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Are Recessions Good for Educational Attainment?

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Abstract

In this study, we examine how economic performance during the child-specific primary school phase, during which teachers make recommendations regarding secondary school level, affects the educational level achieved ultimately by these children. Using data for Germany, we find that an economic downturn, coupled with increased unemployment, affects children's education attainment negatively. In terms of monetary units, the average effect of the 1993 German recession on children's educational attainment corresponds to a loss of average monthly household equivalence income of about 50%. A second important conclusion is that children who live in regions that experience poor economic performance over longer periods are, on average, less educated than children who live in more affluent regions. Since human capital is a determinant of economic growth, declining school performance ultimately hampers future growth potential.

Keywords: educational attainment, educational tracking, macroeconomic uncertainty, family structure, intergenerational link, parental labor supply

JEL classification: I21, E24, J10, J22

1 Introduction

In this study, we examine how economic performance during the child-specific primary school phase affects the educational level achieved ultimately by these children. After four years of primary school, students continue their education at a secondary school (which is tripartite in nature). At the conclusion of the primary school track, teachers make recommendations for students regarding the secondary school track, based particularly on students' performance in the third and fourth grades. Using data drawn from the German Socio-Economic Panel, we evaluate whether the prevailing economic conditions in this phase are related to educational outcome. We obtain evidence that while children are in these pivotal years of school, the rates of GDP growth and unemployment at the state level are significantly related to the education levels they achieve ultimately.

The results suggest that poor economic conditions may have negative long-term effects on aggregated human capital. However, since human capital is a determinant of economic growth, declining school performance consequently hampers future growth potential. A second important conclusion is that children who live under poor (regional) economic conditions for longer periods are, on average, less educated than children who live in more affluent regions. This helps explain why we observe, even within a given country, large and persistent regional differences in economic development. We contribute to the literature by providing the first study that analyzes the effects on children's education attainment that stem from the regional economic conditions present during primary school.

The question of whether macroeconomic shocks affect individuals has been analyzed variously in recent literature. For example, study topics have ranged from human capital accumulation and health, to happiness, divorce, and biological responses to macroeconomic conditions. With respect to human capital investment, recessions can cause two effects. The first of these is the income effect, whereby recessions may impact the budget constraints of households, which in turn increases the likelihood of leaving school earlier than would otherwise be optimal. The second is the substitution effect, whereupon recessions could lower the opportunity costs of attending school, thus increasing the schooling of affected cohorts. Using data for the Great Depression in the USA, Goldin (1999) and Yamashita (2008) find evidence for an increase in average education attainment, while Flug et al. (1998)

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and Behrman et al. (1999) report that negative macroeconomic conditions are negatively related to schooling in Latin America. In addition, Schady (2004) analyzes the 1988-1992 macroeconomic crisis in Peru and finds no effect on school attendance rates, but a significantly higher mean education attainment among the cohort exposed to the crisis.[1]

Using Dutch (2006) and Danish (2008) data, van den Berg et al. (2006) and van den Berg et al. (2008) find that poor macroeconomic conditions at birth or during childhood affect later life outcomes negatively. Almond (2006) considers the period of the Spanish influenza (1918-1919) in the USA and finds that infants conceived during that period have lower rates of educational attainment. Using data from the USA, Ruhm (2000) shows that recessions may have protective and instantaneous health effects, and Dehejia and Lleras-Muney (2004) conclude that infants conceived during times of high unemployment are healthier than other infants. Finally, using data for the USA, Strully (2009) finds that job loss has adverse effects on health, while Catalano (2003) and Catalano et al. (2005) provide evidence that poor macroeconomic conditions induce a biological response among men and women. In both Catalano studies, observations indicate that the ratio of male to female live births declines when populations suffer ambient stressors caused by macroeconomic conditions (e.g., unemployment rate and GDP growth).

From the economics of happiness, it is understood that individual life satisfaction is negatively related to macroeconomic conditions, such as recessions and overall unemployment, and individual unemployment.[2] In addition, Clark (2003) has shown that not only an individual's unemployment, but also a partner's unemployment significantly decreases life satisfaction. These results seem to be consistent with the findings of Gregg and Machin (2000), in which a father's long-term unemployment has negative effects on the school attendance of his children.

Bellows (2007) and Zuo (1992) provide evidence for happiness interac-

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[1] Another example of an exogenous shock is war. Ichino and Winter-Ebmer (2004) compare birth cohorts from Austria and Germany to those in Switzerland and Sweden among those who grew up during WWII. They find that Austrians and Germans have significantly lower average education. However, in contrast to economic crises, war also has adverse effects on educational infrastructure. Thus the effect is expected to be larger.

[2] See, for example, Di Tella et al. (2001), Di Tella et al. (2003), and Frey and Stutzer (2002). In addition, according to the happiness literature, adults are more affected by individual instantaneous unemployment than, for example, by divorce.

tions in the family, such that in recent years, it has been argued in the sociological literature that family instability and high levels of stress contribute to poor child well-being. Children who experience a transition in family structure due to divorce, for instance, attain lower grades and lower scores on achievement measures.[3] Divorce itself can be caused, among other things, by layoffs as Charles and Stephens (2004) have shown. Coleman et al. (2000) and Cooper et al. (2008) find that increased stress in the family may cause children to perform worse in school, and Pong and Ju (2000) conclude that instability and stress in the family is associated with a greater likelihood of dropping out of school. Finally, using data for the USA, Currie and Thomas (2001) find that education outcomes at around age seven are strongly correlated with a range of later outcomes (e.g., education level, employment, and earnings).

In summary, empirical evidence exists for (a) parental responses to changes in individual and macroeconomic conditions, and (b) interactions between family members; e.g., between parents and children. These findings lead us to posit that macroeconomic conditions may affect not only parents, but also their children, even if social interaction in the family is in good order. As the literature has shown, school performance can be affected by exogenous shocks, which might be transferred in the family.

This paper is organized as follows. The next section offers a brief overview of the German education system, and section 3 states the first empirical evidence. Section 4 describes the study's design, including a short literature review, data discussion, and estimation strategy. Section 5 presents the empirical results, while section 6 contains further analysis relative to the robustness of the results. Section 7 provides the conclusion.

2   More on Secondary School Tracking in Germany

In Germany, compulsory school attendance begins around the age of 6 and ends at the age of 16. At the completion of the four-year primary school track, teachers give recommendations regarding students' secondary school track, building upon the performance observed during the last two years of school. The teachers provide these recommendations at the beginning of the year (during fourth grade) and about half a year later, the children

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[3]See, for example, Kurdek et al. (1995), Martinez and Forgatch (2002), Amato (2006), and Fomby and Cherlin (2007).

start at the new school. In most cases, parents follow the teachers' recommendations, while in some cases, the recommendation is binding (as is the case in the Federal States of Bavaria, Baden-Württemberg, and North Rhine-Westphalia).[4]

German secondary school is tripartite in nature, beginning with lower-level secondary (*Hauptschule*), intermediate-level secondary (*Realschule*), and upper-level secondary school (*Gymnasium*).[5] Only pupils who graduate from the upper-level secondary school are entitled to study at a university. Scaling up in secondary school after the recommendation has been made and implemented, such as when the child is in the fifth or sixth grade, is extremely difficult. While upgrading and downgrading are theoretically possible, only the latter alternative is practiced. Hence, the decision concerning educational track has a tremendous impact on an individual's entire life course, primarily through labor market outcomes as discussed in Dustmann (2004). This represents an important difference from other nations, particularly since in other OECD countries, the division of pupils occurs at a higher age, except in Austria (which is similar to Germany).[6]

In addition, the aggregate performance of birth cohorts in terms of their average education level depends on the quality of the tracking decisions made. With respect to Germany, however, Dustmann (2004) and Schnepf (2002) argue that family background is strongly related to teachers' tracking decisions.[7] In addition, as noted by Hanushek and Wößmann (2006), early tracking, such as occurs in Germany, increases educational inequality and reduces aggregate performance.

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[4] For a more detailed description of the German school system, see, for example, Jürges and Schneider (2007).

[5] The comprehensive school (*Gesamtschule*) offers all three levels. However, it does not exist in all German states, and less than 10% of pupils attend a comprehensive school in states that provide this type of school. Therefore, we do not consider this type in our analysis.

[6] See, for example, Brunello et al. (2004) for a comparison.

[7] The Institute for Education and Teaching in the Federal State of Baden-Württemberg analyzes the predictions made by teachers between 1985 and 1996 and concludes that about 8% of the recommendations are misinterpretations. Schnepf (2002) concludes that this error rate is much higher.

3 First Evidence

This paper focuses on the possible effects of economic performance during the child-specific primary school phase, in which teachers make recommendations for the secondary school level, on the tracking decisions made, and thus on the levels of education these children ultimately achieve. In this section, we will provide some initial evidence on the effects of economic conditions on tracking by using aggregated data on regional economic performance and the percentage of upper-level secondary school tracking.

The data used address the German state of Baden-Württemberg. In that state, the final decision concerning track choice is made by the teacher and ultimately confirmed by the school authority, while parental preferences are circumstantial. In figure 1, we see that in the 1990s, the percentage of children recommended for upper-level secondary school varies between 32% and 34.3%. It is readily apparent that the percentage drops during the 1993 recession, such that from 1992 to 1994, we see a decline of 3.6%.

figure 1 about here

In 1993, the GDP growth rate was -4.1% and the unemployment rate increased from 3.6% in 1992 to 6.2% in 1994. While the GDP growth rate has been positive since 1994, the unemployment rate in 2000 was at an even higher level than during 1992, the year before the recession. Figure 1 suggests the possibility of a link between tracking decisions and economic performance.

Figure 2 shows the percentage of children recommended for upper-level secondary school and the number of people employed in Baden-Württemberg. Here, we see an even more obvious correlation ($r = 0.775$). Not only do the share of upper-level recommendations and the number of employed fall in the year of downturn, but both require several years to recover from the recession.

figure 2 about here

The state of Baden-Württemberg can be subdivided into 44 regions (NUTS 3 level) for which we have information on the percentage of children recommended for upper-level secondary school. We also have data on economic and sociodemographic variables. The data cover the period 1995

to 2005 and are provided by the Federal Office for Civil Engineering and Regional Development, and the Baden-Württemberg Bureau of Statistics.

We regress the percentage of children recommended for upper-level secondary school on the economic indicators of GDP growth rate and unemployment rate. Additional regional information, which serves as control variables (not shown in the tables), are: the number of inhabitants per square kilometer; population size; share of foreigners; share of welfare recipients; share of inhabitants 60 years and older; share of inhabitants older than 20 years and younger than 60 years; average household income; net migration; share of those who leave school without certification; and share of upper-level secondary school graduates. We use a fixed effects within estimator with time effects and control for heteroskedasticity (robust standard errors). Following the approach suggested by Driscoll and Kraay (1998), we also control for spatial correlations in the residuals.

$$
\begin{aligned}
upper\ level\ secondary_{it}\ =\ & \sum_j \alpha_j economic\ indicators_{ji,t-\tau} \quad (1) \\
& + \sum_k \beta_k regional\ informations_{ki,t-1} \\
& + \gamma + \lambda_i + \theta_t + \epsilon_{it}
\end{aligned}
$$

The economic indicators enter the equation with different specifications of time lags, $\tau \in \{0, 1, 2\}$, while regional information is lagged by one year. This is because the tracking decision will be made at the beginning of each year. Further, λ_i are regional fixed effects, θ_t are time effects, and ϵ_{it} is a disturbance.

Table 1 shows the results for different specifications. Since teachers give their recommendations at the beginning of the year, the economic conditions during that year cannot be related to the tracking decisions. We test this in the following regression and find no significant relation between economic performance and the percentage of children recommended for upper-level secondary school in time t. Rather, the assumption is that there is a delayed effect. For example, if a father becomes unemployed one year before the recommendation is made, this can affect the child's performance in school, particularly when the father remains unemployed for the long term. The same may apply to the preceding year, since employment prospects

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recover from a recession only after a delay of several years. We test this assumption using one- and two-year lagged effects. In regressions 2 to 5, we provide different combinations of lagged effects and find one very robust effect: the two-year lagged unemployment rate. In all specifications, this effect is significant at the 1% level using standard errors according to Driscoll and Kraay, and it is significant at the 5% level using robust standard errors, except for regression 4.

table 1 about here

Different explanations for this delayed effect are possible. First, parental unemployment commenced one to two years before the recommendation was made. If the unemployment persists for several months, it is possible that it will end sometime during the year before the recommendation is made. Second, a scarring effect of unemployment might exist. Here, the risk of becoming unemployed increases again, and job displacement is followed by a lower trajectory for future earnings after reengagement.[8] Third, the teacher might apply greater weight to the child's school performance in the year before the decision is made. For example, the teacher will rely more on the first appraisal if the child fails to convince the instructor that he or she is capable of better school performance during the recommendation period.

However, since this data does not allow us to analyze these explanations further, they remain speculative. We will use microdata in the next section, which will allow us to control for child-specific family background. At this stage, we can conclude cautiously that there might be a statistical relationship between regional economic performance and recommendations for the secondary school track.

4   Research Design

In this section, we will advance the research design. The strategy is to consider the literature focused on children's educational attainment, which will be summarized in the following subsection. Afterwards, we describe the data used, which consist of a combination of microdata drawn from the German Socio-Economic Panel and regional economic indicators. In the third subsection, we present our estimation strategy in order to identify

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[8]See, for example, Arulampalam (2001) and Arulampalam et al. (2001).

the link between children's educational attainment and prevailing regional economic conditions at the end of primary school.

4.1 Related Literature on Children's Educational Attainment

While investigating a possible relation between regional economic performance and children's educational attainment, we should consider the labor market activities of the parents. Maternal employment and its impact on children's cognitive development have been analyzed in a number of prior studies. Comprehensive surveys of these studies can be found in Bernal and Keane (2006), Haveman and Wolfe (1995), and Ruhm (2004). In almost all cases, the focus has been on the effects on preschool children. The impact of the maternal labor supply on children's educational attainment is typically negative. In addition, evidence suggests that this negative effect diminishes as the maternal education level rises. More often than not, however, paternal employment effects have been neglected. According to Bernal and Keane (2006) and Haveman and Wolfe (1995), a number of studies use simple correlations without additional controls for family and child characteristics, or they use small and sometimes nonrandom samples. These approaches could explain the mixed results. As pointed out in Ruhm (2004), many studies use the National Longitudinal Survey of Youth but come to different conclusions with respect to the estimated effect.

Recent studies into the effect of maternal employment fall into three groups: (1) those that find positive effects (Haveman et al., 1991, Vandel and Ramanan, 1992, and Parcel and Menaghan, 1994); (2) those that find negative effects (Leibowitz, 1977, Stafford, 1987, Mott, 1991, Harvey, 1999, Han et al., 2001, Ruhm, 2004, and Mahler and Winkelmann, 2004); and (3) those that find positive or negative effects depending on specific circumstances (Desai et al., 1989, Baydar and Brooks-Gunn, 1991, Blau and Grossberg, 1992, Boggess, 1998, Ermisch and Francesconi, 2000, Waldfogel et al., 2002, and James-Burdumy, 2005). According to Ruhm (2004), the "overall impact of maternal job-holding during the first three years is fairly small, with deleterious effects during the first year offset by benefits for working during the second and third." In addition, there seems to be little evidence that the effect of parental participation in the labor market turns out to be positive and significant as the child ages.

There are different explanations for the effects of parental employment on

children's educational attainment in the literature.[9] According to Hoffman (1980), parental employment may generate stress, which in turn leads to less and lower quality family interaction. Coleman (1988) alludes to a possible negative relationship between parental employment and the provision of social capital for children. In contrast, Blau et al. (2002) and Haveman and Wolfe (1995) conclude that job holding, especially by mothers, can have positive effects on older children. This conclusion is based on the role model theory, in which a person compares him- or herself to reference groups of people who hold the social role to which that person aspires. The reference group can consist of people who exemplify a positive behavior, which in this context is a parent. Another explanation is offered by Price (2008), who finds that the amount of quality time spent between parent and child decreases as children age. As a result, parents have more time for other activities.

Therefore, we will control for individual parental employment experiences in the empirical analysis. In addition, the literature on children's education attainment has shown that family background can have strong effects on children's school performance. For example, the literature has shown that parental education, household income, marital status, the number of siblings, and birth order can influence a child's cognitive development. In the following section, we will explain how we consider such aspects.

4.2 Data

The data used for this study are drawn from the German Socio-Economic Panel (GSOEP), an annual panel survey of a random sample of German households. We considered students who left school between 1984 and 2005, which yielded information for almost 1,500 children. All children who attended either lower-level, intermediate, or upper-level secondary school were retained in the sample.[10]

Regarding children's educational attainment, we differentiated among five levels of students: (1) those who left school early without appropriate

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[9] Parental labor supply has two main effects on children's levels of educational attainment. First, household income increases with labor supply, which in turn, increases children's educational attainment. Second, a child whose parents have regular employment has, on average, a lower education level because there is less family support available for learning activities.

[10] Children attending a comprehensive school (*Gesamtschule*) had to be dropped since the ordering of this type of school relative to the other is ambiguous.

certification; (2) lower-level secondary school students; (3) intermediate secondary school students; (4) upper-level secondary school students who were not entitled to enter university; and (5) upper-level secondary school students who were entitled to enter university. While the first group consists of dropouts without formal certification, the fourth group includes dropouts from upper-level secondary school. While these finished the 12th grade, in contrast to the fifth group, they have not completed the 13th. Consequently, they are not permitted to study at a university; however, they are eligible to attend a technical college.

Since we are interested in the specific family characteristics that exist between birth and the time each child is of school age, the number of children considered ultimately is smaller than the number of children available in the sample. Table 2 depicts the number of observations available in the data set (complete sample) and the number available after considering the control variables (considered sample) ordered by the children's education levels. This distribution does not change significantly when we consider the set of control variables.

table 2 about here

To account for the possibility of intergenerational mobility and household background effects, we control for different family characteristics. The standard variables that have significant impacts on children's educational attainment are parental education level and household income. Parental education has the same five categories as the children. Additionally, however, we consider a dummy variable that is equal to 1 if the respective parent has a university degree. Household income is measured as equivalence income after taxes and government transfers in 1,000 Euro increments, which were averaged over the period between birth and the time the child leaves school.[11]

Parental labor market experiences are approximated by full- and part-time employment and unemployment. All three variables are measured in years as aggregated experiences until the child finishes school. This means that we do not have a classical reference group, and a parent can have experience in all categories. We have information at the monthly level, which we transform into years.

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[11]Equivalence income weights are calculated as suggested by Buhmann et al. (1988).

To consider the quantity-quality trade off (Becker and Lewis, 1973) and the hypothesis of sibling rivalry (Becker and Tomes, 1986), we control for the number of siblings and the birth order. Black et al. (2005), Booth and Kee (2009), and Plug and Vijverberg (2003) have shown that the birth order effect is important in addition to the number of children. The birth order index is calculated as suggested by Booth and Kee (2009). Single parenthood is an important control variable, since the number of single parent households has increased steadily in Germany.[12] Single parenthood is measured by an index (between 0 and 1), which is calculated according to the number of years a child spends in a single parent household between birth and the time he or she finishes school. Furthermore, the literature offers evidence that on average, girls have a higher level of education, and the timing of birth has significant effects on the educational level attained eventually by the child. The latter is measured according to the mother's age upon first birth. In addition, we consider regional dummies at the state level. Basically, this is done to consider the differences that exist in the formal curriculum at the state level. In cases where a change in residence occurs (relocation to another state) during the schooling phase, the child has more that one entry equal to 1 in the dummy vector.

Not all of the control variables will be discussed. These are: nationality of the students (we differentiate between native and nonnative using a dummy); number of moves between birth and the time the child completes school; divorce of parents (one dummy for the preschool phase and another for the primary school phase); attendance at a kindergarten; dummies for child care among mothers and fathers during the children's first year of life; dummies for deviations from teachers' recommendations for secondary school track[13]; and a dummy to reflect the repeat of a school year. We provide summary statistics for all variables in the appendix.

The macroeconomic conditions will be approximated according to the annual GDP growth and unemployment rates at the state level. In a first step, we use averages over the years for both variables when the child is 9

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[12]See Mahler and Winkelmann (2004) for a detailed discussion of this point and estimates for Germany.

[13]In Germany, teachers make recommendations regarding the secondary school track during the last year of the primary school phase. Where parents desire a higher education track for their child than was recommended by the teacher, a dummy variable takes the value 1. In any other case, this variable has a value of 0. An additional dummy is used to control for the parental deviation from a teacher's recommendation in the other direction.

and 10 years old, ages that correspond to the third and fourth grades. In section 6, we will apply different annual values that correspond to a child's specific age.

4.3   Estimation Strategy

The following hypothesis will stand in the foreground in the empirical analysis: Unfavorable economic circumstances, such as recessions or high unemployment, can cause uncertainty and thus anxiety about the future of the family, particularly among the parents. Children achieve a lower level of education if parents transmit this anxiety at a given time. More precisely, we focus on the prevailing economic conditions at the end of primary school when teachers make their recommendations for the secondary school level. At the family level, this can be correlated with individual parental labor market success. For example, parental labor market success could provide mental stability for all family members, while parental unemployment could impart negative effects on children's achievement, since it causes parents mental instability, disorientation, frustration, and depression. To consider these potential effects, we control for the labor market experiences of parents.

We use a reduced-form model, in which the regional economic environment, labor market experiences of parents, and additional control variables have an effect on children's schooling, S:

$$
\begin{aligned}
S_{ic} \;=\; & \sum_{j} \alpha_j \, economic \; indicators_{jic\tau} \\
& + \sum_{k} \beta_k \, parental \; labor \; market \; success_{kic} \\
& + \sum_{m} \gamma_m X_{mic} + \lambda_c + \epsilon_{ic}
\end{aligned}
\tag{2}
$$

Subscript i indexes the individual children and c is a regional differentiation at the state level. We have j different economic indicators, which represent the regional economic conditions that prevailed at a child's specific age, τ.[14] We use the GDP growth and unemployment rates at the state

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[14]The specific value will be the same for twins. However, in the sample used there are only 11 pairs of twins. For the remaining children, the values are the same if they are

level. Parental labor market success indicates individual parental full- or part-time employment or unemployment experience with k different characteristics. X is a vector of m child-specific family characteristics that serve as control variables. λ_c is a state-level fixed effect while and ϵ_{ic} is the error term.

An ordered probit estimator is used to model children's educational attainment. The standard errors provided are robust and corrected for clustering.

5   Results

Table 3 provides the estimation results from four different specifications. Regression 1 comprises the variables that represent economic conditions only and the full set of observations. Regression 2 uses the number of observations that correspond to the complete set of control variables. Regression 3 also contains the control and standard variables, while regression 4 is the full specification, including parental labor market experiences.

The results from regressions 1 and 2 are not only significant, but they are also very similar. That is, average regional economic performance at the children's ages of 9 and 10 is significantly related to the level of education they eventually complete. The consideration of different sets of family background variables does not alter this conclusion, even if we control for parental labor market experiences (Reg4). The discussion in section 3 has shown that the GDP growth effect can be interpreted as short term in nature, while the impact of the unemployment rate lasts for several years. This means that a one-year economic downturn affects more than one age cohort in primary school. In addition, we can conclude that the unemployment rate has a persistent effect when regional differences in unemployment rates are extensive. In section 6, we will provide further analysis to support these findings.

In principle, the results for the family background variables of regression 3 in table 3 are in line with the existing literature. Parental education affects children's educational attainment positively, and with the exception of the mother's university degree, significantly. Household income has the expected positive effect.[15] Children's education attainment increases, on average, the

born in the same region and the same year.

[15]Presumably, parental income is correlated with their abilities. Hence, the extent to

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older a mother is at first birth. Based on the index that measures the proportion of time in a single parent household until the child graduates from school, children complete a lower level of education if one parent is absent. However, the effect is not significant. Finally, on average, boys have a lower level of education, and the number of siblings and birth order have negative effects on children's educational attainment. Hence, even if we control for the number of siblings, birth order matters.[16]

table 3 about here

Regression 4 also contains the variables that approximate parental labor market activities. With respect to the employment variables, the sign of the respective parameters is always as expected, and the effects are considerably larger for part-time work and for fathers in general. We find that for fathers, the effect is significant for full-time employment, while the effect for part-time employment among mothers is significant.[17] The latter is unsurprising since in the majority of cases, mothers work part-time, especially while the children are completing their schooling.[18] Hence, parental labor market activities comprise direct and indirect effects (via income) on children's educational attainment. In addition, the direct impact might be interpreted as a non pecuniary effect of parental success and failure on the labor market relative to children's educational attainment.[19] Parental experience with unemployment has no significant effect.

With respect to the standard family background variables, we find some interesting changes when we compare regressions 3 and 4. First, the schooling effect of parents, particularly that of the fathers, has increased. Here,

which income really matters is unclear. However, we will not control for this possible bias since the primary focus in this paper is not on family income effects. For a detailed discussion of this issue, see, for example, Shea (2000).

[16] Similar results are obtained by Booth and Kee (2009) for UK and Black et al. (2005) for the US.

[17] If parents have more experience with employment (part- or full-time), the time remaining for interaction with children decreases. The latter effect is expected to diminish children's achievement. Hence, the estimated parameters might be underestimated with respect to the pure employment effect.

[18] See Paull (2008) for a detailed discussion of that point.

[19] We argue that there is a non pecuniary effect in addition to the pecuniary and time-budget effects. First, it is likely that the time-budget effect is diminished for adolescents. Haveman and Wolfe (1995) refer to this as the additional income effect. Notably, when children go to school, they could value the time with friends more highly than they do the time they spend with their parents. Second, parental success in the labor market could generate mental stability or positive non pecuniary effects that affect all family members. Alternatively, one could also argue that the role model may be important.

fathers' schooling is at least as important as that of mothers. It is argued frequently that in particular, the mother's time increases children's educational attainment.[20] Ruhm (2004) concludes that the father's time is similarly important, which implies a degree of substitutability between fathers and mothers. In addition, more recent studies (Behrman and Rosenzweig (2002), Plug (2004), and Plug and Vijverberg (2005)) have found that the positive effect of mothers' schooling disappears when assortative mating and heritable abilities are taken into account. Even Antonovics and Goldberger (2005), who are critical of the methodological issues in Behrman and Rosenzweig (2002), come to the conclusion that the effects of a father's education on his children are greater than those of the mother.

Second, the effect of birth order is much stronger when we control for parental labor market activities, because the index effect has tripled in Reg4 compared to Reg3. Of note, it is interesting that the number of children is not affected significantly by the inclusion of labor market variables. These results are in line with the findings of Price (2008). He argues that parents give roughly equal time to each child. From this, it follows that the first child will get the majority of the time, followed by the second, and so on. According to our results, the birth order effect becomes stronger as the parents spend more time on the labor market.

Third, a mother's age at first birth is no longer significantly related to children's educational attainment if parental labor market experiences are considered. In fact, the mother's age at first birth and employment experience are positively correlated in our sample. It is usually argued that mothers' experience with education of children increases with age, but based on Reg4, we cannot confirm this relationship. Finally, the family income effect is reduced. This corresponds with our argument, where parental labor market activities comprise direct and indirect effects (via income) on children's educational attainment.

Ignoring the parental labor market variables seems to induce an omitted variable bias on some standard variables in the analysis of children's education attainment. Yet it is also possible that these labor market proxies are themselves correlated, such as with parents' ability. Further, unemployment experience can cause the scarring effect mentioned above, which might be

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[20]See, for example, Murnane at al. (1981), Heckman and Hotz (1986), Schultz (1993), Haveman and Wolfe (1995), and Hill and King (1995).

negatively correlated with parental abilities. Therefore, further research is needed relative to parental labor market success and children's educational attainment. Based on our results, however, we can conclude, cautiously, that the less successful parents are on the labor market, the greater the potential will be for lower educational attainment among their children.

6 Fact or Fiction?

In this section, we analyze whether the estimated effects for regional economic conditions are robust with respect to alternative specifications of the model. There is no doubt that the ordering of five education levels may have driven some of the results, and the regional effects could be spurious or correlated with unobserved regional effects. One way to overcome these difficulties would be to use variation among siblings, such as was done by Altonji and Dunn (1996a, 1996b). However, the data do not provide enough sibling information to facilitate an adequate analysis of our research question. Furthermore, the macroeconomic conditions should not be operationalized by means of a binary; rather, a continuous design should be used to analyze the effects of different levels. Similarly, we are not interested in a comparison of specific years. As a result, we do not consider a differences-in-differences approach.

To eliminate the possible effect caused by dropouts, we disregard those who leave school early without earning a formal education degree (former level 1), add the two upper secondary school levels (4 and 5), and run the regressions again. For children's educational attainment, we now differentiate among three levels: (1) lower-level secondary school; (2) intermediate secondary school; and (3) upper-level secondary school. The latter category encompasses the previous levels 4 and 5.

Table 4 presents the regression results for the sample, excluding dropouts who did not obtain a formal education degree. In principle, the results are similar to those in table 3, and the statistical power for the regional economic performance proxy variables remains almost unchanged. Hence, the average regional effects are robust with respect to the change in the aggregation of children's educational levels. With respect to the control variables, the results are also similar to those in table 3. Here, the effect of full-time working mothers is now significant at the 5% level.

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table 4 about here

It is possible that the adverse economic effects are greater for recommendations for the upper-level secondary school track. In particular, parents have an incentive to push their children to improve their performance in school, since this graduation provides a range of opportunities later in life. Therefore, we use the same specification on the right hand side, but use a binary variable on the left. This dummy equals 1 if the child successfully graduates from the upper-level secondary school, otherwise it is 0.

Table 5 provides the results. In all four specifications, the effects of regional economic performance are significant at the 1% level, and they are about twice as large as in the regressions with 5 education levels and 3 education levels as dependent variables. Hence, the above-average pupils in primary school react, on average, more sensitively to economic uncertainty. With respect to aggregated human capital, it follows that the (irreversible) loss in this subcohort is even greater.

When we compare Reg4 in tables 5 and 4 (or 3) we find two differences. First, a mother with a university degree is now significantly related to a child's educational attainment. Second, higher unemployment experiences among mothers are significantly positively related to children's successful graduation. Both seem to underscore that in particular, mothers with above-average education seem to have a positive care or support effect on their children.[21] In addition, the birth order effect has increased in magnitude by about one standard deviation. Hence, compared to the average among pupils, it is even more difficult for children that are not born first to graduate successfully from upper-level secondary school.

table 5 about here

Of course, the results obtained thus far could still be driven by an omitted variable bias, since we have used single values for both economic conditions. One way to control for unobserved effects would be to consider differences in birth cohorts. However, they would also capture the differences in economic conditions at a specific point in time, so we would be unable to measure the effects of interest (which are identical for a given birth cohort). While it is challenging to identify other potential variables in this framework, we will

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[21] According to the data, the educational levels of children and parents are highly correlated.

consider different specifications in terms of the timing of economic effects to shed light on this issue. The variables considered thus far are regional average values for children aged 9 to 10. For most children, school enrollment begins at age 6, and they typically complete primary school by age 10. Hence, we expect that the impact of regional economic performance on children's education attainment increases between ages 8 and 10, and becomes unimportant at age 11.

Based on the specification of Reg4 in tables 3 and 4, we now consider the macroeconomic conditions apparent during the individual years in which the children's ages ranged from 8 to 11. First, we consider the years separately using both dependent variables, 5 education levels and 3 education levels. The results are shown in table 6, Reg1 to Reg8. In a second step, we consider those years simultaneously (Reg9 and Reg10). In addition, we control for annual parental labor market experiences (annual plme) while the children are aged 8 to 11. This allows for the control of the potential correlation of aggregated labor market conditions with labor market experiences at the family level. In all regressions, we consider the full set of control variables and fixed effects.

Regression 1 (5) in table 6 contains regional economic performance at children's age 8, regression 2 (6) at age 9, and so on. As expected, the impact of regional economic performance first increases with children's age but becomes less important or even unimportant once the children begin the secondary school track. The effects are slightly stronger for the specification with five education levels. In addition, the effect of the regional unemployment rate is not significant in the three education level specification. Based on the results, we can conclude that the estimated effects for the average values of regional variables at children's age 9 to 10 seem to be reliable, at least for the GDP growth rate.

table 6 about here

For regressions 9 and 10, we find that when children are 10 years old, regional economic conditions affect their educational attainment significantly. For both dependent variables, we find the effects we expected, namely that economic conditions become important when children's performance is crucial for recommendation to the secondary school track. Further, the plausibility check for children's age 11 shows that the economic conditions during

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that year are not correlated with the tracking decision made the year prior. We argue that is an important result to highlight that the estimated effects are in fact not spurious.

Among the control variables, we have parental deviations from teachers' recommendations. Therefore, we argue that the conditions affect children's performance, which in turn impacts teachers' recommendations for the secondary school track.[22] Subject to the law regarding the German education system, this recommendation is practically irreversible in most cases. Hence, our hypothesis that poor regional economic performance at the end of primary school has, on average, negative effects on children's education attainment cannot be rejected. Rather, this has negative long-term effects on aggregated human capital. Indeed, it results in a human capital-economic growth spiral, since human capital is a determinant of economic growth. In addition, it offers a potential explanation for persistent cross-regional differences (even within a country), that are often observed relative to economic development.

To accentuate the size of the estimated effects, we compare some marginal effects that we compute based on the results presented so far. In Reg10 in table 6, the unemployment rate at the children's age of 10 has a marginal effect for education level 3 (upper-level secondary school) of -0.016. This means that a one percentage point increase in the unemployment rate reduces the probability of education $= 3$ by approximately 0.016 percentage points. Now, we take the 1993 German recession as an example. The unemployment rate rose from 8.5% in 1992 to 9.8% in 1993. To highlight the scope of the impact of this economic performance on children's educational attainment, we translate it into monetary values using the effect of family income as the standard of comparison. According to our estimates and the sample used, the marginal effect of this change in unemployment is equal to a reduction in household equivalence income of almost 15%.[23] The marginal effect of the GDP growth rate for this regression is 0.021, and that growth rate changes from 2.1% in 1992 to -1.5% in 1993. This corresponds to a

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[22]One might also expect that teachers could change their own behavior regarding the recommendations they make. We cannot control for this issue, but we can expect that it would tend to upgrade children's performance. This would correspond with the assumption that in "bad times," teachers would tend to make decisions that might make possible a better future for children.

[23]The marginal effect of a change in household equivalence income of 1,000 € is 0.107 and the average equivalence income is 1,320 € per month.

loss of average monthly household equivalence income of slightly more than 50%. As discussed above, the GDP growth effect is short term, while the unemployment rate effect can last several years if we consider the rate of unemployment before the recession as the initial point. Therefore, it has a larger cumulative effect on aggregated human capital.

Using the results of Reg4 in table 5, we can perform the same procedure. Here, the marginal effect on the probability of completing upper-level secondary school is -0.031 for the unemployment rate and 0.024 for the GDP growth rate.[24] Using these values, we see even greater effects: the increase in the unemployment rate has a monetary unit impact of -38% of the average household income, while the GDP growth rate effect corresponds to 80% of this equivalence income. The differences compared to the results based on table 6 derive from the different econometric methods. The ordered probit estimates yield one coefficient for all categories of education. In the binary probit estimates provided in table 5, we only consider the completion of upper-level secondary school. The comparison of both results might be seen as evidence that the ordered model underestimates the effect of regional economic performance on children who are on the upper-level secondary school track.

Finally, we should say something about potential unobserved effects. With respect to the family level, we have considered a multitude of variables that should control for important family-specific characteristics. In addition, the results for macroeconomic conditions were almost unchanged after controlling for the full set of family characteristics. Therefore, we do not assume that a potentially omitted family background is strongly correlated with the regional economic conditions considered.

One might argue that it is difficult to link the variables of GDP growth rate and unemployment rate to individuals and family interaction. However, after a series of studies, the literature on the economics of happiness has shown that these two macroeconomic variables are statistically significantly related to individual well-being.[25]

A third potential channel is related to school class. For example, differ-

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[24] The marginal effect of a change in household equivalence income of 1,000 € is 0.081.

[25] This applies to the rate of inflation as well. However, since we have no information on regional inflation rates, we do not consider this variable in our estimates. As a matter of course, it is possible that the estimated effects for the unemployment rate are biased due to the omission of the inflation rate. Ultimately, however, both variables are proxies for macroeconomic uncertainty.

ences in class size or composition relative to individual educational capacity can be correlated with prevailing economic conditions. This is possible in principle, but we cannot consider these issues using our data. However, we consider a period of more than 20 years, during which—owing to declining rates of fertility—the number of pupils has declined. On average, this has also reduced class size. During the same time, we can expect that the unemployment rate has increased rather than declined. However, this presumed negative correlation is incompatible with the findings on the effects of class size on educational attainment, which are negative. Finally, with respect to class composition relative to individual educational capacity, we do not believe that this is systematic at the state level over the period considered. However, if we were to use the aggregation level of urban districts, this could pose a substantial problem.

7   Conclusions

This study examines the effects of regional economic performance during teachers' decision making process regarding the secondary school track. Using data drawn from the German Socio-Economic Panel, we gather evidence that the prevailing regional GDP growth and unemployment rates at the children's age of 10 are significantly related to the educational level the children ultimately attained. Our interpretation is that unfavorable economic circumstances, such as recessions or high unemployment, can cause uncertainty, and hence anxiety about the family's future, particularly among the parents. Children achieve lower performance if parents transmit this anxiety in terms of family instability. In turn, this affects teachers' recommendations for the secondary school track, which are given during the last year of primary school. Using the 1993 German recession as an example, the poor economic performance that affected children's educational attainment corresponds to an average monthly loss of household equivalence income of about 50%.

With respect to education policy, we can draw two important conclusions from our results. First, from a general perspective, this study has shown that recessions reduce the average education level of birth cohorts that are in the tracking recommendation phase. Second, regions with enduring high rates of unemployment suffer from a reduction in the average education

attained by their future generations on the labor market. Here, several sequential birth cohorts are concerned. Since human capital is a determinant of economic growth, declining school performance necessarily hampers future growth potential.

Inflexible school systems, such as that in Germany, do not provide enough options to compensate for these adverse effects. The demographic change has reduced the "renewable resources" on the labor market, and this trend will continue for the next two decades. Under these circumstances, the aggregated human capital formation of future generations is of major concern relative to growth and international competitiveness. From this perspective, our results enrich the debate about intergenerational education effects.

In addition, we control for the effects of parental labor market activities on children's educational attainment. In contrast to the existing literature, we consider parental experiences until the children graduate from school. We find that fathers' full-time, and mothers' part-time employment are significantly related to their children's educational attainment. These results indicate that the less successful parents are on the labor market, the lower the average education level of the next generation will be.

This finding may also help explain international differences in children's education attainment, since national labor market conditions show large variances. For example, the labor market participation rate during the second half of the 1990s was 77.3% in the US and 71.2% in Germany.[26] At the same time, the unemployment rate was 4.6% in the US and 9.0% in Germany. In addition, the share of long-term unemployed was about 50% in Germany, but less than 10% in the US. Hence, on average, successful parental labor market participation is lower in Germany, and their effects on children's school performance (if existing) are stronger.

Further research is needed to determine whether the regional economic effects are specific to the German school system. In addition, the possible relation between parental labor market experiences and children's educational attainment must be analyzed in detail.

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[26] The labor market participation rate for men (women) in the second half of the 1990s is 84.1% (70.6%) in the US and 79.9% (62.2%) in Germany. In the same period, the labor market participation rate among the low skilled is 61.4% in the US and 56.5% in Germany. The corresponding unemployment rates are 9.3% in the US and 15.0% in Germany.

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9 Appendix
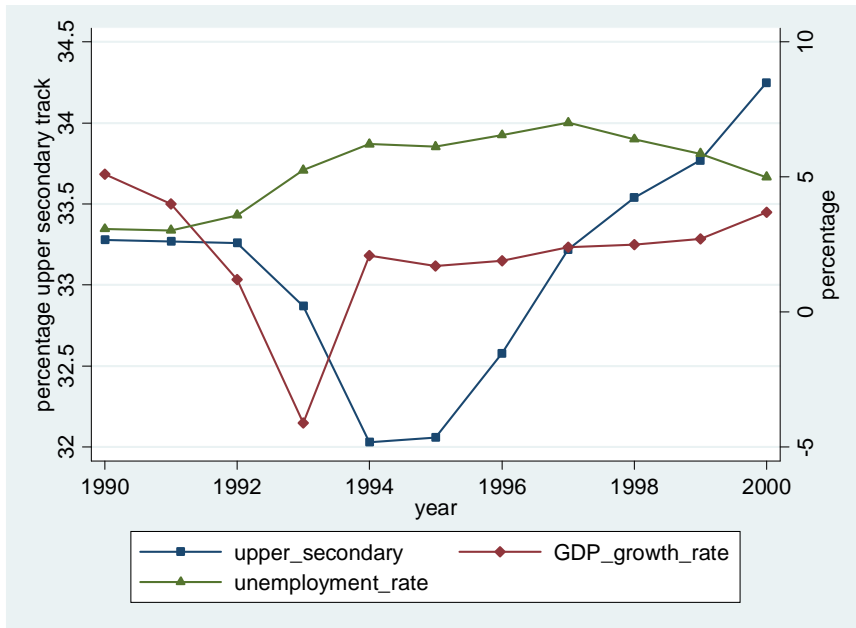
Figure 1: Upper-level secondary school tracking and economic conditions in Baden-Württemberg
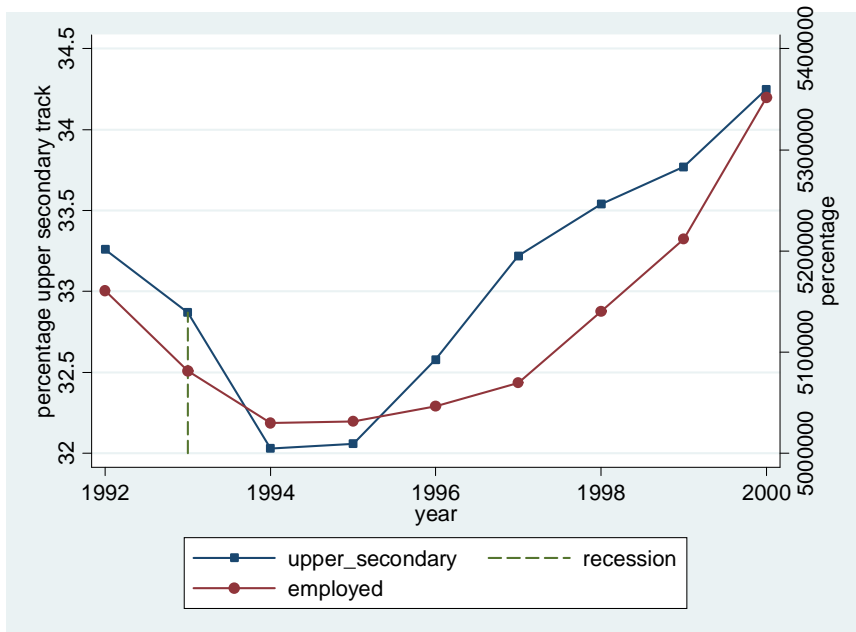
Figure 2: Upper-level secondary school tracking and employment in Baden-Württemberg

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Table 1: Upper-level secondary school tracking and economic performance

	Reg1	Reg2	Reg3	Reg4	Reg5
GDP growth rate in t	-0.352				
	(2.222)				
	[1.067]				
GDP growth rate in $t-1$	-0.701	-0.535	-1.464		-0.404
	(2.321)	(2.109)	(1.942)		(1.950)
	[2.496]	[2.078]	[2.152]		[1.732]
GDP growth rate in $t-2$	-0.422	-0.449		-0.358	
	(2.039)	(2.087)		(1.936)	
	[2.020]	[1.928]		[1.578]	
unemployment rate in t	-0.237				
	(0.286)				
	[0.144]				
unemployment rate in $t-1$	0.483	0.292	-0.001		0.293
	(0.279)	(0.205)	(0.047)		(0.204)
	[0.139]‡	[0.107]‡	[0.014]		[0.107]‡
unemployment rate in $t-2$	-0.114	-0.113		-0.089	-0.113
	(0.059)†	(0.057)†		(0.054)$^{\sharp}$	(0.057)†
	[0.234]‡	[0.022]‡		[0.013]‡	[0.021]‡
R^2	0.654	0.653	0.673	0.650	0.653
observations	396	396	440	396	396
regions	44	44	44	44	44
additional control variables	yes	yes	yes	yes	yes

Notes: Dependent variable: percentage of children with the recommendation for the upper level secondary school; estimation method: fixed effects within regression; all regressions include regional fixed effects and time effects; robust standard errors in parenthesis; Driscoll and Kraay standard errors in angular parenthesis; ‡: significant at the 1% level; †: significant at the 5% level; $^{\sharp}$: significant at the 10% level.

Table 2: Distribution of children's education atainment

	complete sample		considered sample	
	frequency	% of all	frequency	% of all
early school leavers	24	1.62	6	0.73
lower-level secondary school	339	22.91	170	20.71
intermediate secondary school	531	35.88	298	36.30
upper-level secondary school but not entitled to enter university	94	6.35	51	6.21
upper-level secondary school and entitled to enter universit	492	33.24	296	36.05
Σ	1480	100.00	821	100.00

Table 3: Children's education attainment (five education levels)

	Reg1		Reg2		Reg3		Reg4	
gdp growth rate	0.032‡	(0.009)	0.031‡	(0.010)	0.039‡	(0.011)	0.036‡	(0.013)
unemployment rate	-0.032‡	(0.008)	-0.038‡	(0.009)	-0.047‡	(0.013)	-0.044‡	(0.017)
unemployment mother							-0.045♯	(0.024)
unemployment father							-0.002	(0.051)
full-time mother							0.017♯	(0.010)
full-time father							0.057‡	(0.009)
part-time mother							0.037‡	(0.009)
part-time father							0.085	(0.053)
school level mother					0.166‡	(0.032)	0.218‡	(0.034)
uni degree mother					0.226♯	(0.132)	0.236	(0.146)
school level father					0.098‡	(0.040)	0.205‡	(0.048)
uni degree father					0.528‡	(0.091)	0.523‡	(0.101)
age at 1. birth					0.033‡	(0.009)	-0.014	(0.016)
single parent					-1.242	(0.989)	-0.265	(1.012)
family income					0.373‡	(0.061)	0.273‡	(0.069)
boy					-0.513‡	(0.085)	-0.516‡	(0.088)
number of siblings					-0.130‡	(0.050)	-0.158‡	(0.042)
birth order					-0.255‡	(0.096)	-0.745‡	(0.170)
pseudo R^2	0.005		0.009		0.200		0.2352	
additional controls	no		no		yes		yes	
state effects	no		no		yes		yes	
observations	1480		821		821		821	

Notes: Dependent variable: children's education (five levels); estimation method: ordered probit; robust and clustering corrected standard errors in parenthesis; additional control variables: nationality (dummy for non native), move (number of moves), dummy for divorce in the first six years of life, dummy for divorce during primary school, dummy for Kindergarten, dummies for child care of mothers and fathers in first year, dummies for deviation from teacher's recommendation for secondary school track, dummy for repeater; all regressions include federal state fixed effects; ‡: significant at the 1% level; †: significant at the 5% level; ♯: significant at the 10% level.

Table 4: Children's education attainment (three education levels)

	Reg1		Reg2		Reg3		Reg4	
gdp growth rate	0.029‡	(0.009)	0.026‡	(0.011)	0.035‡	(0.012)	0.031†	(0.014)
unemployment rate	-0.031‡	(0.008)	-0.034‡	(0.010)	-0.045‡	(0.015)	-0.041†	(0.019)
unemployment mother							0.034	(0.024)
unemployment father							0.024	(0.050)
full-time mother							0.024†	(0.011)
full-time father							0.063‡	(0.011)
part-time mother							0.040‡	(0.009)
part-time father							0.073	(0.052)
school level mother					0.161‡	(0.034)	0.223‡	(0.037)
uni degree mother					0.176	(0.116)	0.177	(0.139)
school level father					0.101†	(0.045)	0.222‡	(0.059)
uni degree father					0.499‡	(0.094)	0.488‡	(0.110)
age at 1. birth					0.033‡	(0.010)	-0.022	(0.017)
single parent					-1.140	(1.128)	-0.158	(1.255)
family income					0.386‡	(0.067)	0.278‡	(0.076)
boy					-0.537‡	(0.087)	-0.557‡	(0.088)
number of siblings					-0.145†	(0.060)	-0.167‡	(0.048)
birth order					-0.210†	(0.097)	-0.771‡	(0.184)
pseudo R^2	0.006		0.008		0.226		0.271	
additional controls	no		no		yes		yes	
state effects	no		no		yes		yes	
observations	1456		815		815		815	

Notes: Dependent variable: children's education (five levels); estimation method: ordered probit; robust and clustering corrected standard errors in parenthesis; additional control variables: nationality (dummy for non native), move (number of moves), dummy for divorce in the first six years of life, dummy for divorce during primary school, dummy for Kindergarten, dummies for child care of mothers and fathers in first year, dummies for deviation from teacher's recommendation for secondary school track, dummy for repeater; all regressions include federal state fixed effects; ‡: significant at the 1% level; †: significant at the 5% level; ♯: significant at the 10% level.

Table 5: Children's education attainment - upper-level secondary school

	Reg1		Reg2		Reg3		Reg4	
gdp growth rate	0.061‡	(0.013)	0.060‡	(0.013)	0.073‡	(0.015)	0.066‡	(0.017)
unemployment rate	-0.072‡	(0.013)	-0.077‡	(0.013)	-0.093‡	(0.024)	-0.086‡	(0.026)
unemployment mother							0.090‡	(0.029)
unemployment father							-0.015	(0.073)
full-time mother							0.016	(0.013)
full-time father							0.063‡	(0.009)
part-time mother							0.038‡	(0.008)
part-time father							0.061	(0.058)
school level mother					0.133$^{\sharp}$	(0.070)	0.181‡	(0.060)
uni degree mother					0.330‡	(0.091)	0.373‡	(0.126)
school level father					0.156‡	(0.039)	0.274‡	(0.045)
uni degree father					0.496‡	(0.107)	0.519‡	(0.112)
age at 1. birth					0.019$^{\sharp}$	(0.012)	-0.033$^{\sharp}$	(0.019)
single parent					-11.43$^{\sharp}$	(6.905)	-8.804	(6.814)
family income					0.345‡	(0.100)	0.221†	(0.093)
boy					-0.505‡	(0.126)	-0.489‡	(0.120)
number of siblings					-0.123‡	(0.047)	-0.161‡	(0.056)
birth order					-0.492‡	(0.148)	-1.013‡	(0.230)
pseudo R^2	0.029		0.040		0.284		0.329	
additional controls	no		no		yes		yes	
state effects	no		no		yes		yes	
observations	1456		815		815		815	

Notes: Dependent variable: children's education (one level = upper level secondary school); estimation method: probit; robust and clustering corrected standard errors in parenthesis; additional control variables: nationality (dummy for non native), move (number of moves), dummy for divorce in the first six years of life, dummy for divorce during primary school, dummy for Kindergarten, dummies for child care of mothers and fathers in first year, dummies for deviation from teacher's recommendation for secondary school track, dummy for repeater; all regressions include federal state fixed effects; ‡: significant at the 1% level; †: significant at the 5% level; $^{\sharp}$: significant at the 10% level.

Table 6: Regional economic effects at children's age 8 to 11 years

	5 education levels				3 education levels				5 education levels				3 education levels			
	children's age of ... years				children's age of ... years				children's age of ... years				children's age of ... years			
	8	9	10	11	8	9	10	11	8	9	10	11	8	9	10	11
	Reg1	Reg2	Reg3	Reg4	Reg5	Reg6	Reg7	Reg8			Reg9				Reg10	
gdp	0.006	0.037‡	0.046‡	0.039†	0.008	0.034‡	0.040‡	0.030$^\sharp$	-0.001	-0.001	0.051†	-0.016	0.002	-0.003	0.054‡	-0.031
	(0.009)	(0.012)	(0.013)	(0.017)	(0.010)	(0.013)	(0.014)	(0.017)	(0.010)	(0.019)	(0.022)	(0.022)	(0.012)	(0.021)	(0.022)	(0.023)
ur	0.004	-0.030$^\sharp$	-0.025$^\sharp$	-0.021	0.007	-0.026	-0.022	-0.014	0.012	-0.001	-0.038†	-0.009	-0.001	0.011	-0.042†	-0.003
	(0.021)	(0.017)	(0.014)	(0.013)	(0.023)	(0.020)	(0.016)	(0.015)	(0.026)	(0.026)	(0.016)	(0.009)	(0.029)	(0.033)	(0.018)	(0.011)
annual plme	yes	yes	yes	yes	yes	yes	yes	yes			yes				yes	
controls	yes	yes	yes	yes	yes	yes	yes	yes			yes				yes	
state effects	yes	yes	yes	yes	yes	yes	yes	yes			yes				yes	
observations	821	821	821	821	815	815	815	815			821				815	

Notes: Dependent variable: children's education attainment, 5 education levels or 3 education levels; Estimation method: ordered probit; standard errors in parenthesis are robust and clustering corrected; annual plme: labor market experiences of each parent in the consider year(s); controls: full set of control variables; state effects: Federal State fixed effects; $\ddagger$: significant at the 1% level; $\dagger$: significant at the 5% level; $\sharp$: significant at the 10% level.

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Table 7: Variable definitions

Variable	Definition
education	1 = those who left school early without appropriate certification, 2 = lower-level secondary school, 3 = intermediate secondary school, 4 = upper-level secondary school but not entitled to enter university, 5 = upper-level secondary school and entitled to enter university
university degree	Dummy (equals to 1 if the respective parent has a university degree)
Mother's age at first birth	Age of mother at birth of the first child
single parent household	Index (between 0 and 1), which is calculated according to the number of years a child spends in a single parent household between birth and the time he or she finishes school
family income	Average monthly household equivalence income after taxes and government transfers in 1000 Euro between birth and the time the child leaves school
boy	Dummy (equals to 1 if the respective child is a boy)
number of children	Absolute number of children in the household
birth order	Index, which is calculated as suggested by Booth and Kee (2009)
parental unemployment	Sum of unemployment experiences in years until the child finishes school
parental full-time	Sum of full-time employment experiences in years until the child finishes school
parental part-time	Sum of part-time employment experiences in years until the child finishes school
gdp	Regional GDP growth rates at a specific children's age
ur	Regional unemployment rates at a specific children's age
regional dummy	Vector of state dummies (equal to 1 if the family lives in the respective federal state)
nationality	Dummy (equals to 1 if native)
move	Number of relocations to another state between birth and the time he or she finishes school
divorce	Dummies for pre-school and primary school phase (equal to 1 if parents get a divorce)
kindergarten	Dummy (equals to 1 if the child was in the kindergarten)
child care	Dummies (equal to one if mother or father stay at home in children's first year of life)
deviation	Dummies for deviation from teacher's recommendation for secondary school track (equal to 1 if parents deviate)
repeater	Dummy (equals to 1 if the child repeats a school year)

Table 8: Summary statistics

variables	mean	std. dev.	min	max
education children	3.562	1.195	1	5
education mothers	2.878	0.969	1	5
university degree mothers	0.195	0.396	0	1
education fathers	2.998	1.147	1	5
university degree fathers	0.266	0.442	0	1
mother's age at 1. birth	24.022	4.037	15	41
index single parent	0.007	0.049	0	0.667
average equivalence income	1.320	0.569	0.421	6.631
boy	0.546	0.498	0	1
number of siblings	1.396	0.959	0	9
birth order index	0.990	0.351	0.286	1.778
mother's unemployment exp.	0.692	1.557	0	13
father's unemployment exp.	0.465	1.369	0	13.9
mother's full time exp.	10.426	7.619	0	40
father's full time exp.	24.002	6.381	0.8	45
mother's part time exp.	5.267	5.863	0	36
father's part time exp.	0.214	0.840	0	11
regional GDP growth rate (2 years average)	2.466	4.802	-1.385	28.893
regional unemployment rate (2 years average)	3.947	5.454	0	21.7
nationality	0.968	0.175	0	1
move	0.575	0.969	0	8
divorce at age 0-6	0.010	0.098	0	1
divorce at age 6-10	0.023	0.150	0	1
kindergarten	0.395	0.489	0	1
child care mother	0.217	0.412	0	1
child care father	0.026	0.158	0	1
upgrading of recommend.	0.043	0.202	0	1
downgrading of recommend.	0.066	0.248	0	1
repeater	0.107	0.310	0	1

Notes: Observations = 821