Rural	0.048		(0.079)	0.055		(0.077)

Note: S.E. in parenthesis. * p<0.05 ** p<0.01 *** p<0.001. Source: SOEP v35, own calculations.

Table A7: Step-wise linear regression models for effect of German grade at age 9/10 on total cognitive test score at age 17. N=53.

	Model 1		Model 2			Model 3			Model 4		
	b	*se*	*b*		*se*	*b*		*se*	*b*		*se*
German grade			-0.438	**	(0.149)				-0.278		(0.174)
High parental education			0.693	*	(0.311)	0.326		(0.318)	0.391		(0.314)
OECD equivalent household income (in 1,000€)			0.184		(0.288)	0.125		(0.268)	0.021		(0.271)
School track recommendation (ref. category: Academic)											
Intermediate	-1.147	*** (0.222)				-1.020	***	(0.280)	-0.758	*	(0.320)
Lower	-1.558	*** (0.314)				-1.356	***	(0.377)	-0.932	*	(0.455)
None given	-1.906	*** (0.536)				-1.669	**	(0.585)	-1.632	**	(0.574)
R^2 / R^2 adjusted	0.483 / 0.440		0.434 / 0.393			0.553 / 0.484			0.581 / 0.504		

Note: German grade ranges from 1 to 6 with lower grades indicting higher achievement (in sample only 1 to 4), cognitive skills normalized (z-transformed) within sample. S.E. in parenthesis. * p<0.05 ** p<0.01 *** p<0.001. Source: SOEP v35, own calculations.

Table A8: Results of propensity score weighted linear regression models predicting total test score by extracurricular activities, interaction with income. N=2,690.

	Model 1		
	b		se
Activity (ref. category: None)			
Sport	-0.034		(0.100)
Music	0.253	*	(0.125)
Both	0.305		(0.160)
OECD equivalent household income (in EUR 1,000)	-0.034		(0.043)
Activity x Income			
Sport			
Music			
Both			
Gender (female)			
Oldest sibling/only child			
High level of parental education	0.247	***	(0.072)
Parental EGP class (ref. category: Upper service)			
Lower service	-0.072		(0.058)
Higher routine non-manual	-0.035		(0.074)
Self-employed/farmer	0.007		(0.138)
Working class	-0.143		(0.090)
Migration background	-0.250	***	(0.069)
School track recommendation (ref. category: Academic)			
Intermediate	-0.243	***	(0.062)
Lower	-0.458	***	(0.107)
None given	-0.386	***	(0.088)
Academic school track	0.455	***	(0.057)
Childhood location type (ref. category: Large city)			
Midsize city	0.166	*	(0.084)
Small town	0.060		(0.070)
Rural	0.147	*	(0.067)

Note: S.E. in parenthesis. * p<0.05 ** p<0.01 *** p<0.001. Source: SOEP v35, own calculations.

Table A9: Results of propensity score weighted linear regression models predicting total test score by extracurricular activities, interaction with occupational class. N=2,690.

	Model 1		
	b		se
Activity (ref. category: None)			
Sport	0.074		(0.050)
Music	0.195	**	(0.067)
Both	0.278	**	(0.095)
Highest parental EGP class	0.045		(0.075)
Activity x Highest parental EGP class			
Sport	0.114		(0.105)
Music	0.101		(0.122)
Both	-0.095		(0.149)
Gender (female)	-0.189	***	(0.048)
Oldest sibling/only child	0.003		(0.049)
High level of parental education	0.257	***	(0.068)
OECD equivalent household income (in EUR 1,000)	-0.022		(0.036)
Migration background	-0.263	***	(0.069)
School track recommendation (ref. category: Academic)			
Intermediate	-0.249	***	(0.062)
Lower	-0.459	***	(0.106)
None given	-0.389	***	(0.089)
Academic school track	0.460	***	(0.057)
Childhood location type (ref. category: Large city)			
Midsize city	0.159		(0.084)
Small town	0.057		(0.070)
Rural	0.155	*	(0.067)

Note: Parental occupational backgrounds operationalized as highest parental EGP class if at least one parent is in EGP group 1 (upper service). S.E. in parenthesis. * p<0.05 ** p<0.01 *** p<0.001. Source: SOEP v35, own calculations.

Table A10: Absolute standardized mean difference (SMD) before and after propensity score weighting, including parental leisure behavior

Covariates	SMD	
	Before	After
High level of parental education	0.377	0.148
OECD equivalent household income	0.913	0.115
Parental EGP class		0.027
Upper service	0.224	0.063
Lower service	0.92	0.032
Higher routine non-manual	0.089	0.013
Self-employed/farmer	0.048	0.013
Working class	0.286	0.066
Gender (female)	0.244	0.079
Oldest sibling/only child	0.032	0.053
Migration background	0.100	0.121
Academic school track	0.404	0.036
School track recommendation		
Academic	0.412	0.048
Intermediate	0.175	0.097
Lower	0.144	0.044
None given	0.120	0.049
Childhood location type (ref. category: Large city)		
Midsize city	0.025	0.079
Small town	0.036	0.035
Rural	0.034	0.137
Regular parental involvement in arts	0.292	0.076
Regular parental involvement in sports	0.334	0.080

Table A11: Results of propensity score weighted models predicting total cognitive test score by extracurricular activities, including parental leisure behavior. N=1,427

	Model 1			Model 2 (with interactions)		
	b		se	b		se
Activity (ref. category: None)						
Sport	0.018		(0.061)	-0.016		(0.070)
Music	0.165		(0.109)	0.173		(0.137)
Both	0.233		(0.131)	0.183		(0.139)
High level of parental education	0.193		(0.158)	0.123		(0.116)
Activity x High level of parental education						
Sport				0.150		(0.138)
Music				-0.046		(0.188)
Both				0.157		(0.342)
Gender (female)	-0.234	**	(0.082)	-0.236	**	(0.085)
Oldest sibling/only child	0.061		(0.089)	0.058		(0.088)
OECD equivalent household income (in EUR 1,000)	-0.053		(0.065)	-0.048		(0.063)
Parental EGP class (ref. category: Upper service)						
Lower service	-0.238	*	(0.095)	-0.231	*	(0.099)
Higher routine non-manual	-0.043		(0.116)	-0.033		(0.122)
Self-employed/farmer	-0.061		(0.171)	-0.055		(0.171)
Working class	-0.290		(0.151)	-0.285		(0.155)
Migration background	-0.344	**	(0.118)	-0.339	**	(0.120)
School track recommendation (ref. category: Academic)						
Intermediate	-0.187	*	(0.083)	-0.183	*	(0.080)
Lower	-0.536	***	(0.152)	-0.549	***	(0.145)
None given	-0.298	*	(0.136)	-0.319	*	(0.150)
Academic school track	0.472	***	(0.080)	0.473	***	(0.079)
Childhood location type (ref. category: Large city)						
Midsize city	0.274	*	(0.129)	0.284	*	(0.129)
Small town	0.095		(0.134)	0.101		(0.151)
Rural	0.171		(0.119)	0.178		(0.129)
Regular parental involvement in arts	0.014		(0.088)	0.020		(0.085)
Regular parental involvement in sports	0.163		(0.098)	0.162		(0.101)

Note: S.E. in parenthesis. * p<0.05 ** p<0.01 *** p<0.001. Source: SOEP v35, own calculations.

Table A12: Average cognitive test scores at age 17 by extracurricular activities, total score and three dimensions of cognitive skills.

	Mean total score	Mean numeric skills	Mean verbal skills	Mean figural skills
None (%)	-0.225	-0.164	-0.21	-0.16
Sport (%)	0.122	0.166	0.038	0.059
Music (%)	0.376	0.167	0.472	0.288
Both (%)	0.422	0.252	0.415	0.357

Note: Cognitive test scores standardized within sample.

Table A13: Extracurricular activity participation by parental occupational status. N=2,690.

	High occupational status	Low occupational status
None (%)	35.008	57.574
Sport (%)	29.513	24.598
Music (%)	23.234	11.690
Both (%)	12.245	6.137

Note: High occupational status is operationalized as at least one parent in EGP class 1 (upper service).

Table A14: Extracurricular activity participation by household equivalent income. N=2,690.

	High household income	Lower household income
None (%)	37.500	57.136
Sport (%)	25.595	25.818
Music (%)	23.512	11.397
Both (%)	13.393	5.649

Note: High household income is operationalized as having an OECD equivalent household income in highest quartile of the sample.

Table A15: Absolute standardized mean difference (SMD) before and after propensity score weighting for extracurricular activities, unorganized and organized

Covariates	SMD	
	Before	After
High level of parental education	0.352	0.038
OECD equivalent household income	0.830	0.113
Parental EGP class		0.027
Upper service	0.225	0.019
Lower service	0.103	0.007
Higher routine non-manual	0.052	0.027
Self-employed/farmer	0.254	0.003
Working class	0.039	0.016
Gender (Female)	0.148	0.063
Oldest sibling/only child	0.043	0.011
Migration background	0.032	0.020
Academic school track	0.460	0.022
School track recommendation		
Intermediate	0.136	0.010
Lower	0.151	0.011
None given	0.142	0.018
Childhood location type (ref. category: Large city)		
Midsize city	0.013	0.033
Small town	0.030	0.035
Rural	0.049	0.027

Table A16: Results of propensity score weighted linear regression models predicting total cognitive test score by extracurricular activities, unorganized and organized. N=2,690.

	Model 1			Model 2 (with interactions)		
	b		se	b		se
Activity (ref. category: none)						
Sport	0.079		(0.057)	0.097		(0.057)
Music	0.241	**	(0.081)	0.335	***	(0.091)
Both	0.157	*	(0.065)	0.129		(0.074)
High level of parental education	0.164	**	(0.056)	0.221		(0.122)
Activity x High level of parental education						
Sport				0.086		(0.145)
Music				-0.267		(0.178)
Both				-0.047		(0.134)
Gender (female)	-0.132	**	(0.045)	-0.133	**	(0.044)
Oldest sibling/only child	-0.021		(0.049)	-0.017		(0.048)
OECD equivalent household income (in EUR 1,000)	-0.014		(0.031)	-0.016		(0.031)
Parental EGP class (ref. category: Upper service)						
Lower service	-0.027		(0.071)	-0.025		(0.070)
Higher routine non-manual	0.062		(0.086)	0.057		(0.086)
Self-employed/farmer	-0.059		(0.111)	-0.057		(0.109)
Working class	-0.084		(0.083)	-0.084		(0.082)
Migration background	-0.245	***	(0.060)	-0.243	***	(0.059)
School track recommendation (ref. category: Academic)						
Intermediate	-0.157	*	(0.068)	-0.158	*	(0.067)
Lower	-0.640	***	(0.088)	-0.649	***	(0.088)
None given	-0.484	***	(0.083)	-0.490	***	(0.083)
Academic school track	0.509	***	(0.061)	0.503	***	(0.060)
Childhood location type (ref. category: Large city)						
Midsize city	0.204	*	(0.082)	0.208	*	(0.081)
Small town	0.123		(0.078)	0.119		(0.077)
Rural	0.235	**	(0.077)	0.232	**	(0.076)

Note: S.E. in parenthesis. * p<0.05 ** p<0.01 *** p<0.001. Source: SOEP v35, own calculations.

Table A17: Results of propensity score weighted linear regression models predicting total cognitive test score by extracurricular activities, controlling for adolescents' leisure behavior. N=2,680.

	Model 1			Model 2 (with interactions)		
	b		se	b		se
Activity (ref. category: None)						
Sport	0.093		(0.054)	0.087		(0.065)
Music	0.181	**	(0.069)	0.206	*	(0.104)
Both	0.224	*	(0.108)	0.184		(0.163)
High level of parental education	0.203	***	(0.060)	0.200	**	(0.075)
Activity x High level of parental education						
Sport				0.016		(0.110)
Music				-0.046		(0.137)
Both				0.063		(0.217)
Watching TV (ref. category: Every day)						
Every week	-0.007		(0.059)	-0.004		(0.059)
Every month	0.006		(0.106)	0.013		(0.106)
Less than every month	-0.088		(0.122)	-0.084		(0.121)
Never	0.737	*	(0.321)	0.732	*	(0.322)
Playing computer games (ref. category: Every day)						
Every week	0.049		(0.060)	0.048		(0.060)
Every month	0.018		(0.109)	0.013		(0.108)
Less than every month	-0.033		(0.066)	-0.034		(0.066)
Never	-0.164	*	(0.068)	-0.164	*	(0.068)
Reading (ref. category: Every day)						
Every week	0.032		(0.064)	0.032		(0.064)
Every month	-0.035		(0.073)	-0.034		(0.073)
Less than every month	-0.144	*	(0.066)	-0.144	*	(0.066)
Never	-0.077		(0.082)	-0.078		(0.082)
Gender (female)	-0.214	***	(0.051)	-0.215	***	(0.051)
Oldest sibling/only child	0.016		(0.046)	0.016		(0.046)
OECD equivalent household income (in EUR 1,000)	0.014		(0.029)	0.013		(0.029)
Parental EGP class (ref. category: Upper service)						
Lower service	-0.124		(0.071)	-0.126		(0.071)
Higher routine non-manual	-0.028		(0.088)	-0.027		(0.087)
Self-employed/farmer	0.021		(0.115)	0.019		(0.114)
Working class	-0.154		(0.082)	-0.156		(0.081)
Migration background	-0.216	***	(0.061)	-0.217	***	(0.061)
School track recommendation (ref. category: Academic)						
Intermediate	-0.194	**	(0.065)	-0.194	**	(0.065)
Lower	-0.543	***	(0.088)	-0.545	***	(0.088)

None given	-0.498	***	(0.088)	-0.499	***	(0.089)
Academic school track	0.426	***	(0.067)	0.427	***	(0.068)
Childhood location type (ref. category: Large city)						
Midsize city	0.076		(0.077)	0.076		(0.077)
Small town	0.079		(0.071)	0.081		(0.070)
Rural	0.144	*	(0.072)	0.147	*	(0.070)

Note: S.E. in parenthesis. * p<0.05 ** p<0.01 *** p<0.001. Source: SOEP v35, own calculations.

Table A18: Frequencies of other leisure activities measured in Youth Survey – organized and unorganized activities combined

Activity	Daily or weekly	Monthly	Less than monthly	Never	NA
Watching TV, videos, listening to music	0.996	0.001	0.002	0.000	0.001
Playing music	0.360	0.039	0.150	0.448	0.004
Doing sports	0.705	0.044	0.125	0.124	0.003
Reading	0.459	0.126	0.255	0.158	0.001
Theater, dance	0.243	0.069	0.208	0.474	0.005
Technical work, programming	0.165	0.073	0.204	0.554	0.004
Spending time with friends [1]	0.928	0.041	0.023	0.007	0.001
Online activities and computer games [2]	0.846	0.030	0.071	0.053	0.001
Organized youth activities [3]	0.287	0.122	0.253	0.335	0.004
Inactivity	0.682	0.085	0.175	0.055	0.003

[1]Spending time with friends includes time spent with boyfriend or girlfriend, best friend, and clique. [2] Online activities and computer games include playing computer games, using the Internet and social online networks. [3] Organized youth activities include visiting youth centers, going to church and religious activities, and volunteering.

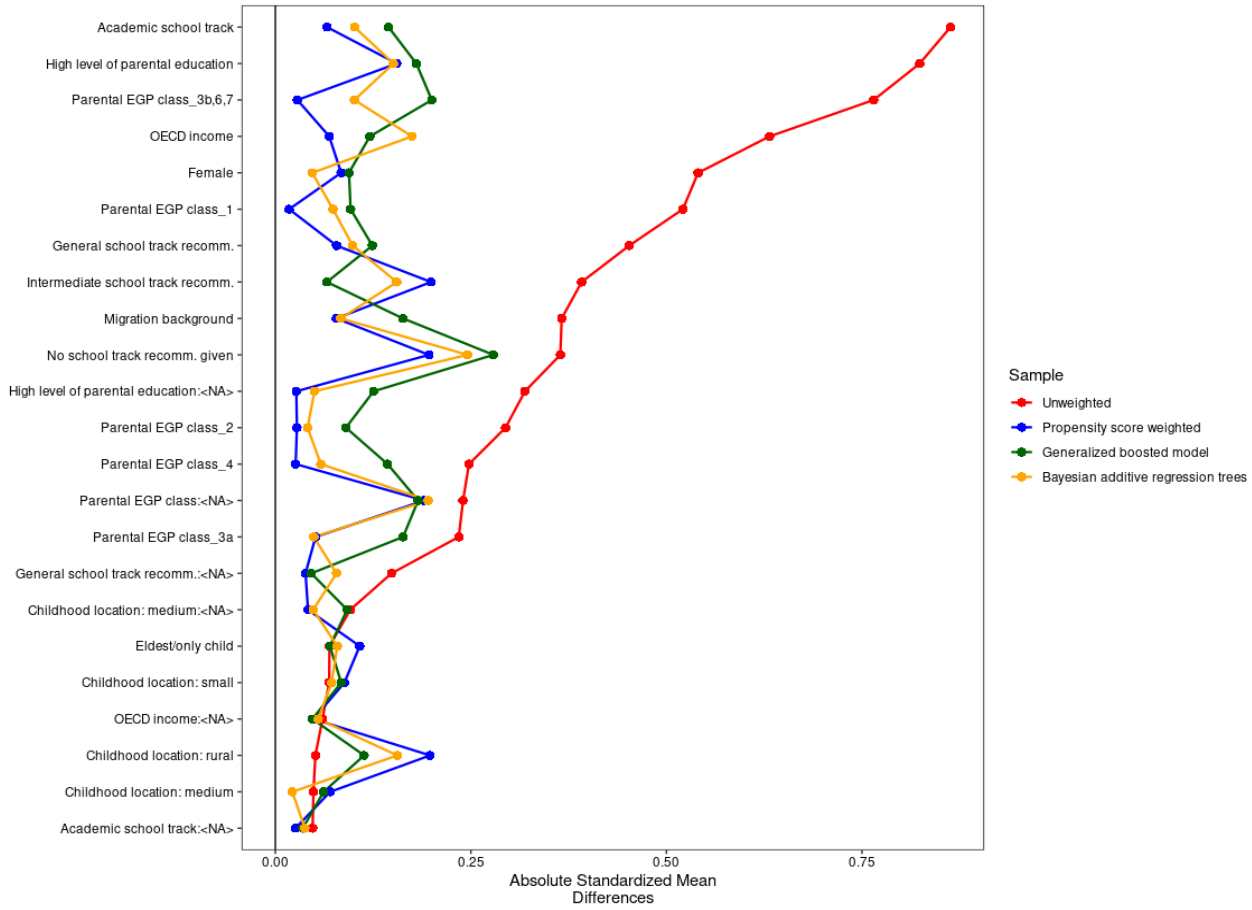

Figure A1. Comparison of absolute standardized mean differences with different weighting techniques (unweighted sample, propensity score weighted, generalized boosted model, Bayesian additive regression trees).

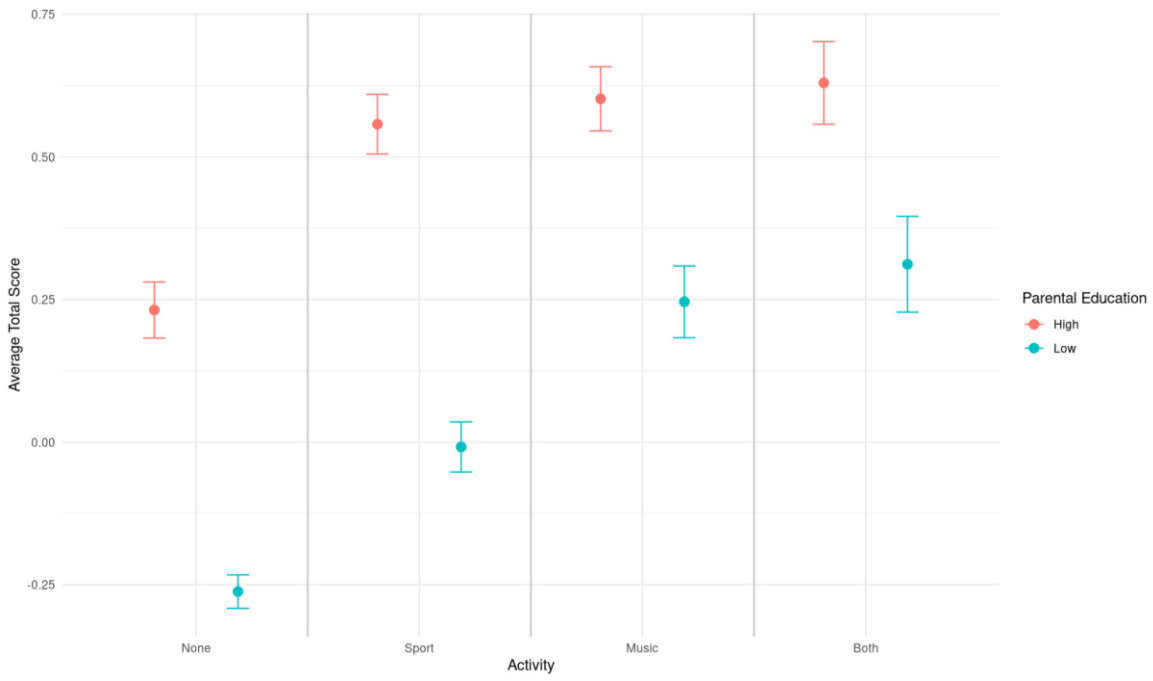

Figure A 2: Mean values of total cognitive test scores by extracurricular activity and parental education.

Table A19: List of covariates used for calculation of propensity scores

Demographics	- Female [yes/no] - Migration background [yes/no] - Month of birth [categorical] - Childhood location size [large city/medium city/small city/rural] - Sibling order [first or only child/second or later born] - Maternal age at birth [continuous]
Family SES	- Parental education [high/low] - Parental EGP [high/low] - Equalized net household income [continuous]
Education	- School track recommendation [academic track/intermediate/general/no recommendation] - Still in school at time of Youth Survey [yes/no]

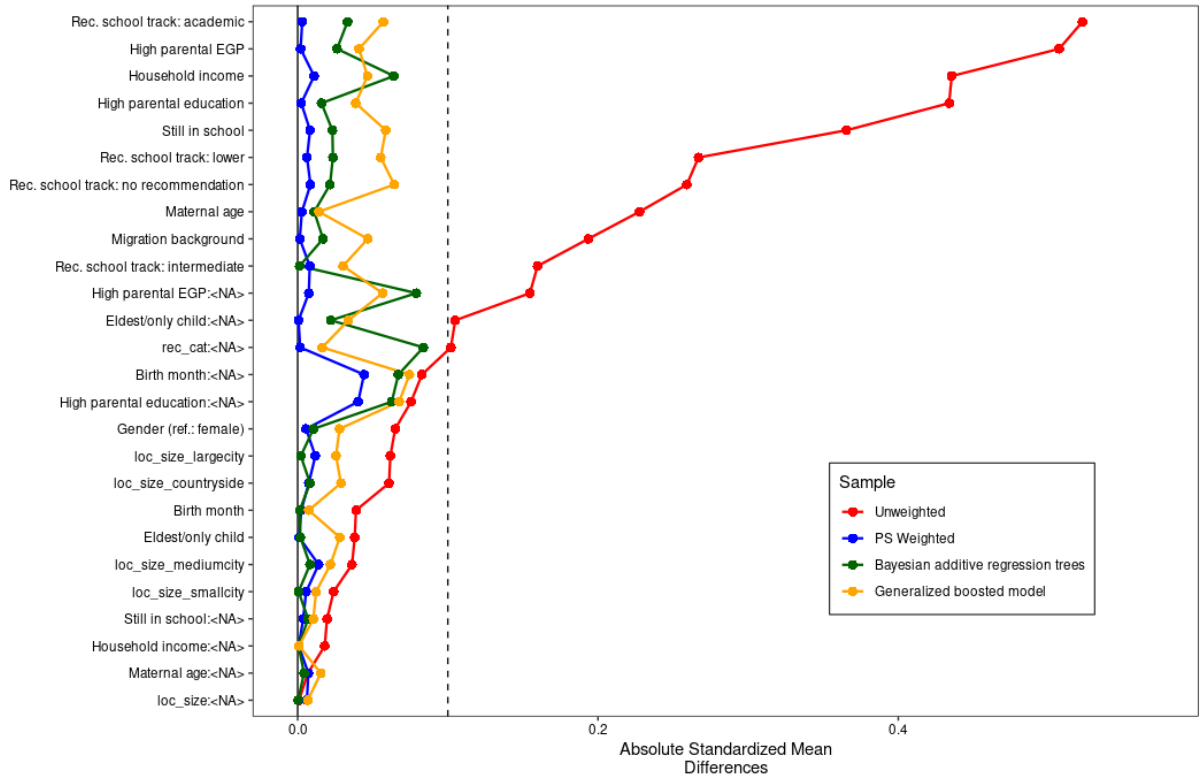

Figure A3: Comparison of absolute standardized mean differences with different weighting techniques (unweighted sample, propensity score weighted, Bayesian additive regression trees, generalized boosted model).

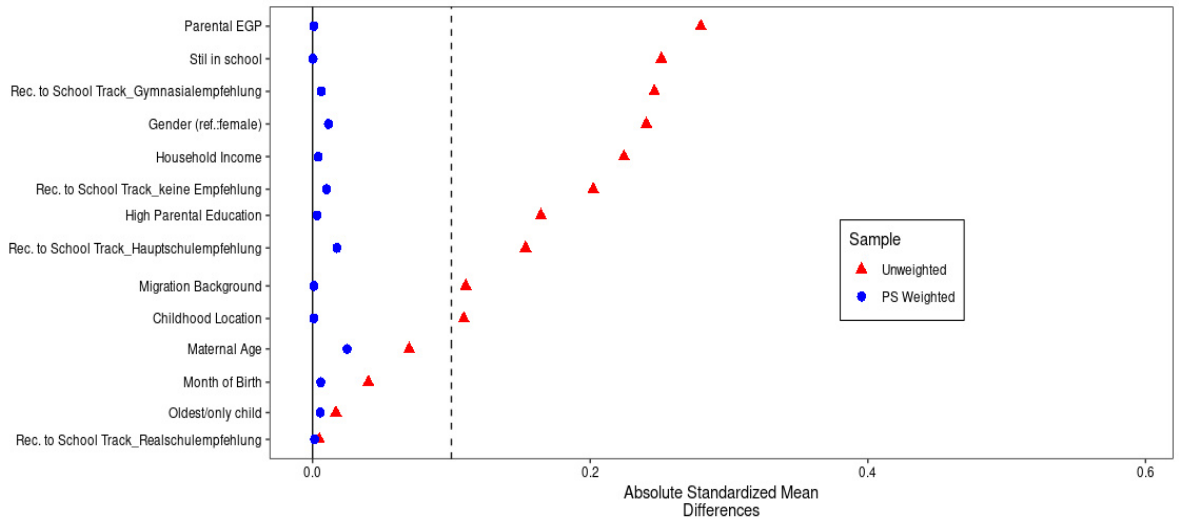

Figure A4: Standardized mean differences before and after weighting by propensity to engage in sport

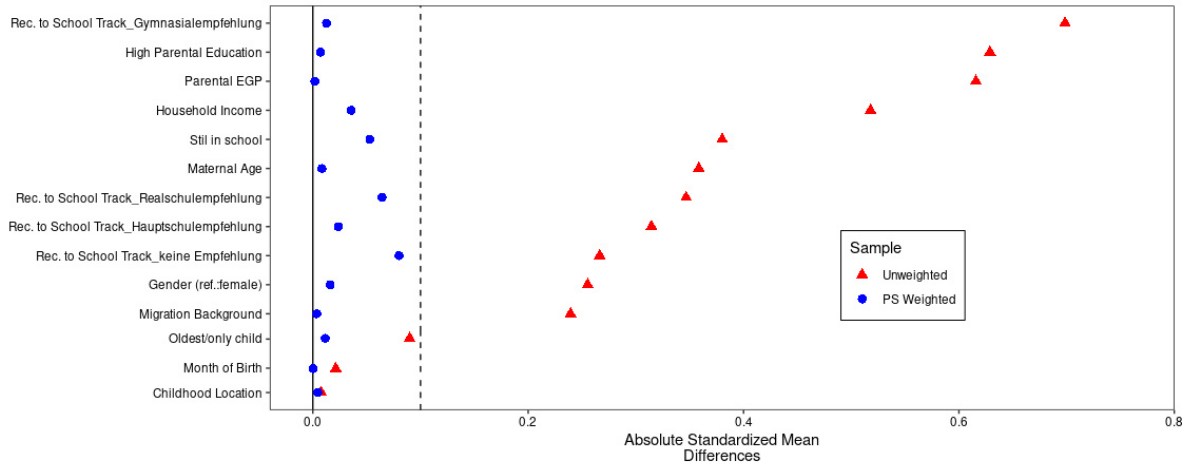

Figure A5: Standardized mean differences before and after weighting by propensity to engage in music

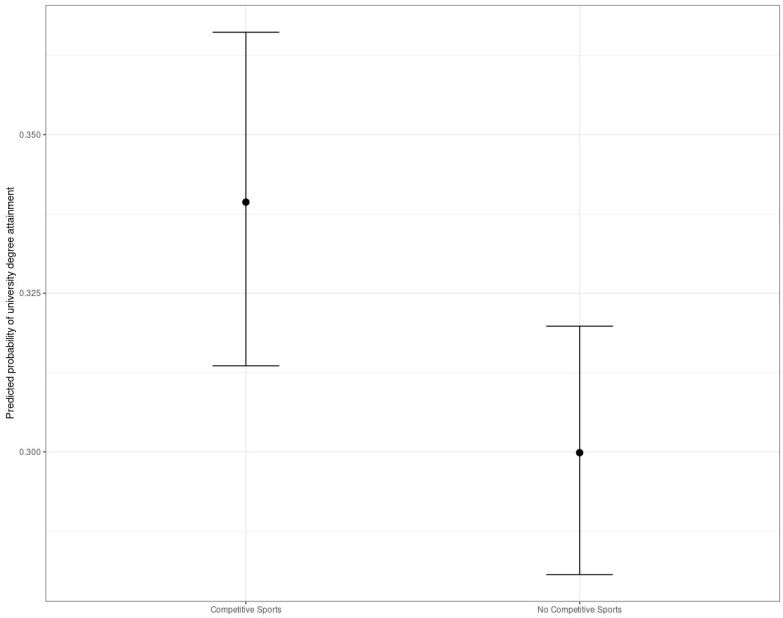

Figure A6: Predicted probability of attaining a university degree by sports participation, based on propensity score weighted regression models

Table A20: Estimates from propensity-score weighted regression models predicting probability of attaining a university degree by sports/music participation

	Model 1		**Model 2**	
Predictors	*Odds Ratios*	*se*	*Odds Ratios*	*se*
Sports	1.20 *	(0.09)		
Music			1.41 ***	(0.10)
Observations	1,675		1,643	

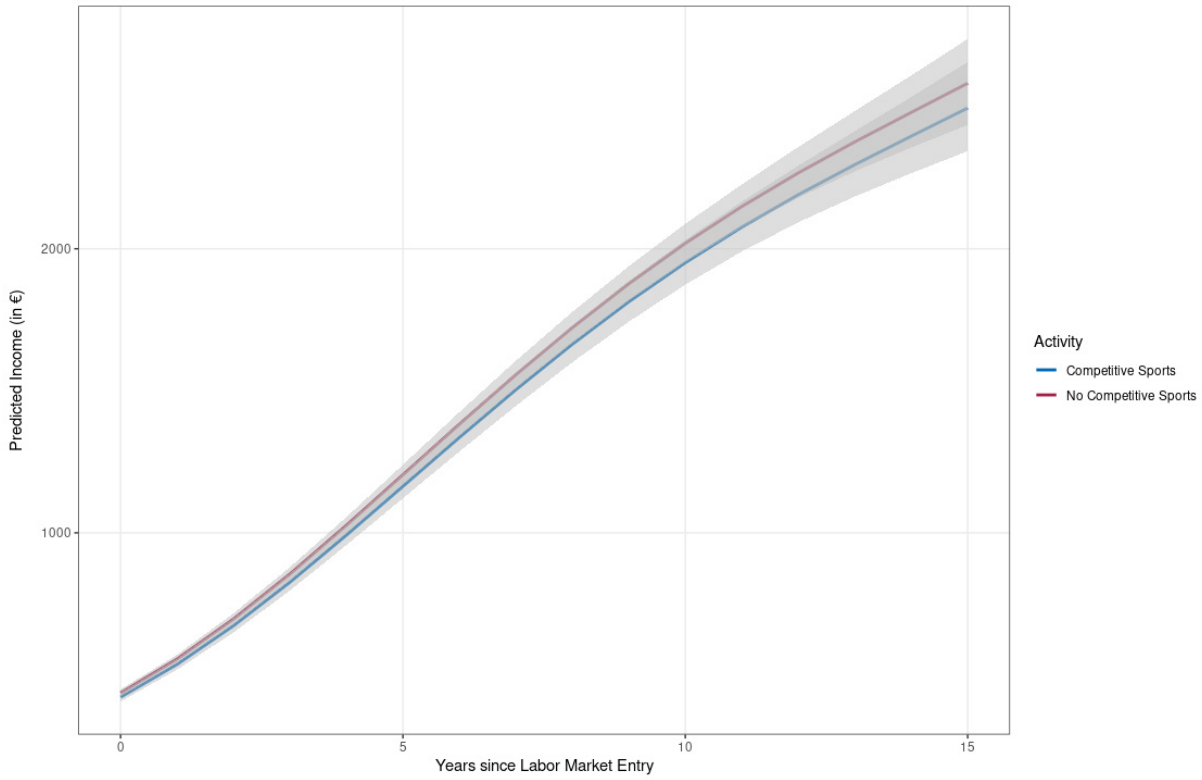

Figure A7: Predicted income by years since labor market entry and sports participation, based on propensity score weighted random growth models

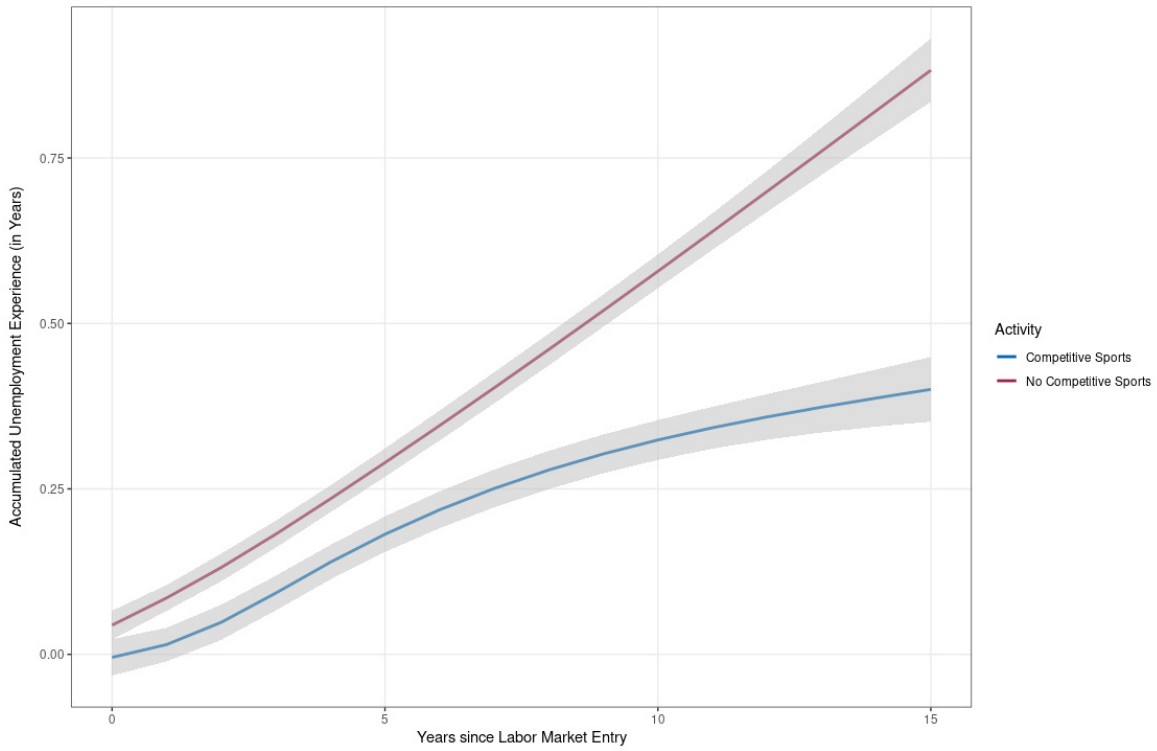

Figure A8: Predicted accumulated unemployment experience by years since labor market entry and sports participation, based on propensity score weighted random growth models

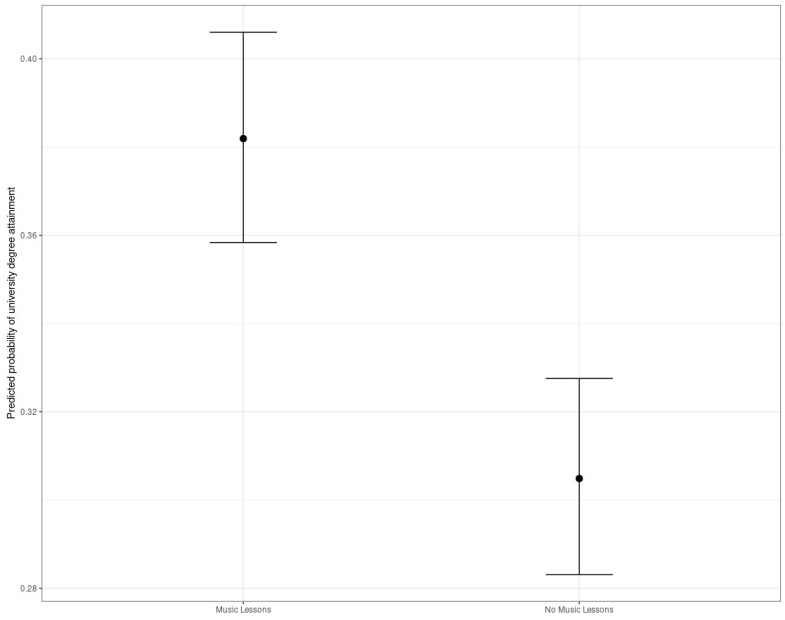

Figure A9: Predicted probability of attaining a university degree by music participation, based on propensity score weighted regression models

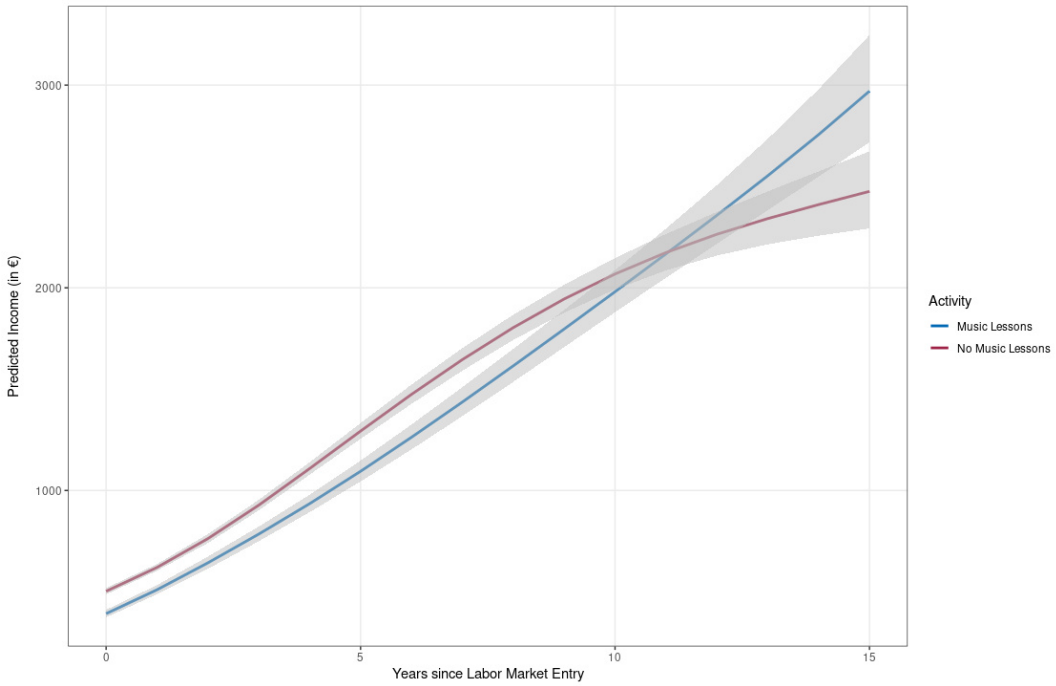

Figure A10: Predicted income by years since labor market entry and music participation, based on propensity score weighted random growth models

Table A21: Estimates from propensity-score weighted mixed-effects models predicting log labor market income by sports/music participation and years since labor market entry

	Model 1		Model 2	
Predictors	*b*	*se*	*b*	*se*
Sports	-0.06 *	0.03		
Music			-0.25 ***	0.03
Splines: Years since labor market entry				
1. (>0 to ≤1)	1.22 ***	0.03	1.25 ***	0.03
2. (>1 to ≤4)	1.79 ***	0.04	1.79 ***	0.04
3. (>4 to ≤15)	1.42 ***	0.04	1.43 ***	0.04
Gender (female)	-0.12 ***	0.02	-0.10 ***	0.02
Extracurricular activities * Splines (Years since labor market entry)				
Extracurricular activities * years since labor market entry >0 to ≤1	0.04	0.05	-0.01	0.05
Extracurricular activities * years since labor market entry >1 to ≤4	0.18 ***	0.05	0.33 ***	0.05
Extracurricular activities * years since labor market entry >4 to ≤15	0.24 ***	0.05	0.38 ***	0.05
Level of education (ref.: secondary or less)				
Vocational degree	0.46 ***	0.02	0.46 ***	0.02
University degree	0.36 ***	0.03	0.38 ***	0.03
N persons	5,610		5,561	
Observations	2,0672		20,379	

Note: Standard errors in parenthesis. * p<0.05 ** p<0.01 *** p<0.001. Source: SOEP v38, own calculations.

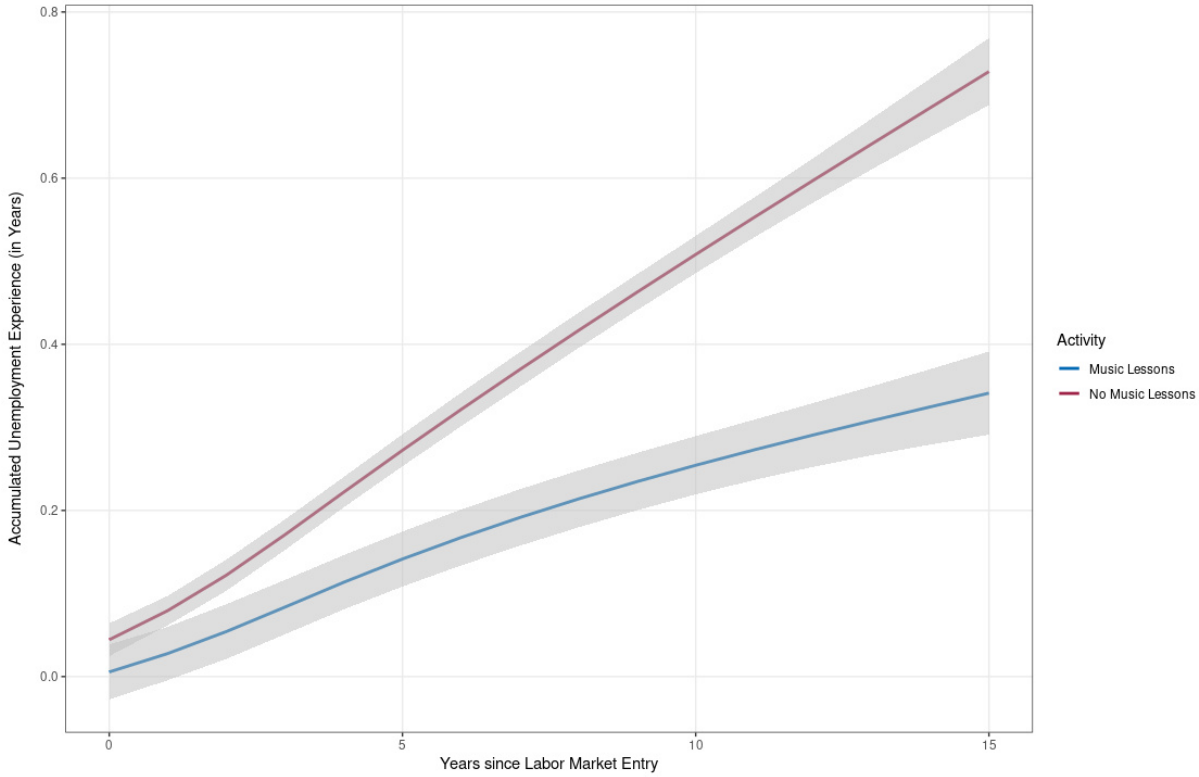

Figure A 11: Predicted accumulated unemployment experience by years since labor market entry and music participation, based on propensity score weighted random growth models

Table A22: Estimates from propensity-score weighted mixed-effects models predicting accumulated unemployment experience in years by sports/music participation and years since labor market entry

	Model 1		Model 2	
Predictors	*b*	*se*	*b*	*se*
Sports	-0.05 **	0.02		
Music			-0.04 *	0.02
Splines: Years since labor market entry				
1. (>0 to ≤1)	0.30 ***	0.02	-0.12 ***	0.02
2. (>1 to ≤4)	0.67 ***	0.02	-0.27 ***	0.03
3. (>4 to ≤15)	0.81 ***	0.02	-0.34 ***	0.03
Gender (female)	-0.03 *	0.01	-0.01	0.01
Extracurricular activities * Splines (Years since labor market entry)				
Extracurricular activities * years since labor market entry >0 to ≤1	-0.02	0.03	0.30 ***	0.02
Extracurricular activities * years since labor market entry >1 to ≤4	-0.29 ***	0.03	0.57 ***	0.02
Extracurricular activities * years since labor market entry >4 to ≤15	-0.41 ***	0.03	0.66 ***	0.02
Level of education (ref.: secondary or less)				
Vocational degree	-0.07 ***	0.02	-0.06 ***	0.02
University degree	-0.19 ***	0.02	-0.17 ***	0.02
N persons	5,388		5,339	
Observations	20,411		20,118	

Note: Standard errors in parenthesis. * p<0.05 ** p<0.01 *** p<0.001. Source: SOEP v38, own calculations.

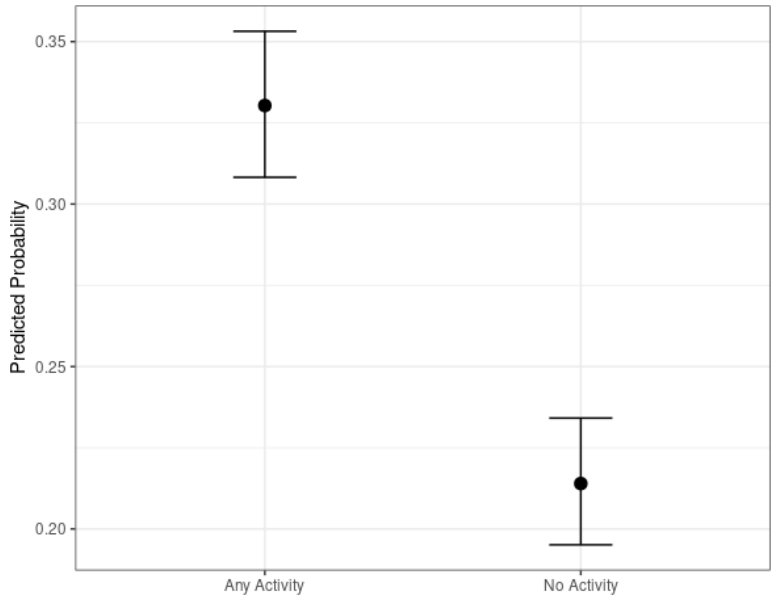

Figure A12: Predicted probability of attaining a university degree by unorganized and organized extracurricular participation, based on propensity score weighted regression models

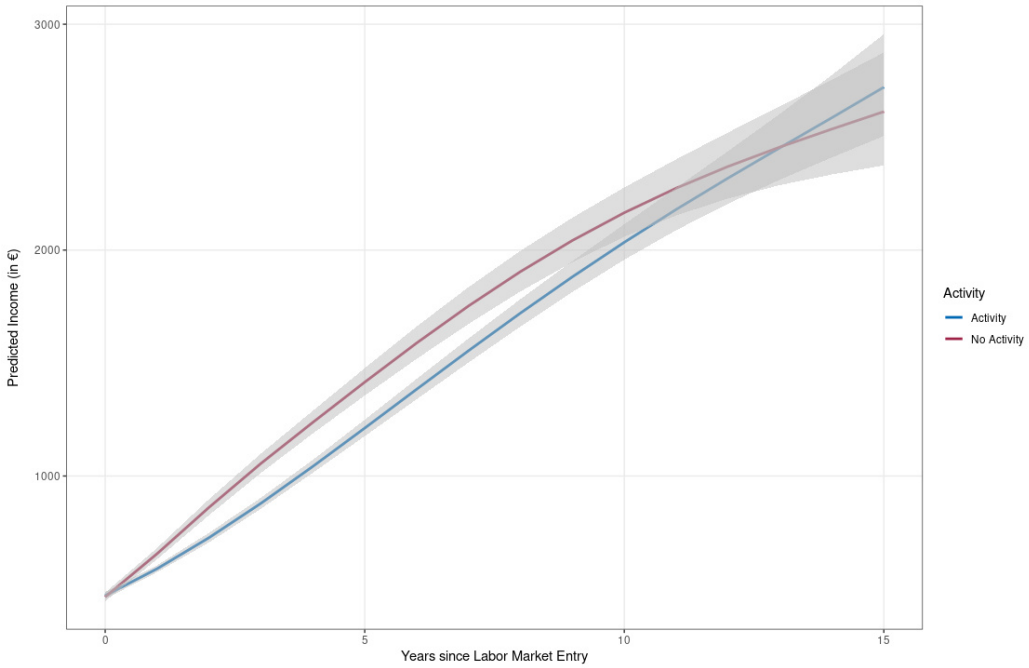

Figure A13: Predicted income by years since labor market entry and unorganized and organized extracurricular participation, based on propensity score weighted random growth models

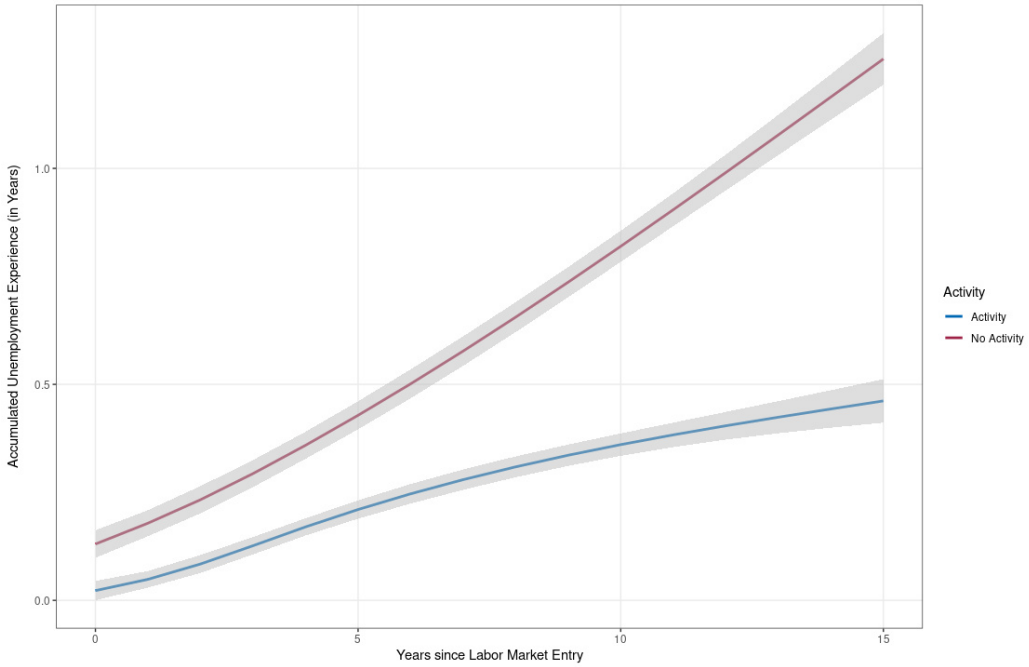

Figure A14: Predicted accumulated unemployment experience by years since labor market entry and unorganized and organized extracurricular participation, based on propensity score weighted random growth models

Table A 23: Results of multilevel regression models predicting subjective math/German performance by extracurricular participation

	Model 1 (math performance)			Model 2 (German performance)		
Predictors	*Estimates*		*se*	*Estimates*		*se*
Extracurricular participation	0.08	***	(0.02)	0.08	***	(0.03)
Gender (female)	-0.44	***	(0.03)	0.23	***	(0.02)
Academic school track	0.07		(0.04)	0.13	***	(0.03)
Parental level of education (at least one tertiary degree)	0.15	**	(0.05)	-0.01		(0.04)
Parental occupational status (ISEI) (per 10-unit increase)	-0.02	*	(0.01)	0.01		(0.01)
No. individuals	4,360			4,357		
Observations	6,795			6,791		

Note: S.E. in parenthesis. * p<0.05 ** p<0.01 *** p<0.001. Adjusted for clustering in individuals. Source: CILS4EU, own calculations.

Table A24: Results of linear regression models predicting students' agreement with the statement "I put a great deal of effort into my school work" by share of co-participating friends

	Model 1		
Predictors	*b*		*se*
Share of co-participating friends	0.11	*	(0.05)
Parental occupational status (ISEI) (per 10-unit increase)	-0.05	***	(0.03)
Gender (female)	0.32	***	(0.03)
Academic school track	-0.10	**	(0.03)
Parental level of education (at least one tertiary degree)	0.15	**	(0.05)
Observations	4,511		

Note: S.E. in parenthesis. * p<0.05 ** p<0.01 *** p<0.001. Source: CILS4EU, own calculations.

Table A25: Results of linear regression model predicting total share of friends who attend the same school track by frequency of participation in extracurricular activities

	Model 1		
Predictors	*Estimates*		*se*
Extracurricular participation frequency (ref. never)			
Less than monthly	-0.05	***	0.01
Monthly	-0.07	***	0.02
Weekly	-0.06	***	0.01
Every day	-0.06	***	0.01
Academic school track	-0.01		0.01
Parental occupational status (ISEI) (per 10-unit increase)	-0.01	***	0.00
Parental level of education (at least one tertiary degree)	0.04	***	0.01
Gender (female)	-0.02	**	0.01
Observations	4,145		

Note: S.E. in parenthesis. * p<0.05 ** p<0.01 *** p<0.001. Source: CILS4EU, own calculations.

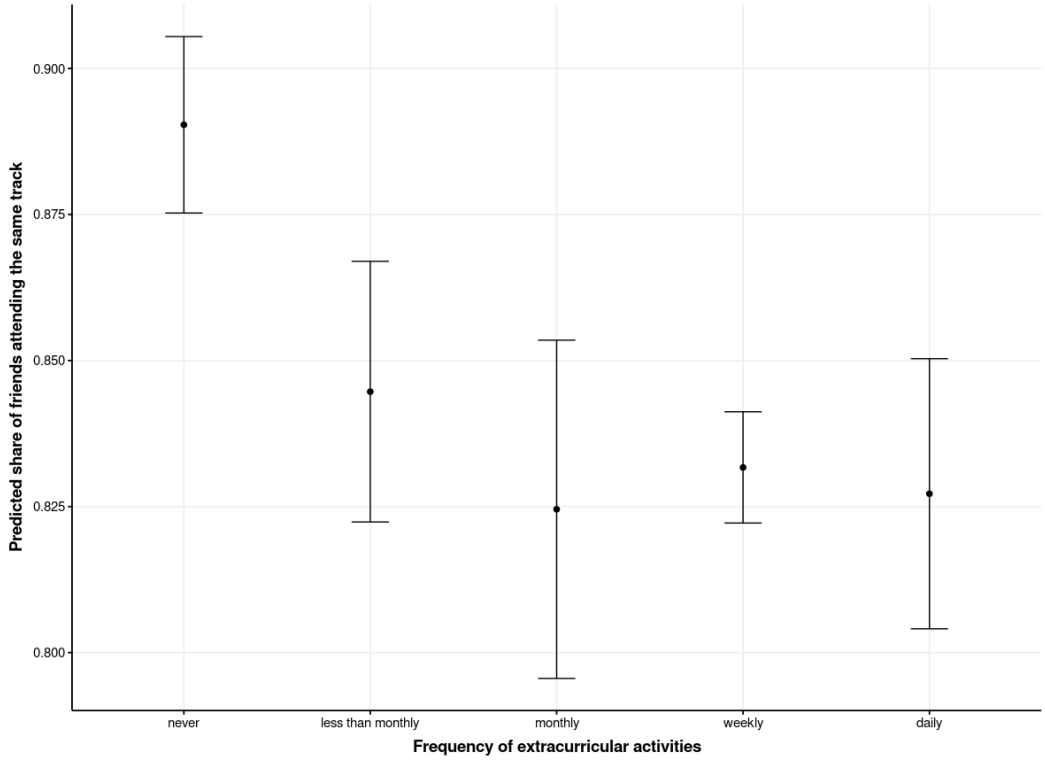

Figure A15: Predicted share of friends attending the same school track by frequency of participation in extracurricular activities

DECLARATION

I hereby declare that I have completed this dissertation without any unauthorized assistance. I confirm that I have used only the sources referenced in the work, and that all ideas, excerpts, and citations that are not my own have been identified and appropriately acknowledged. Furthermore, I consent to the use of specialized software to examine this dissertation for plagiarism.

Bremen, November 15, 2024 Henriette Bering