

# **Educational Aspirations as a Key Element in the Genesis of Early Social Inequality in German Primary and Secondary Education**

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# Chapter 1

## Introduction, research questions, and summary

### 1 Introduction

In a meritocratic society, individual talent, effort, and abilities should be the main determinants of educational and occupational success (R. Becker & Hadjar, 2009; Solga, 2005). However, in the case of Germany, decades of empirical research have shown that these ideals are often undermined and other factors, such as social origin of one's own family (R. Becker & Lauterbach, 2008; Schindler & Lörz, 2012), ethnic background (Dollmann, 2010), or gender (Hadjar, 2011), can have a significant influence on educational success and the entire life course. This is not only tragic for the individual but also for society as a whole. If bright minds cannot achieve their full potential due to some arbitrary influences, this can obstruct economic, technological, and societal progress. Consequently, it is a highly relevant task to understand in more detail how meritocratic ideals fail and why, which is, of course, an immense challenge given the scope of potential causes. To be concrete, the present dissertation will take a life-course perspective and investigate in more detail how some forms of *educational* inequalities emerge early in life, especially in the German educational system. This perspective highlights that early events and decisions can have long-lasting consequences and affect the entire trajectory an individual is on. Additionally, it emphasizes some other features, such as observing longer periods of time (in contrast to singular events), involving multiple life domains (such as family and education), including individual actions but also institutional and structural factors, and taking relevant collective contexts, such as parents or peers, into account (Mayer, 2009). All these aspects will be taken up in this dissertation.

Understanding the genesis of early inequality is a pertinent question since a.) participation in the educational system is mandatory for all individuals, b.) education determines to some extent occupational success, c.) the design of the educational system is based on political decisions and hence, at least in theory, open to interventions and changes, and d.) the German educational system is rather unique by having implemented strong tracking where highly consequential decisions are to be made very early in life. What is meant by that is that students are sorted into qualitatively different school tracks directly after primary schooling (Eckhardt, 2017). As comparative international research shows, this has significant and long lasting influences on individuals, since crucial decisions are faced at a young age and later corrections are difficult (Breen et al., 2012). Due to the system of tracking, families have to make decisions early on about the further course through

the educational system and one can distinguish two decisions of special significance. The first is the type of track that is chosen after the end of primary schooling, which takes place when the students are about ten years old. The second decision, which is to some extent dependent on the first decision, is the type of educational qualification to achieve in secondary education. This type of qualification has long-term influences on the further life-course as it determines, to a large extent, what kinds of vocational training can be realistically achieved and whether and which types of tertiary education are available. Thus, educational and occupational success can be pre-determined to some degree before even reaching adolescence, which underlines the major impact of early decisions.<sup>1</sup>

The major influence of educational decisions has been recognized for a long time. In his groundbreaking work, Boudon, who focused predominantly on *social* inequality, identified differences in (educational) decisions as the so called *secondary* effects of social origin (in contrast to differences in abilities, which he refers to as *primary* effects) (Boudon, 1974). He argues that, even when holding cognitive abilities and academic performance constant, differences between social strata will still be created as decisions often diverge between families of different social origin. Simply bringing all students to the same ability level will not be sufficient to remove all forms of inequality. This means that, especially in the German context where crucial decisions are made very early, potentially even increasing the relative importance of the social origin, understanding why decisions are made is of greatest significance (Müller et al., 1996). However, from a research perspective, this is a rather unsatisfactory framework since only two key variables are available as outcomes, which means that only *final* decisions can be analyzed. Yet it is obvious that these decisions do not simply emerge out of thin air but are themselves consequences of long lasting decision processes that can progress over years and involve multiple actors, such as the student themselves, the parents, other relatives, teachers, or friends. Consequently, it is a highly relevant research desideratum to understand in more detail *why* certain decisions are made, *which factors* drive them and *when* these influences occur. As will be argued in the present dissertation, *educational aspirations* can be regarded as a key construct that enables researchers to answer these very questions (Stocké, 2010b). Originally, aspirations are defined as the, “cognitive orientational aspect of goal-directed behavior” (Haller, 1968, p. 484). This means that an individual has the goal to achieve a certain level of education or attain a specific educational qualification within the

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<sup>1</sup> It should be made transparent that there are of course some possibilities in the German system to catch up on school qualifications also later in life, yet these pathways only play a minor influence given the relatively small number of individuals pursuing them.

institutionalized system and adjusts their behaviour so that this goal can be achieved. The further distinction between *realistic* and *idealistic* aspirations is outlined in more detail below.

Why do aspirations matter? First, one can regard decisions as observable and manifest events in the life course and aspirations as unobserved and latent constructs that predict and anticipate these decisions. While the relevant decisions in the German educational system are rather sparse and far apart, which can be challenging for understanding them better, aspirations are potentially available at all times, even if not directly observable. This means that, in contrast to final decisions, aspirations can be understood as a fluid and versatile construct that can be traced over the life course. This makes it possible to understand when aspirations (and hence, also potential decisions) change and why. This also allows a long window of observation. Parents can potentially have aspirations for their children before they are even born and students can express wishes and desires about their life early on. One can see from this that educational aspirations are of greatest relevance to investigate what drives decisions and which factors contribute to them. They allow researchers to fill the large gaps between the main decision points with meaning and make the long-lasting processes behind decisions transparent and observable. By doing so, they can contribute immensely to the overall understanding of the origins of inequality.

Second, while decisions are directly observable, it is often unclear who contributes to them. For example, the choice of track after primary school mostly concerns the student but clearly the parents will have a major impact as students are usually quite young and will not be able to fully understand the significance of this decision. Therefore, a decision can be a compound of many influences that are not easily deconstructed. In contrast, aspirations of all key stakeholders can be measured, including students, their parents, teachers, and other individuals who can potentially influence a decision. This makes it possible to understand decisions in much more detail and is also relevant for policy as it becomes clear who the main stakeholders are and who can potentially be targeted by interventions.

Third, various types of aspirations can be measured and can be easily tailored to various stages in the life course. Both impending but also distant decisions and life goals can be surveyed relatively easy as aspirations, in contrast to other latent constructs such as well-being or other psychological measurements, usually refer to an actual upcoming choice, which often comes with pre-defined options (e.g. school tracks or educational qualifications). This makes survey questions about aspirations more tangible and concrete.

Given that aspirations are a fruitful starting point to explain educational decisions and hence also educational inequalities, there are some overarching questions that will form the core of this dissertation which can be summarized as follows: *When* do aspirations of children and parents form? *What* is the overall influence of aspirations on relevant decisions? *How* do aspirations change over time and *why*? *Which* contextual and institutional factors are relevant?

The structure of the dissertation is as follows: The next section will give an overview of the current state of research and outline what is already known about aspirations. Based on these findings, relevant research gaps are identified that will be filled by the dissertation. Afterwards, theoretical frameworks are introduced, as they represent established foundations and are useful to understand, from a theoretical perspective, the nature of aspirations. Section four introduces the datasets that are utilized in the empirical research papers to answer the posed research questions. After that, the main findings of the four research papers are briefly summarized. The conclusion gives a final overview of the dissertation and also discusses its limitations.

## **2 Research review and research gaps**

This section gives an overview of the current state of research regarding aspirations. By doing so, it becomes clearer what is already known and what is not. As will be demonstrated, there are relevant research gaps where little empirical research has been conducted until now. After identifying the gaps, concrete research questions are formulated that will be taken up in the empirical part of the dissertation. For a more structured outline, the following research findings are grouped together by their main research focus and stage in the life course, from early to later decisions. First, the relationship between parental aspirations and filial achievement is of special interest since the German system is intended to select on academic achievement, which is therefore of special significance for following educational decisions. Also, as young children in primary school have still developing aspirations, *parental* aspirations might be more relevant to explain early decisions. Afterwards it is discussed whether one can regard aspirations as predictors of secondary track choice and whether they mediate the effects of social origin on this decision. Finally, the individual and structural influences that can lead to changing aspirations in secondary education are presented.

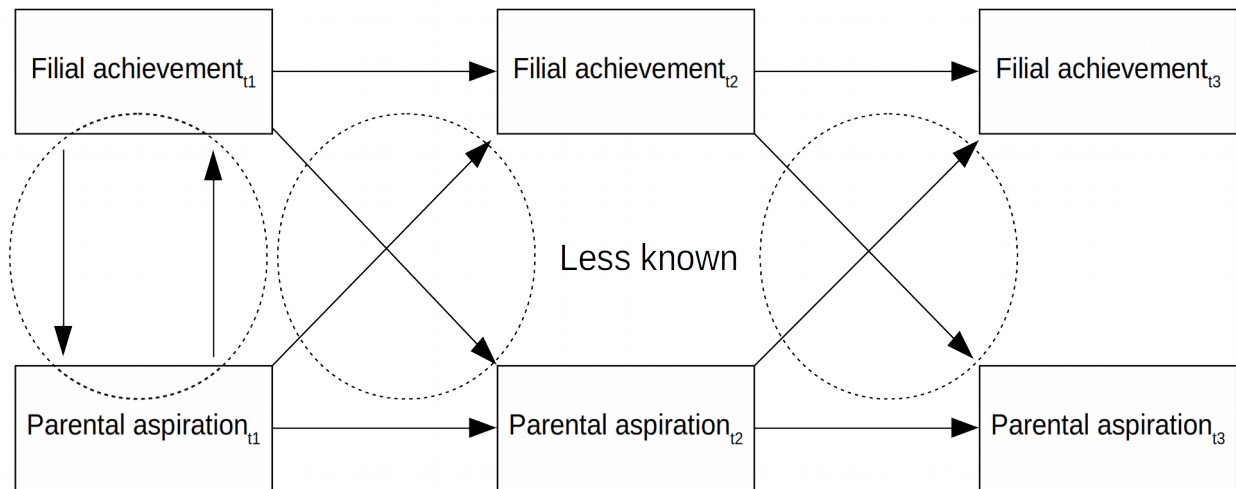
### **2.1 Parental aspirations and filial achievement**

According to Boudon (1974), educational inequalities can arise due to differences in achievement (primary effects) and due to differences in decisions (secondary effects) between social strata, even when holding achievement constant. Apparently, the nexus of achievement and aspirations (which can be regarded as anticipated decisions) is of greatest interest in understanding the genesis of



social and educational inequalities. And indeed, empirically, it is a well established fact that parental aspirations and (early) filial achievement are strongly related to each other. To visualize what is meant by that, Figure 1 can be helpful.

*Figure 1: Theoretical model of how filial achievement and parental aspirations evolve over time*



*Source: own design.*

To the very left, *filial achievement* and *parental aspirations* are depicted as being either correlated with each other or dependent on each other. To start with the influence of parental aspirations on achievement, numerous studies from various cultural contexts have empirically demonstrated that children of parents with higher aspirations also report better academic achievement (Bittmann & Mantwill, 2020; Chen & Ho, 2012; Cheung & Pomerantz, 2012; Kim, 2002; Neuenschwander et al., 2007). This finding has proven quite robust, even when various cofounders, such as parental social status, are taken into consideration. It is obvious that richer parents have more means to support their children, yet these financial aspects are not the sole driver behind the process. Meta studies testing various influences of parental practices and aspirations report, based on many dozens of included studies, that *parental* aspirations have the strongest influence on filial achievement (in contrast to significant others such as teachers or peers) (Fan, 2001; Jeynes, 2007). However, there are also research findings, although far fewer, that point out that having too high parental aspirations can influence filial achievement negatively, probably when parental aspirations are just unrealistically high and put a lot of stress on the children (Trinidad, 2019). To continue with the other directed path (pointing from achievement to aspirations), there is less evidence available that parents adjust their aspirations as a response to filial achievement. While this pathway has been

theoretically assumed for a long time (Bell, 1968), it has attracted much less attention in the form of empirical studies, probably since it has not been introduced in various prominent explanation models. Some studies identify effects of early academic achievement on parental *expectations* and conclude that parents adjust them as response (Englund et al., 2004; Goldenberg et al., 2001). Given these first findings, one can be quite confident that filial achievement and parental aspirations are dependent on each other, to some extent, and the influence can not be easily explained by omitted confounders, as studies including them come to similar conclusions.

However, of further interest is whether crossed effects are present, which is depicted in the middle of Figure 1. This implies two things: first, that aspirations and achievement are not only correlated but also have a causal relationship with each other. Second, that this is not a static but a more dynamic process that includes feedback mechanisms that also develop over time as children mature and pass through school. At least in theory, some more recent research papers outline a *transactional* instead of a uni-directional process (Tucker-Drob & Harden, 2012), meaning that parents can also be influenced by their children. Unfortunately, there is much less empirical evidence, probably due to the fact that requirements on the data to test these pathways is much larger. Only more recently, the crossed pathways have been investigated in more detail. These studies show that crossed effects are indeed present and parental *expectations* and filial achievement do influence dynamically over time (Briley et al., 2014; Murayama et al., 2016; Zhang et al., 2011). However, in the rather distinct German context, where early decisions render the development of early achievement even more relevant, few empirical results are known. Some studies focus on *self-concept*<sup>2</sup> instead of achievement and report statistically significant crossed effects (Ehm et al., 2019; Marsh et al., 2005). Comparable findings are available for Switzerland where the educational system might be more similar to the German one, compared to other ones, and yet, again, no standardized achievement measurement has been available (Buchmann et al., 2022). Another Swiss study attempts to identify types of parental aspirations and distinguishes five typical patterns and how they influence filial achievement in primary education (Stamm, 2005). Potentially, the most relevant conclusion of this study is that aspirations are not *per se* strongly coupled with social origin of the family but it is necessary to distinguish them further for more insight. A third Swiss study comes to the conclusion that parents of pupils who have better grades in various subjects in primary school have a higher probability of selecting a more demanding school track in secondary education

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<sup>2</sup> Academic self-concept can be defined as one's own view of the own academic achievement. Clearly, this is not identical to factual achievement (as measured by grades or standardized test scores) due to a potentially biased self-evaluation.

and that this effect is only to a small extent due to the social origin as achievement is a much better predictor (Baeriswyl et al., 2006).

So what one can see is that while there is evidence available for crossed effects and transactional processes between parents and children, some of the published studies suffer methodological problems such as relatively small sample sizes or using only two available panel waves which obstructs causal inference. Sometimes the available constructs are not identical to aspirations or achievement but mere approximations or correlates, such as expectations or academic self-concept. Especially given that the German context is rather unique due to its early tracking, even increasing the importance of early achievement, only few empirical analyses are available that attempt to model a cross-dependent influence. Therefore, this is clearly a topic that should be investigated empirically.

**Research question 1:** How do parental aspirations and filial achievement co-develop dynamically in German primary education?

Directly following this question, the puzzle arises whether supposed cross-dependencies are identical for all social strata. While apparently all parents want to have a good education for their offspring, it is unclear if “good” means the same thing for all families. Following the concept of status maintenance and relative risk aversion (Breen & Goldthorpe, 1997; Stocké, 2010a), one can argue that parents want their children to at least reproduce their own social status. Therefore, the goal for the child does depend on the parents’ own achievements or status. The consequence is that students from socially well-off families have a high incentive (or pressure) to obtain a high academic achievement (and qualification), while the pressure is lower for children of parents of lower social strata. These arguments predict that parents react differently to initial academic achievement. Especially socially disadvantaged families have a strong incentive to avoid sunken costs, which can arise when students are mismatched with school track. As the few available studies show, these socially less-benefited families pay more attention to achievement than other families and adapt their own aspirations accordingly (Forster, 2021; Karlson, 2015, 2019). However, at this point, this question must be considered neglected in the context of German primary education as no research results are available at all. Yet, this appears to be a highly relevant aspect to better understand how aspirations and achievement develop for families of different social origin, which is deeply related to the genesis of early social inequality.

**Research question 2:** Is the dynamic co-development of parental aspirations and filial achievement in German primary education socially stratified?

## 2.2 Aspirations as predictors and mediators

As outlined above, the choice of secondary track after primary school is a highly relevant decision in the German context. Obviously, a long research tradition has taken up the question and investigated the processes behind this decision in great detail and outlined which factors can be regarded as stable predictors of the choice. The problem with these studies is that they usually consider aspirations to be just another explanatory variable and often include a large set of predictors in the same models. Even if the coefficient of the aspiration variable is reported as being statistically, highly significant, the total contribution to the explanation of the outcome is rarely quantified. It is well established that aspirations contribute to the explanation of track choice and that higher aspirations predict a higher chance of selecting an academically more demanding school track (R. Becker, 2000; Ditton & Krüsken, 2010; Dumont et al., 2013; Gresch, 2012; Kristen & Dollmann, 2010; Kroneberg et al., 2006; Meulemann, 1985). However, the specific explanatory power of aspirations remains unclear, as a regression coefficient alone, even a statistically significant one, is not able to quantify this. Common approaches are either computing correlations between aspirations and outcomes, which neither respect the direction of causality nor account for other confounding influences. Advanced techniques such as regression models usually report regression coefficients of aspirations under the statistical control of all other variables in the model, yet are not able to quantify exactly what the contribution of aspirations is. Readers can only wonder whether aspirations are highly relevant or not in comparison to other variables in the same model, as measurement scales are usually not comparable and the separate influence, quantified by the added share of explained variance of the outcome, is not addressed. There is an apparent research gap that can be filled by quantifying the share of explained variance that is contributed by (filial and parental) aspirations, under the control of other predictors of track choice, to rule out spurious correlations. To my knowledge, there are no studies available that regarded this specific question at all, making this a relevant research question.

**Research question 3:** How well do educational aspirations of parents and children explain the decision of secondary school track choice, under control of various potential other influences and confounders?

After having answered this first question, there is a direct follow up. As shown before, it is well researched that the social origin of a family influences educational decisions, which Boudon refers to as secondary effects of social origin. As has been established, aspirations also predict decisions. The next logical step is to test whether aspirations can be regarded as *mediators* that explain *how* social origin exerts an influence on decisions. And indeed, this task has been taken up before. In

their groundbreaking work, Sewell and Hauser demonstrate empirically that about 60% to 80% of the effect of social origin on educational attainment is mediated by all other variables in their path model and that 10% to 20% are mediated through filial aspirations (Sewell & Hauser, 1975, p. 103) (under the control of other parts of the proposed model, such as grades). A derived framework, the Contextual Systems Model, reports that the effect of social origin that is mediated through parental and filial aspirations on *occupational* attainment is larger than the direct effect (Schoon & Parsons, 2002). A German study using Bavarian data proposes a more complex structural model including even more explanatory and mediating pathways such as motivational characteristics, reading behaviour or family-school-relations (Ditton et al., 2019). The authors find that social origin influences various mediators such as aspirations significantly yet they do not provide the effect on academic achievement that is mediated through such constructs. So, while there are some studies available that explicitly consider aspirations as mediators and test this empirically, there are some clear research gaps.

First, research in the German context is sparse but relevant, as the German system is rather unique. Second, this also means that usually grades, educational or occupational attainment are regarded as the main outcome variables yet not decisions. As children are quite young at this point, proposed mechanisms might be different from looking at outcomes like high school graduation, which happens much later in life in other countries. Third, while the mechanism is clearly proposed from a theoretical point, the statistical handling and presentation is often neglected. As most studies refer to the model by Sewell and Hauser (1968) and apply structural equation modeling, they often only report raw or standardized path coefficients but do not even compute the share that is mediated by the constructs of interests, which is left to the reader (and sometimes even impossible if models are complex). One convenient and clear presentation, the share that is mediated through a pathway, is usually not provided and even if it is, its uncertainty is not quantified. Whenever only samples rather than populations are available, it is necessary to estimate the variability of a statistic of interest for inference. When this is not done properly it is often unclear how stable and strong effects are and whether they can even be generalized to a wider population. Fourth and finally, parental and filial aspirations are often not disentangled. However, especially due to the early age of the pupils in the German context, it appears highly relevant to do so. A few studies that look into this question in some detail find that the parental influence is usually larger due to the young age of the child (Gölz & Wohlking, 2018; Wohlking, 2017; Wohlking & Gölz, 2018), yet there is some bargaining power left for the children (Wohlking, 2019). As a limitation, these studies often

suffer from restrictions in available data as no factual transitions to secondary track can be used as the dependent variable but rather *intentions* for track selection.

**Research question 4:** How much of the influence that social origin exerts on secondary track choice is mediated through educational aspirations? How strong is the separate contribution of filial and parental aspirations?

## 2.3 Evolving aspirations in secondary education

Even though the track decision after primary schooling is of greatest relevance, the German system allows a change of school tracks or sequential upgrading so that the track placement itself is not an inevitable fate and does not perfectly predict final educational attainment. Hence, the question arises whether educational aspirations do change later and, if so, which influences are responsible. This question can be divided into two parts, separating individual factors, such as the influence of social origin, migration background, or grades, and context or institutional factors, such as the type of track attended, or the (social) composition of the classroom. Turning first to individual influences, a relevant study from Austria, which has a quite similar system to Germany, identifies various longitudinal aspiration patterns, starting in grade eight of secondary schooling (Valls et al., 2022). The authors focus on a few key variables, such as parental education, migration background of the family, and school grades. Due to the high number of patterns (eleven distinct ones), it is not feasible to summarize the trajectory of each pattern in detail, yet the overarching findings are that parental education has a positive influence on the development of aspirations; the same holds for grades. Migrants usually also hold rather high aspirations. All three main influences are, to some extent, independent of each other and results stay robust in multivariate analyses. A few further studies focus on the effects that unexpected “shocks” or other rather radical treatments can have on the adjustment of aspirations in secondary schooling. Two studies point out that students react to changes in performance, achievement, or grades, yet both conclude that these changes must be particularly large and potentially even have unrealistic effect sizes to influence aspirations or expectations significantly (Andrew & Hauser, 2011; Carolan, 2017). A study in the German context looks at the unexpected track placement after primary schooling and finds effects on aspirations, yet this is at the very beginning of secondary schooling (and the “treatment” already applied at the end of primary schooling) and does not look at later changes (Forster, 2021). Another study with data from the US shows that socially disadvantaged and high-performing students react the most to new information about their academic achievement and adjust their aspirations accordingly. This highlights that both social origin and performance can influence aspirations even in later stages of schooling (Karlson, 2019). While there is plenty of research linking various individual-level factors

to aspirations, the *change* of aspirations is rarely addressed, especially in the German context. This must be considered a relevant research gap.

**Research question 5:** How do educational aspirations of students change after the transition to secondary schooling? Which (individual) factors can explain whether aspirations increase or decrease?

The next part of the question puts contextual influences into focus. Contextual influences here are factors that are either related to distinct learning environments in the context of tracking or to compositional effects, which are created by selection processes into the tracks. However, there are only few research findings available. One study from the US reports that being placed in a special college class does indeed influence further aspirations, yet there is only little similarity to the quite different German system (Karlson, 2015). Overall, there are no studies in the German context at all that focus on the effect on aspirations or expectations. Studies that are potentially somewhat comparable investigate tracking effects on *achievement* and usually find effects (Köller & Baumert, 2002; Maaz et al., 2008; Traini et al., 2021). This at least underlines that learning environments do matter to some extent and tracking creates differences in relevant outcomes. What is established is the fact that tracks differ strongly in their average aspirations, even under the control of a wide set of individual characteristics and performance (Wicht & Ludwig-Mayerhofer, 2014). While this does not demonstrate that aspirations *develop* differently, initial levels are at least unequal and are not only a consequence of compositional effects. Given that tracking is such a central and deliberate aspect of the German system, it is quite surprising that the effects of distinct learning environments have not been better researched in the past. One reason for this lack of adequate research is that the requirements of the data are high since not only panel data must be available to see how individual aspirations change over time but also context effects must be measured, which requires much more effort as not only individual students but entire classes or schools must be surveyed.

**Research question 6:** What is the influence of learning environments and contextual factors on the further development of students' aspirations in secondary education?

As has been shown in this chapter, even though the overall significance of aspirations, especially in the German context, has been recognized for some time and spawned a great number of research findings, there are still quite large research gaps present. The following empirical analyses attempt to fill these gaps and provide answers to the posed research questions. Before doing that, I will discuss highly influential theoretical research frameworks that are helpful to guide and structure further empirical investigations.

### 3 Theoretical foundations of aspirations

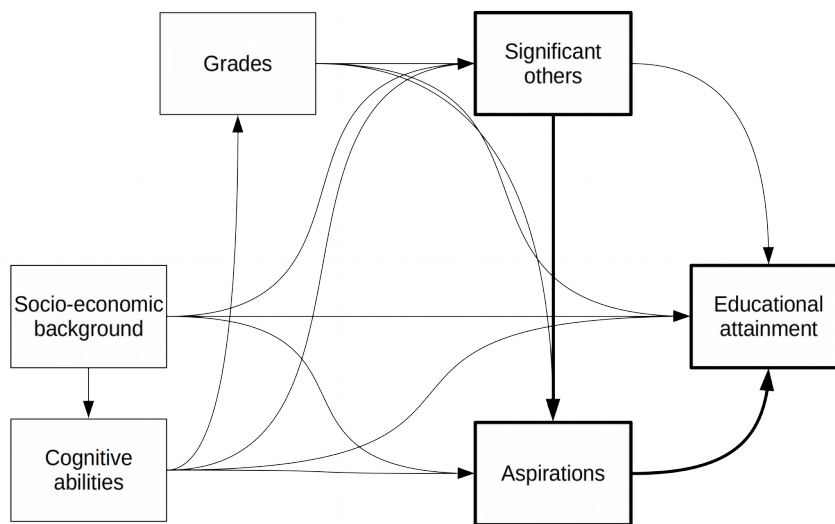
To explain how aspirations emerge and how they can change over time, there are two established sociological frameworks available. Although they differ significantly in their assumptions and take distinct perspectives, they are both highly popular and can be regarded cornerstones of empirical research revolving around aspirations. The first one is the *Wisconsin Model of Educational and Early Occupational Attainment* and mainly considers the influence of significant others on aspirations. The second one comprises different aspects of *rational-choice theories* and assumes that aspirations are the consequence of reasonable deliberations. Taken together, these two main frameworks give a more complete picture of how aspirations develop and change over the life course. Empirical research has repeatedly shown that both types of factors contribute to the explanation of aspirations and it is apparently not feasible to reduce one framework to the other (Stocké, 2013; Zimmermann, 2020). However, there have been also attempts made to better integrate these two main foundations together in one framework, which is also briefly discussed.

#### 3.1 The influence of significant others

In the more than 50 years since its original conception, the *Wisconsin Model of Educational and Early Occupational Attainment* (WiM) has proven to be one of the most influential frameworks to guide theoretical and empirical research that is centered around educational and occupational success (Sewell et al., 1969; Sewell & Shah, 1968). Originally developed as a classical model of socialization to explain educational and occupational outcomes, it has been adapted and further developed by its original authors and applied in hundreds of empirical research papers (Sewell et al., 2003). Given the scope of this summary it is not feasible to even outline the initial and adapted models in all their detail, merely the most relevant parts for the presented research questions with the main focus on aspirations. One can summarize the two fundamental predictions of the model as follows: a.) aspirations are the main determinant of educational attainment (Sewell & Hauser, 1980, p. 64) and b.) aspirations depend mostly on the normative influence of significant others. A simplified graphical version is shown in Figure 2.



Figure 2: Simplified overview of the Wisconsin Model



Source: own designed based on the version by Hoenig (2019). Only central aspects of the model are shown, paths according to Sewell & Hauser (1980). Paths of special relevance for the dissertation are printed in bold.

The path model describes which factors influence the final educational attainment. There are relevant direct pathways, such as from socio-economic background to attainment but also indirect ones, such as via aspirations. It outlines a theoretical model in which aspirations play a crucial mediating role. Building itself on the Blau-Duncan model (Blau & Duncan, 1967), the WiM introduced various aspects of *socio-psychological* explanatory factors, which added to the more *structural* factors that had already been established. Furthermore, the influence of significant others was not only added in the theoretical model but also empirically for a first time, even although this aspect has been theoretically discussed before. In the original WiM, a significant other is understood as parental or teacher encouragement to attend college, yet the term can be used in a much broader sense. In general, a significant other is any person that guides or influences the individual with respect to norms, values, or goals or exerts “...major influence over the attitudes of individuals” (Woelfel & Haller, 1971, p. 75). These influences can be considered as pressure, norms, or expectations other people bring to the individual. These norms can refer to overall, occupational, or educational goals in life and the latter is the most relevant for the presented research questions. Usually the most relevant significant others are seen as the parents, siblings, relatives, friends, peers, teachers, or other individuals that can have a strong influence on a child (for example, a priest or a nurse). They transmit their own norms and values to the child, who usually accepts these, due to the young age, unquestioned and internalizes them. Often the parents have the main influence as they spend the most time with the child, raising and guiding them (Davies & Kandel, 1981; Hauser,

1972). While some parents can have aspirations before the child is even born, and almost all parents hold educational aspirations by the time the child is about six years old (B. Becker, 2018), it clearly takes time until the child understands these aspiration in detail as it matures. Yet it should also be considered that this process is dynamic by nature and not a one-way street. As children grow up they develop their own ideas and interests in life and can express preferences and attitudes from an early age, for example (naive) occupational preferences (Kelly, 1989). It appears plausible that parents react to these filial signals and potentially adapt their own aspirations. Especially when the child has entered school, signals are available that can usually not be ignored, such as grades, which are indicators of filial academic performance. While the WiM considers school grades a relevant influence on filial and parental aspirations (as grades can affect the significant others) and assumes that children compare themselves with each other in class to gauge their further educational potential (Woelfel & Haller, 1971), this is also not captured as a *dynamic* process. Considering Figure 2, this would require that grades are not only regarded as a *cause* but also as an *effect* of aspirations and significant others. Especially in the German context, where students are sorted into various school tracks based on performance, it is crucial for the parents to understand whether their own aspirations, their child's aspirations, and hard limitations, such as grades, are compatible. As children develop continuously and steady feedback from tests and teachers' assessments is available, parents have the option to adapt their own aspirations. As this general example underlines, the development of early aspirations can be highly dynamic and should be considered as a process and not a single event or unidirectional influence.

This also leads to the limitations of the WiM. While it is plausible that parents (and others) transfer their own aspirations to the children, the question arises where *their own* aspirations come from in the first place. Following the WiM, it must be their own parents and peers, resulting in an infinite regress. Also, as has been pointed out before, there are good arguments to assume that the aspirations of the significant others are not static but might change over time, especially as the child develops. Hence, the classical WiM is not ideal to describe the reciprocal influence or dynamic developments over time. In addition to that, it is unclear why students should ever change their aspirations from a certain point on. After the significant others have transferred their initial aspirations to the child, do these always remain static? Do they only change then there are new significant others entering the life of the child, for example through new friends? While the model allows for later changes, especially due to the fact that academic performance can change, which can be regarded as the "rational core" of the WiM, it is, in total, a rather normative model (Morgan, 1998).

Furthermore, the model does not provide other main influences that predict why aspirations should change after (early) childhood, which is rather unrealistic, especially as the child matures and enters secondary school. The model is rather coarse as it predicts that significant others influence the child but does not explain in detail how and especially when this occurs. It does not outline in much detail how *structural* influences that are not necessarily individuals, such as distinct learning environments, influence aspirations. Another aspect that was only added later on and is missing in the original outline is the distinction between idealistic and realistic aspirations. *Idealistic* aspirations mean pure wishes or hopes that are not necessarily grounded in reality. These refer especially to norms and values and can be regarded as desired outcomes in the absence of any costs or limitations. In contrast to these, *realistic* aspirations are outcomes that can be realistically achieved under consideration of all known restrictions, such as bad grades, which are of special significance in the German context but also others, such as low financial means to support schooling and additional tutoring. Separating these two forms of aspirations must be regarded as a relevant addition to the initial WiM (Beal & Crockett, 2010; Gottfredson, 1981). As one can see, even though the WiM has proven highly relevant and successful for explaining educational and occupational outcomes, it is obvious that not all relevant influences are accounted for, which led to the development of other theories to amend these shortcomings.

### **3.2 Aspirations as a consequence of rational deliberations**

A rather different yet not less significant framework of explanation does not focus so much on the influence of other actors but more on rational thought and deliberations. These frameworks are known under the name of rational choice theories, comprising a multitude of various yet clearly related approaches (Beckmann & Heckhausen, 2008). Just to give an overview, popular approaches are known as expectancy theory of motivation (Vroom, 1964), risk-taking-model (Atkinson, 1957), theory of planned behavior (Ajzen, 1991), or expectancy-value theory (Wigfield & Eccles, 2000). The shared cornerstone of all these models is that individuals make decisions rationally, that is, comparing feasible alternatives by costs and potential outcomes to select one final option which promises the best results, taking all available information into account. Clearly, this is in stark contrast to the previously introduced influence of significant others where especially children are assumed to mostly believe anything parents and peers tell them and internalize this information without much critical deliberation (even though aspect such as academic achievement and grades can be influential as well). Theories of rational choice, in contrast, assume that individuals think analytically and rationally about their options. In the following I want to shortly outline the formalization provided by Erikson and Jonsson (1996) as it is a relatively simple model, yet

comprises the most relevant explanatory factors. Based on the work of Boudon (1974), they identify central parameters that are relevant to explain educational decisions. Given that an individual has two or more options available, the choice that will be selected is the one with the highest Utility (U). The utility can be computed as the product of Benefits (B) and probability of success (P), minus the costs (C), or more formally as:

$$U = PB - C$$

For Erikson and Jonsson, benefits and costs are measured by the same unit, which is, however, not monetary but arbitrarily scaled as a psychological category (Erikson & Jonsson, 1996, p. 14). In the German context, education in public schools is free of charge and monetary costs are usually minor (such as for learning materials), yet there are especially psychological cost such as stress and effort that are required to complete an educational degree. The benefits can be seen as access to prestigious occupations and status in society, which is also clearly correlated with financial success. The probability of success is an estimate of how likely it is that a given option can be realistically completed. In the German case, this restriction considers mostly academic performance, as bad grades prohibit the progression to the next school grade or the completion of final exams, such as the *Abiturprüfung*. In theory, if these three parameters are available to a student for all options, selecting the most optimal choice is a rational decision. However, as some empirical studies have also pointed out, differences between social strata can also arise since socially disadvantaged families have usually less information available (Stocké, 2007).

Clearly, this is a strong simplification of real life as a single parameter, such as benefits or costs, can comprise dozens of various and competing influences. Yet these models are rather dynamic and flexible and allow researchers to integrate other aspects, such as the influence of significant others and normative pressure. For example, one could understand normative influence as a further factor contributing to costs and benefits and the violation of pressure can be regarded as a psychological cost on the individual. It allows for the continuous updating of decisions in the light of new information.<sup>3</sup> For example, students and parents receive updates on academic abilities regularly through tests and grades, which gives them the opportunity to re-evaluate parameters such as the probability of success. If grades are too low, the probability of successfully continuing the current school track decreases and can influence future decisions. For the posed research questions, one can consider aspirations as anticipated decisions. While factual decisions are few and far between in the German context, such as track choice after primary schooling, aspirations can be seen as the current

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<sup>3</sup> While the WiM also integrates some of these aspects, as grades are also a part of this model, theories of rational choice attempt to model them in more detail and in a more quantitative fashion.

state of beliefs given the three parameters. Even if a decision is not imminent, an individual can still have a notion of the potential option to select, which is the aspiration in the given context.

Despite the flexibility of the model, there are some limitations which should be discussed. As already implied in the name, theories of rational choice assume that individuals think rationally about their future and make plans which they potentially even need to sit down and compute mathematically. Apparently, this is quite unrealistic and usually individuals hold preferences and aspirations for many aspects in life without having to use a calculator or think for a long time. The model is hence to be seen as an approximation of what might happen automatically within the human brain. These processes are apparently not always transparent but might happen subconsciously. The second main limitation is that the parameters that are required for a computation are often not directly available but must be estimated or inferred. Also, the various parameters can comprise a large number of influences and factors, which can pose theoretical and empirical obstacles, such as measuring and quantifying them precisely. Third, especially for the early development of aspirations in students, the model is rather unrealistic since children usually have little knowledge about the educational system, available choices, their own interests and abilities, and the world in general. Overall, these arguments show that while quite powerful in general, models of rational choice also face significant limitations. While especially quantitative research prefers the “mathematically-exact” framework, which makes it possible to compute which option will be selected by a rational actor, reality is often more complex and even good research can never quantify all factors using surveys.

### **3.3 Integrative models**

Thus far, two rather different models have been presented that both attempt to explain behaviour and outcomes. Clearly, the models also overlap to some extent and contain various parts of each other. The WiM includes rational deliberations, as grades (a measure of academic performance) do affect aspirations and also significant others. Models of rational choice can also incorporate the influence of significant others, norms, and values, especially when they are considered as additional costs and sanctions. Consequently, given these shared elements, it is not surprising that attempts have been made to find integrative models that combine the two rather distinct views on decision making processes. One such framework is the model of frame selection (Esser, 2002; Esser & Kroneberg, 2020; Kroneberg, 2005). It assumes that whenever individuals face a situation or choice, the initial *framing* is crucial to decide how the decision making process continues. Based on this initial framing, one of two *modes* is selected, guiding the further activation of *scripts* that determine the following behaviour or decision. The model assumes that in the first step, the situation is

recognized and framed as a consequence of potential normative pressure. If this normative influence is strong and homogeneous, the automatic-spontaneous mode is activated (as-mode). This implies that internalized norms and values will guide decisions without much rational deliberation. However, if the framing is weaker, as available norms and values are less clear or there is less social pressure for one option, the reflecting-calculating mode is activated (rc-mode). This means that all available information is considered and the decision making process is deliberate and conscious. At its core, the model assumes that the usage of rationality can be variable and some situations involve more rational calculations than others. To give a concrete example, let's consider the choice of secondary school track as the decision. If the overall aspirations in the family are high and there is a lot of pressure to obtain a high educational qualification (as the social origin of the family is high and all family members have obtained such a qualification), the situation is framed in the as-mode and the high qualification is aspired to, even if some limiting factors (such as bad grades) might be problematic. However, in a different context, when there is less social pressure, pre-determining the decision, more thought and deliberations might be given and all limiting factors considered. After the mode has been selected, suitable scripts are activated that guide behaviour and control routines. This has also been tested empirically and found to be a rather accurate description of the decision making process (Kroneberg et al., 2006). Clearly, one can discuss whether such scripts exist for educational decisions, since these are rather unique and are special circumstances and not situations of everyday life which are encountered often and hence profit the most from a quick and spontaneous selection of behaviour.

As one can see, the model of frame selection is helpful as it integrates both aspects of social influence and rational deliberations. It formalizes in great detail how decision making processes (and therefore also related aspirations) emerge. Regarding the review of the literature in section 2, it helps explain why parents pay selective attention to previous achievement. If the initial achievement is low and there is no strong social framing, due to the fact that the parental social origin is rather low and there is not much pressure for high education, the rc-mode will be activated and rational deliberations will come to the conclusions that it is unlikely that selecting the academic track is the best choice. However, if the social origin of the family is high, resulting in a high pressure for a high qualification, the as-mode will be selected and norms will be used to frame the process. Even if prior achievement is low, much less thoughts will be given to rational aspects as the social pressure is high. In this case, the academic track is usually chosen anyway. Overall, one can regard the model of frame selection as an integrative model that explains how both norms and

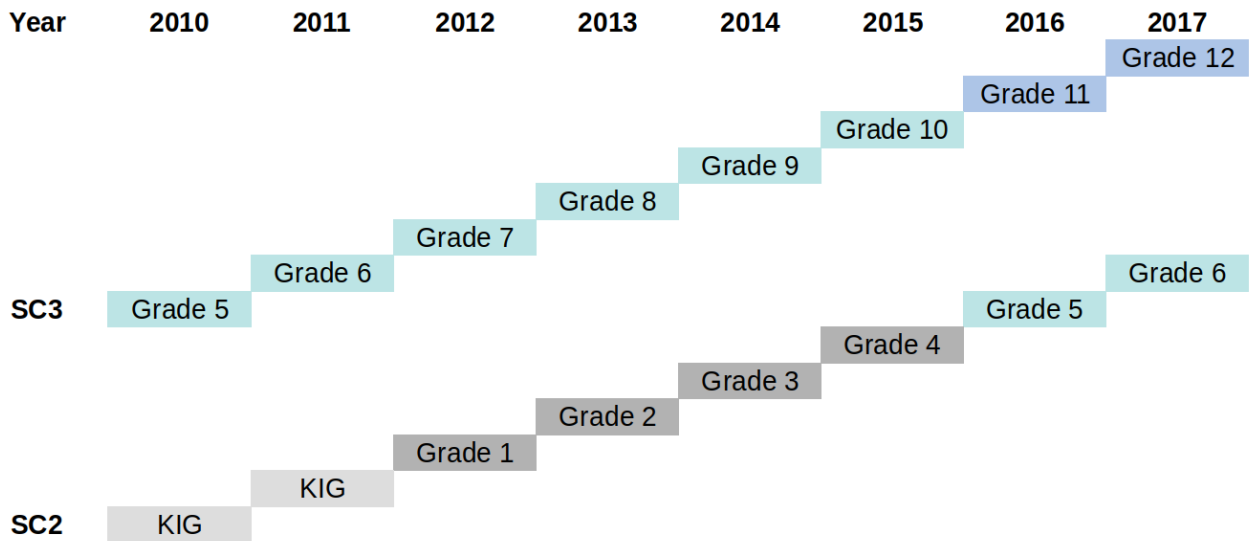
deliberations can influence a decision making process, which is in line with prior research, indicating that educational decisions usually contain both aspects (Zimmermann, 2020).

Overall, while the model is highly promising as it integrates two other models that have both shown to be correct and useful to some extent, there is rather little empirical research that directly builds upon frame selection. While the model itself attempts to be mathematically precise, I assume that there are major difficulties in measuring and operationalizing key elements, such as the selection of frames and scripts. If this cannot be measured somehow in empirical research, it is often difficult to consequently apply the model. Potentially, frame selection itself is not necessary as the other two established models work together without building a new framework around them and researchers simply apply them both or combine them according to their own assumptions and concepts.

## **4 Data**

All of the following empirical analyses utilize datasets provided by the National Educational Panel Study (NEPS) (Blossfeld & Roßbach, 2019). The NEPS is one of the most ambitious research projects in Germany to investigate the role of education in the life course, starting from childbirth to old age and using a multicohort-sequence design. By looking at various starting cohorts and stages in the life course, the NEPS attempts to give a comprehensive overview of the significance and implications of education. Depending on the stage and cohort, a large number of context persons, such as parents, teachers, or educators, are taken into account to map wider social, structural, and contextual influence. First established in 2009, the NEPS surveys respondents approximately annually to collect longitudinal data which enable researchers to trace individual developments over time (panel data). The NEPS provides a rich set of variables for analyses, which comprise socioeconomic and demographic background, psychological items and personality measurements, contextual factors in classrooms and schools, and even comprehensive achievement tests. In the following empirical analyses two starting cohorts will be used. A graphical overview of the two starting cohorts and when surveys are taken is given in Figure 3.

Figure 3: Overview of the NEPS data



Source: own design. Colours are used to depict various contextual stages in the life course: Kindergarten (light gray), primary schooling (darker gray), lower secondary school (light blue), upper secondary school (darker blue).

#### 4.1 Starting cohort 2

Starting cohort 2 is the Kindergarten-cohort of the NEPS, providing information from early childhood (about 4 years old) until after the transition to secondary education (grade 7 in 2020). The population in wave 1 in 2010/11 consisted of children in Kindergarten who were expected to begin schooling in 2012/13. Since there is no official register for Kindergartens in Germany, an indirect sampling approach via elementary schools has been chosen to find information on Kindergartens that supply these schools with children. By doing so, Kindergartens with an operating license and at least ten places available were selected, resulting in a sample of 2,949 children participating in wave 1 of the survey. A refreshment sample was drawn in wave three when children transitioned to primary school, resulting in a total of 6,734 participating children.

Starting cohort 2 is a well-suited database since it covers the entire time in primary school and also the transition to secondary education in a prospective manner for a large number of pupils all over Germany. This eases causal inferences and gives a more complete depiction of the development of aspirations over time. Since the parents are also included in the survey, aspirations of both students and parents are available which makes it possible to model co-development. By using the comprehensive NEPS-tests, the development of competencies can be researched in detail. In contrast to many other studies, factual track choice is measured and not only intentions, which improves data quality and rules out reverse causality.



## 4.2 Starting cohort 3

The second dataset used in the empirical analyses is starting cohort 3. In this cohort, the initial target groups are students in grade 5, that is the first grade of secondary education. Therefore, these students have already completed the transition to secondary education and prospective information is available from this point on. This cohort is well suited to study the development of students in secondary education as it covers the complete course. Given a population of 11,792 public secondary schools in Germany (not included are schools for pupils with special needs, *Förderschulen*), 240 schools were randomly selected. Within each selected school, two fifth-grade classes were randomly selected and all pupils in the class invited to participate in the NEPS study. Further context-persons were also invited, such as parents, teachers, and principals. Achievement tests were conducted regularly in the classroom context. There are 5,208 pupils in wave 1 of the survey, a refreshment sample was drawn in wave 3 to increase the final number of participants to 6,211.

## 5 Results

This section lists the main empirical findings of each research paper. Since the results are grouped by publication, one paper can contain multiple research questions.

### 5.1 Publication 1<sup>4</sup>

Using NEPS SC2 data, the first paper addresses research questions 1 and 2. The availability of the comprehensive achievement tests in mathematics can be seen as a proxy for overall academic performance and make it possible to investigate the co-development of parental aspirations and filial achievement in more detail. Since at the time of the surveys, which were conducted in school grades 1, 2, and 4, students are quite young and are probably not fully aware of the educational options they face. Therefore, filial aspirations are not even surveyed in the first two grades. As has been argued before, parental aspirations are more decisive anyway for the upcoming track decision after grade 4 (a claim that will also be backed up empirically in research paper 2). Parents were asked what qualification their child will realistically achieve after finishing school, that is, taken all known limitations, such as bad grades, into account. They were asked about the highest *qualification* achievable (that is, either the *Abitur* or any lower qualification) and not about the track in secondary schooling. This is due to the fact that tracks do not completely predetermine final qualifications, since sequential upgrading is a feasible option. In this operationalization, parental aspirations were measured as a binary indicator due to theoretical and methodological reasons.

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<sup>4</sup> Bittmann, F. (2022). Investigating the co-development of academic competencies and educational aspirations in German primary education. In *Frontiers in Education*. Volume 7.

The dynamic feedback process, which is visualized in Figure 1, was modeled using a cross-lagged panel model (CLPM), which makes it possible to investigate the dynamic dependencies of two key variables over time. The main assumption is that parents can react to achievement and adjust their aspirations accordingly (Bayesian updating of expectations as new information becomes available) but also influence their child and his or her achievements (e.g., through additional support or tutoring). A large set of control variables to account for potentially spurious correlations and especially the influence of social origin (measured through parental education and income) was included. As the findings outline (N=4,325), statistically highly significant crossed effects are present in the model. This means that children of parents who have high aspirations for them in grade 1 show better academic performance in grade 2, statistically controlling for the achievement in grade 1 and all background variables. The same holds for the mirrored effect, that is, children who show better math achievement in grade 1 have parents with higher aspirations in grade 2 controlling for initial aspirations. This nicely demonstrates that the child-parent trajectory includes feedback loops in a dynamic way and children and parents react to each other. This is empirical evidence for a transactional process.

The second part of the analyses further investigates the question whether these co-developments are socially stratified. As has been outlined before, the assumption is that parents from socially disadvantaged families pay special attention to achievement, since for them a wrong decision can create a burden on their limited (social and financial) resources. And indeed, when the same CLPM is computed separately for families where at least the *Abitur* is available as the highest parental qualification in contrast to families without it, statistically significant group differences in coefficients arise. Parents with a lower education have a larger coefficient for the effect of achievement in grade 2 on aspirations in grade 4 than parents with higher education. This demonstrates statistically that parents with lower education react more strongly to achievement than highly educated parents, supporting the proposed hypothesis. It should be made clear that, even with panel data available, the utilized CLPM is not able to separate within- and between-effects, meaning that reported coefficients include both intra-individual but also between-person differences. As is outlined in much more detail in the paper itself, using related approaches, such as a random intercept CLPM (RI-CLPM) is not adequate due to theoretical and methodological considerations. The coefficients produced by the CLPM are to be seen as upper-bounds of effect sizes.

What can be concluded from the analyses is that filial achievement and parental aspirations are deeply interconnected and adjustments in both directions occur. Parents can influence their

children's achievement via aspirations but the achievement a child shows also has an effect on parental aspirations. I also demonstrated that parents of a lower social origin pay much more attention to achievement than socially well-off families and adjust their aspirations more easily, which is in line with the predictions of the frame selection model. These results are, hence, not only a contribution to the theoretical literature but also are also relevant for practical advice and potential interventions.

## 5.2 Publication 2<sup>5</sup>

The second research paper answers research questions 3 and 4. NEPS SC2 data are well-suited for the intended analyses as the entire course of primary schooling and the transition to secondary education is covered. This is especially relevant for explaining and predicting the transition, in contrast to other studies which only rely on intentions but not factual enrollment. The first part of the paper investigates the total contribution of aspirations on the track decision. This dependent variable is binary and measures whether the child has been enrolled in the academic track (*Gymnasium*) or not. The main explanatory variables are idealistic and realistic aspirations of parents and their children. Idealistic aspirations measure wishes and desires that are not necessarily grounded in reality and refer more to norms and values. Realistic aspirations, in contrast, measure what can realistically be achieved, taking restrictions, such as bad grades, into account. These four items are surveyed in grade 4 and are also binarily coded, measuring whether the *Abitur* can be achieved after schooling or not. In the first analysis, a two step approach is chosen to quantify the share of variance of the dependent variable that is explained by all aspirations, in addition to other control variables. These variables are social origin, measured by parental income, social status, and education, filial academic achievement, and a large number of sociodemographic background variables. In the first model, the track decision is regressed on these measures of social origin and all background variables. In the second model, aspirations are added to the first model. The *additional* explained variance in the outcome is then due to aspirations only. The results (N=2,973) show that the second model explains almost 50% of the entire variance of track choice and all aspirations together explain an additional 24.4 percentage points of variance. This means that aspirations alone almost double the explained variance when adding them to a model with baseline variables. Further tests show that this share of additional explained variances does not vary much by parental education level. This finding highlights that aspirations are highly relevant for explaining and predicting educational decisions, even when other, partially correlated variables, such as social origin and even achievement level, are already accounted for.

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<sup>5</sup> Bittmann, F. (2022). Investigating the role of educational aspirations as central mediators of secondary school track choice in Germany. *Research in Social Stratification and Mobility* 81: 100715.

The second part investigates in more detail whether aspirations can be understood as mediators that explain how social origin influences the track decision. Since the dependent variable is binary, the Karlson–Holm–Breen (KHB) mediation approach has been chosen since it gives statistically correct results. This method also allows the disentanglement of the effect of the four different aspiration variables. The findings outline that 80.1% of the effect (95% confidence interval ranging from 66.7 to 100%) of social origin is mediated through aspirations and that realistic parental aspirations (42.4%) are the single most relevant mediator. These results, computed under the control of other, potentially confounding, variables demonstrate that the major influence of social origin is indeed transmitted through aspirations. Apparently, the residual pathway, less than 20%, is small in comparison. Additional checks further strengthen the robustness of this conclusion and underline that aspirations can be understood as the central mediators of social origin on the track choice decision after primary schooling. These findings are relevant to understanding how social origin exerts its influence on decisions, which might be useful for practical advice and potential interventions. While social origin is a rather constant influence that cannot be changed and would require tremendous amounts of aid (such as providing the parents with more money or education to lift them into higher social strata), aspirations can be targeted more easily. The findings indicate that the strong social influence on decisions could probably be reduced if aspirations of families of lower social origin could be increased, which is potentially difficult, yet still more realistic than changing social origin directly. Overall, the research findings have potential implications not only for theoretical but also practical purposes.

### 5.3 Publication 3<sup>6</sup>

The third research paper focusses on research question 5 and investigates how educational aspirations of students change over time. Individual factors are of special relevance in contrast to research question 6, which is built around contextual influences. To answer this question, NEPS SC2 data are utilized since the further educational progress of students after the transition to secondary schooling is available. Since the main question is about changes of aspirations, two points in time are used. Baseline aspirations (realistic) are measured in grade 4 before the transition has occurred. The second time point is when students are in grade 6. This variable measures the educational qualification the student can realistically obtain with three levels (*Hauptschulabschluss*, *Realschulabschluss*, *Abitur*). By comparing the two time points, three options arise: aspirations are either stable, downgraded or upgraded. To test which factors influence a change of aspirations, two distinct models are computed due to different populations *at risk*. To give an example, students who

<sup>6</sup> Bittmann, F. (2021). Eine Analyse über die Veränderung von Bildungsaspirationen von Schülern nach dem Übergang in die Sekundarstufe. *Zeitschrift für Pädagogik* 67(4), 573-590.

already hold high aspirations in grade 4 cannot upgrade their aspirations even higher, meaning that this outcome is impossible for this group. They are, therefore, not included in a model where upgrading aspirations is tested. This is also quite relevant from a theoretical point of view since one can assume that the mechanism behind either up- or downgrading of aspirations is potentially quite different. The main explanatory variables are type of track, parental social status (measured by the highest International Socio-Economic Index of Occupational Status, or ISEI, of the parents) and academic performance of the student. The first main result is that it is difficult to explain the upgrading of aspirations because the mentioned independent variables and even more sociodemographic control variables explain less than 2% of the total variance (N=1,715). Not a single independent variable is statistically significant at the 5% level. The model for downgrading aspirations does, however, show some effects (N=4,151). Attending the academic track, having a higher academic performance, or having parents with a higher social status are variables with a protective effect, making it less probable aspirations are downgraded. The total explained variance of this model is about 9%.

The second part of the analyses investigates in more detail the interactions between social status and academic performance. For this purpose, both variables, continuously measured in the first analysis, are operationalized as quartiles, leading to a 4x4 matrix. Up- and downgrades are again modeled separately, the results are furthermore stratified by type of track attended (academic track or any other track). When focusing on downgrading, there is a clear protective influence of the academic track. Even the students with the lowest achievement and status only have a probability to downgrade their aspirations of about 10% in the academic track but 28% in the other tracks. It also shows that having either a high level of social status or performance is a protection against downgrading aspirations and performance has the larger influence. For upgrading aspirations, the findings are much less clear as there is only little variation over the various groups. The main findings are that explaining an upgrade of aspirations is difficult and other influences than available in the tested model might be more relevant. For downgrading, interaction effects between social status and academic achievement are present as both factors are relevant to explain the loss of educational aspirations in students. What can be learned from these results is that there is a shortcoming in the theoretical assumptions as supposed central influences are hardly able to explain changing aspirations at all. The main question of which individual-level factors lead to changing aspirations in secondary education remains rather open and will require follow-up investigations.

## 5.4 Publication 4<sup>7</sup>

The fourth and final paper of the dissertation extends the previous research question and looks especially at contextual and institutional factors. As outlined before, the system of tracking has been implemented to create distinct learning environments. The question is how strongly these contextual factors influence the further development of aspirations. To answer this question, NEPS SC3 data are utilized. The data are well-suited since they contain the educational course in secondary education and grades 5 to 9 are available. The main dependent variable is idealistic aspirations of students to achieve the *Abitur* or not. Idealistic aspirations have been chosen in this study to understand how tracks can influence norms and values of what students would like to obtain, not taking any limitations into account. Two main restrictions on the sample were made. First, students needed to show above average academic performance in grade 5, which was measured using the comprehensive NEPS tests. Second, only students were retained who had high educational aspirations in grade 5 and would have liked to obtain the *Abitur*. If effects are present that can influence this highly positively selective sample, it means that effects are potentially even larger on the entire population. In the first part of this study, a descriptive approach was chosen to visualize the development of aspirations over time. These findings underline, again, the highly protective influence of the academic track. In grade 9, more than 98% of the students in the academic track still had high idealistic aspirations but only about 85% in the other tracks. When looking at distinct subgroups, the results are that especially students with lower educated parents tend to lose their aspirations over time. The most severe decline is visible in the group of students at the non-academic tracks with lower educated parents. Overall, these findings are in line with the results of the previous research paper, although a different sample and a longer time frame has been studied.

The second part of the contribution attempts to quantify in more detail which contextual factors explain the loss of aspirations using mediation models. These mediating variables are the average share of students in the school with parents holding high aspirations, the average share of students with parents having completed higher education and average competences. First, the main treatment is attending the academic track or not. The question is how much idealistic aspirations differ after one year of secondary schooling due to attending a different track and which mediators explain this difference. The findings (N=1,063) outline that, from grades 5 to 6, aspirations are 7.4 percentage points lower in non-academic tracks than in the academic track (average partial effect of track under the control of selection effects into track using a propensity-score). However, adding the three mediating variables to this model, this difference is reduced to 1.6 percentage points, the share

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<sup>7</sup> Bittmann, F., & Schindler, S. (2021). Analysing diversion processes in German secondary education: School-track effects on educational aspirations. *KZfSS Kölner Zeitschrift für Soziologie und Sozialpsychologie*, 73(2), 231-257.

mediated is almost 79%. Average competences and aspirations account for the major part of this mediation. When looking at the situation in grade 9, mediation effects are slightly smaller (about 50% mediated).

The final analyses (N=1,163, number of observations which is slightly higher due to a different approach for controlling background variables) consider school track as a mediator and parental education as a treatment variable, since the influence of this variable has been demonstrated to be highly relevant in the descriptive analyses. When looking at the development from grades 5 to 9, the results outline that about 45% of the total influence of parental education is mediated by the variables in the model. Of these 45%, about 11% are due to individual characteristics such as gender, migration status, or academic achievement. The remaining share is due to the contextual factors, with track being the most relevant mediator followed by the share of students in the school with high aspirations. Note that these findings are under statistical control of various other background influences. The analyses were also repeated with *realistic* aspirations, which creates even stronger findings as realistic aspirations decrease even more strongly over time. It becomes clear that contextual factors do play a major role in the change of aspirations over time. This makes sense from a theoretical point of view, since tracking has been implemented to create distinct learning environments. Yet, after the reforms of the educational system to allow sequential upgrading and the implementation of other changes to make the system more permeable in general, these learning environments can also obstruct further educational success as, even in a population of initially highly motivated and high-performing students, aspirations decrease massively in non-academic tracks, which must be considered a reason why social inequality emerges early on in life.

## **6 Limitations and conclusion**

As theoretical considerations and empirical results clearly demonstrate, educational aspirations deserve to be regarded as one of the central factors when attempting to understand the emergence of early social inequality in the German educational system. By taking a life course perspective, the presented analyses trace the development of aspirations from early childhood over the complete course of primary education until upper secondary education, painting a much broader picture of the processes that are usually hidden. By not only considering a few key decisions, which are few and far between, it becomes much clearer what happens in families and schools and how inequality forms slowly but steadily. It is crucial to recap the main conclusions and outline how they support the claim that aspirations are deeply related to the genesis of (early) educational inequality. First, I demonstrated that filial achievement and parental aspirations co-evolve dynamically in primary

schooling, which can be assigned to primary and secondary effects, according to Boudon. It is obvious how this can be considered a self-reinforcing process: Children with initially high achievement (primary effects) will influence their parents so that they increase their aspirations (secondary effects), leading to a much higher chance that the academic schooling track will be selected. However, if initial achievement is already low, parents might lower their aspirations even further. This shows how primary and secondary effects can influence and strengthen each other. The second key finding is that parents of lower social strata will pay even more attention to achievement and react even more strongly to initial low achievement, which is significantly different to socially well-off parents who often do not really care about initial performance, always retaining high aspirations. These two rather basic findings explain how after only four years of mandatory schooling, further educational trajectories can already be highly different for children due to different social origins.

However, all empirical studies come with limitations due to constraints of scope, data, or statistical modeling, which must also be made transparent. As outlined especially by the WiM, social origin and significant others are supposed to influence aspirations. As more realistic and more highly developed models assume, aspirations of students co-develop with other influences and especially parents and children probably have dynamic developments where feedback processes are present. This has been demonstrated empirically in the first research paper. The main conceptual problem when disentangling causal processes of the formation of parental and filial aspirations, potentially also including other factors such as social origin of the family, or filial academic achievement, is that cause and effect are very difficult to differentiate using quantitative research data. This is not about statistical modeling, methods in general, or the unavailability of unmeasured confounders, but more about how individuals develop over time and whether it can be measured (quantitatively) at all. The NEPS surveys students and parents approximately annually and provides panel data, which is a huge advantage in comparison to cross-sectional data. Yet, even the NEPS only captures a small fraction of the overall process as only few points in time, with long durations in between, are available. Parents and students usually live together and talk every day; achievement tests are conducted almost weekly in primary schooling. This means that only a tiny share of the process of when students and parents talk, react, and interact is captured in the data. This makes it so difficult to understand whether the child influenced the parent, the parent influenced the child, or whether there are other (unmeasured) confounders that affected both parents and students. I believe that it is quite unrealistic to capture these highly flexible and dynamic feedback processes using only one measurement per year. This is a hard limitation of virtually any quantitative survey. One proper



solution is the usage of more qualitative methods to understand in more detail how these processes occur in real life, or at least how they are described by students, parents, or other stakeholders. This is far beyond this dissertation and comes with other limitations (such as obtaining enough data that would be representative for a given population) yet offers special insights that might be relevant for further research and also the design of future surveys. The main conclusion and limitation for all reported findings is that it is rather unrealistic to recover pure causal effects. While all attempts available were made, such as respecting the direction of causality through the temporal ordering of events or by including relevant control variables to account for confounding, readers are very much advised to interpret reported findings with caution when it comes to the aspects to causality.

Another potential limitation concerns how educational aspirations are measured in the NEPS. In theory, measuring aspirations can be highly flexible since questions and items can be tailored to virtually any situation or population of interest. This is highly relevant in the rather distinct German context where school tracks and educational qualifications are different from many other countries. Measuring idealistic or realistic aspirations in this context is rather simple since survey items can be short and to the point. Most students, given a certain age, are aware of the main options, which are not many. While this is beneficial in general, since rather manifest decisions or intentions can be measured, in contrast to other constructs, which are much more latent, such as psychological traits, this also creates problems. Whenever there are only a few distinct options (which are usually a.) no degree, b.) *Hauptschulabschluss*, c.) *Mittlere Reife*, and d.) *Abitur*), investigating *changes* is especially difficult.

This creates three main problems. First, when only a small number of outcome levels is available, the variation is limited, which becomes a challenge for statistical analyses. The problem is further exacerbated when some categories are very sparsely populated. In the German context and especially the NEPS, having aspirations for a low degree such as the *Hauptschulabschluss* is rare. This is also a consequence of the changes in the German educational system in the last decades, where some federal states have abolished or merged some school tracks altogether and the tendency to obtain the *Abitur* has steadily increased. This means that both intra-individual but also between-individual variation is often small, which can be problematic. Second, when many students already hold the highest (or lowest) aspirations, this creates ceiling- (or floor-) effects. As for some groups only changes in one direction are possible, this limits the options for some statistical analyses. Third, educational qualifications as outcomes might be too coarse in this context as small changes in some dependent variables (for example, academic achievement) do not produce variation in the outcome since the effect is just too small to generate a large change, as it requires a jump from one

outcome level to the other. To account for these problems, it would be desirable to have a fine-grained measure of aspirations, potentially even a continuous measurement. This, however, is not available with the NEPS. It would also create other problems, for instance, this would probably be a more latent construct and more items would then be required to measure it. This can come with a higher cognitive burden on the participants, especially for younger children, and would also require a higher abstraction level. Such an instrument would need extensive tests in its development to demonstrate its robustness and validity.

Overall, there are advantages and disadvantages when measuring aspirations as the NEPS has done which must be seen as a general limitation. One potential solution to overcome this obstacle is to focus on *occupational* aspirations instead. This type of aspiration focuses on what individuals want to achieve later in life after having entered the labour market. By asking directly which occupation is wished for (idealistic aspiration) or likely to be held (realistic aspiration), much more variation can be generated. By classifying each occupation according to some status- or prestige scale (e.g., by using the ISEI classification), metric variables are available, which can benefit many analyses. However, there are some downsides to this as well. Especially for younger children it might be difficult to imagine what occupation they want to achieve decades later in life, as most children form naive wishes first, which are usually subject to change as students mature. Therefore, such a classification is probably more adequate for older students that are closer to graduation and entering either the labour market, a vocational training, or the tertiary system. Overall, this type of aspiration is a relevant and important addition to educational aspirations, yet could not be integrated in the present dissertation due to its limited scope.

To conclude, the present dissertation has demonstrated that aspirations deserve attention as they are a key element in explaining the genesis of educational inequalities in the German educational system. *Theoretically*, by referring back to well-established sociological frameworks, the dissertation has located itself in the research field and outlined why aspirations are supposed to matter and how potential mechanisms work. Relevant research gaps were identified as to highlight why more research is necessary and useful to better understand how inequalities form early on. The findings have shown that the utilized theoretical frameworks are still highly relevant and are able to explain aspirations and the emergence of inequality to some extent. However, what also deserves further attention are the shortcomings of established theories, especially when investigating the *change* of aspirations in secondary education. Future research might want to test new approaches to better understand these processes in more detail as the current frameworks are not able to explain all changes of aspirations satisfactorily. *Empirically*, by using high-quality panel data, all analyses had

the best data source available at the time to investigate aspirations in the German educational system. By taking a life course perspective, a high level of insight was achieved: First, not only single events or episodes were studied but longer time frames, which lasted from the start of elementary school until upper secondary education, spanning about nine grades in total. Having a longer window of observation is clearly relevant and beneficial to better understand how processes develop over time and paint a clearer picture of what is actually going on in the life of individuals. Second, by not only focusing on the individual student but taking significant others, especially the parents and peers, into account, the social dynamics of the formation and changes of aspirations were regarded and included empirically. Third, by also looking at contextual factors, especially schools and learning environments, the overall life situation of students has been incorporated to understand how these highly relevant, yet often difficult to measure, influences contribute to the creation of inequality. Any analysis omitting them must be deemed to be incomplete as the influence of these distinct environments can be significant. *Methodologically*, the analyses have outlined how aspirations can be measured, how these measures can be utilized in empirical research, and why this matters for survey designs. Since aspirations are usually easy to measure, yet mediate the effects of social origin to a large extent, they can be beneficial for many research questions and study designs. Any researchers attempting to investigate educational inequality, especially in the German context, might want to add at least some measures of aspirations to their questionnaires as the potential for understanding and explaining social processes can be large.

In conclusion, it can be said that this dissertation has been able to show the role aspirations play in the emergence of social inequality. An understanding of the origins of social inequality without taking aspirations into account can therefore only remain incomplete.

## 7 References

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# Chapter 2

## Investigating the co-development of academic competencies and educational aspirations in German primary education<sup>1</sup>

**Abstract:** Academic achievement and educational decisions, which are strongly related to primary and secondary effects, are the two main drivers behind the emergence of social inequality in education. To understand this process in more detail, even before final decisions have to be made, the reciprocal influence of achievement and aspirations is of greatest interest. By not simply looking at an ultimate outcome but investigating its antecedents in a longitudinal fashion over the course of multiple years more insight is gained. Using German large-scale NEPS panel data, it is possible to demonstrate this co-development quantitatively. Cross-lagged panel models are utilized to show that the achievement in mathematics (measured by comprehensive achievement tests) and parental realistic aspirations influence each other positively in a statistically significant way over the course of primary education from grade one to four, even under the control of various potential confounding variables. Further analyses reveal that this process is socially stratified and works differently for lowly and highly educated families. Lower educated parents pay more attention to the performance of the child when adjusting their aspirations than tertiary educated parents, who always hold high aspirations. The results are of interest to understand in more detail how social inequality emerges at a very early point in the highly tracked German educational system.

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# 1 Introduction

Understanding and explaining how individuals decide for or against educational pathways is one of the most prominent themes in sociology and educational sciences (Breen and Yaish, 2006). While these decisions are clearly of greatest interest, especially for investigating how social inequality emerges or grows over time, focusing on these specific points in time, which are rather few when the entire life course is considered, will hardly ever give a complete picture of the situation as they are not able to fully explain the process behind these decisions. In this context, *social inequality* means the unequal chances individuals are facing with respect to obtaining formal educational qualifications, caused by differences in their social origin (especially different level of parental education or the financial means of the family). Overall, one can consider these decisions the final consequence of longer lasting developments, which are, due to their extended temporal nature, much harder to understand and particularly to capture using survey methods. Nevertheless, these processes are of immense importance and relevant to better understand how and why decisions are made. Especially so in the German educational system, which makes families decide the educational trajectories of their children at a very young age (Schindler, 2017). As will be outlined in more detail below, the interplay of academic performance and educational aspirations is the defining aspect of this development as they capture both primary and secondary effects (Boudon, 1974; Neugebauer et al., 2013). Here, primary effects are differences between social groups with respect to actual performance while secondary effects are differences in decisions, even when holding performance constant. Their independent influence on subsequent educational decisions has been well-researched in the past but it is only little understood how these two influence each other dynamically over time (Pietsch and Stubbe, 2007; Buchholz et al., 2016). Due to the early age of the children in primary school and the usually decisive influence of the parents, as will be further outlined below, parental aspirations are the focus of the following analyses. Exemplary, parents may adjust their aspirations continuously, depending on the feedback they receive from the performance of their children in school. Conversely, it makes sense to assume that parents with initially high aspirations will try to influence the academic performance of their offspring, especially when it lags behind expectations. Capturing and measuring these processes in a quantitative fashion appears to be a major interest for educational research. This knowledge is critical to assess how early and how strong social inequality develops in the German system. Thus, the overarching research questions that are guiding the following analyses are: how do parental educational aspirations and the achievement of children co-develop over the course of primary education in Germany? Is this process socially stratified?

To summarize, the following study contributes to the literature in various aspects. First, a theoretical framework is built upon well-established sociological theories that integrate both primary and secondary effects in a longitudinal fashion and allow to capture a dynamic feedback process. Second, it introduces a large-scale and high-quality German panel dataset that makes it possible to investigate named theoretical aspects empirically using a large number of relevant variables and account for potential confounding. Third, it contributes to the ongoing discussion of selecting an appropriate statistical model to answer posed questions for these dynamic feedback loops. Finally, by considering socially stratified effects the study makes it clear how early these social differentials emerge and how they contribute to social inequality that increases over the course of primary and secondary education. Overall, empirical evidence is provided that might be relevant for the evaluation and adjustment of policy to reduce the emergence of social inequality at a very early point in the life course.

## **2 Materials and methods**

### **2.1 Theoretical considerations**

In this chapter theoretical arguments will be presented. First, an explanation of how early educational aspirations develop will be given. Second, following the theoretical account, testable hypotheses are formulated that will guide the following empirical analyses. Third, previous research results are summarized to give an overview of the current state of knowledge.

#### **2.1.1 The early development of educational aspirations**

Theoretically, parents can have aspirations for their child even before it is born, particularly regarding idealistic aspirations. These are not grounded in any known limitations or restrictions, and only express wishes and ambitions. Generally, one can define aspirations as a “cognitive orientational aspect of goal-directed behavior” (Haller, 1968, 484). The realistic aspirations, which are the focus of the following study, can thus be understood as a compromise between the idealistic aspirations and any given limitations. These can be financial (costs of schooling or forgone wages), social or academic. In the German system, this last aspect is usually the most relevant one since schooling is free of charge, and pupils are sorted by ability in an early and strongly tracked system (Eckhardt, 2017). Consequently, as the child develops, parents will usually update their aspirations based on the general cognitive and academic performance of the child. One can assume that this is a dynamic feedback process as parents receive information on their child through his or her behaviour, notions, and interests. Then they can either try to influence the performance of their child

or readjust their aspirations. This becomes especially relevant as soon as the child enters primary education (aged 6 to 7 years), which lasts four years in most federal states. Afterwards, pupils are sorted by their ability (choice of secondary schooling). Hence, these four years are highly relevant to develop and recognize the overall academic ability and interests of the child. One can also assume that this is a dynamic process between parents and children (as they influence each other). However, since one of the strongest sources of filial aspirations is the parental ones (Sewell and Hauser, 1980; Gölz and Wohlkinger, 2019), it makes sense to focus specifically on the parental aspirations. What must also be considered is that a child in primary school is usually not able to grasp the overall importance of education and the meaning of various educational qualifications. Therefore, looking especially at parental realistic aspirations makes more sense at this young age.<sup>2</sup> Nonetheless, these explanations which are based on the influence of significant others, better known as the Wisconsin model of status attainment, usually assume rather constant aspirations and are therefore not detailed enough to explain why aspirations should change, as the significant others (e.g., parents, teachers, family or friends) are normally steady (Sewell and Hauser, 1993; Andrew and Hauser, 2011). To gather further insight, one can invoke well-accepted theories that focus on rational deliberations, which are an important complement.

According to theories of rational choice and derived formalized frameworks, parents want their children to at least reproduce their social status to avoid social demotion, which is referred to as the concept of status maintenance or relative risk aversion (Breen and Goldthorpe, 1997; Stocké, 2010). The initial aspirations are hence based on the parental social status and the respective educational qualifications. Therefore, highly educated parents have a strong incentive for their child to reproduce their status (and educational qualification), which requires showing high academic performance in school. For children of parents with low qualifications, this is apparently different as even mediocre performance will be sufficient to reproduce the parental status. Thus, the initial aspirations are probably based on status and qualifications, which are usually rather constant. So why would parents modify their aspirations at all? Following arguments of rational choice theory, adjustments are required whenever some parameters change. For example, if it turns out that the ability of the child is too low and entering the academic track is hence not feasible, parents will adapt their aspirations to avoid additional costs (dropping out of the academic track before completion). As in the German system, academic performance is the most relevant factor for sorting and assessing pupils, it makes sense to focus on this aspect. The most relevant distinction between the Wisconsin model of status attainment and most rational choice theories is that in the former, aspirations and expectations are seen as rather constant and mostly depending on the (usual not

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<sup>2</sup> Ultimately, it is the parents who select a school and enroll their child.

changing) social status of the family, while the latter invoke aspects like Bayesian learning or information updating, meaning that parents can continuously adapt their beliefs whenever they receive new information (Morgan, 2005). If this holds, it means that aspirations are potentially in constant flux as some information emerges over time as the child matures (for example, interests and abilities). Others are provided by the school in form of tests and grades, which can also be regarded as a rather continuous process since in primary schooling multiple smaller tests are held, distributed over the entire year. The final grade is therefore only a summary of the information parents have received earlier on. For the posed research questions this seems especially relevant as a *development* (and not an event) is investigated that assumes that parents are actually able to change their aspirations. There is some good evidence available that this is actually the case and that both children and parents adapt their aspirations (Andrew and Hauser, 2011; Carolan, 2017; Forster, 2021). As should be made clear, these studies usually rely on a drastic external shock (e.g., track placement after primary schooling), which is often not anticipated and is therefore a strong and sudden update to the beliefs of the families. The question arises whether updates of aspirations will also occur continuously over time in the absence of strong shocks but depending on a steady yet important influx of new information (for example, through schooling grades or developing interests of children). Also of great relevance is that this process differs, depending on the social status of the family (Karlson, 2015, 2019). The studies highlight that high-achieving pupils from socially disadvantaged families have the strongest reactions to signals about academic achievement when aspirations are adapted. This shows that socially stratified effects exist. As another study reports, in the German system, both the Wisconsin model as well as theories of information updating are probably both valid and contribute to an explanation of social inequality with respect to differences in decision-making (Zimmermann, 2020).

### **2.1.2 Co-development and hypotheses**

After having outlined the theoretical aspects of performance and aspirations separately it is now necessary to form an integrated model that explains how these two aspects can influence each other for guiding the following analyses. Theoretically, there are various arguments why crossed effects should be present, meaning that aspirations can influence performance and the other way round as well. In this section, all aspirations are meant as realistic aspirations (already shortly discussed before) since only those are subject to continuous updating.<sup>3</sup> Starting with aspirations, it makes sense that parents with initially high aspirations will attempt to influence the performance of their

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<sup>3</sup> While the idealistic aspirations can function as predictors of achievement and latter realistic aspirations, they should not be itself depend on the subsequent values of these two variables and are therefore not part of the derived dynamic model.

children, especially when it falls behind expectations. Parents are well aware of the fact that certain levels of performance are required to persist in the most demanding schooling tracks, even in the absence of binding teacher recommendations (Bittmann, 2021). If the grades attained are not good enough, children are not able to transfer to the next highest schooling grade and need to repeat the class or even have to switch to a less demanding school form. Consequently, even with very high aspirations and potentially other means to aid the transition to the desired track, parents know that the child's performance is still an important requirement for educational success. They have various options to influence performance, especially using tutoring and offering additional learning resources to their children (Beal et al., 2007; Hof and Wolter, 2014). Often, these means of support come with financial costs and are not available to all families. Another option is to communicate to the child how important education is for having a successful life and to motivate him or her to invest more time and effort in school, learning and homework (Gottfried et al., 1994). Apparently, this is a gradual process that can be as low as giving advice or as high as forcing the children to learn and punish them if they fail to do so. Of course, given the constraints of intellect and cognitive performance, motivating or even punishing children can only do so much as there are other limits that are beyond the influence of parents. In conclusion, one can expect: the higher the educational aspirations of the parents, the higher the academic performance of their children (Hypothesis 1).

To continue with the role of performance, it is obvious that effects in the inverted direction are also possible. As outlined before, parents usually adjust their aspirations on the basis of the information they receive about their child (Bayesian updating). Clearly, as performance is one of the most relevant predictors of future educational success, it makes sense to assume that it will affect the formation of aspirations as well. For example, assuming that parents hold low aspirations at the start of primary education, noticing that their child is well-performing and mastering the requirements easily might be important information to readjust aspirations. When academic success appears to be in reach, there are good arguments to choose a more demanding schooling track as it offers higher educational qualifications and opens up more educational pathways. While this is not necessarily the case for all parents, one can expect, on average, that performance influences aspirations positively (Hypothesis 2).

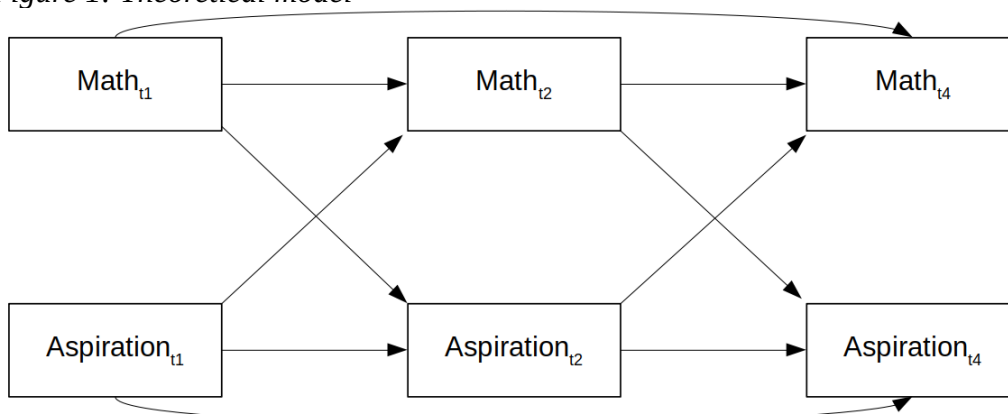
However, this expectation comes with some limitations which are derived from the theories previously discussed. Parents of socially benefited families usually always hold high aspirations and need their children to reach high education, so they are able to reproduce the parental status (status maintenance hypothesis). It is unlikely that these parents will easily readjust their aspirations, even if they notice that their child struggles to reach average performance in class. The motive to acquire



a high academic education is simply too strong to abandon this initial goal. Parents from socially disadvantaged families will probably react differently as they do not have these strong incentives to start with. An additional argument for socially stratified effects stems from parental support. Socially benefited families have much more resources available they can invest in their children, due to additional financial or social support. This is not the case for socially weaker parents. They know that when their child fails in school there is little they can do to help the situation as tutoring or extra assistance are not affordable. This means they have to rely much more on the actual performance the child delivers right now and be careful to not overstretch their aspirations. If it becomes clear that the child struggles in school, it is not wise for them to keep high aspirations as this could mean additional (sunken) costs. Therefore, one would expect socially stratified effects: parents of socially disadvantaged families will readjust their aspirations more easily than parents of socially benefited families (Karlson, 2019; Forster, 2021). In other words, socially disadvantaged families pay more attention to the academic performance of their children when adjusting aspirations while socially benefited families always keep up high aspirations, regardless of the academic performance of their child (Hypothesis 3).

To give an overview, a figure is presented that summarizes the (causal) pathways over the course of primary education. As there are three school grades included in the following analyses, only these points in time are shown. As becomes clear, performance and aspirations are able to influence each other but only in the subsequent wave to account for the temporal order of the events. Additionally, delayed effects are potentially allowed, meaning that variables can directly influence previous waves which are not necessarily mediated by waves in between. The reason for including these are discussed in more detail when the model selection is outlined further below.

*Figure 1: Theoretical model*



Source: own design. No measurements are available for t3, which is hence omitted.

To summarize, the following analyses will give new research insights that go beyond what has been done before. Most importantly, this is the first large-scale ( $N > 4,000$ , 360 schools) analysis that includes actual performance, measured by high-quality achievement tests that are independent of parental, filial or teacher assessment, thus greatly reducing any related measurement errors. It gives insight into the development of aspirations, which is rather unique. Furthermore, a large number of relevant control variables is available to account for spurious correlations and avoid biased estimations. As explained in more detail below, the *total* causal effect is estimated, not separating *between* and *within* influences. Finally, as this study comes from a more sociological perspective, the socially stratified nature of the effects is of special relevance. The overall aim is to explain how early educational inequality forms, which might be relevant for policy and interventions.

### **2.1.3 Previous research findings**

First, selected studies are presented that investigate one-directional effects, so either effects of aspirations on performance or vice-versa. Afterwards, research findings are presented that especially focus on the co-development between achievement and aspirations (or related aspects). To start with the influence of aspirations on achievement, there are quite some studies from varying cultures and contexts that show that positive influences exist. While some reports only present correlations (Cherian, 1994; Rothon et al., 2011; Ahuja, 2016), others attempt to isolate the effects by introducing control variables (Abu-Hilal, 2000; Marjoribanks, 2005; Carroll et al., 2009; Ansong et al., 2019). The overall picture is that high aspirations are associated with better performance, on average. Interestingly, parental aspirations even have a statistically significant positive influence on grades in German secondary education under control of academic performance (measured by test-scores) and other potential confounders (Bittmann and Mantwill, 2020). Overall, the evidence underlines that aspirations of both, parents and their children, can affect the filial achievement. The external validity of the findings is probably high since there is a large variation with respect to important parameters of the studies, like country, culture, statistical method or operationalization. The conclusion is that we can expect positive effects of aspirations on achievement.

To continue with the effect that performance can have on aspirations, we also find positive evidence. Pupils with the highest academic achievement also report the highest educational aspirations (Widlund et al., 2018) and achievement can function as a filter for future aspirations (Shapka et al., 2006). This is in line with other studies that find that achievement predicts aspirations for university majors (Parker et al., 2014). Some more studies come to similar

conclusions in secondary education (Christofides et al., 2015; Korhonen et al., 2016; Widlund et al., 2020). Again, the external validity is probably high since different stages in the educational system are investigated and different measures are available. To conclude, given these empirical results it makes sense to assume that performance does indeed affect aspirations.

Finally, to come to the most relevant part, the cross dependencies of aspirations and achievement, one recent Swiss study finds suspected positive cross-lagged effects of parental aspirations and the academic self-concept of the child (Buchmann et al., 2022). Self-concept refers to a self-assessment of the child of how well it does with school and performance and is potentially a rough proxy of actual performance. While it is not exactly performance but rather how the child perceives its own achievements, this is highly relevant as it shows that parents and children are able to influence each other. As the authors utilize the RI-CLPM one would expect that their findings probably display a lower bound of the effect sizes since trait-like components (the stable components) are partialled out. Further, a Romanian study investigating the interrelations between GPA and personality traits (Big Five) using both kinds of models (CLPM and RI-CLPM) to distinguish between within-person and between-person influences finds that a high GPA can have some protective effects against negative longitudinal effects, like growing neuroticism (Negru-Subtirica et al., 2020). A German study investigating the development of academic self-concept and reading achievement compares multiple statistical methods and only finds between-individual but not within-individual effects, thus questioning the reciprocity of the constructs in elementary school children (Ehm et al., 2019). However, as will be discussed in more detail below, separating between- and within-effects is often neither necessary nor useful. Lastly, a study from the US which also looks at mediation pathways between the two constructs of interest reports that achievement and aspirations influence each other over the course of five waves, even under control of other factors such as overall cognitive ability (Guo et al., 2015). However, the parents were not surveyed and the measures were taken from pupils only. All in all, there is sufficient recent evidence available from multiple countries to conclude parents and their children influence each other over the course of multiple years and readjustment processes of named constructs are present.

## **2.2 Empirical research**

### **2.2.1 Data, variables, and methods**

In this chapter the data, sample, and variables of the empirical analyses are introduced. Afterwards, the analytical model is described.

### 2.2.2 Data and sample

The following analyses are based on the German National Educational Panel Study (NEPS), Starting Cohort 2 (SC2), which initially sampled children in kindergarten (about 4 years old) in 2011 (Blossfeld and Roßbach, 2019; NEPS Network, 2020).<sup>4</sup> The children and their families were then repeatedly interviewed (approximately once per year), which makes it possible to trace their trajectories over time (panel data). In addition to the surveys, participating children were invited to take part in competencies tests developed by the NEPS. Since this is a long-running panel, all children have transferred to secondary education and complete trajectories are available for primary schooling. Summarized, the NEPS is a powerful data source since it not only provides high quality individual panel data but also information on the family, social background, schools, and competencies in various disciplines. Of special interest for the following analyses are waves 3 to 6, which correspond to schooling grades 1 to 4 (the normal range of primary schooling in Germany). For this study, the competencies are restricted to the tests in mathematics, which were conducted in waves 3, 4 and 6. Other domains of interest, especially the reading competencies, were not used since they were measured less often. Note that math competence was not tested in wave 5 (grade 3), therefore this wave is omitted from the analyses. Initially, there were 6,734 pupils participating in grade 1. There are no sample restrictions besides removing pupils with a lot of relevant information missing (never taking part in any math test or the parents never taking part in the adult survey) and pupils who have been identified as having special educational needs. After conducting multiple imputation (for details see below), there are 4,325 cases left for analysis.

### 2.2.3 Variables and operationalization

Parental aspirations are measured using the following item: “And considering everything you know now: What qualification will [name of the child] actually finish school with?”. This item is dichotomized into higher education entrance qualification (*Abitur*, coded 1) or any other lower educational degree (coded 0) as this reflects the most relevant theoretical distinction (directly able to enter tertiary education or not). This item measures realistic educational aspirations - what a child can actually achieve. Idealistic aspirations (which are by design independent of prior achievement or any other economic or social restrictions) are not used since they should be, according to theory, rather independent of performance and are therefore not optimal for the analyses.

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4 This paper uses data from the National Educational Panel Study (NEPS): Starting Cohort Kindergarten, doi:10.5157/NEPS:SC2:9.0.0. From 2008 to 2013, NEPS data was collected as part of the Framework Program for the Promotion of Empirical Educational Research funded by the German Federal Ministry of Education and Research (BMBF). As of 2014, NEPS has been carried out by the Leibniz Institute for Educational Trajectories (LIfBi) at the University of Bamberg in cooperation with a nationwide network.

Performance is measured using the comprehensive NEPS tests which are conducted within the classroom context in grades 1, 2 and 4. To be precise, the mathematics tests are used since this competence domain has been tested the most often in the NEPS primary school sample. To give a concrete example, in grade 4, 24 questions are posed to the children, which are then scaled using a partial credit model (Schnittjer et al., 2020). The general conceptual framework is oriented at other comparable tests (like PISA) and attempts to cover various mathematical aspects like quantity, space and shape or interpretation of data to give a comprehensive view of a child's ability. While the NEPS provides weighted maximum likelihood (WLE) estimates per default, the option is given to estimate plausible values (PVs). Although WLEs represent the individual competence level accurately, they systematically overestimate the variance in a sample and can thus be a source of bias for analyses on the population level (Lüdtke and Robitzsch, 2017; Scharl et al., 2020). Since one is interested in this kind of analysis, generating PVs appears to be relevant. In this process, the values are estimated by not only including the competence items in the models but also all other variables that are part of the following analytical models (for example, gender, migration status, or parental aspirations). This process creates multiple performance estimates for each pupil, which is then similar to the handling of imputed data. In the end, it is straightforward to combine plausible values and imputed datasets (regarding the other variables) and conduct the analyses of interest. Plausible values are computed using the R-package *nepsscaling* 2.0.0 (Scharl et al., 2020). For the following analyses, the performance scores are standardized by grade 1.

Finally, to account for potential spurious correlations, a large set of relevant control variables is selected for the analytical models based on previous research findings (Eckerth et al., 2014). The gender of the child is included as a binary variable, the same holds for the place of residence (East or West Germany). Parental education is measured by the highest educational qualification in the family and dichotomized. If either the father or the mother of the child have obtained the higher education eligibility (Abitur) or any tertiary degree, this variable is coded 1, 0 otherwise. According to the theory of status maintenance, this variable indicates the educational orientation of the family. Parental income is included as the total after tax monthly household income as a logged variable to ease statistical inference. The age of the child is computed in 2013 (date of reference was set to June 1) when pupils were in grade 1. The migration background is a binary variable and coded 1 for migration background if at least one parent is born abroad, 0 otherwise. The number of siblings living in the same household is included as well. Finally, it is measured whether the parents are living together (nuclear family) or not (for any reasons). If the parents report that they are living together at all times from grade 1 to 4, this is counted as a nuclear family (coded 1). If there is at

least one point in time when parents are not living together, it is counted otherwise (coded 0). A final control variable is whether a child has ever been diagnosed with dyscalculia. By including these control variables, the internal validity of the findings should be strengthened as they might potentially function as confounders, meaning they influence both performance and aspirations at the same time.

## **2.2.4 Modeling strategy**

As Figure 1 indicates, the analytical model is some variation of the cross-lagged panel model (CLPM). “Crossed” since the two main variables are allowed to influence each other and “lagged” since values of previous points in time are allowed to influence only following points, therefore respecting the direction of causality. Interestingly, there is a long and still ongoing debate in the literature about the specific model to use (Hamaker et al., 2015; Mulder and Hamaker, 2021; Usami, 2021). Shown in Figure 1 is a hybrid between the standard CLPM and a variation that accounts for higher-order lags, as, for example, variables at  $t_1$  are allowed to influence variables at  $t_4$ , which can be thought of as delayed effects. A quite different implementation of these models is CLPM with random intercepts (RI-CLPM), which were created since the standard CLPM is apparently not able to account for trait-like and time-invariant aspects of variables. To give a concrete example, when the development of math performance over time is of interest, one could suspect that this ability can be decomposed into a constant component (the inherent math ability, the talent or capability, which should be rather stable over time, since some pupils are just better at math than others) and a variable component, that can be influenced by the quality of teaching, the time spent with homework or tutoring. As some authors argue, this RI-CLPM (which can be thought of as a form of fixed-effect models as the fixed part of a variable is accounted for) is inherently better since the CLPM only accounts for temporal stability due to the autoregressive terms in the model (the same variables from earlier points in time). Statistically speaking, this means that it is assumed that each individual varies around the same mean and no stable components exists, which is unrealistic for most variables in the social sciences. While these benefits of the RI-CLPM seem appealing, there is also critique. Quite relevant, the RI-CLPM only captures temporary fluctuations around the individual person mean and is not able to account for effects that explain differences between persons. Furthermore, the claim that this type of model is able to account for unobserved confounding is only true for very specific data constellations and is not a general property of this approach (Lüdtke and Robitzsch, 2021). In addition, the RI-CLPM is usually more appropriate for studies interested in the explanation of shorter time lags (e.g., days) and not in systematic long-term changes (Lüdtke and Robitzsch, 2021; Orth et al., 2021). Another major drawback is that the RI-

CLPM is at the moment only statistically well-defined for continuous outcome variables, which is relevant for the following analyses as aspiration is a binary variable. Given all these considerations, the decision was made to utilize the hybrid CLPM using a selection of higher-order lags and including a large set of relevant control variables.<sup>5</sup> What this means for the interpretation is discussed in more detail in section 4.2. According to simulation studies, this procedure should give valid results for posed research questions as the true data-generating process is not known. As there is no option to test which model is the least biased to estimate causal effects as relevant statistics like model fit indices are not indicative, there is no reason to believe that this modelling is inherently biased. I follow the suggestion of Lüdtke and Robitzsch (2021, 19) to focus on the panel-structure of the data and include relevant control variables (VanderWeele et al., 2020).

Practically, the following analyses will be conducted as structural equation models (SEM). While SEM is not the most prominent statistical approach in sociology, it is highly similar to well-established methods (like regressions) and of great relevance for the current research questions. The main advantage of SEM is that it is feasible to test elaborate models in a single step where variables can be both dependent and independent. As Figure 1 shows, this is exactly what is proposed theoretically. To be clear, SEM is by no means magical or superior to other methods. Aspects like causality are the same in comparison to other models and not the choice of statistical approach but theoretical reasoning and the inclusion of relevant control variables can help to recover causal effects. To be precise, the following model will be a path analysis (since there are no latent constructs included due to the restrictions of the data). In the end, the interest lies in two distinct results: first, the path coefficients, which are interpreted as OLS regression coefficients, and the overall fit of the model, which makes it possible to state whether the data fit the theoretical model or not. If this fit is not satisfying, it might be necessary to reject the theoretical assumptions altogether and create a new analytical framework. The path coefficients are highly relevant to make statements about specific relations within the model and assess the size of the effects. Note that this statistical modeling also applies to the binary outcome variable (parental aspirations). In the past, researchers have often preferred logistic models for these outcome variables, however, there are also good arguments to use OLS for binary outcomes (linear probability model, LPM) (Angrist and Pischke, 2009, 47; Wooldridge, 2010, 579ff.). By doing so, complications due to rescaling effects in the cross-dependency models are avoided to ease interpretation and comparability between the two

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5 Note that this is not a complete full-forward (FF) model since there is no cross-lagged effect between t1 and t4 specified. As some authors argue, there are often no robust theoretical reasons for the presence of these delayed crossed effects (Ehm et al., 2019, 8). The same holds for the introduced theoretical framework, which gives little reason to believe that these delayed crossed effects should appear. For example, why should aspirations in grade 1 affect the achievement in grade 4 independently of what happens in grade 2 as for the child the most recent parental behaviour is probably decisive. However, the FF-CLPM is tested as a robustness check further below.

outcomes, which is the most relevant argument for using a LPM at this point. I do not expect a bias due to this modeling strategy since the shares of high aspirations are usually well below 90% and the linear model is a good approximation in these not extreme regions (see Table 1).

All computations are done in Stata 16.1, except for the estimation of plausible values, which are generated using R. To account for item nonresponse, data are imputed with multiple imputation with chained equations (MICE), creating a total of 50 complete datasets (Azur et al., 2011). Some additional auxiliary variables are included to improve the quality of the imputation. The imputation model is set to draw from the specified predicted posterior distributions which depend on the scaling of the variables (e.g., binary or continuous). Various quality measures of the imputations were tested (distribution of generated values, no impossible values, convergence) and approved. To account for the fact that the competence tests are conducted within schools and not at home, which creates a form of nested data, standard errors are clustered by schools.

## **3 Results**

This chapter provides all descriptive and analytical findings and concludes with a final verdict on the proposed hypotheses.

### **3.1 Descriptive overview**

Before conducting the main analyses, a descriptive overview is helpful to get an impression of the data. The results are summarized in Table 1. In addition, the descriptive statistics are grouped by educational level (parents with at least higher education eligibility vs other parents) as stratification is of special interest for the advanced analyses.



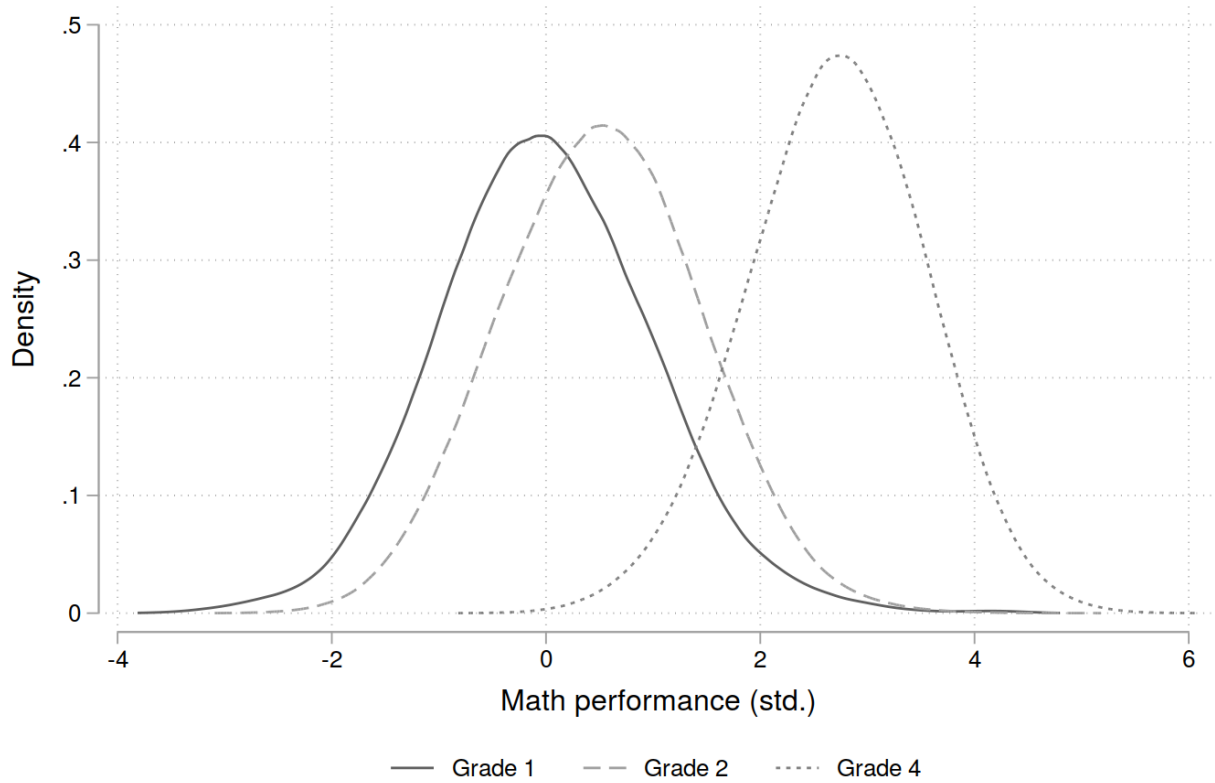
Table 1: Descriptive statistics

	Total sample		Below higher education eligibility		Higher education eligibility or higher		Share imputed
	Mean	SD	Mean	SD	Mean	SD	
Math performance t1 (Std.)	0.00	1.00	-0.30	0.99	0.16	0.97	5.4
Math performance t2 (Std.)	0.52	0.93	0.18	0.91	0.69	0.89	9.5
Math performance t4 (Std.)	2.71	0.82	2.35	0.80	2.90	0.76	14.3
High aspirations t1	0.67	0.47	0.43	0.50	0.80	0.40	11.4
High aspirations t2	0.67	0.47	0.45	0.50	0.78	0.41	17.3
High aspirations t4	0.68	0.46	0.46	0.50	0.80	0.40	31.1
Female pupil	0.52	0.50	0.54	0.50	0.52	0.50	< 5
Age of pupil in 2013	7.27	0.37	7.33	0.38	7.23	0.35	< 5
Living in Eastern Germany	0.14	0.35	0.17	0.38	0.13	0.33	< 5
Migration background	0.21	0.41	0.24	0.43	0.19	0.40	< 5
Number of siblings in the household	1.13	0.89	1.10	0.96	1.15	0.85	14.7
Total logged household income	8.17	0.47	7.91	0.42	8.31	0.43	< 5
Parents with <i>Abitur</i> or higher education	0.66	0.47	0	0	1	0	< 5
Parents living together	0.79	0.41	0.73	0.44	0.82	0.38	< 5
Child having dyscalculia	0.018	0.13	0.034	0.18	0.0098	0.098	8.5
Observations	4325		1479		2846		

Source: NEPS SC2, imputed data.

It becomes clear that overall math performance increases over time. In grade 1, the mean is 0 since it is z-standardized, the following points in time can be interpreted as deviations from this mean. Figure 2 also indicates that these measures are approximately normally distributed. The aspirations are quite constant over time, at least when the aggregated measures are inspected. However, there is also enough *within*-subject variation present in the data to be exploited for the analyses (standard deviation of aspirations is about 0.24). Another way to visualize this is to plot how many parents actually change their aspirations over time, which is done graphically in Figure 3. Apparently, the large majority of parents will hold their aspirations constant while some changes are present. The share slightly increases over the course of primary education. In grade 1, the average pupil was about 7.3 years old. About 66% of all pupils had parents who obtained higher education eligibility or a tertiary degree, which indicates that the NEPS sample is rather highly educated.

Figure 2: Distribution of math competencies by grade



Source: NEPS SC2, imputed data. Competencies are standardized by grade 1.

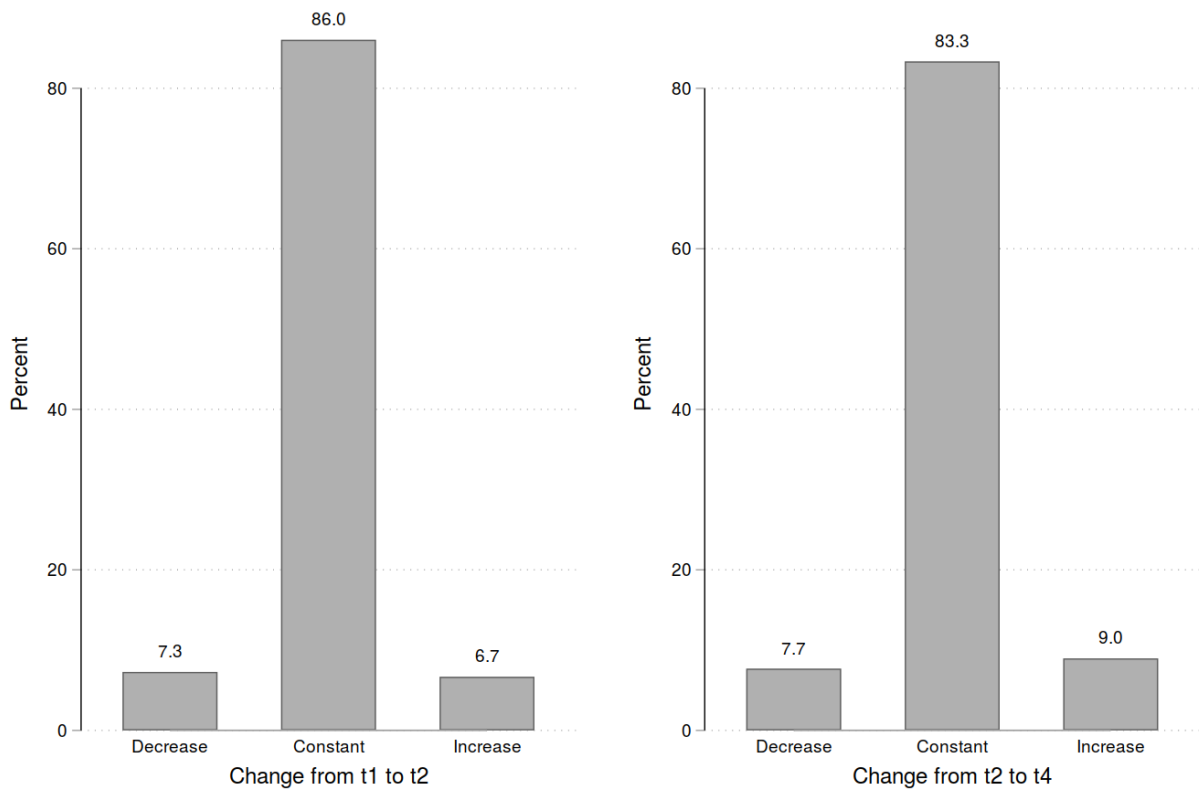
When focusing on the effect of parental education as a stratifying variable, it becomes clear that group differences are present. More highly educated parents have a higher probability to hold high educational aspirations and their children perform better in the achievement tests. Also, they are less likely to have a migration background and their income is higher, on average. These results make sense and indicate that parental education is correlated with social origin.

### 3.2 Cross-lagged panel model

Next, the main model follows, the CLPM, which implements the theoretical model of Figure 1. The results are shown in Figure 4 for a convenient interpretation; numerical results are reported in the appendix in table A1. Since most variables can be both dependent and independent, results are depicted separately by the dependent variable. Note that, strictly speaking, all variables in this model are endogenous (even performance and aspirations in t1) since control variables are included. Visually, this means that an arrow points from the vector of all control variables to each variable in Figure 1 (not shown for a clearer depiction). The error terms between performance and aspirations are allowed to be correlated within each point in time. Reported are 95% confidence intervals in brackets.

Before continuing with the empirical results, the correct interpretation of the model should be explained, which is also referring back to section 3.3 where differences between the CLPM and the RI-CLPM are outlined. Exemplary, the cross-lagged effect of the CLPM as specified above answers the question whether parents having high aspirations (compared to other parents) at time point  $t$  have their child showing higher achievement (compared to other children) at time point  $t+1$  (Lüdtke and Robitzsch, 2021, 13).<sup>6</sup>

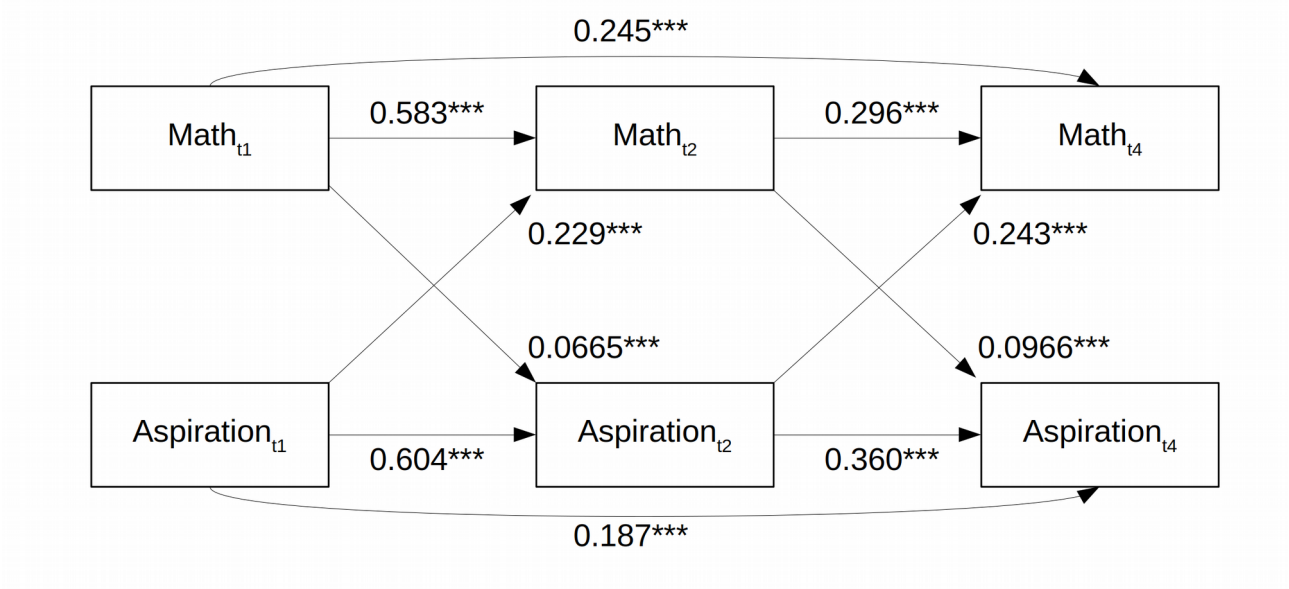
*Figure 3: Share of parents changing aspirations over time*



Source: NEPS SC2, imputed data.

<sup>6</sup> In contrast, the RI-CLPM would tell: do parents who have higher deviations from their long-term average aspirations at time point  $t$  have a child that is likely to show a higher deviation from his or her long term average achievement score at time point  $t+1$ ? Note that answers a quite different research question.

Figure 4: path coefficients for the CLPM



Source: NEPS SC2, imputed data. Control variables: gender, age, income, parental education, migration status, number of siblings, place of residence, single parents, dyscalculia. Standard errors clustered by school.

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

First, the overall model fit is reported to gauge whether the data are congruent with the proposed theoretical model. The probably most relevant statistic is the root mean squared error of approximation (RMSEA). The central idea of this statistic is to compare the observed variance-covariance matrix with the proposed one (the model). If this statistic is large, it means that the proposed model shows larger deviations from the data. In the literature, a RMSEA below 0.05 is considered as very good and between 0.05 and 0.08 as good (Gana and Broc, 2019, 43). As the statistic reported, it is 0.048, indicating that the model is fine. The question might arise why all potential effects are then not simply added to the statistical model, which makes the model identical to the data and lowers the RMSEA to 0. However, such a saturated model is usually not of theoretical interest as it simply states that everything is related to everything else. That is why other indices are reported which also take the degree of parsimony into account. The Comparative Fit Index (CFI) and Tucker-Lewis Index (TLI) should be larger than 0.90 for a good model fit and larger than 0.95 for a very good fit. These values are 0.999 and 0.951, indicating a good overall fit. The conclusion is that the proposed theoretical model is quite congruent with the observed data and that the theoretical assumptions are therefore grounded in reality. After the overall model fit the path coefficients are of special interest.

Starting with performance, we notice that achievement always significantly predicts the achievement in the subsequent wave of the survey, which makes sense. Additionally, there is a highly significant effect of performance in grade 1 on performance in grade 4, even under the control of performance in t2. Interpreting this finding is interesting: potentially, this is a delayed effect. One could also consider this to be the influence of the time-constant trait or “talent” with respect to mathematical ability. This would also explain why the effect of math t2 on t4 is smaller since this is then to be viewed as a compound effect (the stable effect and the variable effect due to additional gains from t2 to t4). For aspirations, these effects are conceptually similar. Since these numbers are the result of linear probability models, one can interpret them as average marginal effects. For example, parents who hold high aspirations in t1 have a 60.4 percentage point larger probability to hold high aspirations in t2 than parents without high aspirations in t1. To continue, the crossed effects are of special interest. For t2, which can only be influenced by t1, we see that children of parents who hold high aspirations have, on average, a performance that lies 0.23 standard deviations above children of parents who do not hold these aspirations. Since this result is under control, so to speak, of math performance in t1, one can interpret this effect as an actual change from the baseline that is due to the higher aspirations. A quite similar finding holds when the effect of aspirations in t2 influences performance in t4. Regarding the effects of performance on

aspirations, we also see positive and statistically significant results. The interpretation is that with each standard deviation more of performance, the probability to hold high aspirations in t2 increases by about 7 percentage points. For the following point in time, this effect even increases to almost 10 percentage points.

As hypothesis 1 states that higher aspirations predict higher performance, one can accept this hypothesis as the relevant coefficients are positive and statistically highly significant. Hypothesis 2 is that there is a positive effect of performance on aspirations. As the coefficients clearly show, this is indeed true. Since this is the case for both grade 2 and 4, hypothesis 2 is accepted.

### **3.3 Socially stratified effects**

As explained before, one could expect that the path coefficients in the above model are not identical for lowly and highly educated parents. This can be tested empirically using Wald tests or whether parameters constrained to be equal across groups should be relaxed. One can think of this as having an interaction term between each coefficient and parental education. Since the education of the parents is the variable to stratify on, it is no longer included in the set of control variables. The rest of the model is identical. Results are displayed in Table 2. For easier identification, the relevant lines in the table are marked with “H3”. To test the difference between the coefficients, either the confidence bands or the p-values (corresponding to the Wald tests) can be used. Regarding performance, it is clear that the effects of aspirations are quite similar and no statistically significant differences are present. However, when aspirations are the dependent variable, other effects are visible. For aspirations in t2, the effect of performance is a bit higher for parents with less education, yet not statistically significant as the difference is only about 2 percentage points. This changes for aspirations in t4, the effect of performance is 0.13 for the lowly educated but only 0.079 for the highly educated. The p-value and confidence bands clearly indicate that this is a statistically significant difference. The conclusion is that less educated parents react more strongly to high performance than highly educated ones. Therefore, hypothesis 3 is accepted.

Table 2: Structural equation modeling path coefficients by parental level of education

	No higher education eligibility	Higher education eligibility or higher	P-value Wald-test difference of coefs.
<b>Math performance t4 (Std.)</b>			
Math performance t2 (Std.)	0.29*** [0.23,0.35]	0.30*** [0.25,0.34]	0.512
Math performance t1 (Std.)	0.25*** [0.20,0.30]	0.24*** [0.20,0.28]	0.578
High aspirations t2	0.24*** [0.16,0.32]	0.25*** [0.18,0.32]	0.621
<b>Math performance t2 (Std.)</b>			
Math performance t1 (Std.)	0.58*** [0.54,0.63]	0.58*** [0.55,0.61]	0.602
High aspirations t1	0.19*** [0.11,0.27]	0.26*** [0.19,0.33]	0.138
<b>High aspirations t4</b>			
Math performance t2 (Std.)	0.13*** [0.099,0.16]	0.079*** [0.062,0.096]	0.000 (H3)
High aspirations t2	0.34*** [0.27,0.41]	0.37*** [0.30,0.43]	0.463
High aspirations t1	0.19*** [0.12,0.26]	0.19*** [0.12,0.25]	0.688
<b>High aspirations t2</b>			
Math performance t1 (Std.)	0.080*** [0.055,0.10]	0.059*** [0.044,0.074]	0.109 (H3)
High aspirations t1	0.59*** [0.54,0.64]	0.61*** [0.57,0.66]	0.491
Observations	4325		

Source: NEPS SC2, imputed data. 95% confidence intervals in brackets. Lines with special interest for H3 are marked.

Control variables: gender, age, income, migration status, number of siblings, place of residence, single parents, dyscalculia. Standard errors clustered by school.

\* p < 0.05, \*\* p < 0.01, \*\*\* p < 0.001

### 3.4 Robustness checks

Various robustness checks are conducted to test the stability and validity of the findings. This concerns mostly the statistical modeling and testing whether the same conclusions hold for various subpopulations. The first aspect is to test whether the findings are similar for boys and girls. It is known that boys usually show slightly larger math achievement than girls, while these effects are especially pronounced in older pupils (Mullis et al., 2012). As a test, the basic model is computed separately for boys and girls. The findings are summarized in the appendix in Table A2. The conclusion is that the coefficients are highly similar and there are practically no gender differences visible. The second test is whether the results are similar for natives and migrants. It is a well-established finding that the role of aspirations differs between these two groups as migrants usually have a higher chance than natives to come from a disadvantaged social origin and have less resources available (Kao and Tienda, 1995; Becker, 2010; Relikowski et al., 2012). Yet, parents often have high aspirations, which is normally not the case for socially disadvantaged natives. This opens up the question whether all findings also hold for the migrant sub-sample. The results are shown in the appendix in table A2. The results are highly similar, with a single exception: the

coefficient of high aspirations on math performance in grade 2 is lower for migrants than for natives (0.15 vs 0.25). However, the coefficient for migrants is still statistically significant. The difference is slightly smaller in the subsequent wave (0.18 vs 0.27), meaning that natives and migrants apparently converge on these estimates over time. As the confidence bands clearly overlap it is probably not the case that very different conclusions should be drawn for migrants and natives. Follow-up studies might want to investigate the role of migration in more detail, which then opens up quite different and novel research questions.

As another side note, using a different cut-off point for high parental education (either having obtained any tertiary degree or not) does not lead to different conclusions as the effects even become slightly more pronounced in the stratified model.

Additionally, the FF-CLPM is tested, which means that crossed pathways between t1 and t4 are introduced to the basic model. The findings are reported in table A3. Apparently, these additional crossed effects are much smaller, which makes sense since the intermediate wave takes most of the effects. The delayed effect of achievement on aspirations is higher than for aspirations on achievement. The conclusions drawn from these two models are highly similar. Since the CLPM as used before is more parsimonious, it is the preferred one.

Finally, it must be made transparent that parental aspirations are in the vast majority the motherly aspirations since in the NEPS SC2 parent survey, only one parent was surveyed. For example, in grade 1, more than 90% of all parental respondents were female (the biological mother or a female legal custodian). Additional tests show that the gender of the responding parent is not associated with the level of aspirations in conditional models (under control of the other variables). Also, I did not find any relevant differences between models when testing the education of either the mother or the father and not the highest of both values. This means that the results are robust with respect to parental education. Potentially, the high level of homogamy with respect to education in couples as well as the transmission of aspirations between both parents can explain why no differentials are found here.

## 4 Discussion

As the results clearly indicate, parental aspirations and filial math achievement do co-develop over the course of primary education. Children of parents holding high aspirations show higher test scores in the following survey wave. Conversely, parents of children who perform better in the tests have a higher probability to report high aspirations in the subsequent wave. These results are in line



with theoretical expectations and earlier publications and underline that a dynamic feedback process is going on. Based on this evidence, one can conclude that the emergence of social inequality, which usually becomes first visible when the decision for the secondary schooling track has to be made (after the end of grade 4), is not a single event but a long-lasting process that goes on for years. While most analyses are only able to shed light on this specific event due to the lack of longitudinal data, the present study elucidates what is happening years before the actual decision. What does this mean for future research and policy? It should be highlighted that all numbers are computed under the control of a large set of potentially confounding variables, and that these spurious influences are hence attenuated. Since both the financial situation of the family (measured by the household income) and the overall educational orientation (measured by the parental level of education) are held constant, it is fascinating that aspirations are still of greatest relevance. The conclusion is that these aspirations are partially independent of these other two factors that are usually the most relevant predictors of social inequality. While this cannot be proven with the available observational data, one can suspect that increasing parental aspirations might have positive effects on the performance of the children. Given the findings, it seems important to pursue this question further and test in more detail whether programs or interventions that specifically target parental aspirations show to affect grades and academic achievement.

When considering the effects of achievement in more detail, the results underline that parents of high-achieving pupils hold higher aspirations. This makes sense as these pupils have a higher probability to enter the academic track and fulfill the high academic expectations. As parents are usually well aware of the performance of their children due to grades and feedback from the teachers, they have good evidence to adapt their aspirations. The socially stratified findings are here of greatest interest. As shown clearly, especially parents with lower educational qualifications pay much attention to the performance of their children. In other words, they are quite sensitive to achievement, their aspirations depend much more on them as it is the case for highly educated parents. This finding, which is in line with theoretical assumptions and previous research results (Karlson, 2019), highlights how social inequality slowly emerges in primary education over the course of multiple years. Since parents with lower educational qualifications have a lower probability to hold high aspirations than more educated ones, even when the performances are equal, this means that the probability is high that their children will not obtain higher educational qualifications as well. Referring back to potential interventions, this means that especially families with lower educational qualifications need to be targeted as the other families will usually always hold high aspirations, which depend much less on actual performance.

To conclude, the limitations of the current study must be made transparent. First, the CLPM as used in the analyses compute a total effect, so within- and between-effects are taken together. This affects the interpretation of the findings as not pure *changes* are investigated. To be clear, it would be incorrect to state that an *increase* of aspirations influences achievement in a certain way as this would only concern intra-individual (within) variation. That being said and what is also known from previous studies, if one were to compute models that specifically take person-constant parts out of the estimation (RI-CLPM), the estimated coefficients would be smaller. Therefore, the findings presented here are probably upper bounds of effect sizes. Second, the data is observational, so it is not feasible to recover pure causal effects. Given the large set of relevant controls, one can assume that there are probably no strong confounders left but this is a theoretical question that cannot be proven statistically. Third, as some research points out, all panel models attempting to establish a causal order rely on the assumption that the lags are correctly specified (Vaisey and Miles, 2017; Leszczensky and Wolbring, 2022). This is highly problematic and there are currently no comprehensive statistical solutions available. As the researchers point out, in a worst-case scenario, coefficients could even switch signs. Given the current state of research one can only refer to previous findings and theory, which are both in line with the results of the present study. Given limitations due to statistical knowledge and data, there is currently no option available to guarantee that the findings are absolutely robust. However, given that dozens of previous studies as outlined in section 2 come to similar conclusions (also given the high degree of variation with respect to research designs and statistical techniques), it is unlikely that they all suffer from an unfortunate lag-constellation and the entire research field comes to the same wrong conclusion. Fourth, presented are results for math achievement. It is obvious that the NEPS-tests are only one of the potentially many ways to define, measure, and operationalize achievement. Other tests might come to different conclusions as “achievement” or “performance” are (latent) constructs. Also, only mathematics was investigated in this study and this is, of course, only one part of the complete picture. Follow-up studies might want to examine the relation with other measures of performance, especially reading as this is another, highly relevant indicator of performance and development.

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## 6 Appendix

Table A1: Path coefficients of the CLPM

	Coef.	95% CI
<b>Math performance t4 (Std.)</b>		
Math performance t2 (Std.)	0.296***	[0.255,0.337]
Math performance t1 (Std.)	0.245***	[0.211,0.278]
High aspirations t2	0.243***	[0.188,0.299]
<b>Math performance t2 (Std.)</b>		
Math performance t1 (Std.)	0.583***	[0.556,0.610]
High aspirations t1	0.229***	[0.176,0.281]
<b>High aspirations t4</b>		
Math performance t2 (Std.)	0.0966***	[0.0806,0.112]
High aspirations t2	0.360***	[0.311,0.408]
High aspirations t1	0.187***	[0.140,0.234]
<b>High aspirations t2</b>		
Math performance t1 (Std.)	0.0665***	[0.0538,0.0791]
High aspirations t1	0.604***	[0.570,0.638]
RMSEA (90% CI)	0.0477 (0.0309; 0.0667)	
CFI	0.9986	
TLI	0.9512	
Observations	4325	

Source: NEPS SC2, imputed data. 95% confidence intervals in brackets. Standard errors clustered by schools.

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

Table A2: Robustness checks (subgroup analyses for the CLPM)

	Boys	Girls	Natives	Migrants
<b>Math performance t4 (Std.)</b>				
Math performance t2 (Std.)	0.30*** [0.25,0.36]	0.29*** [0.24,0.34]	0.29*** [0.25,0.34]	0.31*** [0.23,0.39]
Math performance t1 (Std.)	0.24*** [0.19,0.28]	0.25*** [0.21,0.30]	0.23*** [0.20,0.27]	0.28*** [0.21,0.34]
High aspirations t2	0.25*** [0.17,0.32]	0.24*** [0.16,0.31]	0.27*** [0.20,0.33]	0.18** [0.064,0.29]
<b>Math performance t2 (Std.)</b>				
Math performance t1 (Std.)	0.59*** [0.56,0.63]	0.58*** [0.54,0.61]	0.58*** [0.55,0.61]	0.61*** [0.55,0.66]
High aspirations t1	0.20*** [0.13,0.27]	0.26*** [0.18,0.33]	0.25*** [0.19,0.31]	0.15* [0.032,0.27]
<b>High aspirations t4</b>				
Math performance t2 (Std.)	0.089*** [0.067,0.11]	0.10*** [0.081,0.12]	0.092*** [0.074,0.11]	0.11*** [0.078,0.15]
High aspirations t2	0.39*** [0.32,0.45]	0.34*** [0.27,0.40]	0.38*** [0.33,0.43]	0.28*** [0.18,0.39]
High aspirations t1	0.20*** [0.13,0.27]	0.17*** [0.11,0.23]	0.17*** [0.12,0.23]	0.23*** [0.13,0.32]
<b>High aspirations t2</b>				
Math performance t1 (Std.)	0.070*** [0.053,0.088]	0.063*** [0.046,0.079]	0.065*** [0.050,0.079]	0.074*** [0.046,0.10]
High aspirations t1	0.61*** [0.56,0.65]	0.60*** [0.55,0.65]	0.61*** [0.57,0.65]	0.57*** [0.49,0.64]
Observations	2056	2269	3421	904

Source: NEPS SC2, imputed data. 95% confidence intervals in brackets.

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$



Table A3: Full-forward CLPM

	Coef.	95% CI
<b>Math performance t4 (Std.)</b>		
Math performance t2 (Std.)	0.29***	[0.25,0.33]
Math performance t1 (Std.)	0.25***	[0.22,0.29]
High aspirations t2	0.22***	[0.15,0.28]
High aspirations t1 (FF-Pathway)	0.041	[-0.020,0.10]
<b>Math performance t2 (Std.)</b>		
Math performance t1 (Std.)	0.58***	[0.56,0.61]
High aspirations t1	0.23***	[0.18,0.28]
<b>High aspirations t4</b>		
Math performance t2 (Std.)	0.074***	[0.054,0.094]
Math performance t1 (Std.) (FF-Pathway)	0.032***	[0.014,0.049]
High aspirations t2	0.35***	[0.31,0.40]
High aspirations t1	0.19***	[0.14,0.24]
<b>High aspirations t2</b>		
Math performance t1 (Std.)	0.066***	[0.054,0.079]
High aspirations t1	0.60***	[0.57,0.64]
Observations	4325	
Source: NEPS SC2, imputed data.		
* $p < 0.05$ , ** $p < 0.01$ , *** $p < 0.001$		



# Chapter 3

## Investigating the role of educational aspirations as central mediators of secondary school track choice in Germany<sup>1</sup>

**Abstract:** Educational aspirations are known to be one of the most relevant predictors of secondary school choice after finishing elementary school in the German educational system. Since aspirations themselves mostly derive from the social background of a family, the question arises whether aspirations can be understood as a mediating factor explaining how social origin determines choice of school. In addition to that, it would be of great interest to disentangle parental and filial aspirations to better understand which factor is more relevant for the decision. After proposing a unified theoretical model that accounts for both primary and secondary effects of social origin, the analyses attempt to quantify the share that is mediated through aspirations and hence test the model empirically. Using large scale panel data, I can demonstrate that aspirations explain a considerable share of the variance of the decision for choosing a school track in secondary education (ca. 24 percentage points). The following analyses estimate that the indirect effect of social origin that is mediated through aspirations amounts to almost 80%, which means that the residual pathway must therefore be small in comparison. Detailed analyses reveal that especially parental realistic aspirations explain the major share of this effect (about 42%) and their aspirations will be decisive when conflicting with the aspirations of their children.

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# 1 Introduction

The choice of secondary school at the end of primary education in the German educational system is one of the most prominently researched topics for the explanation of emerging social inequality. In the German system, children are sorted at a very young age (around ten years old) into up to four qualitatively different tracks, based on their academic performance, but also depending on the will of the parents, which has gained increased influence in this decision (Bittmann, 2021b). The consequence of this choice is hard to overstate since it shapes the following educational trajectories and the decision depends on both primary and secondary effects of social origin (Blossfeld et al., 2019; Ditton & Krüsken, 2006, 2010; Gresch et al., 2010; Klinge, 2016). Here, primary effects reflect differences in the ability of children while secondary effects are differences in educational decisions, independent of academic performance (Boudon, 1974). Track selection can be considered as a major and early educational decision, which is strongly dependent on social origin and educational aspirations (Wohlkinger, 2017). In the following, both idealistic and realistic aspirations will be theoretically and empirically disentangled (Haller, 1968). *Idealistic* aspiration refer to overall educational preferences which are not necessarily grounded in what can be realistically achieved but are the expression of normative values, attitudes and beliefs of the parents and their children. In contrast to these, *realistic* aspirations take actual limitations, like insufficient academic performance of the child or low economic resources, which can prohibit the choice of some educational pathways, into account. Taken together, these two kinds of educational aspirations can be assumed to transmit the effect of social origin since they capture both primary and secondary effects (Gresch, 2012). Hence, aspirations are not only a main determinant of track choice but also a mediator that explains how social origin influences this choice (Neuenschwander & Malti, 2009; Wohlkinger, 2019).

I argue that aspirations deserve to be regarded as a key element in the explanation of track choice since they allow the integration of various theoretical constructs and serve as the main mediator that links social origin and choice. In the following, I propose an integrated theoretical model that is derived from multiple, well-established, sociological frameworks. By doing so I not only introduce a theoretical argument but also offer an empirical test using high quality longitudinal data. In more detail, the first step is to quantify the overall share of variance in the decision to enter the academic track in secondary education that is explained through aspirations (RQ 1). In addition to that, it is relevant to investigate social stratification and check whether this contribution of explained variance varies by the social origin of the family (RQ 2). Afterwards I analyze whether aspirations are indeed mediators that explain how and why social origin influences the track decision (RQ 3). Finally, I attempt to disentangle all forms of aspirations to understand which mediating pathway is the most

relevant and to understand how realistic and idealistic aspirations of both parents and their children contribute (RQ 4). I argue that these questions deserve more attention since establishing educational aspirations for the choice of track has not only theoretical but also practical implications for further research and surveys. If it is possible to demonstrate that most primary and secondary effects of social origin are indeed transmitted through aspirations, this could facilitate the simplification of models and surveys, depending on the respective research question. Furthermore, the analyses will help to better understand the decision making processes for educational choices, which involve both parents and their children and are hence rather complex as mutual dependencies and interactions are probably present.

To summarize my contribution, the following analyses will investigate the role of idealistic and realistic aspiration of both parents and their children with German panel data. This allows us to understand in more detail how aspirations mediate the effect of social origin on educational decisions and disentangle their relative contribution in comparison to unexplained influences. By doing so, I am able to demonstrate empirically that aspirations are the most relevant mediator of social origin on this decision.

## **2 Theoretical background**

### **2.1 German secondary education and the role of aspirations**

In Germany, tracking starts relatively early at around age ten in most federal states. After four years of elementary school, children face the choice of up to four different tracks (Eckhardt, 2017). The academically most demanding option, the academic track (*Gymnasium*), awards children with the certificate of higher education eligibility (upper secondary qualification, *Abitur*) after eight or nine years. This certificate is the most prestigious and allows the transition to all tiers of tertiary education. All other tracks, the lower and intermediate secondary schools (*Hauptschulen / Realschulen*) as well as the comprehensive schools (*Gesamtschulen*), which have gained in popularity in the last decades, award a lower degree first, while still allowing the transition to a higher track afterwards to enable sequential upgrading (given sufficient academic performance). In the past, the teacher in elementary school gave a binding recommendation for a track, based on the overall performance and development of the child in grade four. Nowadays, most federal states have abolished the binding character of this recommendation and thus allow parents to overrule it (Kuhn, 2021; Sekretariat der Ständigen Konferenz der Kultusminister, 2015). One can thus argue that the former restrictions imposed by grades and performance have transformed into soft recommendations in most federal states when choosing a track since parents have gained much autonomy for track selection. Even when academic performance is insufficient, parents have the

option to overrule the recommendation of the teacher in most federal states (Bittmann, 2021b). The main difference between the tracks is that higher education eligibility is the default outcome when choosing the academic track while in all other tracks another decision must be made at some point for further upgrade if so desired. Even though the system is more permeable nowadays and children have the option to upgrade and switch tracks more easily than in the past, the decision for a track after elementary school is still a major determinant for children since they are entering rather distinct learning environments, which can affect further trajectories (Bittmann & Schindler, 2021; Traini et al., 2021).

As one can define aspirations<sup>2</sup> as a “cognitive orientational aspect of goal-directed behavior” (Haller, 1968, p. 484), they are well suited to explain track choice since “behavior”, in this sense, is the decision for or against a certain school track, that opens or closes pathways to occupations in the labor market and thus to positions in society (Paulus & Blossfeld, 2007). As Breen and Goldthorpe (1997) argue with their rational choice framework, status maintenance is one of the most relevant factors contributing to this decision making process. However, as different social strata need different educational qualifications to maintain their status through their children, aspirations might function differently when socially stratified. For example, the most socially advantaged and educated groups have usually obtained a tertiary education degree since this enables access to the most prestigious positions in society. For their children to reach the same status, they will require a similar qualification as well. As the academic track is the direct way to higher education eligibility in the German system, these parents are highly likely to choose the academic track. In contrast to these groups, socially disadvantaged families can maintain their status even if their children only obtain a lower educational qualification, which does not require participation in the academic track. Hence, their overall propensity to choose this track is lower. This mechanism should also influence how important aspirations are for the explanation of the choice of track. For the socially most advantaged families, tertiary education is almost mandatory to maintain the social status of the parents and participation in the academic track is the logical choice (Barone et al., 2018; Breen & Goldthorpe, 1997). In contrast to these, socially disadvantaged families do not have a strong imperative to obtain any tertiary education. However, if high aspirations are present in the family for any reasons, they might have an important contribution to the decision and represent other aspects, like status upgrade motives. Referring back to research questions one and two, while it makes sense to assume that educational aspirations are a major contributor to the choice of school in secondary education, it is not clear how these influences are stratified by social origin when the share of explained variance is of interest. Given both the lack of theoretical and empirical guidance

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2 It should be made transparent that in the literature some other terms exist, for example *preferences* or *expectations*. While it is not the goal of the current contribution to disentangle and define these various descriptions in more detail, it will become clear that there is a large overlap and often different expressions have very similar meanings.

regarding this question, no directed hypothesis is formulated and the question is to be seen as explorative. By doing so it can be tested empirically whether the influence of aspirations on the decision is socially stratified or not.

After this first, rather broad research aspect, it makes sense to distinguish the aspirations of parents and their children as they can both contribute to this decision. As the transition is early in the life course, it is assumed that especially parents have a large influence since the children are probably not able to grasp the overall importance of this decision (Gölz & Wohlkinger, 2018; Wohlkinger, 2017; Wohlkinger & Gölz, 2018). At the time of the factual decision (enrollment), which usually happens in the fourth grade of primary school when children are about ten years old, it is unrealistic to expect that they have planned their life course in detail and are aware of all options and pathways in the educational system. This holds since even adults are not familiar with all alternatives, especially those that follow after completing a first secondary degree (like a *Hauptschulabschluss*) (Buse & Hermes, 2019). Given these considerations, one can assume that especially parental aspirations will influence the decision. However, other studies point out that children develop aspirations and ideas about their future early and independently of their parents and thus might contribute significantly to this decision (Wohlkinger, 2019). Supposedly, interaction and feedback processes are present and filial and adult aspirations will influence each other, probably even long before the actual decision has to be made. Children will utter some wishes and desires early on (for example occupational preferences, even if not always realistic (Kelly, 1989)) and parents will react to these and other indicators of performance and aspirations (e.g. grades, hobbies, preferences). Nevertheless, in the end, the parents have to contact the secondary school and actually enroll the child. In the following, I would like to test the relative influence on both parental and filial aspirations empirically. Based on theoretical reasoning and previous research findings I assume that parental aspirations are stronger determinants and thus mediators of secondary school choice than filial ones (Hypothesis 1).

Besides disentangling parental and filial aspirations, it makes sense to examine *idealistic* and *realistic* aspirations separately (Esser & Esser, 2002; Haller, 1968; Stocké, 2014). As already outlined briefly in the introduction, idealistic aspirations express overall educational preferences, which are grounded in norms, values and beliefs, independent of any actual limitations or constraints. These aspirations correspond to ideal wishes, for example, when one could simply “pick” a secondary degree without any costs or investments. These aspirations are especially relevant to measure the overall educational orientation of a family and thus the underlying norms and beliefs. In contrast to idealistic aspirations, realistic aspirations consider any constraints and cannot be, logically deducted, higher than the idealistic ones. In the German system, the most

relevant limitation is academic performance since some educational certificates require a higher performance and better grades. If children cannot attain these standards, insufficient grades will prohibit the choice of track or the transition to the next school year, which then either results in the repetition of the grade or the transition to a less demanding track. Another potential limitation is an economic one since some tracks require a longer time to complete, which results in higher (opportunity) costs.<sup>3</sup> When thinking about realistic aspirations, parents and children regard these known restrictions and adjust their aspirations, even if the idealistic ones are higher.

## **2.2 Theoretical model of track selection**

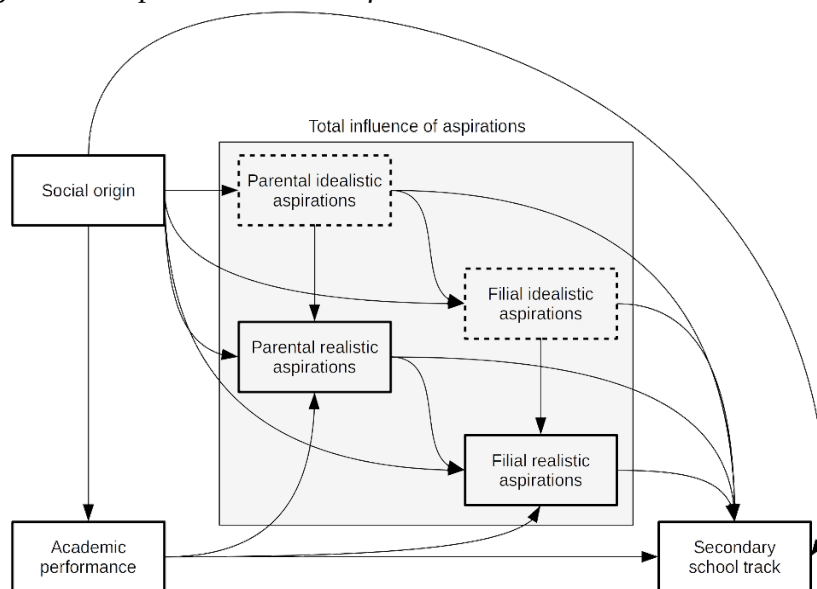
In the following I propose a theoretical framework that allows the modelling of the decision making process of track selection that also serves as a guide for the design of the subsequent empirical analyses. Overall, to understand better how the decision for a school track in secondary school is made, based on aspirations and social origin, a theoretical model is developed and visualized in Figure 1. The key components are social origin, idealistic and realistic aspirations of parents and their children and the academic performance of the children.

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<sup>3</sup> It should be pointed out that public secondary education is free of charge in Germany and private schools only play a subordinate role.



Figure 1: Proposed theoretical framework



Source: own design. Depicted directed graphs are considered to be central explanatory pathways but do not claim to be exhaustive.

First, I introduce the complete framework as a (causal) path-diagram and explain the rationale behind it in detail. To understand how track choice is affected by social origin, Boudon's primary and secondary effects (1974) serve as the most relevant explanation.<sup>4</sup> Socially advantaged families are able to invest more in the education of their children (e.g. tutoring, support, care and nutrition), which results in higher cognitive abilities and better academic performance. These are the so called primary effects of social origin, meaning that children differ in ability as a result of different social origin. This pathway is depicted as Social origin → Academic performance → Secondary school track.

However, even when children from socially disadvantaged families develop high academic performance, they still might choose a lower track since they have different aspirations and goals in life, which do not require a high level of education. These secondary effects of social origin (differences in decision that are independent of performance), are depicted by all other pathways that start from Social origin. To understand better how these secondary effects function, a prominent explanation are rational choice (RC) models that provide further links of mediation (Gambetta, 2020). Based on the formalization of Breen and Goldthorpe (1997), one can assume that children have a strong incentive to at least reproduce the social position of their parents to avoid social demotion (status maintenance, also known as *relative risk aversion*) (Davies et al., 2002; Jæger &

<sup>4</sup> In the following *social origin* is regarded as a multidimensional construct that incorporates various aspect of the household and family, like financial means, social class membership and educational qualifications.

Holm, 2012; Tutić, 2017). However, since lower educational certificates are sufficient to reproduce the social status of socially disadvantaged families, these families have lower incentives for their children to aspire to high educational certificates. Formalized, one can refer to origin differentials as *benefits*, that is, how certain outcomes are perceived (Esser, 1999; Stocké, 2012). For example, when a child develops occupational aspirations, he or she will learn that some educational certificates are required, which in turn influence their aspirations. For parents, this thought process might be more abstract since they probably do not think about one distinct occupation but know that higher qualifications open more pathways in life and hence encourage their child's aspirations. Note that this explanation also predicts that social origin has a larger influence on parental than filial aspirations since status maintenance might be a rather abstract concept for children in elementary school.

The next step is to disentangle aspirations for further insight. As already outlined before, it makes sense to distinguish parental and filial aspirations, and idealistic and realistic aspirations. For the simplified model, two assumptions are made: first, that filial aspirations depend mostly on parental aspirations (and not the other way round) and that realistic aspirations depend mostly on idealistic aspirations (and not vice-versa). These assumptions can be justified as follows: idealistic parental aspirations can, theoretically, exist even before the child is born as they express overall wishes and desires of the family. Only when limitations are taken into account, that are often only learned much later, especially when the cognitive performance of the child becomes evident, realistic aspirations can be formed. To account for this in the model, realistic aspirations of both parents and children are influenced by academic performance (but not the idealistic ones, as these should be rather constant).

Why filial aspirations should depend mostly on parental aspirations is explained by the highly influential Wisconsin model of status attainment. It is outlined that the aspirations of the child are mostly affected by significant others, that is, especially the parents, siblings, relatives, friends, teachers and other role models who have a strong influence (Sewell et al., 1969; Sewell & Shah, 1968a, 1968b). They will teach the child about goals, ethics and values and thus convey how to lead a happy and successful life. Since children are easily influenced by others even without having rational arguments, it is clear that these significant others transmit their own values to the children, which influence their aspirations. Put simply, one can assume that the parents are the single most relevant significant others, as they usually raise the child and spend the most time with him or her. Therefore, filial aspirations are depicted as depending on parental aspirations in Figure 1 (but also on social origin as it cannot be ruled out that these direct pathways exist). Overall, one sees a hierarchical structure with regard to aspirations as idealistic ones can influence realistic ones but not the other way round. To summarize the model so far, based primarily on theories of rational choice,

I expect: the effect that social origin exerts on track choice is partially mediated through parental and filial aspirations (Hypothesis 2).

The main benefit of the proposed model is that it focuses on potential mediators (especially rational deliberations), refers to two highly relevant sociological frameworks that both contribute to the decision (Zimmermann, 2020) and allows us to explain how and why social origin affects aspirations. The final step is to put all explanatory pathways into perspective. From the model, one can derive that there are, in total, four mediation pathways of social origin on the secondary school track: one via academic performance, one via realistic aspirations (filial and parental taken together), one via idealistic aspirations (filial and parental taken together) and one residual pathway. This last one collects all further influences that are captured neither by performance nor by aspirations. The main question remains about the relative importance of aspirations, especially in comparison to unexplained influences. In detail, it is the goal of the following analyses to effectively block the direct pathway of performance (Academic performance → Secondary school) to investigate the relative influence of aspirations when using performance as a control variable.<sup>5</sup> Since it is not feasible to derive a numerical hypothesis, the final question is: what is the overall contribution of aspirations in comparison to unexplained influences on secondary school decision under control of performance?

Regarding previous research, it is obvious that aspirations have been considered not only highly relevant predictors of educational attainment in the past but also mediators. One of the earliest yet most fruitful research frameworks is clearly the Wisconsin model of status attainment. A comprehensive overview of the research projects between 1957 to 2001 lists and summarizes many dozens of papers that, at least partially, regard aspirations as a mediator between social origin and educational or status attainment (Sewell et al., 2003). The authors usually find strong mediation effects. Given their age, sometimes more than 50 years, they have spawned much more research that adapted the original model. In particular, Schoon and Parsons (2002) present two different models that come to similar conclusions. The effect of social origin on attainment is partially mediated through aspirations and filial aspirations depend on parental aspirations. A Canadian study shows that maternal aspirations mediate the risk of academic failure that is caused by poverty (De Civita et al., 2004). A study from Australia demonstrates that aspirations reduce the effect of parental social status on attainment by about 60% and provide about 25 percentage points of additional explained variance, highlighting that aspirations are indeed an important mediator (Marjoribanks, 2005). A German study comes to similar conclusions for primary schooling and

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<sup>5</sup> This setup effectively blocks most primary effects of social origin but allows effects of academic performance that work through aspirations. The main influence of primary effects on the transition to secondary education have been widely studied in the German context (Gresch, 2012; Klinge, 2016; Relikowski, 2012) and given the scope of this research project it is advised to focus on the effect of aspirations alone.

explains how social origin affects academic achievement through expectations and aspirations (Ditton et al., 2019). Summarized, we see that there is a large research tradition that has already clearly established that effects of social origin on various relevant outcomes are partially mediated through aspirations or expectations.

However, there are some limitations of previous research that are addressed in the current study and deserve further attention. Many studies that investigate the effect of some measurement of social origin on relevant (educational or occupational) outcomes do not quantify the mediation in detail or are unable to isolate the effect of aspirations. Sometimes aspirations are grouped together with other variables in the same model and one can no longer directly compare coefficients. Often, only “full” models, including all variables, are presented, which makes it impossible to quantify the exact share mediated by aspirations, or quite coarse results are shown (such as p-values of the Sobel test), which do not explain the share of explained variance by aspirations or gauge the uncertainty around this statistic in a manner that is easy to grasp. Sometimes idealistic and realistic aspirations are not distinguished, further reducing the level of insight.

The present contribution attempts to give some new insights that have not been studied in detail before. First, I would like to quantify the relative importance of aspirations to the decision making process of track selection and disentangle the influence of parental and filial aspirations. In contrast to previous studies, this is done rigorously, separating various effects and providing confidence bands or other relevant statistics to quantify the uncertainty of these results in more detail. Next, I propose a theoretical framework and predict that aspirations are the main mediators that explain how social origin influences the choice of track. This allows us to measure the contribution of aspirations in relation to other effects that depend on social origin. By doing so, it is possible to estimate which influence is stronger and has more power to explain track choice. Finally, it is of interest to quantify the contribution of idealistic and realistic aspirations on track choice. The analyses will exceed previous studies in terms of quality of data by introducing a large-scale panel study including the majority of all German federal states where the actual track choice is observed instead of just preferences measured a priori, which is a limitation of previous analyses (Wohlking, 2019). Furthermore, due to the prospective nature of the panel and integration of multiple waves of the survey, the arrow of causality is clear in comparison to cross-sectional studies and hence the findings should be able to give robust estimates.

### 3 Data, sample and methods

#### 3.1 Data and sample

The source of the following empirical analyses is the National Educational Panel Study (NEPS), starting cohort two (Blossfeld & Roßbach, 2019; NEPS-Network, 2020).<sup>6</sup> The sampling frame consists of children in kindergarten at age four, who were repeatedly surveyed over the course of more than ten years. These data are well suited for the intended analysis for various reasons: firstly, due to the panel nature of the study, the individual educational trajectories of the children can be traced. Since the panel has been running for many years and the children are currently around age 12 (wave eight of the panel, surveyed in 2018), they have passed the crucial transition from elementary to secondary schooling (that is, the transition from grade four to five). Due to the prospective design of the study with annual surveys, aspirations were measured before the decision was made (enrollment) and the direction of causality is clear. To do so, the analyses utilize data from grade four (additional, information from grade three serves as a robustness check). In contrast to some other studies, the actual decision is observed (that is, realized behavior) and not only some form of intention to do so. Finally, since the survey also includes various aspects of the schools, learning environments, filial performance and the social background of the parents, a wide range of relevant control variables is available.

The dependent variable, the choice of secondary school, is first observed in wave seven (school year 2016/17) and there are a total of 4,220 children participating in that wave. Next, as explained in more detail below, some federal states are excluded (Bavaria, Berlin, Brandenburg, Saxony, Thuringia), which leaves 3,157 children in the sample. Children with a physical or intellectual disability are also excluded, removing another 23 observations. Finally, cases are removed where neither the parents nor the children reported any aspirations, which removes another 161 cases. The final sample size is 2,973.

#### 3.2 Operationalization

The central independent variable, social origin, is operationalized as a compound measurement including three other variables. By doing so I attempt to give a more complete picture of what *social origin* actually means and not only rely on one dimension. For this, information about logarithmized monthly household income (total post-tax income of all members of the household), parental education with three distinct levels<sup>7</sup> and the parental International Socio-Economic Index

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6 This paper uses data from the National Educational Panel Study (NEPS): Starting Cohort Kindergarten, doi:10.5157/NEPS:SC2:9.0.0. From 2008 to 2013, NEPS data was collected as part of the Framework Program for the Promotion of Empirical Educational Research funded by the German Federal Ministry of Education and Research (BMBF). As of 2014, NEPS has been carried out by the Leibniz Institute for Educational Trajectories (LIfBi) at the University of Bamberg in cooperation with a nationwide network.

7 Intermediate degree (*Mittlere Reife*) or lower; higher education eligibility (*Abitur*), any tertiary degree. If available, information of both parents is included when computing this compound score.

of Occupational Status (ISEI)<sup>8</sup>, which measures social status of the currently held occupational position (Ganzeboom 2010), are incorporated to generate the latent construct *social origin* via empirical Bayes Means (Ip & Molenberghs, 2010). By doing so, a single continuous measurement, which is approximately normally distributed, is generated. This is beneficial for the mediation analyses since a continuous variable simplifies the statistical procedure and is much clearer to interpret than multiple indicators or a categorical one. All three input variables correlated highly with the compound score (Spearman's  $Rho > 0.70$ ), which is z-standardized to enhance interpretability. The average child thus has a mean of zero, a child with a value of one stems from a family, which is one standard deviation above the sample mean.

The central dependent variable is the school track chosen after elementary school. This variable is recoded into a binary one: either the academic track (*Gymnasium*), coded value 1, or any other track, that is, *Hauptschule*, *Realschule* or a comprehensive school (*Gesamtschule*), coded value 0. This reduction is applied since the academic track is the only track which has higher education eligibility (*Abitur*) as the default outcome. After entering the track, no further decisions are required and schooling will be completed (if successful) after eight or nine years, depending on the federal state. All other tracks require a further decision for any upgrade, for example, after completing a lower secondary track. Even the comprehensive schools, which sometimes incorporate distinct tracks within one school, will require a decision by the child and the parents to switch between the tracks and opt for a higher educational degree. Consequently, a binary design is chosen, which also simplifies the interpretation of the following statistical models.

There are four mediator variables, which measure the aspirations of both the child and the parents. The two kinds are realistic ("When you think of all the things that you now know: Which school-leaving qualification will you actually obtain?") and idealistic ("Not considering how well you do in school: Which school-leaving qualification do you wish to obtain?") aspirations to give a complete picture of the situation (Stocké, 2014). To be consistent with the outcome variable, all four items, which originally consist of three levels (*Hauptschulabschluss* / *Mittlere Reife* / *Abitur*) are coded in a binary fashion and indicate whether the *Abitur* (higher education eligibility) is selected (1) or not (0).

Academic performance is operationalized using the comprehensive NEPS performance tests conducted in grade 4 in the classroom context. The tests are identical for all pupils and do not depend on federal states, schools or teachers, rendering them highly comparable (which is a big

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8 It should be acknowledged that the ISEI is also partly based on income information to estimate the social rank of a given occupation. If both parents provide information on the ISEI, the arithmetic mean of the two values is computed.

advantage in comparison to grades which are assigned by the teachers).<sup>9</sup> To give a broad overview of the performance of the children, the tests in German and mathematics are used. The NEPS provides weighted likelihood estimates (WLE) which summarize the ability of each child. Since these two variables are only used as control variables and their effects are not interpreted, the arbitrary scaling, which is based on Item-Response-Theory, is unproblematic (Pohl & Carstensen, 2012).

Further control variables are the age of the child in grade four (measured in years), the gender of the child, whether the child has already been enrolled by the parents at a secondary school at the time of the survey, migration background (both parents born in Germany / one parent born abroad / both parents born abroad), and the federal states of the family in grade four, which is slightly coarsened since some states have very low case numbers (Schleswig-Holstein + Hamburg + Bremen / Lower-Saxony / North Rhine-Westphalia / Hesse / Rhineland-Palatinate + Saarland / Baden-Württemberg / Mecklenburg-Vorpommern + Saxony-Anhalt). Missing states (Bavaria, Berlin, Brandenburg, Saxony and Thuringia) were excluded due to the sample selection process since in these states the transition to secondary school was not after grade four or regulated by the academic performance of the child and hence partly independent of the parental will. A final control variable is whether parents are living together in grade 4 or not (including being divorced, widowed, separated).

### 3.3 Strategy of analysis

Figure 1 outlines the theoretical framework in which all analyses are embedded. As explained above, there are three main pathways influencing secondary track choice: the direct effect of social origin (residual pathway), the indirect effect of social origin, mediation completely through realistic and idealistic aspirations, and finally the effect of academic performance, which also depends on social origin. For the intended analyses, I would like to focus on the first two pathways and effectively block the performance pathway that is independent of aspirations. This means that the decision of secondary track should not depend on performance in elementary school. While there are multiple options to achieve this statistically, I control for academic performance. By doing so, this pathway is closed.

To investigate the first question, two nested linear (OLS) regressions are computed and the coefficients of determination ( $R^2$ ) are compared. In the first model, the decision to transfer to either the academic track or any other track is regressed on the measurements of social origin (parental education, parental ISEI, household income) and all control variables.  $R^2$  of this model is stored. In the second step, the four measurements of aspirations are added as additional control variables and

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9 For detail information on the NEPS testing framework, refer to [https://www.neps-data.de/Portals/0/NEPS/Datenzentrum/Forschungsdaten/SC2/6-0-1/NEPS\\_SC2\\_Competences\\_W6\\_en.pdf](https://www.neps-data.de/Portals/0/NEPS/Datenzentrum/Forschungsdaten/SC2/6-0-1/NEPS_SC2_Competences_W6_en.pdf) (2022-02-04).

$R^2$  is computed again. The difference of the two  $R^2$  gives an estimation of the share that is explained by aspirations that is independent on social origin and all control variables (net-effect). This procedure is subsequently repeated with the three different strata of social origin, measured by the highest parental educational qualification to check whether the effect of aspirations differs by social origin.<sup>10</sup> As recent research shows, for this purpose it might be better to rely on the rather simple decomposition of variance instead on more complex measures like Pseudo- $R^2$ , since for them, comparability between models might be biased (Breen et al., 2018).<sup>11</sup> To quantify the uncertainty around these point estimates, bootstrapping is applied (Bittmann, 2021a; Efron & Tibshirani, 1994; Ohtani, 2000). By doing so, a random sample is drawn repeatedly, then the imputation is generated and the results computed. As this procedure is computationally intense (that is, for each bootstrap-resample, all imputations have to be generated anew), 1,000 bootstrap resamples are used. This approach follows the suggestion of Little and Rubin (2019).

The second step is to test the direct and indirect effects of social origin on the choice of track. For doing so, a classical mediation design of two nested regressions is chosen. As the outcome is binary, it is necessary to resort to logit models. However, as has been demonstrated, mediation results can be biased when the naive approach is utilized due to the nature of re-scaling logits or odds ratios when including further explanatory variables. To avoid this pitfall I rely on the KHB method, which facilitates the correct estimation of direct and indirect effects in logistic mediation models through rescaling coefficients (Breen et al., 2013). With this method, it is also possible to disentangle the separate contributions of all four variables. As an additional robustness check, the mediation analyses are repeated with the aspirations measured one year earlier (that is, in grade three). This is necessary to check the stability of the findings and assure that no reverse causality is present as in grade four a rather large share of the parents have already enrolled their children at a secondary school at the time the aspirations were surveyed (see Table 1).

Missing information is imputed using MICE (multiple imputation with chained equations), creating a total of 35 complete datasets (Azur et al., 2011). The assumption is that the data are missing at random (MAR) and other variables in the model can predict missingness. For example, dropout, to some extent, depends on social origin. The cross-correlations of the other variables are subsequently used to account for this missing information. This should be fine since there are strong predictors available (such as aspirations of previous waves). The imputation relied on various models, depending on the scaling of the imputed variable (truncated; binary, ordinal, and multinomial logistic; predictive mean matching). The quality and convergence of the results has been inspected

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10 The computations have been repeated using either the educational level of the father or the mother since the dominance approach might yield biased results (Thaning & Hällsten, 2020). However, no significantly different conclusions emerge with these different operationalizations.

11 As a robustness check, regular  $R^2$  and Pseudo  $R^2$  based on logit models will be compared.



using graphical means and using summary statistics. There are no signs of problems within the imputation models. All analyses are computed in Stata 16.1, complete do-files are available on request. Furthermore, I use the user-written packages *mimrgns* to compute predicted probabilities with imputed data (Klein, 2014) and *khb* for the mediation model (Kohler et al., 2011).

## 4 Findings

To start with an overview of the data, a descriptive table is computed (Table 1). This shows that about 62% of all children transitioned to the academic track after elementary school, which underlines its popularity in recent cohorts. Idealistic aspirations are high (ca. 84%) and similar for both parents and children (aggregated shares over the entire sample). As expected, realistic aspirations are lower on average (ca. 73%) but still fairly similar for parents and children. Interestingly, the average aspirations are apparently larger than the actual transition rate to the academic track so there must be families who do not select the academic track despite high aspirations.

Table 1: Descriptive statistics

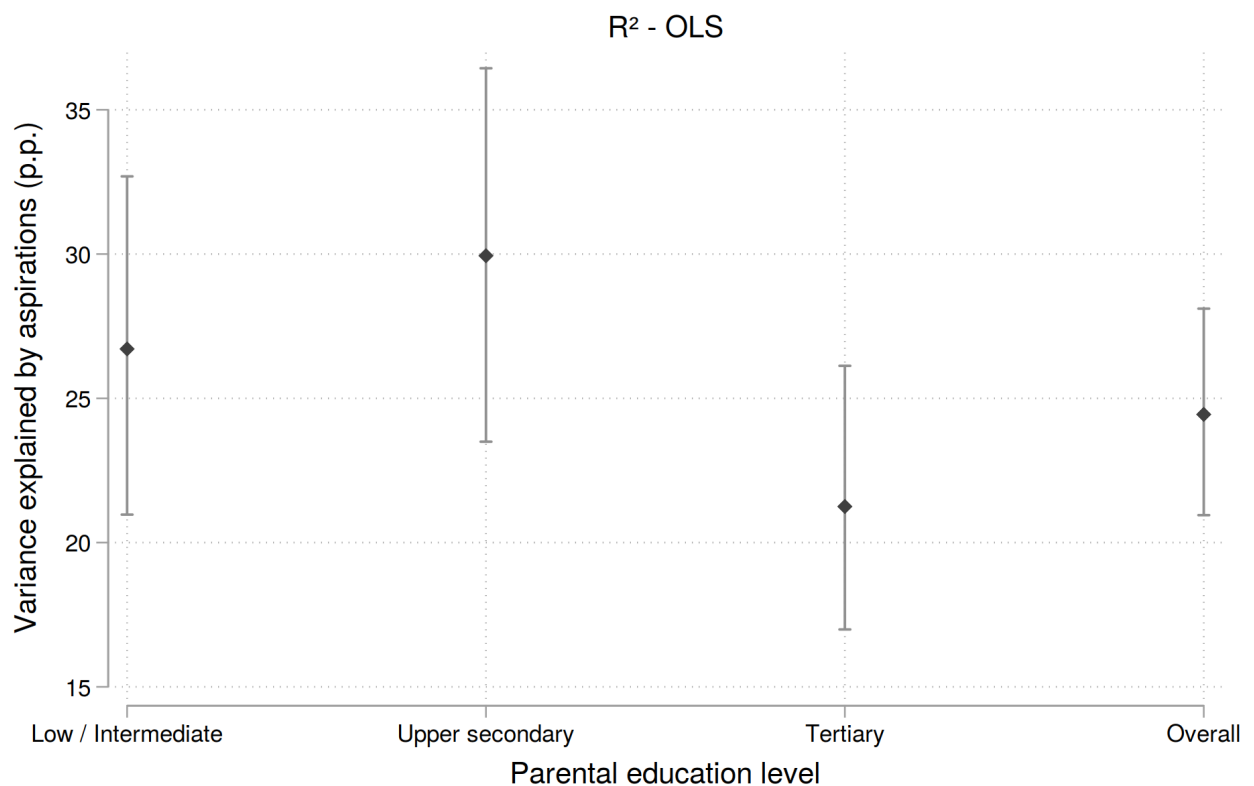
	Mean	SD	Min	Max	Share imputed
Social origin (z-standardized)	0.00	1.00	-3.18	2.87	-
Log. parental income	8.23	0.44	5.70	10.6	0.08
Parental ISEI	51.6	14.2	16	90	< 0.05
Education mother					
Low / Intermediate	0.41		0	1	0.10
Higher education eligibility	0.26		0	1	0.10
Tertiary education	0.32		0	1	0.10
Education father					
Low / Intermediate	0.42		0	1	< 0.05
Higher education eligibility	0.20		0	1	< 0.05
Tertiary education	0.38		0	1	< 0.05
Academic track	0.62		0	1	0.10
Ideal aspirations	0.84		0	1	0.09
Ideal. aspirations (parents)	0.83		0	1	0.18
Real. aspirations	0.72		0	1	0.13
Real. aspirations (parents)	0.75		0	1	0.18
Female pupil	0.52		0	1	< 0.05
Age in grade 4	9.85	0.35	8.26	11.5	< 0.05
Child enrolled at secondary school	0.78		0	1	0.20
Parents living together	0.84		0	1	0.18
Migration status					
Both parents born in Germany	0.79		0	1	0.09
One parent born abroad	0.12		0	1	0.09
Both parents born abroad	0.094		0	1	0.09
Math test score	0.22	1.12	-4.59	4.88	0.06
Reading test score	-0.32	1.29	-5.67	3.84	0.06

Source: NEPS SC2, imputed data. Information about federal states not depicted due to data restriction guidelines of the NEPS. Social origin is a variable generated after the imputation has been conducted.

Next, I present the results regarding the first research question, that is how much variance of the decision to transition to the academic track or not is explained by aspirations. For a concise and clear presentation of the findings, see Figure 2. It shows the variance that is explained by aspirations (parental and filial aspirations, both idealistic and realistic), in addition to measures of social origin and the control variables (net-effect of aspirations). As the results indicate, for the entire sample, the point estimate is 24.4 percentage points. As the rather narrow confidence bands indicate, this is a substantive contribution and aspirations are highly relevant, even when accounting for other known predictors of track choice. For a better understanding, consider the contribution of aspirations in detail. The baseline model which uses all measures of social origin, academic performance and all control variables explains about 26% of the variance, while the model which adds all four measures of aspiration explains 50%, hence the additional explanatory power of about 24 percentage points. When focusing on the next research question and the socially stratified results one notices that the

explained variance is even higher for families with either a low, intermediate or upper secondary educational qualification. There is little difference for the point estimates and the confidence bands. However, when the parents with tertiary education are studied, it becomes clear that the influence of aspirations is lower. As the confidence bands indicate, this finding is not statistically significant as the confidence bands overlap. The conclusion is that aspirations work fairly similarly for all social strata. For reference, complete regression tables with regression coefficients are presented in Table A1 in the appendix, for the overall sample and also by social stratum. As an additional robustness check, the regular  $R^2$  from OLS regressions is compared to Pseudo  $R^2$  based on logit models. The results can be found in the appendix in Figure A1. Summarized, the results are robust and computed explanatory shares are highly similar. For the group of tertiary educated parents, the share explained is a little lower in the logistic models (17.85% vs 21.25% in the OLS). However, since the confidence bars still always overlap and the overall patterns are identical, the overall robustness is high and both models come to the same conclusions.

Figure 2: Share of explained variance through aspirations by educational level of the parents



Source: NEPS SC2, imputed data. 95%-confidence bars are generated using bootstrapping (1,000 resamples). “Overall” gives the effect for the total sample,  $N = 2,973$ .

The following analysis goes into more detail and investigates how parental and filial aspirations act together. After having computed a first result of the importance of aspirations for the track decision, one can now disentangle them even further. Since the decision for a track should be predominantly grounded in *realistic* aspirations, these are also investigated. In total, there are four potential outcomes: both children and parents have high aspirations, neither of them have, or only one party has. The next step is to observe the probability to transition to the academic track for each cell in this grid of possibilities (Table 3). Note that this computation is purely descriptive and no control variables are included to generate these probabilities.<sup>12</sup>

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12 Further tests have shown that the results presented are stable and are only slightly different when including all controls for predicting transition probabilities.

Table 3: Probability to transition to the academic track by parental and filial realistic aspirations

		Parental aspirations	
		High	Low
Filial aspirations	High	84.8% (83.1; 86.5) [65.2%]	14.8% (10.0; 19.6) [8.0%]
	Low	59.3% (53.1; 65.5) [9.3%]	3.1% (1.3; 4.9) [17.5%]

Source: NEPS SC2, imputed data. 95% CIs in parentheses. Percentages in brackets indicate relative cell-frequencies and add up to 100% (except for rounding errors).  $N = 2,973$ .

When neither parents nor children have aspirations for higher education eligibility, the probability to transition to the academic track is very small as one would expect (3.1%). However, when conflicting aspirations are present, a strong asymmetry becomes apparent: when the parents have higher aspirations, the probability of choosing the academic track is about 60%, while it is only 15% when the child holds the higher aspirations. This hints at a clear dominance of the will of the parents since the difference is more than 40 percentage points. One can conclude from this finding that, indeed, parents will usually influence the decision more by a wide margin and they tend to overrule their child's aspiration. However, conflicting constellations occur rather seldomly and concern less than 20% of the total sample. Finally, when looking at the group where both parties hold high aspirations, the transition rate is high at approximately 85%. Interestingly, this also means that about 15% of all children in families with overall high aspirations still do *not* choose the academic track. Taken together, the findings are in line with hypothesis 1, which states that parental aspirations are more important than filial ones.

To conclude the analysis, I continue to test the overall mediation effect through aspirations. The design of this analysis is rather simple and follows the regular logic of mediation studies. In the first model, only the compound measurement of social origin and all control variables are included. In the second step, I add mediating variables (the four binary aspiration items). By testing how much the coefficient of social origin changes it is possible to estimate the share of the effect that is mediated through aspirations. To avoid bias due to the logistic estimation models, the coefficients are transformed using the KHB method. Results are reported in Table 4. For a more convenient interpretation, average partial effects (APEs) are reported. The main model is for grade four (left panel), the results for grade three are also shown (right panel) and serve as a robustness check.

Table 4: Mediation and decomposition results using the KHB approach

Mediation analysis		
	Grade 4	Grade 3 (Robustness check)
Social origin (Baseline)	0.081*** (0.008)	0.083*** (0.008)
Social origin (Mediators added)	0.016 (0.008)	0.024* (0.009)
Share mediated (Total)	80.08% [66.66; 100.00]	71.52% [58.81; 96.42]
Idealistic	7.78% [4.02; 13.91]	2.60% [0.00; 7.79]
Idealistic (Parents)	15.00% [7.40; 25.01]	13.97% [7.35; 24.12]
Realistic	15.12% [9.68; 22.07]	9.37% [4.35; 16.31]
Realistic (Parents)	42.18% [33.71; 55.30]	45.66% [36.55; 64.33]
N	2,973	2,973

Source: NEPS SC2, imputed data. Standard errors in parentheses. Reported are APEs. Percentages do not add up due to rounding errors. Control variables: gender, age, migration, federal state, parents living together, math test score, reading test score, child enrolled at school (this last variable is not included in the robustness check since it is a constant in grade three). 95% Bootstrap confidence bands based on 1,000 replications in brackets.

\*  $p < 0.05$     \*\*  $p < 0.01$     \*\*\*  $p < 0.001$

The baseline effect is 0.081 or 8.1 percentage points. This means that a change of social origin (compound score) by one standard deviation increases the probability of choosing the academic track by about 8.1 percentage points. This makes sense, as it is well known that socially advantaged families have a higher propensity to enroll their children in the academic track. However, as soon as one adds the four aspiration variables as mediators to the model, the effect of social origin reduces to about 1.6 percentage points, which can be considered a huge decrease. That is, when controlling for aspirations of both parents and children, the effect of social origin is drastically reduced, which is also apparent in the reduced significance level. What one can conclude from this is that the effect of social origin is indeed mediated to a large degree through educational aspirations. In other words, the share mediated through aspirations amounts to about 80%. Since this is a large mediation effect and 0 is not included in the confidence band, hypothesis 2 is accepted.

Concluding with the final research question I would like to disentangle the various mediating pathways and decompose the total share mediated into the four variables of interest. Idealistic

aspiration of the child account for about 8% of the share mediated. However, the parental idealistic aspirations are almost twice as relevant as they explain about 15% of the share. The realistic aspirations have larger influences. While the filial aspirations mediate about 15%, the parental realistic aspirations mediate the single largest share at more than 42%. About 20% are unaccounted for by the aspirations.

### **Robustness checks**

As table 1 indicates, the majority of all respondents have already made a selection for the type of track at the time of the survey when aspirations were measured. This might affect the findings since reverse causality cannot be excluded, even when controlling for this variable. To test the stability of the mediation results, the analyses are repeated using the aspirations from grade three, which are measured approximately one year earlier (Table 4, right panel). For these measures, which are identical to the others (idealistic and realistic aspirations of both parents and their children), reverse causality cannot intervene since the time of the decision is much further away. The results indicate that the total share mediated is slightly lower (71.5%). When disentangling the separate contributions, the figures are 9.4% (children) and 45.7% (parents) for realistic and 2.6% (children) and 14% (parents) for idealistic. Apparently these numbers are all slightly lower than in grade four, except for parental realistic, which are larger. While there are some deviations between grade three and four, the overall results are rather stable. It should be made clear that deviations are not necessarily due to bias or reverse causality, but can also derive from the fact that the decision is further away and parents and their children have not made up their minds yet. To conclude, the temporal stability of the findings is quite strong.

## **5 Discussion**

It is the goal of the current study to investigate how aspirations mediate the influence of social origin on track choice and quantify this statistically. Regarding the first research question, it is indeed the case that educational aspirations of both parents and their children are major factors which are able to explain the decision for or against the academic track in secondary education. Overall, aspirations explain about 24 additional percentage points of the decision to enter the academic track or not, which can be regarded as a substantial influence. As these results are under the control of various measurements of social origin as well as academic performance, this shows that aspirations are, first, partially independent of these two other highly relevant influence factors and that, second, aspirations clearly deserve attention from researchers. The analyses furthermore show that the additional influence of aspirations is rather similar for all families and depends less on parental educational qualifications. Potentially, the influence is a somewhat smaller for parents who have obtained academic degrees, yet these differences are not pronounced. These findings are based

on observational data, so no pure causal effects can be recovered, even when using relevant control variables, yet future research might want to study in more detail whether aspirations are a parameter that is open to interventions. If so, it might be easier to target aspirations, instead of parental social status, to affect the educational outcomes of children.

The second analysis looks at the relation of parental and filial aspirations and shows that, as expected, parents have the stronger influence on the decision. However, children apparently have some bargaining power left, as sometimes the child is able to put his or her high aspirations first and choose the academic track, even when the parents apparently do not share these high ambitions. What this analysis cannot show is how parents and children influence each other's aspirations over time, as this must be a dynamic feedback process that is difficult to capture using quantitative panel data. Future research, especially qualitative approaches, might see this as a research gap that could further explain how aspirations are formed within a family in detail. In addition, looking at the influence of other significant others might prove worthwhile.

Lastly, the third analysis concerns the mediation aspect of aspirations. As the results clearly show, about 80% of the effect of social origin on the track decision are mediated through aspirations. Especially parental realistic aspirations explain most of this effect. This is interesting for various reasons: first, it shows that realistic aspirations are more relevant than idealistic ones, which is in line with the theory as idealistic aspirations do not take any limitations into account. Second, in line with the previous analysis, it underlines that parental aspirations are more relevant than filial ones. Third, this demonstrates that the residual effect of social origin must be rather small as it accounts for only 20% that are unexplained. The strength of the mediation is hence substantial, even when controlled by various confounders and even measures of performance. This in turn shows that research about aspirations is clearly justified when the emergence of social inequality is to be studied. However, future research could investigate in more detail which factors are responsible for the residual pathway.

While these findings are from the German school system, I would argue that international research can still profit. In contrast to many previous studies, the mediating influence of aspirations has been tested statistically and rigorously. Disentangling filial and parental aspirations are apparently worth the effort. While the German educational system is rather unique, aspirations probably do not depend on it (since these results are obtained at a rather early point in the life course of children where the school itself probably only had smaller impacts). One can assume that the influence of parents might become weaker over time, for example, when subsequent decisions are investigated, like the transition to academic education after secondary schooling, as children become more independent. This might create differences, depending on when in the life course a decision has to



be made. To check this empirically, replication studies in other educational systems are highly relevant and welcome.

Lastly, the limitations of the analyses should be discussed to assess the scope of the findings. First, due to the sample selection design, the external validity of the results is restricted and does not generalize to all federal states. However, as the majority has already abolished the binding character of the teacher recommendation and the historic development indicates that this is apparently a trend, one can assume that parents will gain further say in the decision for secondary track choice and it makes sense to impose this restriction. As discussed in more detail in other studies, it is unclear whether this development is beneficial or problematic for the children but parents should be aware of the significance of their decision (Bittmann, 2021b; Pfof et al., 2018). Another limitation regarding external validity is the overall representativeness of the NEPS. As this is a long term panel study and selective dropout and panel-attrition are present, it is known that participating families are positively selected, which is also visible from Table 1 (note the rather small share of lower educated parents). Therefore, the NEPS sample is not perfectly representative of the overall population which is, however, not extremely problematic since the analyses are mostly stratified by social origin and this factor is hence accounted for.

Second, aspirations were surveyed in grade four but it is well known that the development of both parental and filial aspirations is a process that co-evolves over longer periods. While parental aspirations can theoretically exist even before the birth of the child, it is clear that filial aspirations only develop slowly as they require some maturity and a basic understanding of the importance and relevance of education in one's own life. The main assumption is that children will be first influenced by their parents and significant others, however, when the child develops his or her own ideas and values it is known that parents can also adjust their original ideals. One can view this as a dynamic feedback process that develops over time and the measurement of aspirations in grade four is thus only a snapshot. Also, the current analyses only take parental aspirations into account. Following the Wisconsin model, other significant others, like grandparents, other relatives, friends or teachers could also contribute. Clearly, this requires much more intensive surveys yet might be worthwhile for future investigations.

## **6 Conclusion**

As demonstrated empirically, it is indeed the case that educational aspirations of both parents and children can be regarded as strong mediators that explain how social origin influences the decision for the secondary schooling track in Germany. Of special interest is the strength of this mediation pathway that leaves only small residual effects that act independently of aspirations. In addition to

this, the results demonstrate that parental aspirations are a much stronger predictor than filial, which makes sense from a theoretical standpoint. Yet, when conflicting positions arise, parents will not always decide on their own, children do have some bargaining power. Subsequent studies could investigate these processes in more detail, which is not possible at this point given the limitations of scope and length. It might be of relevance to investigate in more detail how and why children can affect the decision when their aspirations are not congruent with those of their parents.

Finally, the present contribution highlights that it might be difficult to identify residual pathways of social origin that act independently of aspirations, which has been quantified statistically in much detail. As the mediating effect of aspirations is apparently quite strong, it might be challenging to gauge these other influences. One related puzzle that is left to solve is why some families with overall high aspirations of both parents and children still opt for a non-academic track, which is difficult to explain with the current theoretical framework. It is obvious that this open question deserves more attention as the decision for or against a given track still influences further educational trajectories to a large extent, even given that options for educational upgrades are widely available. If some schooling tracks lead children in a certain direction that make them abandon their initial high aspirations, this might be a further explanatory factor for the origin and reproduction of social inequality in the strongly tracked German system.

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## 8 Appendix

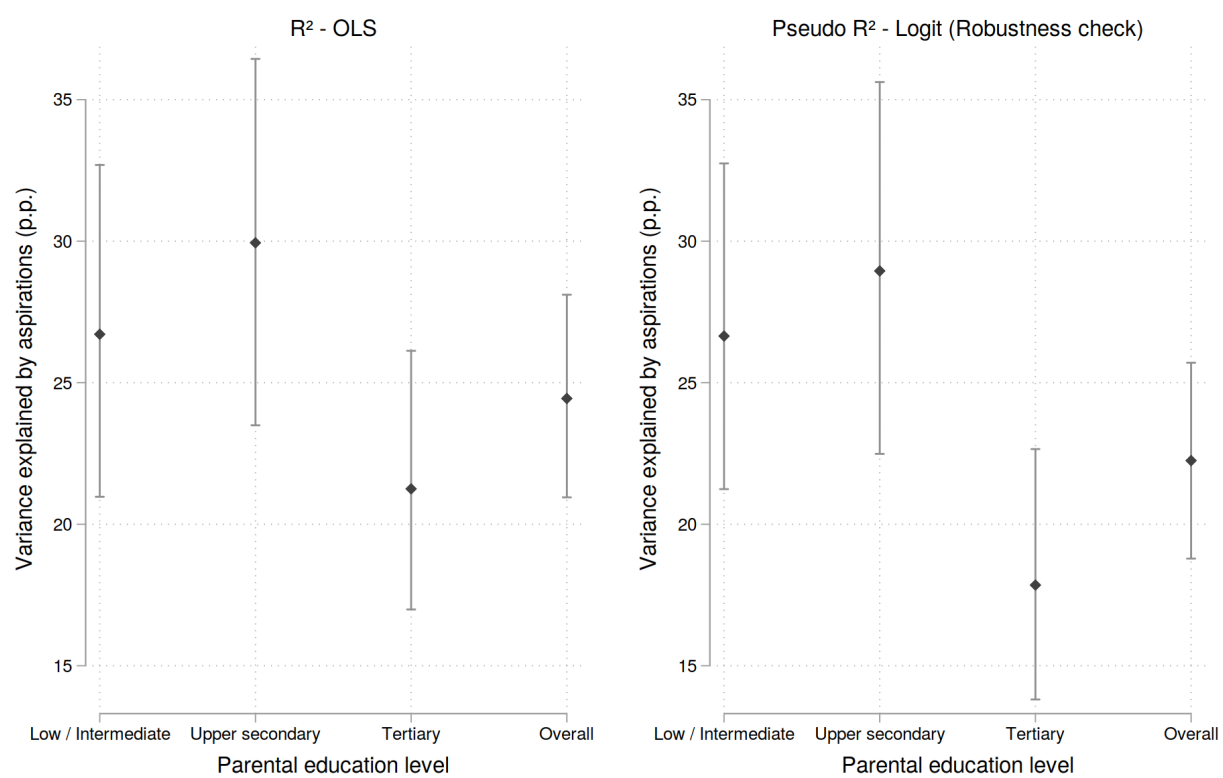
Table A1: OLS regression results by highest parental education

	Low / Interm.	HEE	Tertiary	Overall
Social origin (z-standardized)	0.048 <sup>#</sup> (0.03)	0.041 (0.03)	0.038* (0.02)	0.040*** (0.01)
Idealistic aspirations	0.050 (0.04)	0.022 (0.05)	0.118* (0.05)	0.063* (0.03)
Idealistic aspirations (parents)	0.056 (0.04)	0.123* (0.05)	0.107* (0.05)	0.082** (0.03)
Realistic aspirations	0.159*** (0.04)	0.200*** (0.05)	0.130*** (0.04)	0.162*** (0.03)
Realistic aspirations (parents)	0.462*** (0.04)	0.494*** (0.05)	0.514*** (0.05)	0.490*** (0.03)
Gender of the child	0.009 (0.03)	0.006 (0.03)	0.011 (0.02)	0.009 (0.01)
Age in grade 4	-0.001 (0.04)	-0.044 (0.04)	0.019 (0.03)	-0.004 (0.02)
Migration status				
Both parents born in Germany	Ref.	Ref.	Ref.	Ref.
One parent born abroad	0.061 (0.05)	0.045 (0.04)	0.028 (0.03)	0.041 <sup>#</sup> (0.02)
Both parents born abroad	0.046 (0.04)	0.047 (0.05)	0.097 <sup>#</sup> (0.06)	0.046 (0.03)
Parents living together	0.008 (0.04)	0.040 (0.04)	0.081* (0.03)	0.043* (0.02)
Child enrolled in secondary school	0.020 (0.04)	-0.009 (0.05)	0.086* (0.04)	0.045 <sup>#</sup> (0.02)
Math test score	0.036* (0.02)	0.054** (0.02)	0.041*** (0.01)	0.042*** (0.01)
Reading test score	0.034* (0.01)	0.016 (0.01)	0.013 (0.01)	0.019** (0.01)
Highest parental educational qualification				
Low / Intermediate				Ref.
Higher education eligibility				-0.045* (0.02)
Tertiary				-0.071** (0.03)
Federal state controlled	Yes	Yes	Yes	Yes
Constant	0.054 (0.38)	0.344 (0.44)	-0.423 (0.30)	-0.006 (0.21)
R <sup>2</sup>	0.565	0.512	0.371	0.501
N	824	728	1,421	2,973

Source: NEPS SC2, standard errors in parentheses. 35 imputations. Reported are unstandardized regression coefficients. Dependent variable: child enrolled in the academic track (1) or not (0).

<sup>#</sup>  $p < 0.10$ , \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

Figure A1: Robustness check for variance explained (OLS and logit models)



Source: NEPS SC2, imputed data. 95%-confidence bars are generated using bootstrapping (1,000 resamples). “Overall” gives the effect for the total sample, N = 2,973.



# Chapter 4

## Eine Analyse über die Veränderung von Bildungsaspirationen von Schülern nach dem Übergang in die Sekundarstufe<sup>1</sup>

**Abstrakt:** Bildungsaspirationen von SchülerInnen können als Indikatoren des letztlich erreichten Schulabschlusses angesehen werden und sind daher aus einer Ungleichheitsperspektive betrachtet von großem Interesse. Gegenwärtig ist nur unzureichend bekannt, welche Faktoren dazu beitragen, dass sich Aspirationen nach dem Übergang in die Sekundarstufe positiv oder negativ verändern. Mit Daten des NEPS kann gezeigt werden, dass niedrige schulische Leistungen, eine geringe soziale Herkunft und der Besuch einer nichtgymnasialen Schulform tendenziell mit einem Abstieg von Aspirationen assoziiert sind. Dabei scheint die Schulform den stärksten Effekt auszuüben, gefolgt von der gezeigten schulischen Leistung. Obwohl Aufstiege insgesamt häufiger vorkommen, ist keine der betrachteten Variablen in der Lage, eine solche positive Veränderung zu erklären. Insgesamt wird deutlich, dass eine starke Asymmetrie zwischen Auf- und Abstiegen vorliegt und die einbezogenen Theoriemodelle kaum in der Lage sind, Aufstiegstendenzen vorhersagen bzw. erklären zu können.

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# 1 Einleitung

Bildung und insbesondere formale Bildungsabschlüsse nehmen zweifellos im Leben jedes Einzelnen eine herausragende Bedeutung ein und eröffnen bzw. verschließen diverse Berufe und Karrieren. Bekannt ist, dass die letztlich erreichten Bildungsabschlüsse stark mit Bildungsaspirationen korrelieren und Letztere einen bereits frühzeitig verfügbarer Indikator des Bildungserfolgs darstellen (Khattab, 2015). Im Sinne eines in der Bildungssoziologie häufig gebrauchten handlungstheoretischen Ansatzes erscheint es zentral, tatsächliche Handlungen zu untersuchen und aufzuzeigen, welche intentionalen Prozesse und Absichten diese erklären können, da auf diese Weise subjektiv kausale Handlungsketten verstanden werden können, die idealerweise auch Interventionen zugänglich sind (Hedström, 2005). Aspirationen als Intentionen *typischer Akteure* (Blossfeld & Müller, 1996), welche Handlungen vorausgehen, verdienen daher besondere Beachtung, da sie eine Prognose des weiteren Bildungsverlaufs erlauben und auch als Maßstab für Korrekturen dienen können. Aus dieser Perspektive betrachtet erscheint es von großem Interesse zu verstehen, warum und wie SchülerInnen Aspirationen entwickeln und wie sich diese im Zeitverlauf verändern. Besonders die Korrektur von Aspirationen verdient weitere Aufmerksamkeit. Woran liegt es, dass sich Aspirationen im Zeitverlauf verändern? Können solche Entscheidungen rational erklärt bzw. verstanden werden? Die Zielsetzung dieses Beitrags besteht darin, die Veränderung von Bildungsaspirationen von SchülerInnen nach dem Übergang in die Sekundarstufe zu verstehen und, soweit es möglich ist, zu erklären. Wie häufig werden Aspirationen korrigiert und welche Faktoren korrelieren mit dieser Entscheidung? Da bekannt ist, dass besonders der Sozialstatus des Elternhauses und die Leistungsfähigkeit relevante Faktoren sind (Paulus & Blossfeld, 2007), sollen diese im Detail einbezogen werden. Letztlich stellt sich die Frage, ob gegenwärtige theoretische Modelle in der Lage sind, die Veränderung von Bildungsentscheidungen zu prognostizieren und somit als prädiktive Modelle dienen können.

Zusammenfassend werden folgende Forschungsfragen untersucht:

- Wie häufig und in welche Richtung werden Aspirationen zu Beginn der Sekundarstufe korrigiert?
- Welchen Einfluss haben gewählte Schulform, schulische Leistungsfähigkeit sowie elterlicher Sozialstatus auf eine Korrektur der Aspirationen?

## 2 Theoretische Grundlagen

Sewell et al. (1969) weisen nach, dass Aspirationen von SchülerInnen besonders von signifikanten Anderen beeinflusst werden, beispielsweise von den Eltern, LehrerInnen oder FreundInnen. Dies zeigt klar auf, dass die Aspirationen stark durch soziale Faktoren verändert werden können. Aufbauend auf diesen Ergebnissen nutzen daher manche Studien gar die Aspirationen der Eltern als Proxy für die Aspirationen der Kinder, da der Einfluss stark ist. So stehen in vergleichbaren Studien besonders die elterlichen Aspirationen im Fokus (Ditton, Krüsken & Schauenberg, 2005; Meulemann, 1979), was mitunter an Einschränkungen durch das Erhebungsdesign liegt.

### 2.1 Rational Choice Theorien

Um erklären zu können, wie Aspirationen entstehen und sich verändern, eignen sich verschiedene Theoriekonzepte, die sich in der Schule der Rational Choice Ansätze zusammenfassen lassen. Gemein ist diesen die Annahme, dass Bildungsaspirationen aufbauend auf rationalen und vorausschauenden Abwägungen entstehen. Von besonderem Interesse für die eigene Fragestellung ist dabei, welche Faktoren diesen Entstehungsprozess beeinflussen und weshalb es zu einer Korrektur kommen kann.

Demnach sollten die realistischen Bildungsaspirationen von verschiedenen Faktoren abhängen, die einen Effekt darauf ausüben, welche Ziele ein Kind anstrebt bzw. welche Beschränkungen es berücksichtigen muss. Esser (1999) entwirft ein Modell, das Bildungsaspirationen als Produkt eines rationalen Entscheidungskalküls betrachtet und drei zentrale Faktoren benennt: Kosten, Nutzen und Erfolgswahrscheinlichkeit. Der Nutzen ist dabei der effektive Vorteil eines Bildungsabschlusses für das spätere Leben, der sich beispielsweise im resultierenden Gehalt oder Ansehen bemessen lässt (Becker, 2009). Dieser Punkt ist aber auch relativ zu betrachten, da nicht nur monetäre Aspekte entscheidend sind, sondern auch soziale Wertungen. Hierbei kann auf die Formalisierung von Breen und Goldthorpe zurückgegriffen werden (1997), die darlegen, dass Kinder versuchen, den sozialen Status der Eltern zu reproduzieren. Dies ist vor allem deshalb relevant, weil es aufzeigt, dass der Nutzen eines Bildungsabschlusses relativ betrachtet werden muss. So reicht beispielsweise Kindern aus niederen sozialen Schichten oft ein Haupt- oder Realschulabschluss, um den elterlichen Sozialstatus zu erreichen, während Kinder aus der Oberschicht dazu meistens ein Abitur benötigen. Alleine auf Basis dieser unterschiedlichen Nutzenkalküle können Unterschiede bei den Bildungsaspirationen entstehen. Die zu erwartenden Kosten sind die monetären und ideellen Kosten, die zur Erreichung des angestrebten Bildungsabschlusses erbracht werden müssen. Dazu zählen etwa finanzielle Kosten für Schulen, Material, Nachhilfe oder Lohnausfälle, aber auch eher psychologische Faktoren wie Stress oder zeitliche Kosten für Unterricht und Lernen. Die Erfolgswahrscheinlichkeit bezeich-

net schließlich die individuell veranschlagte Wahrscheinlichkeit, den angestrebten Bildungstitel auch tatsächlich erfolgreich erwerben zu können. Hierbei kann besonders der rückgemeldete Leistungserfolg genannt werden, da dieser beeinflusst, ob ein gewisses Klassenziel und damit der jeweilige Schulabschluss erworben werden kann. Zusammenfassend scheinen demnach besonders zwei Aspekte relevant, nämlich die soziale Herkunft, da sie den relativen Nutzen eines Bildungsabschlusses vorhersagt, sowie die Leistungsfähigkeit, da sie die Erfolgswahrscheinlichkeit beeinflusst. Die Kostenfaktoren können vernachlässigt werden, da sie entweder von den anderen Faktoren abhängen (SchülerInnen mit hoher Leistung werden vermutlich weniger Zeit aufwenden müssen, um die gleichen Ergebnisse zu erzielen wie leistungsschwächere SchülerInnen) oder für alle SchülerInnen identisch sind. Staatliche Schulbildung ist in Deutschland kostenlos und es bestehen keine finanziellen Beschränkungen (z. B. Aufnahmegebühren) bei der Wahl einer staatlichen Schule. Die nach sozialer Schicht unterschiedlichen *relativen* Kosten (beispielsweise der Anteil des familiären Einkommens, der für Schulmaterial benötigt wird), wird wiederum über die soziale Schicht gemessen. Somit gilt zusammenfassend: Je höher der erwartete Nutzen und die Erfolgswahrscheinlichkeit und je geringer die Kosten, desto höher die resultierende Bildungsaspiration. Aufbauend auf diesen Annahmen kann geschlussfolgert werden, dass sich SchülerInnen bereits zu Beginn der Sekundarstufe in ihren Aspirationen unterscheiden und die Aspirationen umso höher sind, je höher der Sozialstatus ist. Wieso aber kommt es nun zu selektiven Veränderungen dieser Aspirationen? Da, wie argumentiert, das Motiv des Statuserhalts zentral ist, kann angenommen werden, dass sich die Aspirationen aus sozial hochgestellten Familien kaum mehr verändern und wenn, dann tendenziell Aufstiege erfolgen, da die Kinder mit fortschreitendem Alter eher einsehen, dass sie zur Statusreproduktion anspruchsvolle Bildungstitel benötigen. Anders verhält es sich für Kinder mit einem geringeren Sozialstatus. Aufbauend auf dem Argument des Statuserhalts ist nicht zu erwarten, dass diese im Laufe der Zeit höhere Aspirationen ausbilden. Sollten diese vorhanden sein, so werden sie tendenziell öfter verloren gehen, da es keine andauernde Motivation bzw. sozialen Druck gibt, diese aufrecht zu erhalten. Somit kann gefolgert werden, dass die Wahrscheinlichkeit eines Verlusts von Aspirationen umso größer wird, je niedriger der Sozialstatus einer Schülerin oder eines Schülers ist (Hypothese 1). Betrachtet man weiterhin die Rolle von akademischer Leistungsfähigkeit (unabhängig von der sozialen Herkunft), so kann angenommen werden, dass SchülerInnen mit unzureichenden Leistungen ihre Aspirationen tendenziell öfter nach unten korrigieren (Hypothese 2). Selbst bei anfänglich hohen Aspirationen kann es sein, dass die rückgemeldeten Leistungsergebnisse (z. B. Schulnoten) den Kindern aufzeigen, dass ursprüngliche angestrebte Bildungstitel wohl nicht erreicht werden können und somit eine Korrektur erfolgt. Ob hingegen bei sehr guten Leistungen und anfänglich niedrigen Aspirationen eine Korrektur nach oben erfolgt, ist dennoch ungewiss, da möglicherweise

schlichtweg keine Motivation gegeben ist, den höheren Bildungsabschluss anzustreben (etwa, wenn kein Druck durch die Eltern erfolgt). Insofern wird dies nicht als explizite Hypothese formuliert.

Unklar ist allerdings noch der Effekt der Schulform in der Sekundarstufe sowie die Interaktion mit beiden zuvor genannten Variablen. Zu erwarten ist dabei, dass die Wahrscheinlichkeit, das Gymnasium zu besuchen, mit steigendem Sozialstatus ansteigt, da hier soziale Selektionseffekte bestehen (Stocké, 2008). Umgekehrt sollten SchülerInnen mit einem eher geringen Sozialstatus tendenziell die anderen Schulformen besuchen, da sie hier die Möglichkeiten haben, sich weiter abzusichern und zunächst geringere Bildungsabschlüsse zu erwerben, was im Einklang mit einer allgemein höheren Risikoaversion dieser Gruppe steht (Tutić, 2017). Letztlich sind aber die genauen Wechselwirkungen bzw. Interaktionen der drei zentralen Variablen (gewählte Schulform zu Beginn der Sekundarstufe / soziale Herkunft / Leistungsfähigkeit) nicht eindeutig theoretisch abzuleiten. So ist unklar, welche der drei Variablen die stärkste Wirkung ausübt oder ob etwa eine geringe soziale Herkunft durch eine sehr hohe Leistungsfähigkeit ausgeglichen werden kann. Zudem wäre es sehr umfangreich, an dieser Stelle eine Vielzahl von (Unter-)Hypothesen abzuleiten, die alle denkbaren Kombinationen berücksichtigt. Insofern erscheint es sinnvoll, diesen Teil der Analysen als explorativ zu betrachten und zu versuchen, die letztlich erzielten Ergebnisse in die bisher dargelegten theoretischen Annahmen einzubetten. Weiter verkompliziert wird die Hypothesenbildung, wenn man eine Asymmetrie zwischen Auf- und Abstieg annimmt. Wie bereits zuvor erwähnt, kann nicht zwingend angenommen werden, dass eine Variable, die einen Abstieg unwahrscheinlicher macht, einen Aufstieg dafür wahrscheinlicher macht. Zusammenfassend werden die nachfolgenden Berechnungen sehr feinteilige Analysen bzw. Interpretationen erlauben, auch wenn an dieser Stelle keine gerichteten Hypothesen formuliert werden.

## 2.2 Forschungsstand

Aus früheren Studien sind bereits verschiedene Determinanten der Bildungsaspirationen bei SchülerInnen bekannt. So scheinen zweifelsohne die elterlichen Aspirationen einen Hauptfaktor darzustellen, da diese die kindlichen Aspirationen stark beeinflussen (Kirk, Lewis-Moss, Nilsen & Colvin, 2011; Meulemann, 1985; Paulus & Blossfeld, 2007; Stamm, 2005; Stocké, 2010). Auch ältere Geschwister mit hohen Aspirationen bzw. einem Besuch des Gymnasiums wirken sich ebenso positiv aus wie eine verstärkte elterliche Unterstützung bei schulbezogenen Aktivitäten, die hier alle als sozial vermittelte Faktoren betrachtet werden können. Als weitere prädiktive Variablen lassen sich die soziale Herkunft bzw. die Bildung im Elternhaus (Gehrmann, 2018) und das Leistungslevel bzw. die Leistungserwartung durch die LehrerInnen identifizieren (Gölz & Wohlking, 2018; Zimmermann, 2018). Auch andere Faktoren, wie beispielsweise das Geschlecht (Gil-Flores, Padilla-Carmona & Suárez-Ortega, 2011) oder ein Migrationshintergrund, können sich positiv auswirken (Becker &

Gresch, 2016; Kristen, 2002). Zitierte Studien betrachten jedoch in der Regel nur einen Zeitpunkt. Es handelt sich daher meistens um Querschnittsanalysen. Die Frage hingegen, wie sich Aspirationen in Abhängigkeit bestimmter Faktoren verändern, bleibt in vielen Fällen unbeachtet. Besonders der Effekt der gewählten Schulform nach dem Übertritt ist unzureichend erforscht. Die Studien, die diese Frage am Rande erwähnen, bleiben dann auch eher vage: „Zum Zeitpunkt der neunten Jahrgangsstufe scheinen die primären und sekundären Herkunftseffekte dafür gesorgt zu haben, dass sich Schülerinnen und Schüler bereits auf der entsprechenden Schulform befinden und dort entsprechende schulische Leistungen ab[zu]liefern, die der Bildungsaspiration entsprechen, ein Selektionsprozess nach der sozialen Herkunft scheint dort nicht mehr stattzufinden“ (Gehrmann 2018: 114). Insofern ist es der Anspruch der vorliegenden Untersuchung, diese Fragestellung im Detail zu betrachten und besonders den Effekt der Schulform bzw. auch deren Interaktion mit Variablen der sozialen Herkunft und der Leistungsfähigkeit näher zu analysieren.

### **3. Empirische Analysen**

#### **3.1 Daten und Sample**

Alle Analysen basierten auf den Daten der National Educational Panel Study (NEPS), welche seit 2010/11 ein Multikohorten-Sequenz-Design umsetzt (Blossfeld, Roßbach & Maurice, 2011). Dabei wurden Personen in verschiedenen Lebensabschnitten wiederholt (jährlich) befragt, um längsschnittliche Individualdaten zu generieren. Für die vorliegende Untersuchung dienten die Daten der Startkohorte 2, welche zum Beginn der Befragung vierjährige Kindergartenkinder umfasste, die 2012 schulpflichtig wurden. Da seit Studienbeginn bereits acht Befragungen durchgeführt wurden, haben alle Kinder die Grundschule abgeschlossen und sind auf eine Sekundarstufenschule übergegangen. Dieses Design machte die Kindergartenkohorte zu einer geeigneten Datengrundlage, da zahlreiche Informationen zur Schulhistorie und Aspirationen, aber auch zum familiären Hintergrund sowie umfassende Kontextvariablen vorlagen. Darüber hinaus wurden auch zugehörige Kontextpersonen (Eltern, ErzieherInnen und LehrerInnen) befragt. Das ursprüngliche Sample umfasste in der ersten Befragungswelle (2010/11) 2.949 Kinder, wobei im Studienverlauf mehrere Sample-Auffrischungen durchgeführt wurden, um eine konstant hohe Teilnehmerzahl auch bei Panelattrition zu gewährleisten. Für die interessierenden Wellen (sechs und acht) lagen somit 5.418 bzw. 4.164 Fälle vor. Das Stichprobendesign basierte auf einer repräsentativen Stichprobe aller Kindertageseinrichtungen in Deutschland mit mindestens zehn Plätzen.

Dieses Sample wurde für alle nachfolgenden Analysen weiter eingeschränkt. Kinder aus den Bundesländern Berlin und Brandenburg wurden nicht einbezogen, da für diese das Alter der ersten Selektion später erfolgt ist und somit nicht klar war, auf welche Schulen diese Kinder übergegangen

sind (N = 262, Welle sechs). Zudem wurden alle Kinder ausgeschlossen, die zwischen Klasse fünf und sechs die Schulform wechselten, da in diesem Fall der Effekt der Schule in der Sekundarstufe nicht mehr klar zugeordnet werden konnte (N = 48).

### 3.2 Variablen und Operationalisierung

Die Operationalisierung der zentralen abhängigen Variable (realistische Bildungsaspiration) erfolgte mit folgendem Item: „Wenn du einmal an alles denkst, was du jetzt weißt: Mit welchem Abschluss wirst du wohl tatsächlich die Schule verlassen?“. Zur Auswahl standen dabei die Antwortmöglichkeiten: Hauptschulabschluss, Realschulabschluss und Abitur. Dieses Item wurde gewählt, da es im Zeitverlauf wiederholt abgefragt wurde und einen Eindruck darüber vermittelt, welchen Schulabschluss die befragten Kinder tatsächlich glauben, erreichen zu können. Sie waren somit angehalten, ihre eigene Leistungsfähigkeit, Interessen und Rahmenbedingungen in die Antwort einfließen zu lassen und nicht nur einen idealisierten Wunsch zu äußern. Dieses Item sollte daher, im Gegensatz zu idealistischen Aspirationen, eine genauere Vorhersage des letztlich tatsächlich erreichten Abschlusses ermöglichen. Grundsätzlich ist die Frage berechtigt, inwiefern SchülerInnen der vierten Klasse dies richtig einschätzen können. Dennoch wurde dieses Item und nicht etwa die Aspirationen der Eltern gewählt, da besonders der Zeitverlauf im Fokus der Analysen stand und somit bei der zweiten Befragung in der sechsten Klasse nur dann ein Vergleich möglich war, wenn jeweils das Kind selbst geantwortet hatte. Es war anzunehmen, dass im Laufe der Zeit die Einschätzungen grundsätzlich realistischer und akkurater werden, da die Kinder an Reife hinzugewinnen und mehr Informationen zu ihrer Leistungsfähigkeit und ihren Interessen erhalten.

Die Leistungsfähigkeit der Kinder wurde in Klasse vier über eine Einschätzung der jeweiligen Lehrerinnen und Lehrer generiert. Dabei sollten diese verschiedenen Kompetenzen der Kinder (beispielsweise sprachliche, mathematische, soziale Fähigkeiten und die Konzentrationsfähigkeit) im Vergleich zu anderen Kindern gleichen Alters beurteilt werden. Es wurde somit aus insgesamt neun Einzelitems eine Skala mit einer sehr hohen Reliabilität generiert (Cronbachs Alpha = 0,905), mit Werten zwischen 1 (sehr geringe Fähigkeiten) und 5 (sehr hohe Fähigkeiten). Dieses Konstrukt wurde den klassischen Schulnoten aus zwei Gründen vorgezogen. Zunächst wies das Item eine größere Variabilität auf, da statt der klassischen Schulnoten mit den Stufen 1 bis 6 durch die neun Einzelitems deutlich mehr Zwischenabstufungen vorlagen und eine quasimetrische Variable gebildet wurde (statt einer ordinalen Notenskala), die demnach ein höheres Detaillevel bieten sollte. Zudem konnte nicht angenommen werden, dass Noten verlässlicher oder standardisierter wären, da bekannt ist, dass zahlreiche Faktoren die Notengebung beeinflussen und eine hohe Variabilität nach LehrerInnen aber etwa auch nach Schulformen vorliegen. Der soziale Status des Elternhauses wurde über den ISEI gemessen (*International Socio-Economic Index of Occupational Status*), welcher auf dem

Einkommen, Bildungslevel und Beruf basiert (Ehmke & Siegle, 2005). Da diese Informationen von beiden Elternteilen im Laufe der Studie mehrfach abgefragt wurden, wurde über alle Wellen hinweg der Median gebildet. Lagen Informationen von beiden Elternteilen vor, so wurde das arithmetische Mittel gebildet, ansonsten wurde der vorhandene Wert herangezogen. Die errechneten Werte lagen zwischen 16 (sehr geringer Sozialstatus) und 90 (sehr hoher Sozialstatus).

Die Schulform der weiterführenden Schulen in der Sekundarstufe wurde binär operationalisiert (Gymnasium oder andere Schulform). Obwohl das deutsche Schulsystem traditionell dreigliedrig aufgebaut ist, lässt sich in vielen Bundesländern ein Trend hin zu einer Zweigliedrigkeit beobachten (Hoffmann & Malecki, 2018, S. 12). Die klassischen Haupt- und Realschulen werden immer öfter in einer Schulform (z. B. „Mittelschule“ oder „Stadtteilschule“) kombiniert oder durch den Ausbau von Gesamtschulen ersetzt. Der somit letztlich einzige noch bestehende große Kontrast ist demnach zwischen Gymnasien und den anderen Schulformen. Problematisch war weiterhin, dass nicht alle Schulformen in allen Bundesländern bestehen und somit tendenziell leere Kategorien entstehen, also teilweise keine Vergleichsgruppen gebildet werden konnten. Auch dieses Problem wurde mit der gewählten Operationalisierung umgangen. Letztlich war es auch ein Aspekt der Fallzahlen. Die weiter schwindende Attraktivität der akademisch weniger anspruchsvollen Schulformen und insbesondere der Hauptschulen führte dazu, dass diese Kategorien oftmals nur schwach besetzt waren und somit Effekte nicht verlässlich berechnet werden konnten. Um tendenziell irreführende oder stark vom Zufall beeinflusste Ergebnisse zu vermeiden, wurden keine Statistiken für diese Unterkategorien berechnet.

Um Scheinkorrelationen so weit wie möglich auszuschließen, wurden die folgenden Kontrollvariablen einbezogen: Geschlecht des Kindes, Familienstand, Migrationshintergrund sowie das Bundesland.<sup>2</sup> Die Auswahl kann damit begründet werden, dass theoretisch denkbar ist, dass genannte Variablen die Aspirationen und die erklärenden Variablen gleichzeitig beeinflussen, was eine Scheinkorrelation verursachen würde. Weitere Variablen, nämlich Alter des Kindes sowie durchschnittliches Alter der Eltern, wurden nach ersten Analysen letztlich nicht einbezogen, da sie keine zusätzliche Varianzaufklärung boten und Standardfehler durch Einbezug möglicherweise vergrößert worden wären.

### 3.3 Analysestrategie

Um die Veränderung von Aspirationen untersuchen zu können, bieten sich verschiedene statistische Methoden an, wobei hier der Längsschnittcharakter der Daten ausgenutzt werden sollte. Aus allen

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2 Um den Datenschutzbestimmungen des NEPS zu entsprechen, wurden die Bundesländer zusammengefasst und damit vergrößert: Norden (Schleswig-Holstein, Hamburg, Niedersachsen, Bremen), Ostdeutschland (inkl. Berlin), Süden (Bayern und Baden-Württemberg) und Westen (alle anderen).



Wellen wurden zwei ausgewählt: Welle sechs, die Befragung in der vierten Klasse und damit die letzte vor dem Übergang in die Sekundarstufe sowie Welle acht, die Befragung in der sechsten Klasse und die aktuellste verfügbare Welle. Da Aspirationen in beiden Wellen vorlagen, konnte ein Differenzmaß gebildet werden, welches die Veränderung der Aspirationen misst. Von Interesse waren dabei alle Fälle, in denen eine Veränderung, also ein Ab- oder Aufstieg erfolgt ist. Es wurde damit jeweils eine binäre Variable generiert (keine Veränderung (0) oder Ab- bzw. Aufstieg (1)). Diese abhängigen Variablen dienten als Grundlage aller nachfolgenden Analysen. Als statistische Methode wurden binär logistische Regressionen gewählt. Dieses relativ simple Design erlaubte die Erklärung der Veränderung der Aspirationen im Zeitverlauf. Alle Analysen wurden in Stata 16 durchgeführt, Do-Files sind auf Anfrage verfügbar. Fehlende Datenpunkte (item nonresponse) wurden über Multiple Imputation (MICE) ergänzt, um die Anzahl der effektiv nutzbaren Informationen zu erhöhen. Generiert wurden dabei für jedes Analysemodell 20 Imputationen nach einem Burn-In von 100. Die fehlenden Werte wurden dabei unter Einbezug aller genutzten Variablen im Modell sowie einigen Hilfsvariablen erzeugt. Die üblichen Robustheitsmaße nach Imputationen, wie beispielsweise Tests auf Konvergenz der Imputationen, wurden dabei berücksichtigt (Allison, 2001).

## 4 Ergebnisse

### 4.1 Deskription

Zunächst werden knapp deskriptive Statistiken für alle einbezogenen Variablen berichtet (Welle 8, Klasse 6), um einen allgemeinen Eindruck über deren Verteilung zu gewinnen. Zunächst fällt auf, dass die Aspirationen im Sample allgemein sehr hoch sind. So weisen in der vierten Klasse 70 % aller SchülerInnen Aspirationen für das Abitur auf und nur knapp 3 % Aspirationen für den niedrigsten Schulabschluss. Eine Übersicht über alle deskriptiven Statistiken findet sich in Tabelle 1. Erwähnenswert ist zudem, dass in Klasse 6 63 % aller SchülerInnen das Gymnasium besuchten, was aufzeigt, dass andere Schulformen zunehmend marginalisiert werden. Weiterhin werden für eine grobe Übersicht die Zusammenhänge zwischen der Veränderung von Aspirationen und dem Geschlecht, Migrationshintergrund, Schulart, Sozialstatus, Leistungsfähigkeit sowie dem Familienstatus in Tabelle 2 dargestellt. Hierbei wird erkennbar, dass in fast allen sozialen Gruppen ein Aufstieg wahrscheinlicher war als ein Abstieg. So kam es, betrachtet für das gesamte Sample, in ca. 14 % zu einem Aufstieg, ca. 11 % erlebten einen Abstieg und 75 % veränderten ihre Aspirationen nicht. Auch wird deutlich: Je höher der soziale Status des Elternhauses bzw. je höher die Leistung, desto geringer die Wahrscheinlichkeit für einen Abstieg oder einen Aufstieg. Dies bedeutet, dass Personen mit einem hohen Sozialstatus bzw. einer hohen Leistung ihre Aspirationen seltener veränderten als andere Personen.

*Tabelle 1: Deskriptive Statistiken für Welle 8 (Klassenstufe 6)*

<b>Variable</b>	<b>Mittelwert</b>	<b>SD</b>
Realistische Aspirationen		
Hauptschulabschluss	0.03	0.17
Realschulabschluss	0.26	0.44
Abitur	0.70	0.46
Kompetenz (Lehrerbewertung)	3.77	0.72
Elterlicher ISEI	51.81	13.93
Mädchen	0.51	0.50
Alter	10.94	0.36
Migrationshintergrund		
Beide Eltern Deutsch	0.79	0.41
Ein Elternteil im Ausland geb.	0.12	0.33
Beiden Eltern im Ausland geb.	0.09	0.28
Familienstatus		
Eltern leben zusammen	0.83	0.37
Geschieden / Verwitwet	0.10	0.30
Alleinerziehend	0.07	0.25
Bundeslandgruppe		
Süden	0.30	0.46
Osten	0.13	0.34
Norden	0.20	0.40
Westen	0.37	0.48

Quelle: NEPS SC2, imputierte Daten. N=5122.

Tabelle 2: Zusammenhang zwischen Änderungen von Aspirationen und zentralen Variablen

Variable	Konstant	Abstieg	Aufstieg
<b>Ganzes Sample</b>	74.93	11.22	13.85
Geschlecht			
Jungen	75.05	11.37	13.58
Mädchen	74.09	11.09	14.11
Migrationshintergrund			
Beide Eltern Deutsch	74.78	11.03	14.19
Ein Elternteil im Ausland geb.	78.70	9.45	11.85
Beiden Eltern im Ausland geb.	73.05	13.57	13.38
Schulart			
Alle anderen	58.19	20.36	21.45
Gymnasium	86.08	4.80	9.11
ISEI Terzile			
1 (Niedrig)	65.49	16.72	17.79
2	75.80	10.67	13.53
3	83.44	6.29	10.27
Kompetenzterzile			
1 (Niedrig)	60.51	19.11	20.37
2	75.70	9.78	14.52
3	89.66	3.73	6.61
Familienstatus			
Eltern leben zusammen	76.47	9.77	13.75
Geschieden / Verwitwet	65.93	19.99	14.08
Alleinerziehend	72.60	12.97	14.43

Quelle: NEPS SC2, imputierte Daten. Aufgrund der Rundung addieren sich Anteile nicht immer zu 100.

## 4.2 Verlust von Aspirationen

Zunächst wurde getestet, welche Variablen einen Abstieg von Aspirationen beeinflussen. Das Sample umfasste dabei alle Personen, bei denen ein Abstieg theoretisch möglich war, die also in der vierten Klasse nicht die niedrigsten Aspirationen aufwiesen (*population at risk*). Es wurden binär logistische Regressionen durchgeführt. Die abhängige Variable gab an, ob ein Abstieg erfolgt ist (1) oder nicht (0). Dabei wurden zwei hierarchisch genestete Modelle gerechnet: Das erste Modell enthielt nur die zentralen Prädiktorvariablen: Schulform, akademische Leistungsfähigkeit sowie soziale Herkunft. Das zweite Modell nahm danach zusätzlich alle soziodemografischen Kontrollvariablen auf. Zusammengefasst waren folgende unabhängigen Variablen im Modell enthalten: Schulform, Leistungsfähigkeit, Sozialstatus (ISEI), Geschlecht, Migrationshintergrund, Familienstand, Alter

des Kindes und die Bundeslandgruppe. Die Variablen Leistungsfähigkeit sowie ISEI waren dabei z-standardisiert eingebracht, um eine vergleichbare Interpretation zu ermöglichen. Die Ergebnisse finden sich in Tabelle 3, Modelle M1 und M2.

Tabelle 3: Ergebnisse logistische Regression

Variable	M1	M2	M3	M4
	Abstieg		Aufstieg	
Gymnasium	-0.106*** (0.019)	-0.102*** (0.018)	0.042 (0.038)	0.044 (0.038)
Kompetenz <sup>#</sup>	-0.034*** (0.009)	-0.032*** (0.009)	-0.024 (0.022)	-0.032 (0.022)
Elterlicher ISEI <sup>#</sup>	-0.020* (0.008)	-0.019* (0.009)	0.010 (0.016)	0.010 (0.017)
Mädchen		-0.002 (0.012)		0.036 (0.028)
Alter		0.000 (0.000)		-0.000 (0.000)
Migrationshintergrund				
Beide Eltern in Deutschland geboren		Ref.		Ref.
Ein Elternteil im Ausland geboren		-0.009 (0.022)		-0.013 (0.049)
Beide Eltern im Ausland geboren		-0.003 (0.023)		-0.011 (0.054)
Familienstatus				
Eltern leben zusammen		Ref.		Ref.
Geschieden / Verwitwet		0.056 (0.028)		-0.092* (0.044)
Alleinerziehend		0.007 (0.028)		-0.029 (0.066)
Bundeslandgruppe				
Süden		Ref.		Ref.
Osten		0.003 (0.023)		0.017 (0.058)
Norden		-0.001 (0.021)		0.061 (0.049)
Westen		0.015 (0.019)		-0.044 (0.037)
N	4151	4151	1715	1715
Adjustiertes R <sup>2</sup>	0.083	0.091	0.002	0.014

Quelle: NEPS SC2, imputierte Daten. Berichtet werden durchschnittliche Marginaleffekte (AMEs). Standardfehler in Klammern. Variablen mit # sind z-standardisiert. \* p < 0.05, \*\* p < 0.01, \*\*\* p < 0.001

Hierbei wird deutlich erkennbar, dass Sozialstatus und Leistung einen negativen Effekt auf die Wahrscheinlichkeit eines Abstieges haben. Je höher der Sozialstatus oder die Leistung, desto geringer die Wahrscheinlichkeit, dass ein Abstieg erfolgte. Diese Effekte sind signifikant und ändern sich

auch unter Einbezug der Kontrollvariablen in M2 kaum. Da die Variablen standardisiert wurden, wird deutlich, dass die Leistung einen stärkeren Einfluss ausübt. Auch die Schulform hatte einen hochsignifikanten Effekt. Personen auf dem Gymnasium hatten eine um mehr als zehn Prozentpunkte geringere Wahrscheinlichkeit, ihre Aspirationen abzusenken, als Kinder auf anderen Schulformen.

In einem weiteren Schritt wurden zusätzlich Interaktionsterme zwischen Schule, Leistungsfähigkeit sowie Sozialstatus eingeführt, um basierend auf diesem Modell vorhergesagte Wahrscheinlichkeiten zu berechnen. Diese geben individuell für jede Person an, wie hoch die Wahrscheinlichkeit ist, dass diese Person ihre Aspirationen in der sechsten Klasse nach unten korrigiert hat. Für eine anschauliche Interpretation wurden die Ergebnisse anschließend nach Schulform sowie ISEI bzw. Leistungsquartilen aggregiert und in einer Tabelle dargestellt. Somit wird eine übersichtliche Interpretation möglich, siehe Tabelle 4, oberes Panel. Hier wird der „protektive“ Effekt des Gymnasiums erkennbar, der auch als „Halteeffekt“ der deutschen Sekundarstufe und insbesondere des Gymnasiums interpretiert werden kann (Fend, 1980). Für jeden Zellenvergleich über die Schulform hinweg weist das Gymnasium geringere Wahrscheinlichkeiten auf. So hatten beispielsweise Kinder mit dem geringsten Sozialstatus und den geringsten Leistungen auf dem Gymnasium eine Wahrscheinlichkeit von ca. 10.5 % ihre Aspirationen zu senken, während vergleichbare Kinder auf anderen Schulformen eine annähernd drei Mal so hohe Wahrscheinlichkeit hatten.

*Tabelle 4: Vorhergesagte Wahrscheinlichkeit für Aufstiege und Abstiege nach Schulart, ISEI und Kompetenzen*

Abstiege								
ISEI		Andere Schularten				Gymnasium		
4	20.55	14.42	11.44	8.23	7.77	4.59	2.89	1.59
3	22.29	16.54	13.89	10.21	8.60	5.79	3.94	2.62
2	25.51	19.06	15.95	11.76	9.02	7.03	5.07	3.62
1 (niedrig)	28.45	22.10	18.63	15.59	10.46	8.62	7.10	5.77
Kompetenz	1 (niedrig)	2	3	4	1 (niedrig)	2	3	4

Aufstiege								
ISEI		Andere Schularten				Gymnasium		
4	32.34	33.10	32.98	33.77	42.52	40.75	35.42	29.54
3	31.25	32.11	31.84	32.04	40.20	38.08	36.21	30.25
2	32.21	30.51	30.45	29.26	40.31	37.79	34.90	30.52
1 (niedrig)	31.01	29.53	28.59	26.31	38.26	35.44	33.00	29.61
Kompetenz	1 (niedrig)	2	3	4	1 (niedrig)	2	3	4

Quelle: NEPS SC2, imputierte Daten. Berichtete Wahrscheinlichkeiten basieren auf Modellen M2 (Abstiege) und M4 (Aufstiege). Interaktionseffekte zwischen ISEI, Kompetenz und Schulart wurden eingefügt. ISEI und Kompetenzen wurden in Quartilen kategorisiert.

### 4.3 Zugewinn von Aspirationen

Die nachfolgenden Analysen erfolgten analog zu den bereits eben präsentierten. In diesem Fall wurde untersucht, wie die verschiedenen erklärenden Faktoren einen möglichen Aufstieg beeinflussten. Das Sample umfasste dabei alle Personen, bei denen ein Aufstieg theoretisch möglich war, die also in der vierten Klasse noch nicht die höchsten Aspirationen aufwiesen. Diese Einschränkung wirkte sich erheblich auf die Anzahl der nutzbaren Fälle aus, da viele Kinder eben bereits zu Beginn sehr hohe Aspirationen berichteten. Die Ergebnisse finden sich in Tabelle 3, Modelle M3 und M4, sowie Tabelle 4, unteres Panel. Es wird deutlich, dass in der Regressionstabelle keine signifikanten Effekte für Sozialstatus, Leistung oder Schulform bestehen. Die vorhergesagten Wahrscheinlichkeiten liefern ein ähnliches Bild. Zwar waren die Chancen für einen Aufstieg mit ca. 30-40 % relativ hoch, doch unterschieden sie sich quasi nicht über Spalten und Zeilen hinweg. Die Schlussfolgerung ist, dass weder Schulform, Leistung noch Sozialstatus die Wahrscheinlichkeit eines Aufstieges signifikant beeinflussen.

## 5 Diskussion

Anhand der Ergebnisse wird deutlich, dass das Sample insgesamt recht hohe Aspirationen aufweist, was zu starken Asymmetrien führt. Ein Großteil der SchülerInnen kann die Aspirationen beispielsweise überhaupt nicht weiter erhöhen, da sie bereits in der vierten Klasse die höchsten Aspirationen aufweisen. Aus diesem Grund wurden zwei getrennte Analysemodelle mit unterschiedlichen Samp-

les berechnet. Hierbei wurde bei der Untersuchung der Abstiege erkennbar, dass soziale Herkunft und Leistungsfähigkeit die erwarteten Effekte haben und eine hohe soziale Herkunft bzw. eine hohe Leistungsfähigkeit mit einer geringeren Wahrscheinlichkeit assoziiert sind, die Aspirationen abzusenken. Für die Schulform zeigt sich, dass Personen, die auf ein Gymnasium übergegangen sind, signifikant geringere Wahrscheinlichkeiten haben, ihre Aspirationen abzusenken. In Bezug auf die Aufstiege wird hingegen deutlich, dass eine starke Asymmetrie besteht und keine der genannten Variablen einen Effekt ausübt. Insgesamt zeigt Tabelle 3 auf, dass alle drei zentrale Faktoren Schulform, Leistungsfähigkeit und soziale Herkunft einen individuellen Effekt aufweisen. Da die Ergebnisse belegen, dass die Wahrscheinlichkeit eines Abstiegs mit steigendem Sozialstatus sinkt, kann Hypothese 1 angenommen werden. Gleiches gilt für Hypothese 2. Auch diese wird angenommen, da ein Abstieg mit steigendem ISEI unwahrscheinlicher wird.

Betrachtet man nun den Nexus aus Schulform, Leistungsfähigkeit und sozialer Herkunft im Detail, so bietet Tabelle 4 weitreichendes Interpretationspotenzial. So fällt zunächst der sehr starke protektive Effekt des Gymnasiums auf. Die Wahrscheinlichkeit eines Abstiegs ist selbst für die schwächsten SchülerInnen mit dem geringsten Sozialstatus kaum höher als für die privilegiertesten und leistungsfähigsten Kinder auf anderen Schulformen. Dieser Effekt ist beeindruckend und verdeutlicht, dass offenbar quasi keine Korrekturen mehr erfolgen, sofern das Gymnasium einmal erreicht wurde (sicherlich mögen manche dieser Kinder aufgrund unzureichender Leistungen letztlich zwangsweise auf eine andere Schulart wechseln). Dieser Befund ist insgesamt verständlich, da das Gymnasium als zentrales Ziel den Erwerb des Abiturs hat, also keine weiteren Entscheidungen getroffen werden müssen. Viel stärker sind die Effekte auf anderen Schulformen. Offenbar spielt es hier eine Rolle, dass der nächste Schulabschluss nicht unbedingt der höchste sein muss und weiter Raum für Korrekturen bzw. weiterführende Schulbesuche besteht. Betrachtet man im Weiteren die Bedeutung von sozialer Herkunft und Leistung, wird erkennbar, dass Leistung offenbar den größeren Effekt hat. Die Vergleiche verdeutlichen, dass die Wahrscheinlichkeit eines Abstiegs bei geringerer Leistung stärker ansteigen als bei geringerer sozialer Herkunft. Dieser Befund erscheint plausibel, immerhin ist es in vielen Fällen schlichtweg unmöglich, einen hohen Abschluss zu erreichen, wenn die Noten nicht ausreichend sind. Hier wirken harte Grenzen (Klassenziel, Versetzung), die auch ein hoher Sozialstatus nicht zu brechen mag. Dies gilt übrigens ebenso für Kinder auf dem Gymnasium. Die Ergebnisse für Aufstiege sind insgesamt deutlich unklarer und zeigen insgesamt wenig Variation in Abhängigkeit von den interessierenden Variablen, was sich bereits in Tabelle 3 abgezeichnet hat. Insofern sind diese Ergebnisse kaum zu interpretieren. Es zeigen sich nur insgesamt recht hohe Tendenzen zu einem Aufstieg, der unabhängig von Schulform, Leistung und Herkunft ist. Diese eher unerwarteten Ergebnisse mögen auch mit der *population at risk* erklärbar sein. Welche SchülerIn-



nen besuchen etwa ein Gymnasium, aber weisen *keine* Aspirationen für das Abitur auf? Dies scheint eine kleine, sehr spezielle Gruppe zu sein, der die Bedeutung der Schulwahl womöglich noch nicht klar geworden ist. Auch könnte es sein, dass der Messfehler eine größere Bedeutung hat und hier Ergebnisse verzerrt werden. Auch ein optimistisches Bias der SchülerInnen, also eine mögliche Überschätzung der eigenen Fähigkeiten, erscheint denkbar und würde die allgemein hohen Aspirationen bzw. starken Aufstiegstendenzen erklären. Mit den in Zukunft verfügbar werdenden Nachfolgesurveys des NEPS kann analysiert werden, wie lange diese Trends anhalten und wie die langfristige Entwicklung in den höheren Klassenstufen aussieht. Vermutlich werden viele Veränderungen erst dann auftreten, wenn das Ende der unteren Schularten näher rückt und die Kinder mit der Entscheidung für den weiteren Bildungsweg aktiv konfrontiert werden. Interessant wäre ebenfalls eine detailliertere Betrachtung der anderen Schulformen, also eine Trennung nach Haupt-, Real- und Gesamtschulen. Aufgrund der deutlich reduzierten Fallzahlen in diesen Kategorien ist es mit den gegebenen Daten leider nicht möglich, stabile Effekte zu schätzen, weshalb diese Fragestellung in nachfolgenden Analysen mit anderen Daten besonders relevant erscheint. Ebenfalls von Interesse sind Variablen, die offenbar *keine* Effekte ausüben. Mädchen zeigen demnach keine anderen Aspirationsveränderungen als Jungen. Gleiches gilt für Kinder mit Migrationshintergrund. Diese zeigen ebenfalls keine besonderen Effekte. Da alle Ergebnisse unter Kontrolle aller anderen Variablen berechnet wurden, kann daraus geschlossen werden, dass diese Effekte vermutlich in den statistisch signifikanten Variablen aufgehen.

Abschließend sollen die Limitationen der eigenen Untersuchung diskutiert werden. Zentral zu nennen ist hierbei die Messung der abhängigen Variable der Aspirationen, welche über ein einzelnes Item erfolgt, dessen Reliabilität bisher noch nicht tiefergehend untersucht wurde. Insofern können verschiedene „Effekte“ auch dem Zufall zugeschrieben werden, sodass angenommen werden muss, dass eine hohe zeitliche Variabilität vorliegt, die nicht mit anderen Variablen erklärt werden kann. Weiterhin besteht das Problem der fehlenden Gewichtung aufgrund des Paneldesigns, das dafür sorgen kann, dass hier berichtete Zahlen nicht repräsentativ für die Bundesrepublik sind. Dies wird auch an den insgesamt sehr hohen Aspirationen im Sample deutlich, die vermutlich nicht repräsentativ sind. Abgemildert wird dieser Nachteil durch den Einbezug von Kontrollvariablen in den erweiterten Modellen, da dadurch die verzerrenden Faktoren (beispielsweise das Bundesland) teilweise ausgeglichen werden. Weiterhin fehlen bestimmte interessierende Variablen im Datensatz, wie etwa die Aspirationen im Freundeskreis, die als wichtige Erklärungsfaktoren angenommen werden können. Nur ein Rückgriff auf andere Datensätze kann hier Abhilfe schaffen. Möglicherweise bietet sich die nachfolgende Schülerkohorte des NEPS (SC3), wobei hier eine Messung der Aspirationen vor dem Übergang in die Sekundarstufe fehlt.

## 6 Zusammenfassung

Wie die Analysen aufzeigen, beeinflussen besonders die gewählte Schulart in der Sekundarstufe, die eigene Leistungsfähigkeit sowie die soziale Herkunft die Wahrscheinlichkeit, ursprünglich angestrebte Aspirationen nach unten zu korrigieren. Für die Wahrscheinlichkeit eines Aufstieges finden sich hingegen nicht die erwarteten Zusammenhänge. Diese Ergebnisse scheinen von großer Relevanz, da offenbar andere, bisher nicht identifizierte Konstrukte bzw. Faktoren einen gewichtigeren Einfluss ausüben. Überraschend erscheint, dass Aufstiege insgesamt relativ häufig vorkommen, diese jedoch von den einbezogenen Faktoren aber fast nicht erklärt werden können. Somit stellt sich für nachfolgende Untersuchungen besonders die Frage, was SchülerInnen dazu bringt, Aspirationen *im Zeitverlauf* positiv zu verändern. Angesichts der aktuellen Datenlage und der Verfügbarkeit hochwertiger Längsschnittdatensätze erscheint es möglich, diese Aufgabe empirisch anzugehen. Notwendig werden dabei allerdings vermutlich auch weitere theoretische Ansätze sein, die über die hier gezeigten hinausgehen sollten. Zusammenfassend kann somit ausgesagt werden, dass der vorliegende Beitrag nicht nur neue Erkenntnisse in Bezug auf die Veränderungen von Aspirationen erbracht hat, sondern auch Forschungslücken identifiziert wurden. Weitere Forschungsbemühungen in Bezug auf Aspirationen scheinen demnach sinnvoll.

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# Chapter 5

## Analysing Diversion Processes in German Secondary Education: School-Track Effects on Educational Aspirations<sup>1</sup>

**Abstract:** Educational aspirations can be regarded as a predictor of final educational attainment, rendering this construct highly relevant for analysing the development of educational inequalities in panel data settings. In the context of the German tracked secondary school system, we analysed school-track effects on the development of educational aspirations. Using data from five consecutive waves of the National Educational Panel Study (NEPS), we selected a sample of high-performing students with initially high aspirations. Our results indicate that pupils in the nonacademic track or with a low social origin tend to lower their aspirations significantly more often than pupils in the academic track or pupils with a high social origin. With mediation analyses, we demonstrate that these differences can be attributed to learning environments at the school level. We also show that the downward adjustment of aspirations in the nonacademic track is less pronounced for students from highly educated families than for students from low-education family backgrounds.

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## 1 Introduction

Fair access to education for all social classes is undoubtedly an ideal for most modern societies. In order to approach this goal, numerous educational reforms have been implemented over the past 50 years in West Germany to make its classic tripartite school system more inclusive and permeable (cf. Dudek and Tenorth 1994; von Friedeburg 1989). Particularly noteworthy is the introduction of new types of schools, which were designed to allow students who completed a lower-level educational track in secondary education to upgrade their credentials to the upper secondary level. While the political intention behind the introduction of these sequential options was to open up pathways into higher education for students who otherwise would have been stuck in educational dead-ends, recent research points out that the introduction of these options could also have led to unintended adverse effects (cf. Schindler 2014). In particular, high-performing but risk-averse students who otherwise would have opted for the more demanding academic route might be diverted into the less risky sequential alternative of starting in a lower track first and to upgrade to upper secondary education after they have reached a first lower-level credential. This diversion process has adverse effects whenever attending a lower-level track instead of the academic track is connected to influences that cause the student to abandon the initial plan of attaining an upper secondary credential.

For that reason, we want to analyze to what extent and why different school tracks actually influence the development of students' educational aspirations. We pay particular attention to patterns that are correlated with social background, since one major aim of the reforms was to open up more educational opportunities for students of disadvantaged social background (cf. von Friedeburg 1989).

We believe that these issues deserve more attention in order to understand how social inequality arises. If, in fact, a substantial number of children with initially high educational aspirations are systematically redirected into lower-level educational trajectories, it appears desirable to scrutinize the underlying mechanisms. By analyzing school track effects on changes in educational aspirations, our contribution is a first step in this direction and we hope we can shed some light on the processes related to diversion in secondary education. The paper proceeds as follows: In the next section, we will describe the context of West German secondary education, outline our theoretical framework and derive testable hypotheses. Furthermore, we summarize the current state of research. After that, we introduce data, operationalization and methods, before we present the empirical analyses. The paper concludes with a discussion of our findings and their implications.

## **2 Theoretical framework**

### **2.1 Secondary Education in Germany**

In contrast to the comprehensive secondary school system of the former German Democratic Republic (GDR), the classical view of the West German secondary education system is that of a rigorous between-school tracking that starts as early as at the age of ten. Based on their primary school achievement, pupils are sorted into one of three qualitatively different tracks. The five-year lower secondary school track (Hauptschule) is the least demanding form that prepares pupils for low-skilled service or manual work. The six-year intermediate track (Realschule) instructs pupils for vocational training in skilled white-collar or service occupations. The eight- or nine-year upper secondary school (Gymnasium) awards pupils with the university entrance qualification (Abitur) and is regarded as most prestigious.

To increase the share of students in higher education, reforms have been initiated in West Germany in the mid-1960s. Their aim was to dissolve the dead-end character of the tracked school system by creating new opportunities for upward track mobility (cf. von Friedeburg 1989). All federal states established additional upper secondary schools in the vocational school system, where students with an intermediate degree could obtain eligibility for higher education in two-to-three-year programs with a strong vocational focus. Thus, even students who started secondary education in one of the two lower tracks can, if they surpass certain performance thresholds, continue their education immediately afterwards and acquire a higher education entrance qualification. Some federal states have introduced comprehensive schools in addition to the tracked tripartite school system. These comprehensive schools can be considered as another approach to make the secondary school system more permeable. While they offer all three school-leaving certificates of the traditional tripartite school system, students can subsequently continue from one to the next level given adequate performance. In a more recent development, most federal states have merged the two lower school tracks due to a progressing marginalization of the lowest track (Hurrelmann 2013).

Even though the permeability of the system has increased considerably over the past decades, the different tracks and trajectories still describe differential learning environments (Maaz et al. 2008). Learning environments comprise the total influence of all factors contributing to the track-specific teaching and learning situation. Two major aspects can be distinguished: a) compositional effects and b) institutional effects (Baumert et al. 2006; Neumann et al. 2007). The former are the consequence of the non-random selection into tracks. This selection is primarily based on prior performance, but also overlaps with additional factors, such as social or migration background. It results in different social classroom contexts, which can influence learning progress, educational ambitions or values and attitudes. Institutional effects refer to all systematic influences associated

with the educational tracks per se, such as differences in curricula and educational goals, teacher quality or financial resources.

It is very likely that compositional and institutional effects influence the educational aspirations and educational goals of the pupils. The academic track follows a dedicated academic curriculum with the university entrance qualification as its target. The entire instruction provided is geared towards a student population aiming at higher education and the composition of students is selective with regard to both above-average school performance and educationally and economically privileged social background (Hillebrand et al. 2014). Teachers in the academic track are required to have completed more advanced training programs than teachers in the other school tracks. The situation is different in the lower school tracks. Curricula are more practically oriented, learning progress is slower, requirements for teacher education are lower, the student populations show lower average ability levels and a less academically oriented social composition. Hence, the academic track constitutes a learning environment, which provides more stimulation for the development and maintenance of aspirations towards academic goals.

## **2.2 Diversion processes in secondary education**

As outlined above, the German secondary school system offers numerous opportunities for students to obtain a higher education entrance qualification after completing a first lower-level school track. As a consequence of this institutional variety, especially high-performing but risk-averse students might choose the less risky sequential alternative of starting in a lower track first and upgrade to upper secondary education after they have reached a first lower-level credential. However, in these non-academic tracks, those students are exposed to learning environments which do not support ambitious academic goals in the same way as it would be the case in the academic track. First, as curricula tend to focus more on practical and non-academic education, it can be assumed that any interest in more scientific and academic topics is not particularly encouraged (cf. Bayer 2020: 69-71). Second, as the social composition of the non-academic tracks is dominated by students whose parents are not academically educated and work in manual or lower-to-medium-level service occupations, peer-group effects and significant others can be expected to influence educational and occupational aspirations towards non-academic spheres (cf. Sewell et al. 1969). Third, aspirations can also be influenced by teacher effects (van den Broeck et al. 2020). Teachers in non-academic tracks may be less able to stimulate academic goals in gifted or interested pupils when the institutional context requires them to focus on practical and non-academic skills.

All these factors should contribute to school track effects, according to which the non-academic tracks trigger downward adjustments of educational aspirations among students who initially



aspired to a higher education entrance qualification. Accordingly, we can deduct the following empirically testable hypotheses. We expect that

*among the students who enter secondary education with aspirations for a higher education entrance qualification, a larger share will adjust their aspirations to lower-level aims in the non-academic tracks than in the academic track (hypothesis 1a);*

*this effect can be explained by the different learning environments (hypothesis 1b).*

These processes are also of great interest for the analysis of mechanisms behind the formation of social inequality. We know from previous research that socially disadvantaged pupils display higher levels of risk aversion (Breen et al. 2014; Barone et al. 2018; Tutic 2017). As the introduction of second-chance options in the education system opened up sequential and hence less risky pathways to higher education eligibility, we can assume that these trajectories are particularly attractive for pupils from disadvantaged social backgrounds. We therefore expect that they choose non-academic school tracks more often than students of privileged social background at the beginning of secondary education, even if they aspire to a higher education entrance qualification. This also means that substantial fractions of the students from disadvantaged social backgrounds who aspire to a higher education eligibility at the beginning of secondary education are exposed to the detrimental influences of the learning environments in the non-academic school tracks. Conversely, students from privileged social backgrounds can be assumed to choose the academic track as a default. This follows from relative risk aversion theory (Breen and Goldthorpe 1997), which suggests that families pursue those educational trajectories that are most likely to help avoid social demotion. This means that they are less likely affected by the influences of non-academic learning environments. Hence, we expect that

*among all students who have aspirations for a higher education entrance qualification at the beginning of secondary education, students of disadvantaged social background are more likely to adjust their aspirations to lower-level aims than students of privileged social background (hypothesis 2a);*

*this effect can again be explained by influences of the different learning environments (hypothesis 2b).*

Finally, we can also assume an interaction effect between learning environments and social background. Following the concept of compensatory advantage (Bernardi 2014), socially privileged families are more likely to compensate negative educational experiences than socially disadvantaged families. On the one hand, they have higher incentives that their children reach higher-level educational outcomes. This derives from the core assumption of relative risk aversion

theory (Breen and Goldthorpe 1997), which states that families usually want to avoid social demotion of their children. On the other hand, socially privileged families also possess more resources to realize those educational upgrading processes. Thus, it can be assumed that children from socially privileged families who start secondary education in a non-academic track (for example due to performance deficits at the end of primary school), are less affected by the influences of their learning environments. We expect that

*the negative effect of non-academic school tracks on the development of aspirations for higher education entrance qualification is less pronounced for students of privileged background than for students of disadvantaged background (hypothesis 3).*

## **2.3 Previous research**

In general, it is well established that educational aspirations are predictors of future outcomes. Students with high aspirations have better outcomes, even net of other confounding factors (Marjoribanks 2005; Ou and Reynolds 2008; Messersmith and Schulenberg 2008). Apart from a few earlier studies that refer to diversion processes after attaining a university entrance qualification (Schindler 2014; Becker and Hecken 2008; Müller and Pollak 2004), the literature on diversion effects in the German education system is very sparse. Between the lines, these existing studies might suggest that different pathways to higher education eligibility do have some influence on subsequent educational decisions. However, we are not aware of any study that explicitly deals with the adjustment of educational aspirations in secondary education (the study by Forster (2020) deals with the adaptation of parental expectations after unexpected school track assignment, which has a different focus, though). There is some research on a related topic, namely the effect of school tracks on cognitive development. These studies conclude that the different learning environments associated with school tracks have a substantial influence on the achievement gains of their students (Maaz et al, 2008, Köller and Baumert 2002). Accordingly, learning progress is steeper in the more demanding school tracks, especially in the upper-secondary track. While these conclusions are seldom based on real causal research designs, it also remains unclear whether these findings on competences can be easily transferred to aspirations.

In a different country setting, two Danish studies deal with the influences of learning environments in a tracked school context. One analysis uses a counterfactual differences-in-differences-approach to estimate the effects of different ability-groups in secondary education on educational preferences (Karlson 2015). The study finds that pupils indeed adjust their educational preferences according to the signals the school or track sends, which is in line with our assumptions. In another article, Karlson (2019) investigates the interaction of learning environments with social background. He concludes that especially low-SES (socio-economic status) pupils react strongly to signals sent by

the school or by performance indicators (Karlson 2019). This could mean that disadvantaged pupils are especially sensitive to adverse learning environments. Overall, however, it becomes obvious that there exists a considerable research gap regarding the interplay of school tracks, aspirations and social inequality in the German context. We seek to address this gap with our analyses in the remainder of this article.

### **3 Data, operationalization and methods**

#### **3.1 Data and sample**

The data basis for all subsequent analyses is the Starting Cohort 3 of the National Educational Panel Study (NEPS), which comprises students who are surveyed once a year from the first grade of secondary school (grade 5) onwards (cf. Blossfeld et al. 2011). The available data cover the first five years of secondary education from grades 5 to 9, collected in a prospective panel design. Students' educational aspirations are recorded annually. In addition, the data provides comprehensive information on social background, which is obtained through separate parent questionnaires. These data, which are unique for Germany, thus offer an excellent basis for our research interest.

For all subsequent analyses, we impose restrictions on the sample. First, only pupils who have transferred to a regular secondary school form after primary school are included. Pupils at special needs schools ("Förderschulen") are excluded. Second, pupils who change school types between grades 5 and 9 are also excluded, as track effects cannot be ascribed unequivocally in these cases. Third, we further restrict the sample based on performance. To be able to measure diversion effects among those who realistically should be able to reach higher education eligibility, we limit the sample to an academically high performing group. For this purpose, we use the comprehensive competence tests of the NEPS and exclude all students whose combined math and reading skills (composite score) in survey wave 1 (grade 5) are below the sample median. We also consider this step as crucial to reduce the likelihood that downward adjustments of aspirations are mere "regression-to-the-mean" effects. We assume that, among high performing students, it is less likely that their statement about academic aspirations in wave 1 is due to randomness rather than the true latent construct. Fourth, since we are concerned with downward adjustments of aspirations, we also exclude all students who do not have idealistic aspirations for higher education eligibility in grade 5. In our analyses, we only consider students participating in all relevant waves (1, 2 and 5). We also remove all pupils who switch school tracks between grade 5 and 9 (this concerns 95 pupils), because for them, we cannot precisely relate the effects of tracks and mediator variables. Finally, we exclude all pupils with missing information in either of the relevant waves, so that the sample is constant over all waves (listwise deletion). Note that the largest share of case exclusion due to

missing information concerns parental education (one of the main explanatory variables) and whether the parents live together or not. Since this information is only available from the parent questionnaires, even participating children with non-participating parents are excluded. This leads to a final sample size of 1,163 pupils, which meet all selection criteria and have full information on all relevant variables in all relevant waves (1, 2 and 5). In the matching analyses, this sample will be further reduced to satisfy the common support requirement for the matching procedure. We provide figures on this sample selection in Table A1 in the appendix.

### 3.2 Measurement

Our central dependent variable, idealistic educational aspirations, is deducted from the following survey question:

*“Regardless of which school you go to and how good your grades are, what kind of school-leaving qualification would you like to have?”*

Possible answers were: Hauptschulabschluss (lowest degree), Realschulabschluss/Mittlere Reife (intermediate degree), Abitur (higher education eligibility) and leaving school without any degree. We recoded these items into a binary variable distinguishing aspirations for higher education eligibility (1) from aspirations for any lower or no degree (0). We draw on idealistic aspirations, since these generally allow a statement about educational ideals. Compared to realistic aspirations, which are an assessment about the educational outcomes that will most likely be reached, idealistic aspirations are less prone to being influenced by external circumstances, such as family resources or actual school performance. Hence, they provide a more conservative estimate of school track effects. In other words, we expect our analyses to return smaller effects compared to analyses based on realistic aspirations (we provide more detailed information and empirical evidence in the robustness checks below).

Regarding the operationalization of the school tracks, we decided to dichotomize the type of school attended: academic track (1) vs. any other type of school (0). There are several reasons for this. First, this appears to be a logical separation, since only the academic track (Gymnasium) leads to higher education eligibility (Abitur) directly. For all other school forms, at least one further school-leaving qualification must be obtained. We assigned comprehensive schools to the non-academic forms, even though some comprehensive schools can lead to the Abitur directly. However, since the learning environments in comprehensive schools are more similar to those in non-academic tracks, we opted for this solution. The second important reason is the number of cases. Since more than 42 percent of all pupils are nowadays transferring to the Gymnasium (Autorengruppe Bildungsberichterstattung 2020: 110) and some school types have already been abolished or merged

in some federal states, the case numbers are often very low, so that a few hundred data points are spread over five survey waves. Subgroup analyses, for example according to social background, are therefore no longer realistically possible. In this respect, we have opted for a rather coarse structure at this point in order to be able to estimate at least the difference between the academic and non-academic learning environments.

We measure students' social background based on parents' education. We distinguish three categories: (1) less than upper secondary education (CASMIN 1a-2a), (2) upper secondary education (Abitur, CASMIN 2c), and (3) any higher education degree (CASMIN 3ab). When information is available for both parents, we consider the highest certificate. While much of the theoretical literature on social reproduction refers to social class as a concept of social background, we opted for parents' education as it provides a more straightforward link to educational aspirations. Sensitivity analyses with parents' social class as measure of social background reveal similar patterns (available upon demand).

To avoid spurious correlations, we include the following control variables in the propensity score models: gender, age at the time of the interview, migration background (none vs. one parent vs. both parents born abroad, whether the parents are living together, and place of residence (West vs. East Germany)). Furthermore, we add four measurements of competence that are tested by the NEPS in the classroom context. These are competences in math and reading as well as a general test on cognitive ability. This ability test follows the theoretical concept of Baltes et al. (1999) and comprises two different scores. The first dimension is the overall cognitive reasoning score and the second measures the perceptual speed score (NEPS Information on competence testing 2018). Taken together, these scores should reflect the overall cognitive ability of a child in grade five. Note that the competence tests were conducted after the transition to secondary education as students have been sampled in grade 5. However, the tests have been conducted only a few months after the start of the school year (from October 2010 to February 2011), so that competences in grade 5 can be considered a close approximation of pre-treatment competences.

To test our mediation hypotheses, we draw on a set of variables, which are all measured as aggregated variables at the school level in wave 1. Since there are cases with only a few pupils available per class, which could lead to aggregated results that are driven by outliers, we decided to use variables aggregated at the school level. Hence, these variables also comprise information from other school classes with the same age level. As there is usually only little segregation within schools, this should not severely bias our results. We include the information from wave 1 as time-constant measures also for the analyses in subsequent waves. The school-level measures suffer from heavy nonresponse in later waves, which can lead to severe bias. Assuming that the student

compositions remain rather stable for the majority of schools, we consider this approach as the lesser evil compared to time-varying measurements. These aggregated variables comprise: (1) the share of pupils with aspirations for higher education eligibility, (2) the share of pupils with highly educated parents (higher education), and finally (3) the average academic competences (derived from composite individual-level indicators which are based on math and reading competences). Following our theoretical arguments, these measures provide indicators for the influence of peer effects. Following the Wisconsin model (Sewell et al. 1969), we expect a positive influence on individual aspirations through exposure to academically oriented peers. Unfortunately, the data does not provide information on curricula or relevant teacher characteristics. Hence, we cannot measure the role of these mechanisms in our analyses.

### 3.3 Analytical strategy

In order to quantify the effect of school tracks on idealistic aspirations (hypothesis 1a), we consider it crucial to control for all factors that influence the process of selection into tracks. Only if we consider this properly, it will be possible to estimate a track effect that is independent from selection (and therefore, social background, academic performance in primary education, etc...). To achieve this, we utilize a matching design that allows us to model this process explicitly and to inspect the quality of the results. Since there are only two tracks in our design (academic track or any other track), we compute a binary logistic regression to model selection into tracks depending on relevant pre-selection factors. After considering these, we can predict, individually for each pupil, the propensity to enter the academic track. Based on the distribution of these propensities within both tracks, we can select a region of common support. If we only include pupils from the areas of common support in the subsequent analyses, we can assume to rely on a comparable sample of pupils from both tracks. As outlined above, only pupils will be considered in the analyses that comply with our initial sample selection criteria. To test for school track effects on the adjustment of aspirations (hypothesis 1a), we predict aspirations with our school track indicator controlling for propensity scores. To test our mediation hypothesis (1b), we conduct a mediation analysis to scrutinize whether the effect of school tracks on aspirations can be explained by our school-level measures of learning environment characteristics. Since our outcome variable is binary (aspirations for higher education eligibility), we apply logistic regressions. To conduct the mediation analysis, we rely on the KHB-method (Kohler et al. 2011; Karlson et al. 2012) and its implementation in Stata through the ado-file *khb*<sup>2</sup>. Since coefficients from nested logistic models are not comparable due to scaling effects, the KHB-method provides a rescaling procedure, so that we can determine the relative reduction of a coefficient after adding additional variables to the model. That way, we can determine to what extent our school-level measures account for the influences of school tracks

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<sup>2</sup> <https://ideas.repec.org/c/boc/bocode/s457215.html> (2021-05-18)

on aspirations. We present two separate models. The first model refers to the differences in aspirations in grade 6, the second model refers to differences in aspirations in grade 9. By doing so, we can estimate how the effects change over the course of secondary education.

To analyze the differences in the adjustment of aspirations by social background (hypotheses 2a and 2b), we no longer rely on a causal analytical framework. As we do not want to conceptualize social background as a “treatment”, our analyses follow a more descriptive design. Hence, in contrast to the matching procedure applied for the analyses related to hypotheses 1a and 1b, we do not further restrict the sample based on the common support criterion, but control for the same variables that we used in our matching models. To account for the differences in the adjustment of aspirations between pupils of different social background, we again conduct mediation analyses with the KHB method. In a first step, we test to what extent track attendance can explain the differences. In a second step, we also include our school-level measures to test if they explain parts of the differences in addition to track attendance. Finally, we test our hypotheses 3 on interaction effects by comparing the track effects on the development of aspirations separately by social background.

We show results that are based on a sample where we did not impute missing data. Since the program *khb* is not able to compute all relevant statistics with imputed data, we decided to report results based on a sample after listwise deletion. We conducted sensitivity analyses based on imputed data, which we discuss below among other robustness checks to validate our findings.

## **4 Results**

### **4.1 Descriptive statistics**

We present basic descriptive statistics for all variables in wave 1 (grade 5) in Table 1.

Table 1: Descriptive statistics for wave 1 (grade 5), entire sample and by type of track

	Total (N=1,163)				Non- acad. (N=185)	Acad. (N=978)
	Min	Max	Mean	SD	Mean	
Ideal. aspirations for higher education eligibility	1.0	1.0	1.00	0.00	1.0	1.0
Parental education						
Less than upper secondary education	0.0	1.0	0.27	0.44	0.41	0.24
Upper secondary education	0.0	1.0	0.24	0.43	0.21	0.25
Higher education	0.0	1.0	0.49	0.50	0.38	0.51
Attending the academic track	0.0	1.0	0.84	0.37	0.00	1.00
Female	0.0	1.0	0.49	0.50	0.46	0.50
Age in 2011	8.6	12.5	10.89	0.40	11.03	10.86
Competence measurements (Wave 1)						
Math competence	-1.3	4.0	0.98	0.84	0.52	1.07
Reading competence	-0.9	4.0	1.03	0.91	0.91	1.06
Reasoning score	0.0	12.0	8.27	2.15	7.51	8.41
Perceptual speed score	4.0	93.0	45.90	12.56	45.29	46.02
Living in eastern Germany	0.0	1.0	0.09	0.29	0.06	0.10
Parents living together	0.0	1.0	0.84	0.37	0.76	0.85
Migration background					0.85	0.84
Both parents born in Germany	0.0	1.0	0.85	0.36	0.11	0.10
One parent born abroad	0.0	1.0	0.10	0.30	0.03	0.06
Both parents born abroad	0.0	1.0	0.06	0.23	0.0	0.1
School-level mediators (Wave 1)						
Average share of parents with higher education	0.0	0.9	0.45	0.18	0.28	0.48
Average share of pupils with high aspirations	0.2	1.0	0.93	0.15	0.65	0.98
Average competences	-1.3	1.3	0.57	0.41	-0.12	0.70

Source: NEPS SC3.

Due to the sample selection process, which we outlined above, our analysis sample comprises a specific sub-population of the initial sample. This is reflected in the reduced number of cases and it produces a very selective sample with regard to some key aspects. For example, the average parental education is rather high. Almost half of all children have parents with a higher education degree. Only 27 percent of the children have parents with a degree lower than upper secondary education. 84 percent of the children attend the academic track.

The last two columns of Table 1 display the mean values of each variable separately by school track. The differences in these values indicate that the individual characteristics of the students in the two tracks differ somewhat, which can also cause differences in the patterns related to the adjustment of aspirations. To adjust for these compositional differences, we apply propensity score

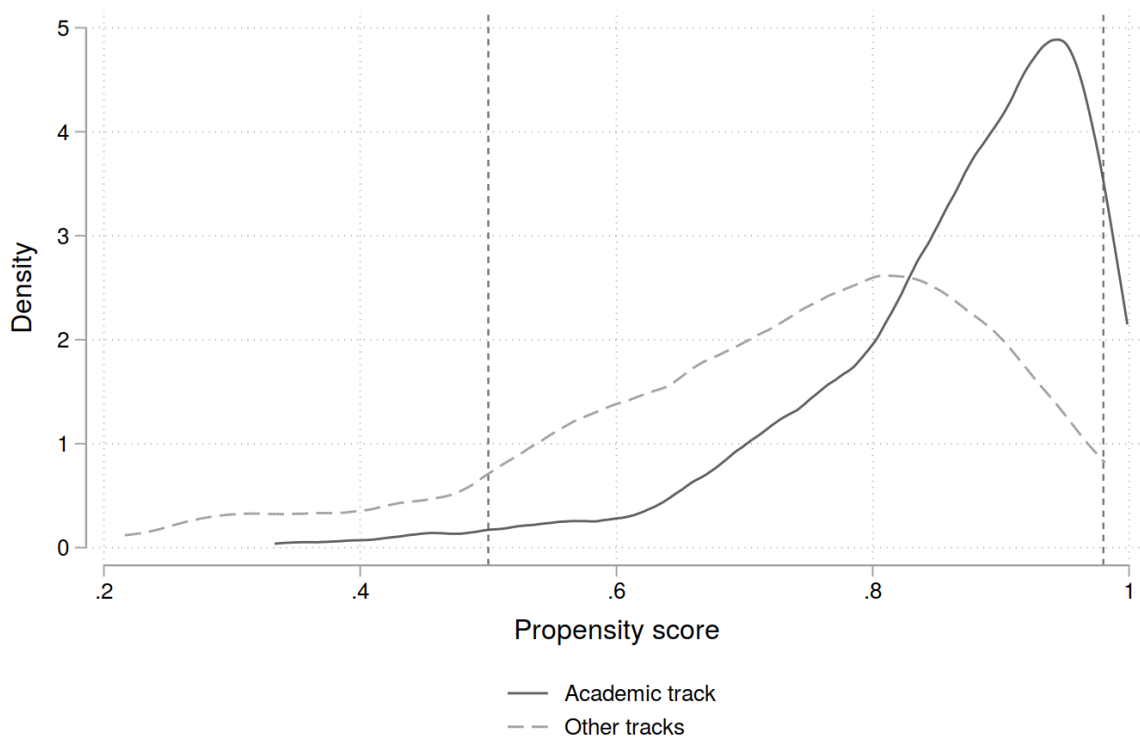


matching to isolate school track effects. The table also highlights the differences in the three school-level variables, which we will use as mediators to explain potential differences between the two tracks. They show that the different tracks indeed provide different learning environments with regard to social and cognitive environments. The share of highly educated parents, the share of students with aspirations for a higher education degree and the average competences are clearly higher in the academic track.

## 4.2 Effects of school tracks

First, we calculate a propensity-score model to match pupils in grade five. With this logistic model, we estimate for each pupil the propensity to attend the academic track as a function of the model's covariates (cf. Table A2 in the appendix). As covariates, we include the pre-treatment control variables described in section 3.2. Based on the propensity scores, we identify a region of common support that comprises highly comparable pupils in different school tracks. Figure 1 displays the distributions of the propensity scores by school track.

*Figure 1: Distribution of propensity scores to attend the academic track in grade 5*



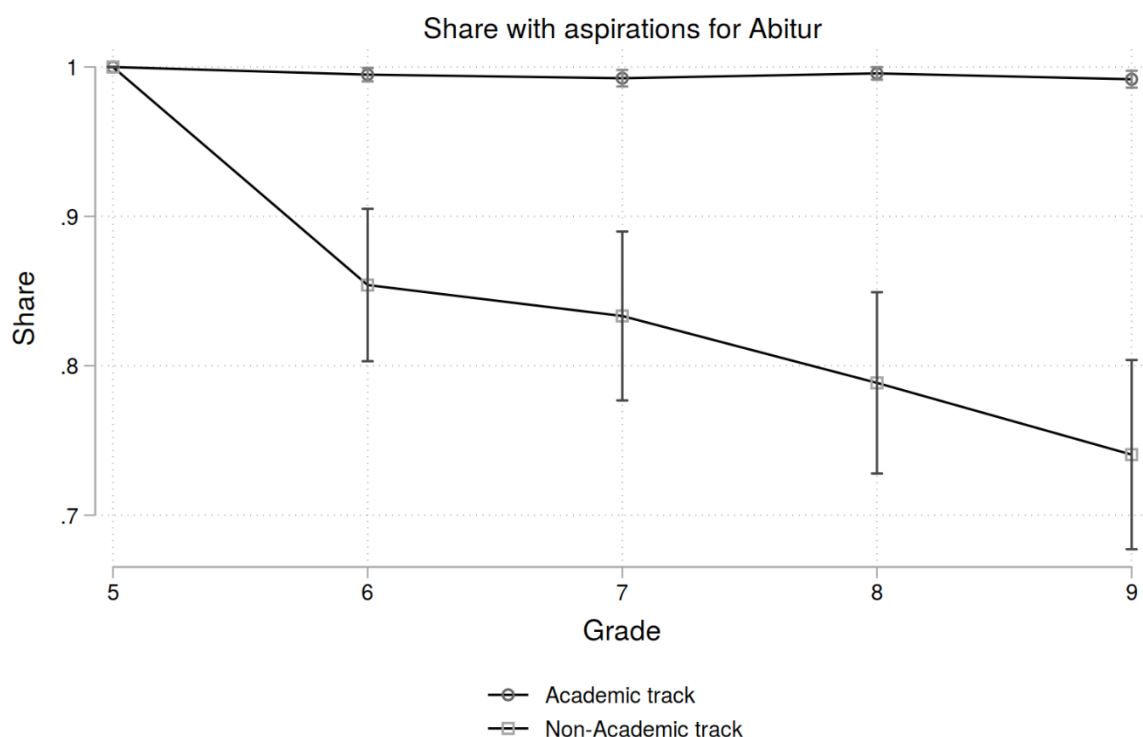
Source: NEPS SC3. The region of common support is depicted by the vertical dashed lines.

As expected, high propensities to attend the academic track are more common among pupils who actually attend the academic track. However, we do find high propensity scores even among the students attending the non-academic track. We select a region of common support to ensure that enough observations with similar propensity scores from each comparison group enter the analysis.

A simple numerical rule is to use the overlap between the treatment and the control group. However, if the range of propensity scores is similar but the shapes of the distributions strongly differ between the two groups, regions can exist with very weak common support. To avoid this, we only select propensity scores that ensure a density exceeding three percent in both distributions. Through restricting the region of common support, we make sure that the two groups are actual comparable and pupils without any “matches” in the other group are removed. We indicate the selected region of common support through the dashed vertical lines in Figure 1. Pupils falling outside that range are not included in the subsequent analyses on school track effects. For this part of the analyses, this leaves us with an analytical sample of 1,063 observations.

As a first descriptive analysis, we compare the development of aspirations over time between the two school tracks for all pupils within the selected range of common support. Figure 2 displays the percentages of pupils with aspirations for higher education eligibility across the five survey waves from grade 5 to 9, including 95% confidence intervals. There are no further control variables or adjustments for any of the following figures (2, 3, 4, A1, A2) as they should demonstrate the purely descriptive development of aspirations from grade 5 to 9.

*Figure 2: Development of idealistic aspirations by school track*



Source: NEPS SC3. 95% Confidence bars depicted.

We see that the trajectories clearly differ between tracks. While aspirations for higher education eligibility are constantly high in the academic track, the share drops significantly even just one year

after entering secondary education in the non-academic track (about 15 percentage points). This downward trend continues over the following years and is about 24 percentage points lower in grade nine. Since the confidence bars never overlap, we can assume that this difference is statistically significant. This descriptive finding is in accord with hypothesis 1a. However, as we have pointed out above, the result can be partially driven by differences in the compositions of individual student characteristics between the two tracks, which is why we now turn to models that are adjusted by the propensity scores.

In addition to the descriptive analyses shown in Figure 2, we include the propensity scores as a sole control variable to take into account the differences between the two comparison groups. Table 2 presents the results in the columns labelled M0. Since the dependent variable is binary and we compute logistic models, we report average partial effects (APEs), which facilitate a clear interpretation (therefore, no constant is computed). Even after controlling for the propensity scores (M0), we observe that significantly more pupils in the academic track than in the non-academic track report aspirations for higher education eligibility in grades 6 and 9. In grade 6, the APE is 0.074. This means that pupils in the academic track have a 7.4 percentage point higher probability to hold aspirations for higher education eligibility than pupils in other school tracks. In grade 9, the respective value amounts to 17.4 percentage points. This again supports hypothesis 1a. If the propensity scores were able to account for all pre-treatment differences between these pupils, one could refer to this as the causal effect of tracking on aspirations. However, since we are only able to control for observable characteristics, we rather consider it as an approximation to a causal effect.

*Table 2: Logistic regression of aspirations for higher education eligibility on school track and mediators (grade 6)*

	Grade 6 (N=1063)			Grade 9 (N=1063)		
	Overall model comparison					
	M0	M1	Diff	M0	M1	Diff
	(Reduced)	(Full)		(Reduced)	(Full)	
Academic school track	0.074	0.016	0.058	0.174	0.087	0.086
	(0.018)	(0.014)	(-)	(0.032)	(0.035)	(-)
			78.9%			49.7%
	Separate contribution of the mediating variables					
Average share of parents with higher education		0.003	7.9%		0.015	23.0%
		(0.005)			(0.001)	
Average share of pupils with high aspirations		0.014	31.4%		0.026	39.7%
		(0.008)			(0.012)	
Average competences		0.017	39.6%		-0.008	-13.0%
		(0.009)			(0.014)	

Source: NEPS SC3. Notes: Reported are Average Partial Effects (APEs). Standard errors clustered within school.

\* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ . Standard errors are not available for APE difference statistics.

In a next step, we are interested to what extent the differences between the tracks are due to differences in learning environments. For that reasons, we add the school-level mediators to the models (share of students with high aspirations, share of students with highly educated parents and average academic competences). To estimate the extent to which those variables are able to account for the differences between the two tracks, we proceed as follows: we start from the reduced model (M0) without any of the mediating variables and then compare it to a model that includes the mediators (M1). For linear models (for example OLS regressions), this procedure is straightforward and coefficients can be compared across models to assess the degree of mediation, which is reflected in the relative change of the coefficient of the treatment variable (in our case, the school track attended). However, in nonlinear binary models, this is not possible in the same way since the coefficients can also change across models due to scaling effects, even in the absence of any “true” mediation. This can lead to false conclusions. This issue is taken care of by the KHB decomposition technique (Karlson et al. 2012). We apply this method using the Stata package *khb* to compute the degree of mediation (Kohler et al. 2011). We present a reduced and a full model and display the difference between their academic track coefficients. When this difference is statistically significant, our mediators can be considered to account for the differences between the school tracks. In addition, we decompose the total mediation, which allows us to assess the influence of all mediators separately. We present mediation analyses for differences in aspirations in grade 6 and 9. The standard errors are clustered by school. The results are listed in Table 2.

After adding the mediator variables in the full model (M1), the coefficient of the academic school track decreases from 7.4 to about 1.6 percentage points in grade 6 (also note that the statistical significance of the effect vanishes). By comparing the coefficients between models M0 and M1, we can calculate the relative reduction. Together, the three mediators account for about 79 percent of the difference in aspirations between the school tracks. When we consider the separate contributions of the mediators in the bottom part of the table, we see that, in particular, average competences and aspirations account for the differences between tracks, while the percentage of highly educated parents only contributes little in addition.

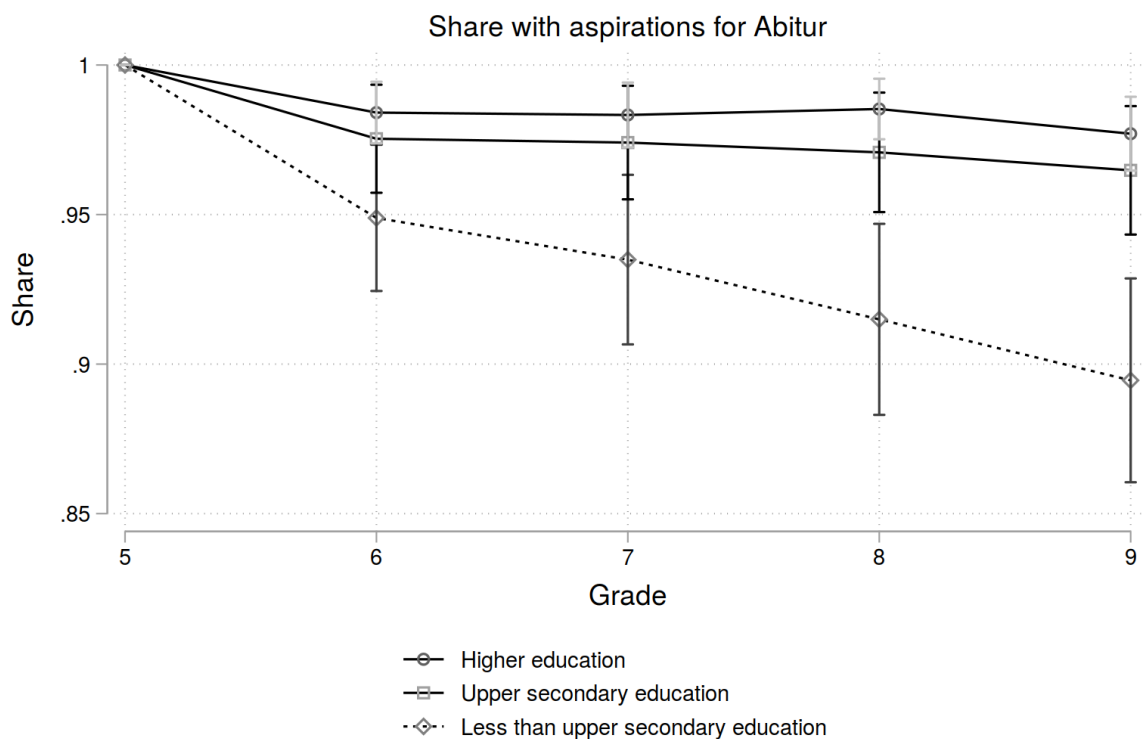
In grade 9, the mediators only account for about 50 percent of the differences in aspirations between the two tracks. While the school-level aspirations again explain a large fraction of the difference, the contributions of the other two mediators are different from the grade 6 analysis. The percentage of highly educated parents now accounts for a substantial fraction of the gap, while average academic competences at the school level do not contribute at all to the explanation. Recall however, that the mediators have been measured in grade 5. It might be possible that the results are influenced by changes in the learning environments that we do not fully capture with our

measurement. Yet, as our indicators of learning environments' characteristics account (at least partially) for the differences in the development of aspirations between school tracks, we find support for our hypothesis 1b.

### 4.3 Association between social background and aspirations

For the following analyses, we employ a different design than before. We start again with a descriptive analysis to visualize how aspirations develop for pupils of different social background over time. Figure 3 pictures this development without any controls. Social background refers to parents' highest educational degree. Especially for the least educated group, aspirations drop significantly over time. In this group, the share of pupils with aspirations for higher education eligibility decreases from 100 percent in grade 5 to about 89 percent in grade 9. As the confidence intervals do not overlap with those of the other groups, we can assume that the differences are statistically significant. This conforms to our hypothesis 2a. The differences between the two other groups are rather small and not statistically significant.

Figure 3: Development of idealistic aspirations by social background



Source: NEPS SC3. 95% Confidence bars depicted.

In the next step, we compute the mediation models. We consider the same school-level mediators as before, but also include the track (academic track or any non-academic track) as an additional binary mediator. Since we do not rely on a matching model, we include control variables (as we do not apply any common support restrictions, the case numbers are slightly larger). The control

variables are the same that we used for the assignment model in our matching analysis, except for place of residence (East/West) due to empty cells.<sup>3</sup> We employ a nested design to trace the explanatory contributions of different sets of variables. The first model only includes parents' education. The second model adds all control variables. The third model adds the school track variable. The fourth and final model adds the three school-level mediators. Table 3 displays the results for grade 6 and Table 4 the results for grade 9, respectively. In addition, the last column of the tables displays the relative contribution of each variable from model 4 to the explanation of the aspiration gap between students with parents with less than higher education eligibility and students with parents with a higher education degree.

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3 Detailed inspections reveal that due to the overall much smaller number of pupils in the East (< 10% after sample selection) empty cells emerge with no pupils with low aspirations available at all in waves 2 and 5.

*Table 3: Logistic regression of aspirations for higher education eligibility on parents' education and mediators (grade 6)*

	Grade 6 (N=1163)				
	M1	M2	M3	M4	Share mediated
Parental education level					
Higher education	Ref.	Ref.	Ref.	Ref.	
Upper secondary education	-0.009 (0.012)	-0.002 (0.012)	-0.003 (0.013)	-0.002 (0.013)	
Less than upper secondary education	-0.018 (0.010)	-0.010 (0.010)	-0.005 (0.009)	-0.004 (0.010)	79.2 % (Total)
<i>Control variables</i>					33.6 % (sub-total)
Female		0.019* (0.008)	0.017* (0.008)	0.016 (0.009)	3.4 %
Math competence		0.015 (0.008)	0.009 (0.007)	0.008 (0.007)	7.7 %
Reading competence		0.007 (0.005)	0.007 (0.005)	0.006 (0.005)	7.3 %
Reasoning score		0.005* (0.002)	0.004* (0.002)	0.004* (0.002)	3.1 %
Perceptual speed score		0.001 (0.000)	0.001 (0.000)	(0.001) (0.000)	-5.1 %
Migration status					
Both parents born in Germany		Ref.	Ref.	Ref.	
One parent born abroad		0.003 (0.012)	0.003 (0.012)	0.004 (0.012)	0.7 %
Both parents born abroad		-0.025 (0.024)	-0.034 (0.012)	-0.030 (0.025)	6.0 %
Age in years		-0.012 (0.010)	-0.006 (0.010)	-0.005 (0.010)	3.6 %
Parents living together		0.024* (0.011)	0.019 (0.011)	0.018 (0.011)	6.9 %
<i>School-level mediators</i>					45.6 % (sub-total)
Attending the academic school track			0.082*** (0.016)	0.031 (0.016)	19.9 %
Average share of parents with higher education				-0.006 (0.030)	-5.6 %
Average share of pupils with high aspirations				0.044 (0.023)	16.6 %
Average competences				0.020 (0.014)	14.7 %

Source: NEPS SC3. Notes: Reported are Average Partial Effects (APEs). The mediated share refers to the comparison of the two most extreme parental education levels (lower than upper secondary education vs higher education) between M1 and M4. Standard errors clustered within school.

\* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ .

Note that in this analysis, parents with a higher education degree are the reference group. Considering the differences in aspirations in grade 6, model 1 just mirrors the results from Figure 3. We see that the aspirations for higher education eligibility in grade 6 are 1.8 percentage points lower for students from low educated than for students from highly educated families. However, this difference in the drop of aspirations is not statistically significant. Yet, adding control variables and the mediators for tracks and learning environments both contribute to a reduction of the coefficient. The variables in model 4 account for 79 percent of the initial difference, of which about 46 percentage points are due to influences of the tracks and learning environments. While the differences in grade 6 are small and not statistically significant, the situation is different in grade 9. Table 4 presents the findings.



*Table 4: Logistic regression of aspirations for higher education eligibility on parents' education and mediators (grade 9)*

	Grade 9 (N=1163)				
	M1	M2	M3	M4	Share mediated
<hr/>					
Parental education level					
Higher education	Ref.	Ref.	Ref.	Ref.	
Upper secondary education	-0.011 (0.011)	-0.010 (0.011)	-0.010 (0.011)	-0.008 (0.013)	
Less than upper secondary education	-0.056*** (0.014)	-0.046*** (0.013)	-0.037** (0.013)	-0.031* (0.013)	44.6% (Total)
<i>Control variables</i>					10.6 (sub-total)
Female		0.027* (0.011)	0.023* (0.011)	0.022* (0.011)	1.7%
Math competence		0.010 (0.007)	0.001 (0.007)	0.002 (0.007)	0.6%
Reading competence		0.003 (0.005)	0.003 (0.005)	0.004 (0.005)	1.5%
Reasoning score		0.007* (0.003)	0.006* (0.003)	0.006* (0.003)	1.8%
Perceptual speedscore		0.001* (0.001)	0.001* (0.001)	0.001 (0.001)	-4.4%
Migration status					
Both parents born in Germany		Ref.	Ref.	Ref.	
One parent born abroad		0.022 (0.016)	0.022 (0.016)	0.022 (0.016)	1.5%
Both parents born abroad		0.037** (0.013)	0.033* (0.015)	0.032* (0.015)	-4.2%
Age in years		-0.038* (0.013)	-0.028* (0.014)	-0.027 (0.014)	8.1%
Parents living together		0.034* (0.014)	0.026 (0.013)	0.026 (0.013)	4.0%
<i>School-level mediators</i>					33.9% (sub-total)
Attending the academic school track			0.153*** (0.027)	0.124*** (0.047)	21.0%
Average share of parents with higher education				0.026 (0.042)	8.8%
Average share of pupils with high aspirations				0.074* (0.032)	10.7%
Average competences				-0.023 (0.019)	-6.6%

Source: NEPS SC3. Notes: Reported are Average Partial Effects (APEs). The mediated share refers to the comparison of the two most extreme parental education levels (lower than upper secondary education vs higher education) between M1 and M4. Standard errors clustered within school.

\* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ .

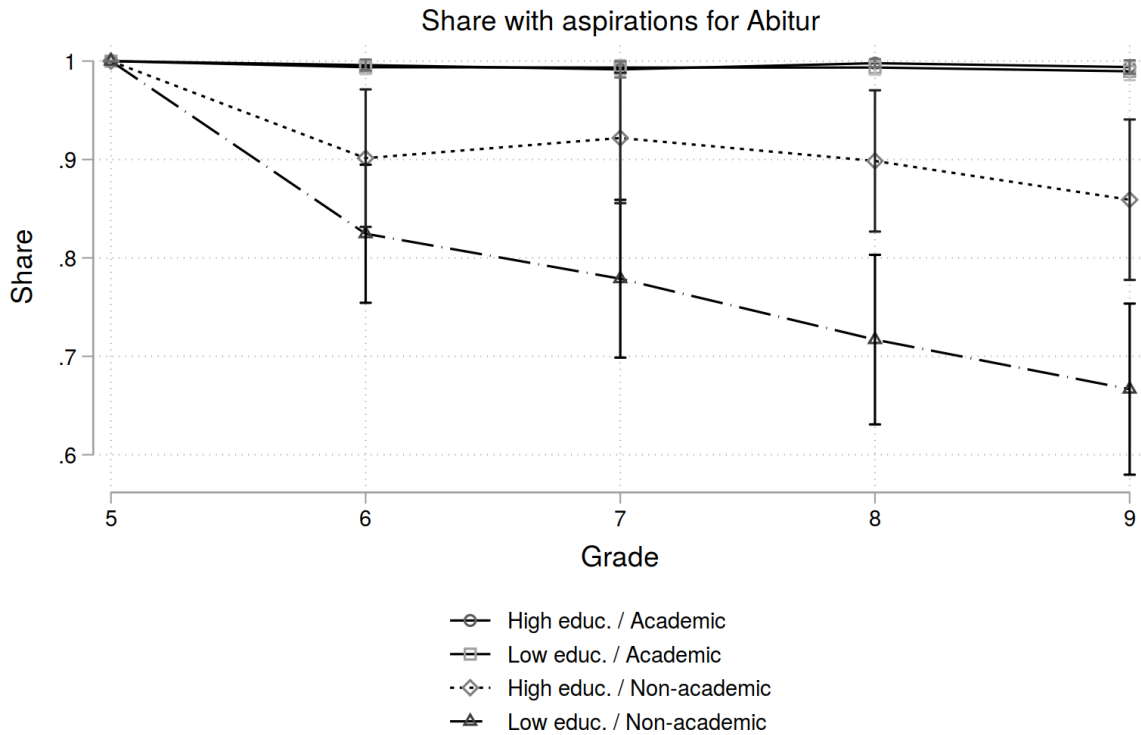
First, we see a statistically significant effect between parents with higher education and parents with less than upper secondary education in model 1. Children in the latter group have a 5.6 percentage points lower probability to hold high aspirations in grade 9 than children from academically educated parents. This gap in aspirations still amounts to 4.6 percentage points when adding control variables in model 2. Introducing the track variable in model 3 leads to a further reduction of the coefficient to 3.7 percentage points. This means that participation in different school tracks provides a partial explanation why children of low educated families adjust their aspirations more often in downward direction than children of academically educated families. Adding the three school-level mediators in model 4 does not lead to a substantial further reduction of the coefficient. Our model is not able to account for the remaining gap of 3.1 percentage points. In total, model 4 accounts for about 45 percent of the difference in aspirations between students from low and highly educated families, 34 percentage points of which are due to influences of school tracks and our measures of school-level learning environments. Note that, in model 4, the school track variable still accounts for 21 percent of the gap. This means that our measures of learning environment do not fully capture the differences between the tracks. On the other hand, these school-level factors also account for differences within tracks.

In support of our hypothesis 2b, these results indicate that the more pronounced downward adjustment of educational aspirations that we observe for students from less educated families is at least partially attributable to their more frequent exposure to learning environments that are assumed to provide less stimulation for academic ambitions.

#### **4.4 Heterogeneous school track effects**

To complete our analyses, we consider whether the school track effects on aspirations differ by social background. We display the development of aspirations for four groups, which are created from the interaction between track attended (academic or non-academic) and parents' education. To simplify the interpretation, we omit the group of pupils with parents with upper secondary education as their highest level of education. For each grade, we compute arithmetic means and 95% confidence bands. No control variables or restrictions are imposed for these descriptive analyses. The results are depicted in Figure 4.

Figure 4: Development of idealistic aspirations by track attendance and social background



Source: NEPS SC3. 95% Confidence bars depicted.

In support of our hypothesis 3, the figure displays a clear interaction effect. While pupils attending the academic track have consistently high aspirations, regardless of their social background, we see pronounced social differences within the non-academic track. Even though both social groups show declining rates of aspirations for higher education eligibility, the decline is much more pronounced for pupils with low educated parents. While among the pupils with highly educated parents about 88 percent still hold aspirations for higher education eligibility in grade 9, the respective share is as low as 67 percent for pupils with low educated parents. Since the confidence bands do not overlap, we can assume that this difference is statistically significant at the 95% level.

To corroborate the robustness of our findings, we conducted a large number of additional sensitivity checks. First, we repeated our analyses with imputed data using multiple imputation with chained equations (Azur et al. 2011). While we cannot reproduce all statistics because the *khb* command is not fully compatible with imputed data, the main patterns of our findings are highly similar and lead to the same conclusions. In the imputed models, we always observe a strong reduction of the main effects through the mediators, just like in the non-imputed models. Hence, we believe that selective dropout of students is not a main driver behind our findings. Second, we tested whether the *change* of individual competences is another confounder. Due to the nature of the data, we can only add this variable in the wave 5 models since there is no test-data available in wave 2. For these models, we

computed the relative change in ability ranks for each pupil. For example, if a pupil has a relative rank of percentile 70 in wave 1 and a percentile of 75 in wave 5, we can conclude that this pupil has improved their relative rank over time. However, adding this variable as a further control variable does not affect the results or conclusions in any substantive way.

Finally, when we focus on *realistic* instead of idealistic aspirations, we argued above that effects might be even stronger. Our empirical tests (cf. Appendix, Figures A1 and A2) are in line with this expectation. When repeating the analyses from Table 2 (left panel, grade 6), we observe a difference of 27 percentage points before adding the mediators and 1.6 percentage points afterwards. This is a reduction of about 94%, which underlines that effects become more pronounced when realistic aspirations are investigated instead of realistic ones.

## 5 Discussion and conclusions

We started from the educational reforms that established more opportunities for second chance education in the German secondary education system. The rationale behind these reforms was to open up channels into higher levels of education even for those pupils who do not transition into the academic pathway at the beginning of secondary education right away. In particular, these reforms targeted at disadvantaged social groups that are known to be underrepresented in academic tracks and higher education. Our concern was that – while these measures were intended to reduce the level of social inequality in educational attainment – they could even have produced some unintended side effects that work counter this initial target and contribute to the maintenance of inequalities instead. By taking into account behavioral patterns, and in particular the role of risk aversion in educational choices, we argued that the introduction of alternative, sequential pathways to higher education eligibility might probably divert students of disadvantaged backgrounds away from the academic tracks that lead there directly. While we have shown empirical evidence for these diversion patterns elsewhere (Schindler and Bittmann 2021), the aim of this paper was to inquire about the consequences for further educational trajectories. We argued that pupils who attend non-academic school tracks despite above-average cognitive competences and high educational ambitions might be exposed to learning environments that influence their educational aspirations in downward direction. By comparing students with similar characteristics and with aspirations for higher education eligibility that transition into different tracks of the German secondary school system, we find clear support for our expectations. Learning environments appear to have a severe impact on educational ambitions. This also means that pupils with initially high educational aspirations, who opt for the risk-averse alternative of starting secondary education in a non-academic track, are likely to adjust their educational goals and eventually end up without a higher-level educational degree.

As we know from previous research that these diversion processes primarily concern students of disadvantaged family background, these mechanisms have implications for the formation of social inequality in educational attainment. It means that the formal provision of opportunities for second chance education is less effective as initially thought if the unintended behavioral consequences are taken into account. Our findings contribute two insights in this respect. First, we could show that the more frequent downward adjustment of educational aspirations that can be observed for students from disadvantaged family backgrounds can be at least partially attributed to their more frequent exposure to non-academic tracks and thus to learning environments that are detrimental to higher-level educational ambitions. Hence, since many of those students appear to be diverted from the academic into the non-academic tracks, the related exposure effects effectively counteract the goal of raising their participation rates in higher education that was initially intended by the reforms. Second, these exposure effects seem to be less consequential for pupils of privileged social background who – for whatever reason – do not attend the academic track right away. As this group does not adjust their educational aspirations in the same way, second chance education indeed seems to provide avenues into higher education for them, thereby contributing to a reinforcement of educational inequality.

Our analyses were focusing on idealistic aspirations, as we wanted to provide a conservative estimate of the track effects. One could argue that realistic aspirations provide a more accurate measure of students' perceptions of further educational trajectories that are realistically open to them. Our additional analyses confirm our initial expectations that – when considering realistic aspirations – the school track influences are even more pronounced.

As a final remark, we may stress that our findings in this paper only relate to the influences of learning environments on the individual-level development of educational aspirations. This might be interesting in itself. However, it might have become clear in our discussion that if we embed our results in the broader context of educational inequality and educational reforms, the implications are much wider. They suggest that neglecting socially selective behavioral incentives in the design of policy measures can limit their effectiveness or make them ineffective at worst.

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## 7 Appendix

Table A1: Sample selection process

	Original sample	Above median performance	Aspirations for higher education eligibility in wave 1	Participating in wave 1, 2 and 5	Complete information
Total	4,812 (100%)	2,403 (50%)	2,038 (42%)	1,535 (32%)	1,163 (24%)
<i>By school track</i>					
Non-Academic	2,577 (100%)	717 (28%)	404 (16%)	279 (11%)	185 (7%)
Academic	2,235 (100%)	1,686 (75%)	1,634 (73%)	1,256 (56%)	978 (44%)
<i>By parents' education</i>					
Less than upper secondary education	1,602 (100%)	617 (39%)	460 (29%)	374 (23%)	313 (20%)
Upper secondary education	795 (100%)	446 (56%)	390 (49%)	306 (38%)	284 (36%)
Higher education	1,177 (100%)	863 (73%)	809 (69%)	603 (51%)	566 (48%)
No information	1,238 (100%)	477 (39%)	379 (31%)	279 (23%)	0 (0%)

Source: NEPS SC3. Notes: Calculations for survey wave 1 (grade 5). "Original sample" refers to all participating pupils in wave 1 in regular schools, excluding special needs pupils and pupils still in elementary schools.



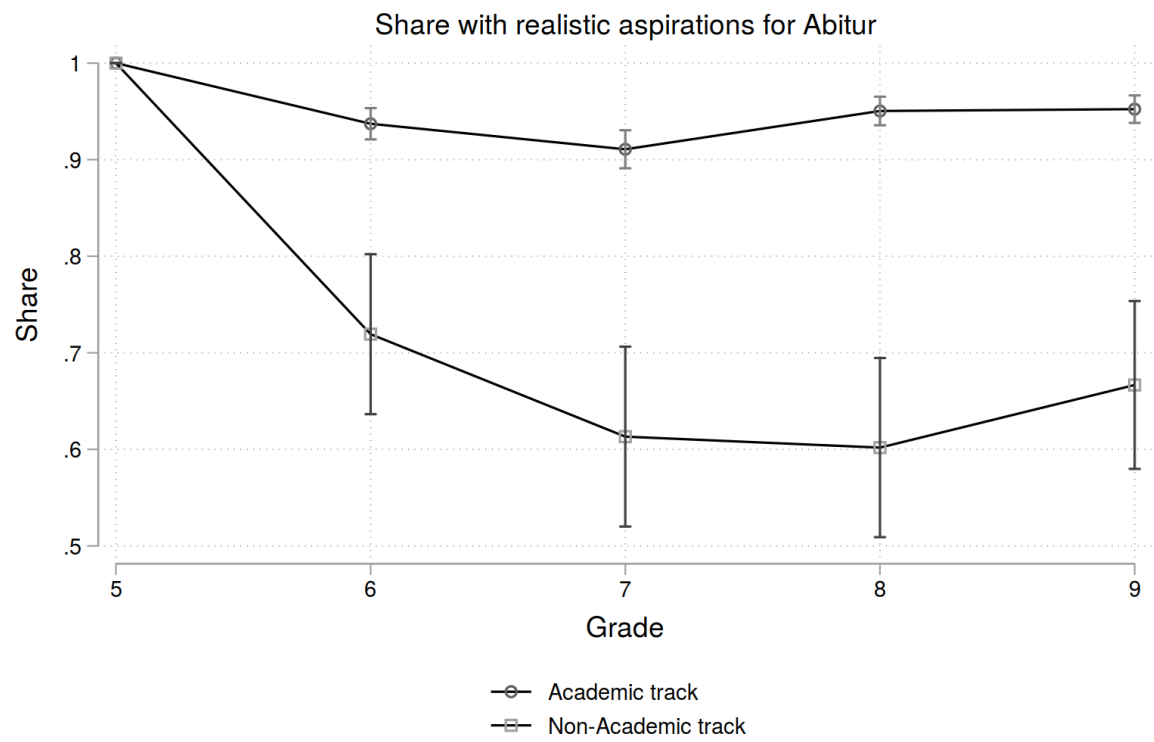
Table A2: Propensity score assignment model (logistic regression)

	Attending the academic track
Female	1.489* (0.265)
Parental education	
Less than upper secondary education	Ref.
Upper secondary education	1.900** (0.444)
Higher education	1.943*** (0.390)
Age in 2011	0.398*** (0.0909)
Math competence	2.626*** (0.369)
Reading competence	1.079 (0.114)
Reasoning score	1.083 (0.0439)
Perceptual speed score	1.000 (0.00702)
East	2.522* (0.910)
Parents living together	1.770** (0.384)
Migration status	
Both parents born in Germany	Ref.
One parent born abroad	1.113 (0.310)
Both parents born abroad	2.687* (1.250)
Observations	1163
R-Squared	0.14

Exponentiated coefficients (odds ratios); Standard errors in parentheses. Dependent variable: attending the academic track (1) or not (0). Standard errors clustered within school.

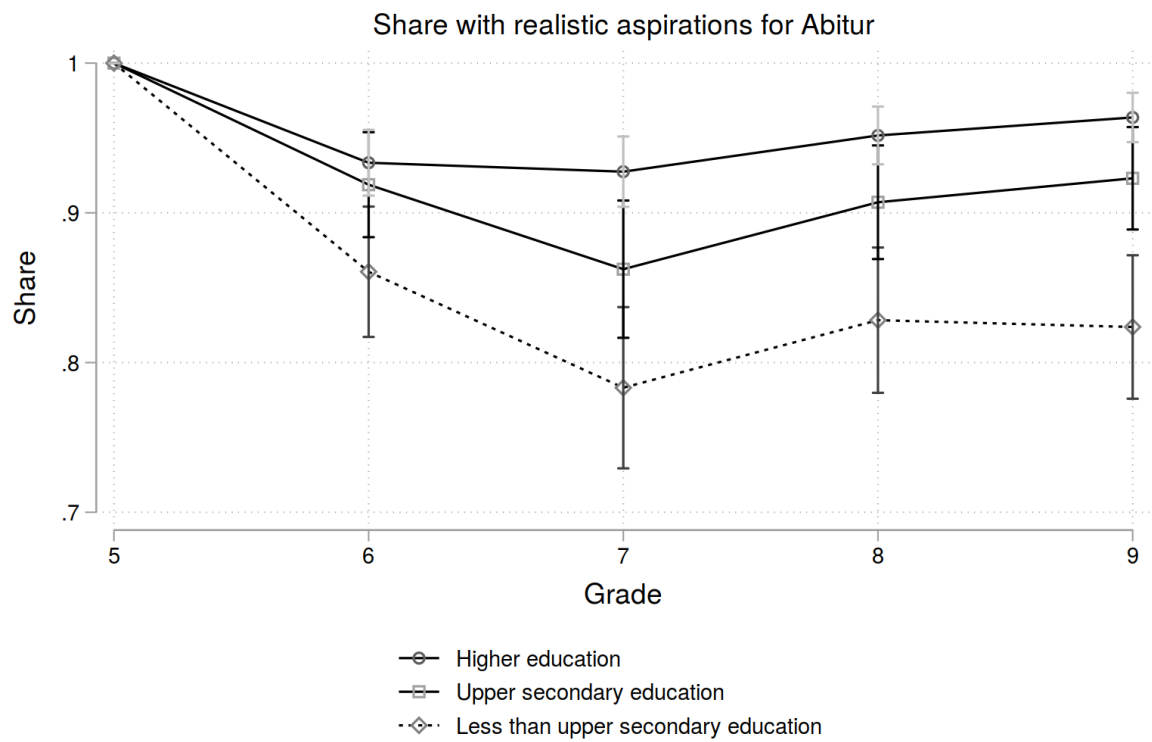
\* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$

Figure A1: Development of realistic aspirations by school track



Source: NEPS SC3. 95% Confidence bars depicted.

Figure A2: Development of realistic aspirations by social background over time



Source: NEPS SC3. 95% Confidence bars depicted.

