Primary and Secondary Effects in Class Differentials: The Transition to Tertiary Education in Germany

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Abstract

In this article we investigate social inequality at the transition to tertiary education in Germany by drawing on Boudon's well-known distinction between primary and secondary effects of social class origin. Primary effects describe class differentials that are related to academic performance, secondary effects comprise class differentials in educational choices, given the same performance levels. In order to generate estimates on the relative importance of primary and secondary effects in the creation of class differentials in tertiary choices and their development over time, we apply a procedure which has recently been developed and applied by Erikson (2007) and Jackson et al. (2007). For our analyses we rely on a series of datasets from the German Higher Education Information Systems Institute (HIS) on students who have gained eligibility for tertiary education in 1983, 1990, 1994 and 1999. Our results show that class differentials in the transition to higher education in Germany are mainly due to secondary effects. While the relative importance of primary vs. secondary effects does not change over time, overall class effects seem to be generally more pronounced for women. In the second part of the analyses we related the secondary effects to explanatory factors, such as motivational differences or cost-benefit expectations. Applying a nonlinear decomposition technique developed by Fairlie (2005) we find that cost-considerations as well as class differences in the valuation of academic skills seem to account for part of the class differential in access to tertiary education.

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Introduction

It is a well established finding of social stratification research that students from lower class backgrounds, on average, choose less ambitious educational pathways than their peers from more privileged class origins. In this context Boudon (1974) introduced a useful distinction decomposing these class differentials into two components. The first component, so called primary effects, describe class differentials in transition to higher levels of schooling that are related to class differences in academic performance, while secondary effects comprise class differentials in educational choices, given the same performance levels. Primary effects can be assumed to depend on various factors in the family of origin, such as material conditions and socialization practices. Secondary factors depend on choices made by students and their families. While the distinction between primary and secondary effects is well established and often cited in the literature, only few attempts have been made, to analytically separate both effects. Recently however, Jackson et al. (2007) as well as Erikson (2007) and Erikson et al. (2005), introduced a new methodological approach, which permits to provide quantitative estimates for the relative importance of primary vs. secondary effects. Studying the transition to A-level courses in the United Kingdom for different time points, Jackson et al (2007) find that that secondary effects account from at least a quarter to a half of observed class differentials, measured by odds ratios. Similar results for Sweden with data from the greater Stockholm area (Erikson 2007) show that for the transition from primary to upper secondary school secondary effects account for between 30 and 65 per cent for the class differential between salariat and working class students – depending on gender as well as the time point considered. In the same paper, estimates for the relative importance of secondary effects for the transition from upper secondary school to university are provided indicating that for boys secondary effects make up 67% in 1973 and 71% in 1983 for the class differential between salariat and working class students while for girls the corresponding numbers are 68% and 73%. The aim of this paper is to complement the aforementioned studies by focussing on class differentials in access to tertiary education in Germany over the course of the past two decades (1983-1999) using the new method developed by Erikson and colleagues as well as a nonlinear decomposition technique (Fairlie, 2005). Thus, we will provide estimates of the relative importance of secondary vs. primary effects for a ‘late’ transition in the context of the German schooling system. In the second part of the paper we also introduce explanatory variables, such as motivational differences or cost-benefit expectations to gain more insight into the underlying mechanisms which generate secondary effects.

The transition to tertiary education in Germany

The first major branching point in the German educational system comes after fourth grade already where children and their families have to choose between entering the Gymnasium, Middle-School and Hauptschule, while only the successful graduation from Gymnasium permits entry to tertiary education.[1] Even if German states (*Bundesländer*) vary in the extent to which they let parents (as opposed to schools) choose these differentially ranked schooling tracks for their children, primary and secondary effects lead to considerable class differentials in the takeup of these school types in all of Germany. Recent analyses by Stocké (2007), as well as Müller-Benedict (2007) using somewhat less refined analytical techniques, illustrate that secondary effects can be assumed to account for at least half of the class differentials in the choice of the Gymnasium vs. lower tracks. Thus, due to the ability sorting at prior transitions, class differences in performance levels of students who reached eligibility for tertiary education should be reduced. This, in turn, should lead to a diminished relevance of primary effects at the transition to tertiary education which would be in line with Boudon's (1974: 84-86) expectations that primary effects will only play a role at early transitions while they "die out" at later transitions. Nevertheless, the previously mentioned results by Erikson (2007) illustrate that in Sweden primary effects also have a considerable impact at the transition to university. The specific institutional setup of post-secondary educational alternatives in Germany could further amplify the relevance of secondary effects vs. primary effects. Students eligible for tertiary education mainly have to decide between enrolling at a tertiary institution, either university or the more applied *Fachhochschule* (University of applied sciences), or taking up vocational training while only very few students opt for direct labour market entry or no further education.[2] Compared to tertiary education, vocational training offers many advantages such as a relatively short training period (in most cases only two years for students with *Abitur*) and a small training salary, which are especially attractive for students from working class backgrounds with lower financial resources. Furthermore, academic requirements for vocational training courses are considerably lower compared to tertiary-level courses.

Regarding change over time, it should be highlighted that the proportion of students who reached eligibility to tertiary education increased markedly in the period we consider with 22 % of an age cohort reaching eligibility in 1980 compared to 37 % in the year 2000

[1] It should be mentioned that comprehensive school (*Gesamtschule*) constitutes an additional school type which combines all three school-forms under one roof. However, according to PISA data from the year 2000, most students (70%) are still in one of the tree schooling tracks (cf. Müller-Benedict 2007: 622).

[2] Disregarding variations according to year and class, roughly 2/3-3/4 of all students take up tertiary education while the rest goes into vocational training or chooses direct labour market entry.

(Statistisches Bundesamt, 2007). The expansion of upper secondary education possibly leads to an increasingly heterogeneous pool of students reaching eligibility. If, as a result of expansion, increasingly less able working class students succeed in obtaining eligibility while the ability composition of upper class students remains unchanged, the relative importance of primary effects is likely to increase. One could also argue, however, that the relative weight of secondary effects increased in the past two decades. If for example, returns to vocational training vs. tertiary qualifications increased over time, then one could expect that (even) more working class students opt for the vocational alternative while children from more privileged background are likely to always prefer the highest educational alternative due to avoid social demotion (e.g. Breen and Goldthorpe, 1997). Nevertheless, most research points to stable rates of return to tertiary education in the 1980s and 1990s (Handl, 1996; Müller, et al., 2002). Furthermore, changes related to various other factors, such as average disposable household incomes available to salariat class vs. working class families or modifications regarding student aid programs (e.g. Baumgartner and Steiner, 2005) also could have lead to increasing relevance of secondary effects at the transition to tertiary education.

Data

For our analyses we draw on four datasets based on large scale school leaver mail surveys, collected in 1983, 1990, 1994 and 1999 by the German Higher Education Information System Institute (HIS). The data sets come from stratified, random samples of students with entrance qualifications to higher education in Germany. From 1990 onwards the five new eastern 'Bundesländer' are included in the sample. Students in the surveys are typically interviewed twice: half a year and three and a half years after graduation.[3] In order to observe real postsecondary schooling decisions rather than intentions, we construct our dependent variables using information from the second wave rather than the first wave of the respective surveys, even though there is considerable panel attrition in the second wave in addition to nonresponse in the initial waves of the surveys.[4] To reduce heterogeneity, we exclude individuals who were older than 29 when they obtained their entrance qualification. To

[3] The 1983 study deviates from this pattern as it includes a second wave collected 1 ½ years and a third wave collected 4 ½ years after graduation. In order to make the data comparable we use data from the third wave and use information on educational choices up to 3 ½ years after graduation only.

[4] According to HIS (personal communication) response rates for the initial waves were approximately 32% in 1990, 31% in 1990, 34% in 1994 and 26% in 1999. However, these estimates might somewhat overestimate nonresponse because not all students who received the questionnaire were part of the target population.

correct for sample selection bias due to panel attrition, we weight the observations in each dataset inversely to their predicted dropout probabilities.[5]

Dependent Variable

As our dependent variable we consider whether students eligible to tertiary education at some point enrolled at a tertiary institution in Germany within the first 3 and a half years after graduation. Thus, some students who managed to complete vocational training and subsequently take up tertiary education are also coded into the 'tertiary' group. We also do not differentiate between enrolment at traditional universities and the more applied universities of applied sciences (Fachhochschulen) even if the latter might be more attractive for students from working class background.

Class background

We take the occupational position of the father as our indicator of student's class background. Because measurement of occupational background changed over the four surveys we coded father's occupational position into three classes as an approximation to the threefold collapse of the Goldthorpe class scheme (e.g. Jackson, et al., 2007). We differentiate between service classes (Classes I and II), intermediate classes (Classes III, IV) and working classes (Classes V-VII). For those students with missing values for the father, information from mother's occupational position was utilized in case it was nonmissing. A finer classification, even if desirable, would compromise the comparability of the class variable over time.

Academic performance

To measure achievement prior to the transition, we use the self-reported grade point average obtained in the graduation certificate (*Abiturnote*). This measure is, we believe, an adequate indicator to capture primary effects because it is very salient for most students and most postsecondary selection decisions, such as for example entry into certain academic fields with access restrictions, which is based on this average. We standardize these grades (which range from 1.0 for the best to 4.0 for the worst grades) for each survey year for all groups to achieve better comparability over time. Also, the standardized values are reversed so that higher values indicate better grades.

[5] The selection models are displayed in table A1 in the appendix.

The relative impact of primary and secondary effects

To determine the relative impact of primary and secondary effects, we apply a method developed by Jackson et al. (2007).

According to Erikson and Jonsson (1996) the proportion of a given class *j* that is making the transition to the next educational level, can be expressed by the function

$$P_{jj} = \int f_j(x)\, g_j(x) dx \qquad (1)$$

where $f_j(x)$ describes the distribution of a given performance measure x and $g_j(x)$ denotes the conditional transition probability at any specific performance level x. Erikson and Jonsson (1996) model the integral by assuming a normal distribution for the performance measure and a logistic function for the transition probabilities.

The division into two components mirrors Boudon's distinction of primary and secondary effects and it opens the way for counterfactual considerations. It is now possible to substitute either the performance distribution or the transition function with the respective function of any other class *k*:

$$P_{jk} = \int f_j(x)\, g_k(x) dx \qquad (2a)$$

$$P_{kj} = \int f_k(x)\, g_j(x) dx \qquad (2b)$$

Following the method proposed by Jackson et al. (2007), the relative impact of primary and secondary effects can be determined by utilizing the counterfactuals from (2a) and (2b) to explain the gap between class *j* and class *k* in the proportions that are making the transition.

This is done as follows:

The odds ratio of the transition proportions P between class j and class k can be written as

$$Q_{jj.kk} = \frac{P_{jj} / (1 - P_{jj})}{P_{kk} / (1 - P_{kk})}$$

Now, the transition propensity of one class is being manipulated by substituting it through one of the counterfactuals:

$$Q_{jj.kj} = \frac{P_{jj} / (1 - P_{jj})}{P_{kj} / (1 - P_{kj})}$$

In this case, the conditional transition behaviour of class *k* is being replaced by that of class *j*. Consequently, the remaining differences in the odds between the two classes are exclusively due to differences in the performance distributions, or in other words, the odds ratio now describes pure primary effects.

If we want to insulate secondary effects, respectively, class *k*'s performance distribution has to be replaced:

$$Q_{jj.jk} = \frac{P_{jj}/(1-P_{jj})}{P_{jk}/(1-P_{jk})}$$

The relative importance of primary or secondary effects is then calculated by setting the logarithms of the counterfactual odds ratios in relation to the real overall log-odds-ratios in the transition propensities between the classes.

Thus, the relative impact of secondary effects can be calculated as

$$\frac{L_{jj.jk}}{L_{jj.kk}} \qquad (3a)$$

or

$$\frac{L_{kj.kk}}{L_{jj.kk}} \qquad (3b)$$

However, formulas 3a and 3b lead to slightly deviating results. Therefore, Jackson et al. (2007) propose to take the averages of both values.

Results

As can be seen in table 1, the vast majority of the students with eligibility for tertiary education indeed make the transition to higher education within three and a half years after obtaining their entrance qualifications. The overall figure increases only moderately from 67% in 1983 to 73% in 1999. The increase is more pronounced for the female subgroup, which started at a relatively low level of 58% in 1983 but is still underrepresented with a transition rate of 69% in 1999 if compared to men.

Access to higher education is clearly stratified by class background as comparisons of the transition rates across the three class categories indicate. The salariat classes have the highest propensities to enter higher education, the working classes have the lowest transition rates and the intermediate classes find themselves in between. This is further illustrated by the odds ratios in the lower panel of table 1, which also show a trend of rising inequalities if the total columns are regarded. For example, the odds ratio between the salariat and the working classes increases from 2.0 in 1983 to 2.5 in 1999. However, a look at the gender subgroups reveals that this trend might mainly be driven by the female subsample, i.e. the pace of the expansion of female participation rates in higher education might vary across classes.

Table 1 *Transition rates (%) to tertiary education of students of differing class background, 1983, 1990, 1994 and 1999 (observations weighted with inverse sample selection propensities).*

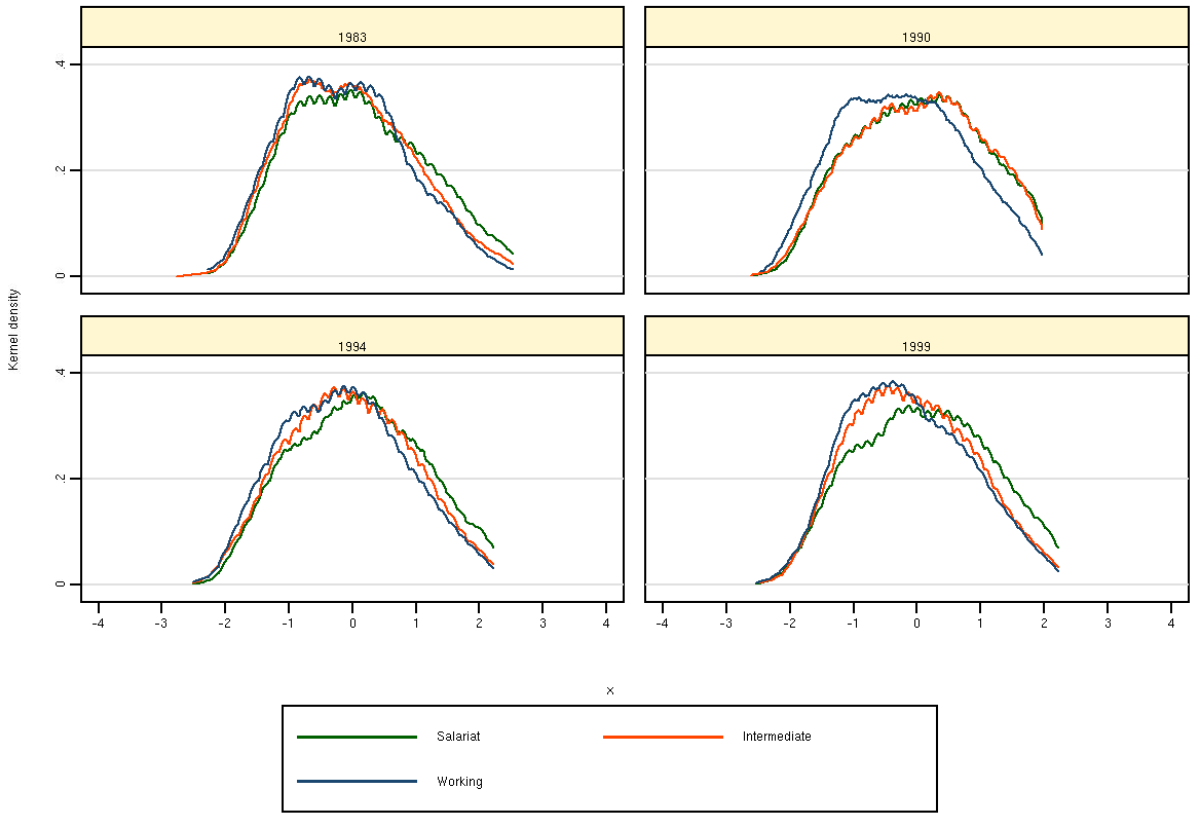
Class	Year	All	Male	Female	N(Male)	N(Female)
Salariat	1983	74	80	67	2,528	2,045
	1990	79	84	74	3,382	3,067
	1994	79	82	77	2,604	2,948
	1999	80	82	79	1,303	1,975
Intermediate	1983	64	73	53	2,762	2,084
	1990	70	75	64	3,472	3,148
	1994	69	73	65	1,593	1,890
	1999	70	77	65	908	1,564
Working	1983	59	69	46	1,424	862
	1990	63	71	53	1,431	1,082
	1994	63	70	57	1,201	1,404
	1999	62	70	57	461	886
All	1983	67	75	58	6,714	4,991
	1990	72	78	66	8,285	7,297
	1994	73	77	69	5,398	6,242
	1999	73	78	69	2,672	4,425

	Odds ratios								
	S/I			I/W			S/W		
	All	Male	Female	All	Male	Female	All	Male	Female
1983	1.60	1.48	1.80	1.24	1.21	1.32	1.98	1.80	2.38
1990	1.61	1.75	1.60	1.37	1.29	1.58	2.21	2.14	2.52
1994	1.69	1.68	1.80	1.31	1.16	1.40	2.21	1.95	2.53
1999	1.71	1.36	2.03	1.43	1.43	1.40	2.45	1.95	2.84

In the next step, we are interested to what extent class differentials in the transition rates to tertiary education are due to either primary or secondary effects. As already stated above, we expect selectivities at the tertiary stage to be primarily a matter of secondary effects since the population under consideration is already ability selected through the passage of earlier transitions. This is confirmed by figure 1, where the standardized grade point average distributions are plotted by class background, using kernel density estimates. Except for the working class curve in 1990[6] and to some degree also for the salariat curve in 1999, the distributions are almost congruent, indicating that performance levels after graduating from upper secondary school are not very much dependent on class background.

[6] This can be due to coding dissimilarities as for the 1990 cohort different questionnaires have been applied for East and West Germany.

Figure 1 *Performance distributions by class background and year, kernel density estimates*



To determine the relative impact of primary and secondary effects, we now apply the method proposed by Jackson et al. (2007).

In order to check if the function assumed by the model matches the observed transition rates, we contrasted the predicted transition propensities with observed values and found that they were identical in most cases.[7] Thus, the model can be applied without any doubts in the subsequent analyses.

The results of the counterfactual estimations are depicted in table 2, where P_{jk} denotes the predicted transition probabilities, with the first subscript indicating the performance distribution of class j and the second subscript indicating the conditional transition propensities of class k. The impact of secondary effects becomes most apparent if one regards the rows with the performance distribution of the intermediate classes. For example if we consider the 'all'-section of the table, the intermediate classes have an overall transition rate of 70% in 1999. If now the performance distribution stays the same, but the transition behaviour of the intermediate classes is replaced by that of the salariat classes, the overall transition rate increases to 79%. If the transition behaviour is replaced by that of the working classes, the propensity to enter higher education decreases to 63%. This makes a difference of

[7] The comparison of estimated and observed values is displayed in table A2 in the appendix.

16 percentage points which is solely due to class specific transition behaviour, independent of performance. As one would already have expected from the odds ratios in table 1, the deviations of the counterfactual estimates are more pronounced for the female subgroup and smaller for the male subgroup.

Table 2 *Counterfactual transition rates*

		Transition rate estimated by numerical integration			
Counterfactual Combinations*		1983 per cent	1990 per cent	1994 per cent	1999 per cent
All	P_{ss}	*74*	*79*	*79*	*80*
	P_{si}	65	70	71	71
	P_{sw}	61	66	66	65
	P_{is}	72	79	78	79
	P_{ii}	*64*	*70*	*69*	*70*
	P_{iw}	60	66	64	63
	P_{ws}	72	76	77	78
	P_{wi}	63	67	68	69
	P_{ww}	*59*	*63*	*63*	*62*
Male	P_{ss}	*80*	*84*	*82*	*82*
	P_{si}	74	75	74	79
	P_{sw}	70	73	72	73
	P_{is}	79	83	82	81
	P_{ii}	*73*	*75*	*73*	*77*
	P_{iw}	69	72	72	71
	P_{ws}	78	82	80	80
	P_{wi}	72	73	72	*77*
	P_{ww}	*69*	*71*	*70*	*70*
Female	P_{ss}	*67*	*74*	*77*	*79*
	P_{si}	55	63	71	71
	P_{sw}	48	56	60	60
	P_{is}	65	74	75	78
	P_{ii}	*53*	*64*	*65*	*65*
	P_{iw}	46	57	58	58
	P_{ws}	64	70	74	76
	P_{wi}	52	59	65	64
	P_{ww}	*46*	*53*	*57*	*57*

* The first subscript represents performance distributions and the second subscript transition propensities.

To measure the share of secondary effects in the transition gap between two classes, we divide the counterfactual log-odds ratios by the factual log-odds ratios, as stated above. Table 3 summarizes the results for each combination and by gender subgroups according to formulas 3a and 3b, together with average values.

First, in almost every class comparison, the share of secondary effects comprises more than 80 per cent of the gap in the transition propensities. This is in line with our theoretical expectations and with the first impressions we gained by a look at the performance distributions by class. Exceptions can be found in the contrast between intermediate and working classes for 1990 and for the male subgroup in 1994. Second, the relative importance of secondary effects seems to be stable over the four time points. Third, even though class inequalities in access to higher education are more pronounced within the female subgroup, the composition of these inequalities in terms of primary and secondary effects seems to be similar in both gender subgroups. Exceptions are the slightly larger share of primary effects in the comparisons with the salariat classes for the male subgroup in 1999, which might mirror the performance premium already noticed in the kernel density plots, and the contrast between intermediate and working classes in 1994, where secondary effects make up only one to two thirds in the male subgroup.

Table 3 *Relative impact of secondary effects in class differentials as percentage of log-odds ratios*

		Relative impact of secondary effects								
		S/W			S/I			I/W		
		(3a)	(3b)	Average	(3a)	(3b)	Average	(3a)	(3b)	Average
	All	*88*	*85*	*86*	*91*	*78*	*85*	*80*	*80*	*80*
1983	Male	92	79	86	87	84	86	100	74	87
	Female	91	85	88	86	85	86	100	86	93
	All	*83*	*78*	*81*	*100*	*100*	*100*	*58*	*56*	*57*
1990	Male	87	81	84	100	87	94	76	49	62
	Female	87	79	83	109	100	105	64	54	59
	All	*83*	*85*	*84*	*82*	*89*	*85*	*84*	*83*	*83*
1994	Male	85	81	83	90	100	95	34	66	50
	Female	87	82	85	77	81	79	88	100	94
	All	*86*	*87*	*86*	*91*	*89*	*90*	*88*	*87*	*87*
1999	Male	78	81	79	62	78	70	87	100	93
	Female	88	83	86	87	92	89	88	87	87

We also observe a peculiar finding in table 3 which is that the relative importance of secondary effects amounts to 109 per cent in the comparison between salariat and intermediate classes in 1990. This reveals one shortcoming of the method but it has a simple explanation. In 1990, the female students from the intermediate classes have on average better performance scores than the female students from the salariat classes. Since the model assumes primary and secondary effects to work additive, it predicts values bigger than 100 per cent whenever both components work in opposite directions. However, in these cases, secondary effects are 100 per cent responsible for the gap per definition.

Explaining secondary effects

One major advantage of the transition surveys compared to ordinary population data is that they include a number of questions regarding the rationale behind the chosen postsecondary career path. Each survey includes an item list in which students have to indicate on a scale from one to six how much the current motive (item) influenced their postsecondary decision (see appendix for exact wording). Expecting that students from different class background differ in the evaluation of costs and benefits associated with tertiary or non-tertiary alternatives, we selected the following items (table 4) as possible explanations for secondary effects in class differentials at the transition to tertiary education.[8]

Table 4 *Selected Items for the explanation of secondary effects*

High Occupational Position
Status
Job security
Financial Independence
Short Duration of Training
Evaluation of vocational vs. academic employment prospects*
Interested in Academic Work
Interested in Practical Work

*not included in the 1990 survey

The first two items were chosen because obtaining a high occupational position as well as high (occupational) status might be more important for salariat class offspring compared to working class peers due to downward mobility avoidance. Furthermore, for students from salariat class backgrounds cost constraints such as financial independence, a short duration of

[8] It should be mentioned that the question wording (see table A3 in the appendix) as well as the scale (in some years 0-5, in other 1-6) slightly changed across survey years. Given that we are only interested in the relative contribution of these respective variables in the class gap (and not size of coefficient estimates) we find it unlikely that these changes lead to a bias in our results.

training as well as job security might be less relevant than for their working class peers resulting in a more tertiary prone evaluation of postsecondary alternatives. Additionally, in each, but the 1990 survey, students were asked to indicate on a scale from one to five how they evaluate the job prospects for graduates with a tertiary qualification as well as for graduates with a vocational training qualification only. We subtracted both items from each other to generate an index on which positive values indicate a more positive evaluation of job prospects of vocational training qualifications. Students from different class backgrounds might also differ in how they value the skills conveyed in typical tertiary or vocational training programs which is why the last two items were selected as possible explanation of secondary effects.

Decomposition of the class differential in the transition to tertiary education

A downside of the method used to provide estimates for the relative importance of primary vs. secondary effects is that the contribution of explanatory variables that affect class differentials in the transition to further levels of schooling cannot easily be quantified. To complement the previous counterfactual analyses, we use a technique developed by Fairlie (2005; 2006) which follows the logic of the widely applied Blinder-Oaxaca decomposition technique for linear regressions (Blinder, 1973; Oaxaca, 1973). Fairlie (2005) suggests a decomposition technique for a non-linear equation $Y = F(X\hat{\beta})$ where differences in the average predicted probabilities for an outcome, such as choice of tertiary education, can be decomposed in the following way (subscript *s* indicates salariat and *w* working class students):

$$\overline{Y}^S - \overline{Y}^W = \left[\sum_{i=1}^{N^S} \frac{F(X_i^S \hat{\beta}^W)}{N^M} - \sum_{i=1}^{N^W} \frac{F(X_i^W \hat{\beta}^W)}{N^W}\right] + \left[\sum_{i=1}^{N^S} \frac{F(X_i^S \hat{\beta}^S)}{N^W} - \sum_{i=1}^{N^S} \frac{F(X_i^S \hat{\beta}^W)}{N^W}\right]$$

The first term in brackets can be attributed to class differences in the distribution of X, and the second term to group differences in the group processes determining levels of Y.[9] While the first term in brackets in provides an estimate of the overall contribution of all independent variables to the (transition) gap, the contribution of specific variables to the can be identified in an additional calculation using the 'Delta method' developed by Oaxaca and Ransom (1998), c.f. Fairlie 2006:4-5). According to this calculation, the contribution of each variable to the gap is equal to the change in the average predicted probability that occurs upon replacement of the working class with the salariat class distribution of that variable, while

[9] One could also write the decomposition using the salariat class coefficients as weights for the first term in the decomposition and the working distributions of the independent variables as weights for the second term (see Fairlie 2006: 3).

holding the distributions of the other variables constant. In order to apply the decomposition, we follow Fairlie's (2006) recommendation and use coefficient estimates from a pooled model ($\hat{\beta}^{*}$) to calculate average predicted probabilities for outcome Y for both groups under consideration.[10] Next, a random sub-sample of the group with a smaller N is drawn, equal to the size of the larger group. Each observation in the sub-sample and the larger sample is then separately ranked by the predicted probabilities and matched by their respective rankings. This procedure matches salariat class member who have characteristics placing them at the top (bottom) of their distribution with respect to the propensity to enter tertiary education with working class offspring who have characteristics placing them at the top (bottom) of their distribution. Because the results of the decomposition depend on the sub-sample (in our case the smaller subsample of working class students) that is selected, it is advisable to draw a large number of random sub-samples in order to achieve reliable results.

Results

Table 5 reports results of non-linear decompositions across all four periods. For the sake of parsimony, we restrict the decomposition exercise to salariat and working class students. In addition to grades and study motives we also estimate how much the type of entrance qualification as well as the completion of vocational training prior to obtaining an entrance qualification contributes to the class gap in access to tertiary education. Some students obtain a restricted entrance qualification which only permits entry to the university of applied sciences and not university. Furthermore, we also consider whether the age (at graduation) as well as gender composition of working class and salariat class sample account for some part of the transition gap.

We report the results of decomposition based on two models. The first model can be considered as a replication of the previous method because we estimate how much class differences in grades account for the difference in the transition gap. We see that across the four periods, class differentials in grades account for between 15.7 and 18.9 per cent of the class gap in access to tertiary education, indicating that with the use of the decomposition method, the size remaining secondary effects is estimated to between 84.3 and 91.1 per cent which closely mirrors the results in table 3.

[10] Because the size of the relative contribution the gap is sensitive to the estimation sample used, we computed additional decompositions where coefficients estimates from a working class as well as a salariat class reference sample where used. Regardless of the specification, results were largely the same.

Table 5 *Non-linear decomposition of the class differential in transition to tertiary education*

	1983		*1990*		*1994*		*1999*	
% of Salariat	0.7429		0.8068		0.8112		0.8203	
% of Working Class	0.5886		0.6521		0.6457		0.6264	
Salariat/Working Class Gap	0.1543		0.1538		0.1655		0.1940	
Contribution to the gap from class differences in the following variables	M1	M2	M1	M2	M1	M2	M1	M2
Grades	-0.0243***	-0.0111***	-0.0287***	-0.0152***	-0.0237***	-0.0109***	-0.0302***	-0.0111***
% of Class Gap	15.7	7.2	18.9	9.9	14.2	6.6	15.7	5.7
Motives								
Leading Position		-0.0001		0.0003		-0.0012		0.0000
% of Class Gap		0.1		-0.2		0.7		0.0
High Status		-0.0009		-0.0001		0.0035***		0.0031*
% of Class Gap		0.6		0.0		-2.1		-1.6
Job Security		-0.0086***		-0.0038***		-0.0070***		-0.0085***
% of Class Gap		5.6		2.5		4.2		4.40
Financial Independence		-0.0301***		-0.0239***		-0.0360***		-0.0385***
% of Class Gap		19.8		15.5		21.7		19.8
Short Duration of Training		-0.0016***		0.0003		-0.0011**		-0.0041***
% of Class Gap		1.0		-0.2		0.7		2.1
Interested in Academic Work		-0.0168***		-0.0138***		-0.0170*** *		-0.0118***
% of Class Gap		10.8		8.9		10.2		6.1
Practical Work		-0.0002		-0.0006		-0.0016**		-0.0049***
% of Class Gap		0.2		0.4		1.0		2.5
Evaluation of Job Prospects		-0.0015***		n.a.		0.0014***		-0.0027***
% of Class Gap		1.0				-0.8		1.4
Restr. Entrance qualification		-0.0147***		-0.0092**		-0.0244***		-0.0223***
% of Class Gap		9.5		6.0		14.8		11.5
Prior Vocational Training		0.0138**		0.0003		0.0155***		0.0041*
% of Class Gap		-8.9		-0.2		-9.4		-2.1
Age		0.0000		-0.0006		0.0003		0.0007
% of Class Gap		0.0		0.4		-0.169		-0.4
Gender		0.0046***		0.0039***		-0.0010**		-0.0010
% of Class Gap		-3.0		-2.5		0.6		0.5
All Variables (Total Explained)		-0.0677		-0.0619		-0.0792		-0.0970
% of Overall Gap		43.8		39.3		46.2		49.1
N Estimation Sample	6341	6341	8894	8894	7870	7870	4410	4410

*p<0.05 ** p<0.01 *** p<0.001

Notes: Significance levels based on standard errors approximated by the "delta method", see Fairlie 2006: 5. Contribution estimates are mean values of the decomposition using 50 sub-samples.

In the second specification we provide estimates for the relative contribution of explanatory and control variables net of the measure for primary effects. An inspection of the results in the second columns reveals that part of the primary effect seems to be transmitted through the explanatory variables because class differences in grades now only explain between 5.7 and 9.9 per cent of the transition gap[11] with no apparent trend indicating that the relative importance of primary effects did increase over time. With the inclusion of all variables we are able to explain between 39.3 and 49.1 per cent of the overall gap indicating that even with an extended set of variables more than half of the class differential remains unexplained. Nevertheless, the results regarding explanatory mechanisms lend some support to our expectations. Especially differences in the way students evaluate the relevance of 'financial independence' seem to account for a considerable part of the class gap, between 21.7 and 15.5 per cent, across all years. Also, differences in the evaluation of job security (between 2.5 and 6 per cent), in the importance of a short-duration training (except for 1990) and in the evaluation of non-academic vs. academic job prospects (except for 1994) account for a small part of class gap in access to higher education. The explanatory impact of these variables can be seen as evidence for the role of cost factors in generating class differentials. Working class students seem to be more concerned about stable financial conditions and rather opt for the less risky non-tertiary training qualification, whereas for salariat class offspring the costs of a tertiary qualification seem to be less relevant.

However, differences in the importance of reaching leading or high status positions do not contribute much to the explanation of the class gap. For 1994 and 1999 the gap even slightly increases when the motive of high status attainment is taken into account. While this could be seen as evidence that status maintenance does not affect class differentials in access to higher education, we are relatively hesitant to provide such an interpretation given the weak measurement of this concept.

A larger share of the class gap is explained by differences in intrinsic motivations. The orientation towards practical work and the interest for academic work explain together more than 8% of the differential in the transition behaviour. This might point to class effects via the transmission of cultural interests or the proximity to academia.

As in the first analysis, we cannot observe a clear trend over time regarding the development of the factors we have included in our models.

[11] Additional analyses (not reported) revealed that the reduction of the performance effect is due to correlations between grades and the type of entrance qualification as well as prior vocational training and some of the explanatory variables for secondary effects. Particularly 'financial independence' and 'interest in practical work', are negatively correlated and 'interest in academic work' is positively correlated with performance.

With respect to the control variables one can see that the fact that working class students more often obtain a restricted entrance qualification compared to their salariat class peers also contributes to the class gap in all years. This could also be considered as part of the primary effect. Prior vocational training has the opposite effect and leads to a considerable decrease of the gap. Apparently, obtaining eligibility to tertiary education after (or while) completing vocational training constitutes a pathway into tertiary education that reduces class inequalities. Student's age does not contribute to class differentials while the gender composition of the class samples explains a very small part of the class differential in 1994 and 1999. In the two previous periods however, assigning the salariat class gender composition to the working class sample would have led to a further increase of the class gap.

Conclusions

The goal of this paper was to provide estimates for the relative importance of secondary effects in access to higher education in Germany in the period from 1983-1999. In line with our expectations, the considerable class differentials in the choice of tertiary education across all four time points are mainly due to secondary effects. Using a counterfactual method developed by Jackson et al. (2007), our analyses revealed that secondary effects account for between 81 and 86 per cent of the difference between working class and salariat class students in access to higher education. Thus, even if the population that reached eligibility to tertiary education considerably increased in the course of the 1980s and 1990s, primary effects do not seem to have become more important. This indicates, that the ability composition of the working class students, in comparison to salariat class students, has not become more heterogenous. Of course, primary and secondary effects could have increased at the same time leading to no change in the relative importance of both effects. Furthermore, even though class inequalities in access to higher education are more pronounced within the female subgroup, the composition of these inequalities in terms of primary and secondary effects seems to be similar in both gender subgroups. It should be pointed out, however, that we might underestimate the relevance of primary effects due to the substantial nonresponse in the initial waves of our data. The fact that working class students are overrepresented in the lower tail of the performance distribution of all tertiary eligible students and academically weak students are less inclined to participate in a survey about post-secondary plans might lead to reduced class differentials in performance scores in our analytical sample.

In the second part of the paper we introduced a number of explanatory variables in order to explain secondary effects. Using a nonlinear decomposition technique we could show that the relative size of secondary effects is very similar when using this different approach.

Furthermore, even though more than half of the class differential remained unexplained even if we introduce an extended set of independent variables, especially cost considerations seem to account for a substantial part of class differences in the take up of tertiary education. Furthermore, differences in the valuation of academic and non-academic skills also account for a considerable part of the class differential. We could also show that the type of entrance qualification matters for the generation of class differentials, which can be considered as part of the primary effect. Overall, the impact of these explanatory variables remained very stable which further underlines that the mechanisms generating class differentials in access to tertiary education seem not to have not substantially changed in the course of the 1980s and 1990s.

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Appendix:

Table A1 *Probit Models for prediction of sample drop out after 1st waves*

	1983	1990	1994	1999
Class (Ref: Salariat)				
Intermediate	-0.01	0.03	0.03	-0.04
Working	0.05	-0.11***	0.02	-0.05
GPA (std.)	0.15***	0.18***	0.17***	0.17***
Type of Qualification	0.10***	0.13***	0.14***	0.19***
Voc. Training Before				-0.18***
Male	0.17***		-0.06**	-0.16***
Age	-0.04***	-0.03***	-0.25***	
Federal State (Ref: all others)				
Baden-Württemberg			0.23***	
Bayern	0.54***	0.13***	0.30***	0.06
Berlin East		-0.55***		
Brandenburg		-0.54***		
Meckl.-Vorp.		-0.68***	-0.16**	
Niedersachsen		0.14***	0.28***	
Nordrhein-Westf.			0.13***	
Rheinland-Pfalz		0.11**	0.19***	
Sachsen		-0.54***		
Sachsen-Anhalt		-0.61***		
Schleswig-Holstein			0.23***	
Thüringen		-0.53***		
Parents' Education (Ref: other)				
Casmin 1bc			0.23***	0.12***
Casmin 2ab			0.19**	
Casmin 2c			0.11	
Casmin 3ab			0.18**	
Occup. in 1st wave (Ref: other)				
University of applied sciences		0.06		
Tertiary, not specified	-1.03***		-0.87***	
Abroad			-0.12*	
Civil servant training course		0.19**		
Vocational training			-0.06*	
Military service		0.12***		
Social year		0.26**		
Job			-0.13**	
Internship		0.13**		
Motives Factor 1	0.02***	0.00		-0.01***
Motives Factor 2	0.00	0.01**	0.00	-0.01***
Motives Factor 3	-0.01*	0.00		
Motives Factor 4	0.01	0.02***		0.01*
German Citizen			0.21***	0.22*
Study intention (Ref: no)				
yes		0.12***	0.11**	
don't know		0.07	0.10**	
missing			1.40**	
Intercept	1.04***	0.96***	0.02***	-0.17***
N	16745	23205	19662	12988
McFadden Pseudo-R^2	0.04	0.04	0.04	0.03

*p<0.05 ** p<0.01 *** p<0.001

Note: Non-significant predictors at 10%-level have been excluded from the models.

Table A2 *Transition rates to tertiary education for students of differing class background by gender, as estimated from integrations and as observed (decimals not reported)*

Class	Sex		1983 per cent	1990 per cent	1994 per cent	1999 per cent
Salariat	Male	Estimated	80	84	82	82
		Observed	80	84	82	82
	Female	Estimated	67	74	77	79
		Observed	67	74	77	79
Intermediate	Male	Estimated	73	75	73	77
		Observed	73	75	73	77
	Female	Estimated	53	64	65	65
		Observed	53	64	65	65
Working	Male	Estimated	69	71	70	70
		Observed	69	71	70	70
	Female	Estimated	46	53	57	57
		Observed	46	53	57	57

Table A3 *Wording of the questions on motives and evaluations*

'Please indicate how relevant the following reasons and motives were for the choice of your postsecondary career path?' [1 (very relevant) – 6 (not relevant at all)]

- 'to attain a high occupational position' (position)
- 'to attain a high social status'(status)
- 'desire for a secure occupational future' (security)
- 'to gain financial independence soon' (financial independence)
- 'short duration of the training' (short duration)
- 'interest in academic/scientific work' (academic work)
- 'inclination towards applied/practical work' (practical work)

'How would you evaluate the employment prospects for tertiary graduates in general?' [1 (very good) – 5 (very bad)]

'How would you evaluate the employment prospects for graduates with vocational training but without a tertiary degree in general?' [1 (very good) – 5 (very bad)]