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Conference Paper

The more the merrier? The impact of longer high school on performance in college

Beiträge zur Jahrestagung des Vereins für Socialpolitik 2010: Ökonomie der Familie - Session: Empirical Studies of Education, No. C10-V2

Provided in Cooperation with:

Verein für Socialpolitik / German Economic Association

Suggested Citation: Tamm, Marcus; Görlitz, Katja (2010) : The more the merrier? The impact of longer high school on performance in college, Beiträge zur Jahrestagung des Vereins für Socialpolitik 2010: Ökonomie der Familie - Session: Empirical Studies of Education, No. C10-V2, Verein für Socialpolitik, Frankfurt a. M.

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The more the merrier?

The impact of longer high school on performance in college

Katja Görlitz and Marcus Tamm^{*}

February 2010

– very preliminary version –

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Abstract. Following German reunification the East German states were confronted with the need to adapt their schooling system to quality criteria settled by the western states. Most importantly this included an extension of high school education by one year. We use this variation in high school duration to estimate the impact of years of schooling on choice of school degree, on attendance of college and on performance in college. The analysis is based on difference-in-differences estimates using variation in the timing of the reform between states.

JEL classification: I21, I28.

Keywords: effects of schooling, educational performance, schooling reform

^{*} The authors highly appreciated comments from David Card and Stefano DellaVigna. Financial support from the German Science Foundation (DFG) within the research program "Flexibility in Heterogeneous Labour Markets" (FSP 1169) is gratefully acknowledged. Part of the paper was written while Marcus Tamm was visiting scholar at UC Berkeley. All correspondence to Marcus Tamm, Rheinisch-Westfälisches Institut für Wirtschaftsforschung (RWI Essen), Hohenzollernstr. 1-3, 45128 Essen, Germany, Tel: +49-201-8149211, Fax: +49-201-8149200, Email: tamm@rwi-essen.de.

1. Introduction

While there is a general consensus about the importance of schooling for labor market success, there is, at least for the case of Germany, no clear empirical evidence to what extent it is time in school or the final schooling degree that matters. Evidence that it might not be time in school that matters is provided by Pischke and van Wachter (2008) who show that an increase of compulsory schooling by one year does not have any significant effect on wages, which is in stark contrast to findings for other countries (e.g. Angrist and Krueger 1991, Harmon and Walker 1995, Oreopoulos 2007). Pischke (2007) analyzes variation in length of the school year and finds no effect on earnings and employment later in life. The reforms Pischke (2007) and Pischke and van Wachter (2008) analyze all took place during the 1950s and 1960s.

In this paper we investigate a more recent change in German schooling law. While high school students in West German states traditionally attend school for 13 years, high school students in East German states attended school for 12 years. After German reunification at the beginning of the 1990th there was an agreement to adapt school regulations to western standards which included an increase of time in high school in East German states by one year. We use this variation in high school duration, which was implemented in the East German states in different years, to estimate the impact (i) on the choice of school track students follow, (ii) on attendance of college and (iii) on performance in college.

We contribute to the literature investigating the impact of changes in school duration by analyzing outcomes that received less attention so far, namely career decisions and performance in post-secondary school education. Specific to the reform we analyze is that school duration was increased for high skilled students, while low skilled students were not affected. This is in contrast to most of the literature which generally analyzes changes in compulsory schooling laws which are relevant for low skilled students only.

In addition, we contribute to the literature investigating the impact of age at entry into educational institutions on performance. Most of this literature focuses on the effects of age at entry into primary school (e.g. Angrist and Krueger 1992, Bedard and Dhuey 2006, Black et al. forthcoming). In contrast, Billari and Pellizzari (2008) analyze the impact of age at entry into university. Using Italian data they find that younger university students outperform older ones during undergraduate studies which they attribute to psychological effects of relative age that induce younger students to reduce social activities in favor of learning activities. Given that the increase in high school duration in East German states was implemented by making students stay in school for one year longer, instead of making them enter at a younger age, high school leavers will generally be older by one year when graduating from high school after the reform. Thus, all reform effects on college performance might either be due to the additional time in high school or to increased maturity.

Our analysis focuses on women only. Firstly, this is because among women the share of students affected by the reform is larger. This is the case because more women attend high school than men. Secondly, women generally enter college faster after graduating from high school than men. A sizable share of men first has to complete basic military service or civilian service before being able to enter college. Since the reform took place recently the additional year between graduation from high

school and entry into college would not allow for observing in the data sufficiently high numbers of male students graduate from college.

The paper is organized as follows. Section 2 describes the German schooling system and the college system as well as the reform implement in East German high schools. Section 3 describes the identification strategy and the data. Section 4 presents results and the final section concludes.

2. Institutional Background

2.1 The schooling and college system

In Germany, education policy is set on the level of federal states. While all states agree upon certain minimum quality criteria for awarding schooling degrees, there remains certain heterogeneity between states. The schooling system is characterized by early tracking after four years of primary school. Selection of students to school tracks is based on ability and achievement in primary school. Students with low and intermediate achievements are sent to lower secondary schools (*Hauptschule*) and intermediate level secondary schools (*Realschule*) which both provide basic general education and applied labour market skills and prepare students to enter vocational education afterwards (e.g. the apprenticeship system). Students remain in these tracks for 5 to 6 years. Students with high achievements in primary school are sent to high school (*Gymnasium*) which is regarded as highest track, because it provides in-depth general education preparing for academic careers. Students attend high school for 8 or 9 years, i.e. (not taking into account grade repetition) they leave school with a total of 12 or 13 years of education, including primary school. At the end of high school students obtain a general university entrance certificate (*Abitur*) which gives access to all institutions of higher education (e.g. colleges, universities) and all fields of study.

After initial sorting at the end of primary school, changing from one track to the other is generally possible; however, the majority of children do not change tracks. Students attending *Hauptschule* or *Realschule* however may receive a university entrance certificate by passing vocational education. University entrance certificates awarded after graduating from vocational schools are generally more restrictive than *Abitur*, in terms of choice of institution of higher education or choice of field of study. Figure 1 provides a schematic outline of the way from primary education via the tracking system, vocational education and higher education towards entry into the labor market.

The German system of higher education comprises several types of institutions (in the following the terms colleges and institutions of higher education are used interchangeably). In our analysis we distinguish between three main types of institutions, which are universities (Uni), universities of applied sciences (FH) and other colleges. Table 1 provides a short overview on the different types and our classification.

Figure 1 – The schooling system in Germany

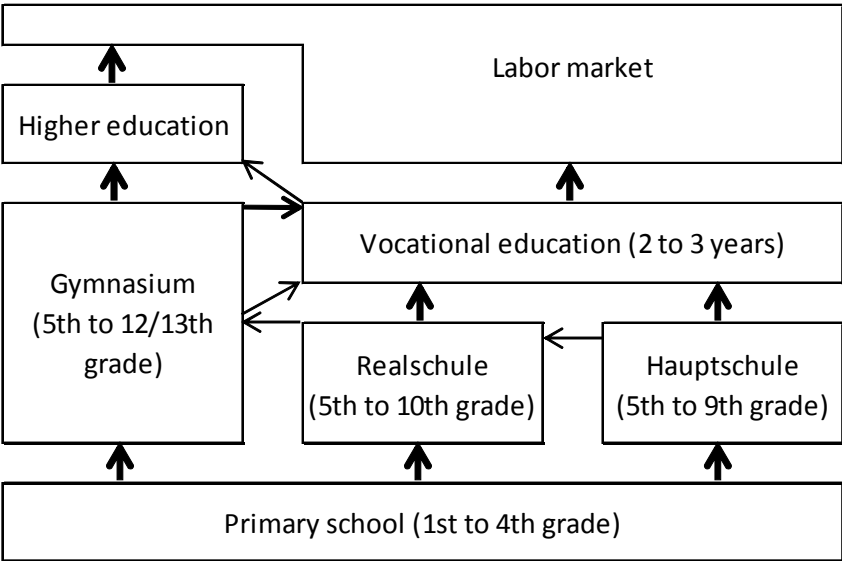


Table 1 – Institutions of higher education in Germany

<p>University (Uni)</p> <ul style="list-style-type: none"> • University (<i>Universität</i>, education is research-oriented and professors have to be engaged in research)
<p>University of applied sciences (FH)</p> <ul style="list-style-type: none"> • University of applied sciences (<i>Fachhochschule</i>, education is hands-on oriented and professors/instructors have to possess practical experiences in business)
<p>Other colleges</p> <ul style="list-style-type: none"> • College for public administration (<i>Verwaltungsfachhochschule</i>, education is hand-on oriented focusing on areas of public administration and includes training on the job periods) • Art academy (<i>Kunsthochschule</i>) • College of education (<i>Pädagogische Hochschule</i>) • School of theology (<i>Theologische Hochschule</i>)

2.2 The high school reform

While in all West German states high school education was fixed at 9 years and thus required students of high school tracks to attend school for 13 years overall, students in East German states attended school for 12 years only. After German reunification East German states had to adapt to West German standards, which implied that time in high school should be extended by one year. Duration of schooling in other school tracks did not change. Table 2 displays the years of schooling required in each state by year of graduation from high school. For the East German states Saxony (SN) and Thuringia (TH) we observe that they did not extend high school yet. Brandenburg (BB) extended high school by one year shortly after reunification in the years 1993/1995. In the eastern part of Berlin the reform took place in 1993/1995 as well; i.e. in Berlin (BE) both types of high school systems coexisted before 1995. Finally Mecklenburg-Western Pomerania (MV) and Saxony-Anhalt (SA) expanded high school to 13 years several years later. Specifically, in MV and SA the last high

school cohort leaving after 12 years finished in 2000 and the first cohort under the new system graduated in 2002; there were no regular high school graduates in 2001. The high school reform was agreed upon in MV in May 1996 (*SchulG M-V, §21 Abs. 5*) and in SA in January 1998 (*Gesetz zur Änderung des Schulgesetzes, §1*).

Table 2 – Timing of the high school reform

State	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
BB	12	12	-	13	13	13	13	13	13	13	13	13	13	13	13
MV	12	12	12	12	12	12	12	12	12	-	13	13	13	13	13
SA	12	12	12	12	12	12	12	12	12	-	13	13	13	13	13
SN	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
TH	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
BE	12&13	12&13	- &13	13	13	13	13	13	13	13	13	13	13	13	13
SL	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
HH	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
BY	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
NI	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
BW	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
HB	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
HE	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
NW	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
RP	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
SH	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13

Note: Table indicates the number of years of schooling required in each state by year of graduation from high school.

3. Identification Strategy and Data

In the analysis we will focus on the reform in MV and SA. (The reforms in BB and BE took place too early and are not covered in our data.) Students graduating in MV and SA in the year 2000 are the last cohort of students graduating after 12 years of schooling. We compare their performance with the performance of students graduating in MV and SA in the year 2002, which is the first cohort graduating after 13 years of schooling. To control for other changes over time (e.g. changes in the business cycle, reforms to the college system like, for example, the replacement of diploma degrees by bachelor and master degrees) we use students graduating from high school in the other East German states (BB, SN and TH) as control group. Given that Berlin differs from all other East German states, especially in terms of urban density, composition of the population and supply of colleges, high school graduates from Berlin are not included in the control group as well as graduates from all West German states.

Our analysis is based on several administrative data sets. Our first data set, which is used to examine changes in school track choice, is collected by the school administration and provided by BMBF (2009). It comprises the number of all graduates from all secondary school types by year, state, type of school degree and gender. We have access to data from the year 1996 on. We relate this information to data on resident population within the relevant age group by gender, state and year to generate the share of school graduates with Abitur per age cohort. Data on resident population is provided by Statistisches Bundesamt (2009).

To examine college attendance and college performance we use data collected by the college administration. The data on college students (*Statistik der Studenten* and *Statistik der Prüfungen*) is provided at the research data centre of the statistical offices of the federal regions (*Forschungsdatenzentrum der Statistischen Ämter*). For each college and semester between winter term 2000/01 and winter term 2007/08 the data includes individual information on each student registered at college. The information records whether students are freshmen or were already registered before the current semester, whether they drop out of college, change college, interrupt their studies (e.g. due to health reasons, pregnancy or times at foreign universities/Erasmus semesters) or leave college after graduating and their field of study and any information on final exams. Most importantly the data also includes information on year and state where students received their university entrance certificate and the exact type of certificate. Unfortunately legal restrictions bar from linking information on students from one semester to information in other semesters, i.e. we are not allowed to generate a panel data set. Yet, the information on year and state of graduation from high school enables to generate several performance indicators.

4. Results

4.1 Choice of school degree

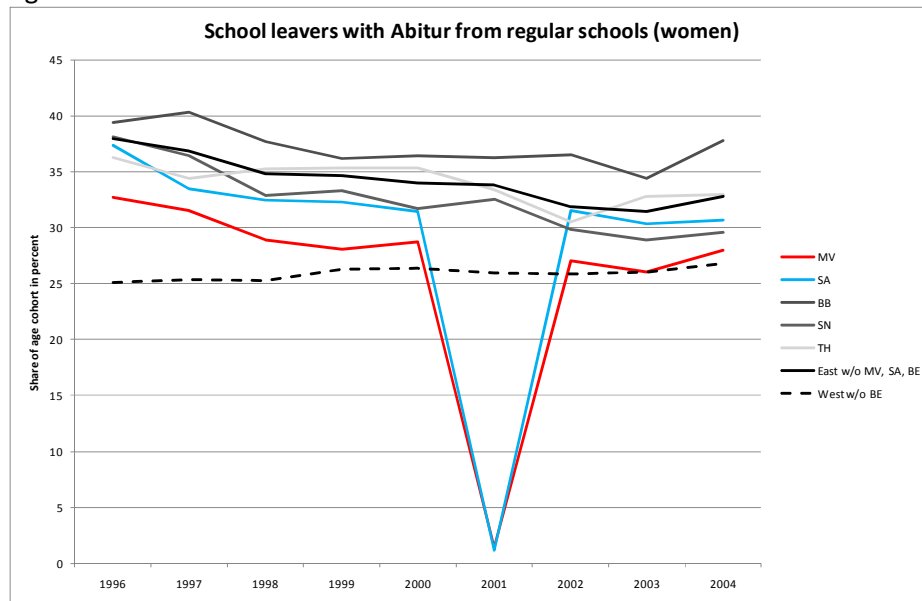
In the first subsection we focus on the impact of the reform on decisions of students at school concerning school track choice or more specifically the choice of school degree. In addition we provide evidence about choosing the appropriate control groups/states.

As outcome measure we use the share of students within a cohort that obtain Abitur from a regular school. Besides high school (Gymnasium) there are other regular schools giving access to Abitur, e.g. comprehensive schools, evening schools, Waldorf schools and selected schools for students already having passed a vocational education. Among these comprehensive schools were affected by the reform as well, the other schools not. Yet, the other regular schools are relatively unimportant (99% of all school graduates with Abitur from a regular school attended Gymnasium or a comprehensive school). Students graduating from vocational school with a more restrictive university entrance certificate are not included in the outcome measure, as they were not affected by the reform. We follow the standard definition used by the educational authorities and define cohorts by the average number of individuals within specific age intervals resident in each state on December of the year preceding graduation. For states/years with graduation after 12 years of schooling the relevant cohort comprises the age groups 17 to 19 and for states/years with graduation after 13 years of schooling the relevant age groups are 18 to 20.

Figure 2 shows the development of our outcome measure for women in several states between 1996 and 2004. For the period 1996 to 2000 we observe a slight decrease of the share of female graduates with Abitur within a cohort which is very similar in all East German states. In contrast, we observe an increase in West German states which confirms the decision to exclude West German high school

graduates from the control group. In 2001 we observe virtually no graduates in MV and SA.¹ In 2002 the shares in MV and SA jump to their old levels before the reform and afterwards closely follow trends observable in other East German states.

Figure 2



Source: BMBF (2009) and Statistisches Bundesamt (2009), own calculations.

Using the underlying information on cohort size and exact number of graduates we generate a microdata set and estimate probit models for graduation with Abitur. In the models we control for year and state dummies and cluster observations at the level of states and years. We compare MV with BB, SN and TH using 1996 as reference year for difference-in-differences estimates. This is the year when the reform was announced in MV. In SA the announcement was in 1998, so for SA we take 1998 as reference year and BB, SN and TH as control states. Clearly, the difference-in-differences estimate for 2001 is highly significant for MV and for SA (Table 3). In contrast, none of the difference-in-differences estimates for 2000, 2002 or later years is significant. We do not observe any Ashenfelter's dip among students graduating in 2000, i.e. they made similar school track choices as students in 1996, even though they knew about being the last cohort graduating after 12 years. (The 1999 cohort in MV was somewhat less likely to graduate with Abitur than the 1996 cohort. The difference-in-differences estimate is significant at the 10%-level.) Students graduating in 2002 or later made similar school track choices as students in 1996, as well. That is, the extension of high school by one year did not affect choice of school degree.²

¹ The few students graduating in MV and SA in 2001 graduated from evening schools, Waldorf schools and selected schools for students already having passed a vocational education or failed the final exam at high school in 2000 and had to repeat the exam in 2001.

² As a corollary we analyzed similar outcomes for graduates from vocational school with university entrance certificate, which were not affected by the reform. Difference-in-differences estimates are insignificant for all years.

Table 3 – Students graduating from high school with Abitur

	MV versus control states		SA versus control states	
	Marginal effect	t statistic	Marginal effect	t statistic
DID 1997	-0.0019	-0.15		
DID 1998	-0.0088	-0.69		
DID 1999	-0.0164	-1.79	0.0002	0.01
DID 2000	-0.0028	-0.20	-0.0015	-0.08
DID 2001	-0.3128	-55.59	-0.3167	-43.66
DID 2002	-0.0004	-0.03	0.0199	0.98
DID 2003	-0.0073	-0.46	0.0114	0.60
DID 2004	0.0007	0.03	0.0020	0.08
# Obs.	668831		555698	

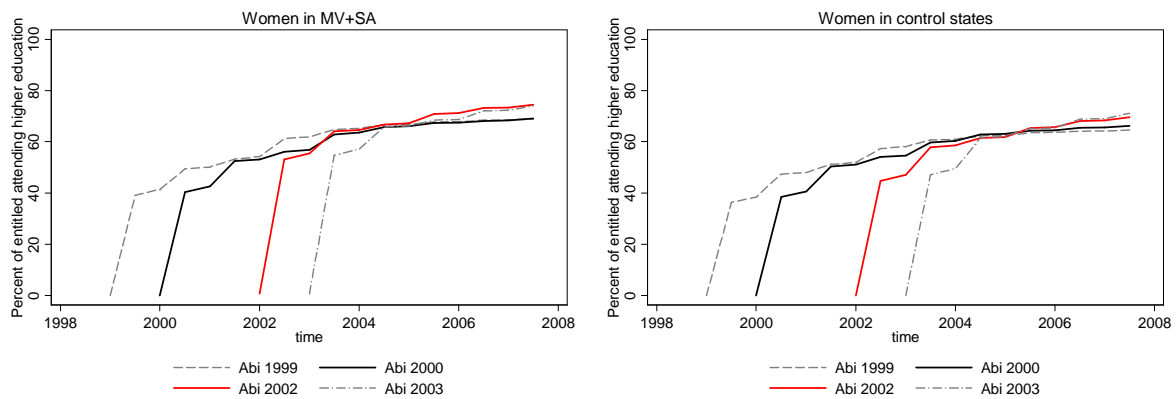
Note: Probit regression controls for year and state dummies and clusters observations at the level of states and years. For MV reference year is 1996, for SA 1998. Control states are BB, SN and TH for both treatment states. Years included are 1996 to 2004 for MV and 1998 to 2004 for SA.

4.2 Attendance of college

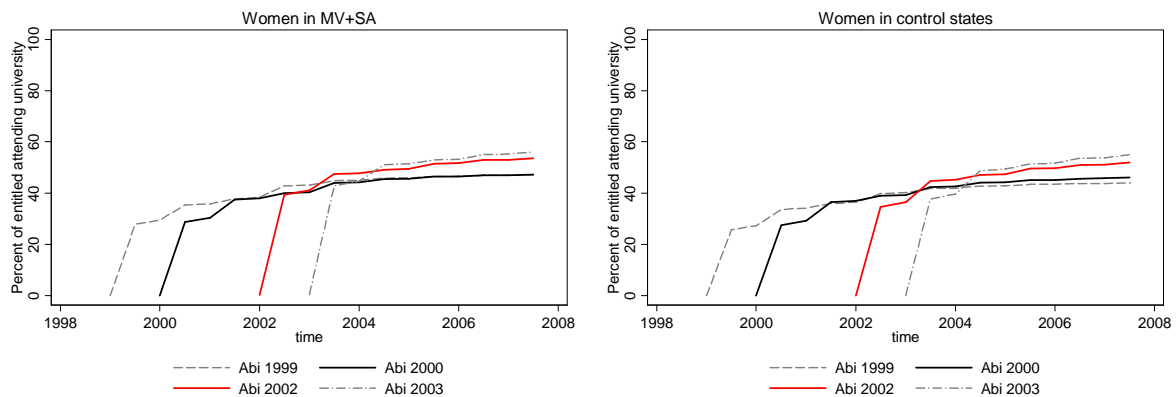
In the second subsection we focus on the impact of the reform on entry into college for those students who graduated from high school. We analyze the entry rate into college, the time between graduation from high school and entry into college, the type and location of college students choose as well as the field of study and the final degree aiming for. As the data comes from administrative sources, it only includes information on college attendance within Germany.

Figures 3a and 3b display the cumulated share of women with initial registration at any college relative to all graduates from high school over time. The figures display these shares separately for the graduation cohorts 2000 and 2002 as well as 1999 and 2003. Figure 3a presents results for the treatment states and Figure 3b for the control states. Figures 4a and 4b contain similar information for registration at university only. For female graduates in MV and SA in 2000, for example, we observe a sharp increase to 40% at the start of the year 2000 (see black solid line in Figure 3a). This indicates that directly after graduating in summer 2000 40% of graduates entered college in winter term 2000/01. The line then flattens out, which indicates that only few graduates entered college in summer term 2001 and makes a further jump up when more graduates enter in winter term 2001/02. At the end of the observation period (winter term 2007/08) some 69% of female high school graduates from 2000 entered college. For the first graduates after the reform leaving high school in 2002 (red line) we observe a much higher share of women entering college directly after graduation (53% enter college in winter term 2002/03) and also a higher share of women ever entering college (74% of graduates enter college until winter term 2007/08). In the control states we observe a similar tendency but not as pronounced. The graphical inspection indicates that high school graduates in 2000 and 2002 might differ in college attendance and also in attendance of university. In contrast, high school graduates in 1999 and 2000 (both graduating after 12 years) behave very similar and high school graduates in 2002 and 2003 (both graduating after 13 years) behave very similar as well.

Figures 3a and 3b – Entry into any college



Figures 4a and 4b – Entry into university



In Table 4 we present results on the empirical significance of these findings. The upper panel presents results for entry into college directly after graduating from high school (i.e. in the winter term following graduation) and the lower panel presents results for entry into college within 5 years after graduation. Difference-in-differences estimates from probit models and from linear probability models are presented for entry into any college and separately for the three main types of institutions.

The share of women entering any college directly after graduation increases by 6.5 percentage points after the reform relative to the control states and the share of women entering university directly after graduation increases by 3.6 percentage points, which are both highly significant (university of applied sciences no significant difference, other college 2.4 percentage points increase). It is not only the share of women entering college directly after graduation that changes significantly but also the long term share. The long term share of women entering college increases by 2.2 percentage points relative to the control states. This long term share, however, is mainly driven by more women entering other colleges, while there are no significant changes in the share of women entering university or entering university of applied sciences. The share of women entering university is significantly higher only directly after graduation from high school. One year after graduation the difference is significant at the 10%-level only and becomes insignificant for all points in time later than that.

Table 4 – Entry into college

	Any college		Uni		FH		other college	
	marg eff	t-stat	marg eff	t-stat	marg eff	t-stat	marg eff	t-stat
Entry directly after graduation from high school								
DID (Probit)	0.0644	7.24	0.0331	3.95	0.0061	1.28	0.0289	7.35
DID (OLS)	0.0654	7.45	0.0360	4.36	0.0050	1.04	0.0244	7.62
N	59792		59792		59792		59792	
Entry within 5 years after graduation from high school								
DID (Probit)	0.0250	2.97	0.0047	0.53	-0.0049	-0.82	0.0256	5.95
DID (OLS)	0.0215	2.57	0.0048	0.54	-0.0067	-1.09	0.0234	6.17
N	59792		59792		59792		59792	
Outcome: Entering higher education								
Treatment states: MV, SA; control states: BB, SN, TH								
Years: Female high school graduates from 2000 and 2002								

- Placebo tests (1999vs2000 and 2002vs2003) show that the share of women attending other colleges is significantly higher in 2002 than in 2003 and the share of women attending university is marginally higher in 1999 than in 2000 (significant at 10%-level only for share 5 years after; insignificant for share entering university directly)

What kind of subject do students study?

- We distinguish between 9 different fields of study. Estimates are based on multinomial logit models and linear probability models estimated separately for each field of study.
- Concerning the choice of mayor field of study in college of those entering directly after high school graduation there is only little evidence of differences between treatment states and control states over time (Table 5a). There is a slight tendency to choose mathematics/natural sciences and engineering sciences less often (engineering sciences only significant at 10%-level) and to choose law/economics/social sciences more often. If we only focus on student attending university, the DID estimates are insignificant altogether. I.e. the changes among all students are due to changes among students attending university of applied science or other college and the overall increase in the share of students attending other college.
- Considering the choice of field of study in college of those entering within 5 years after high school graduation (Table 5b) there is evidence of choosing engineering sciences less often (significant at 5%-level). If we only focus on student attending university, the DID estimates are insignificant altogether.
- Placebo test: Placebo test for the choice of field in college of those entering directly after graduation are all insignificant. However, placebo test for the choice of field at university of those entering directly after graduating from high school show that there have been slight different changes between treatment and control states at other points in time.

Table 5a – Field of study (entry directly after graduation)

	Languages/arts		Sports		Law/economics/ social sciences		Math/natural sciences		Human medicine		Veterinary medicine		Agricultural and food sciences		Engineering sciences		Fine arts	
	marg eff	t-stat	marg eff	t-stat	marg eff	t-stat	marg eff	t-stat	marg eff	t-stat	marg eff	t-stat	marg eff	t-stat	marg eff	t-stat	marg eff	t-stat
Conditional on entry directly after graduation from high school																		
Any college																		
DID(mlogit)	0.0038	0.32	0.0017	0.47	0.0368	2.89	-0.0243	-2.39	-0.0042	-0.63	-0.0014	-0.67	-0.0012	-0.25	<i>-0.0121</i>	-1.91	0.0009	0.22
DID(separate OLS)	0.0030	0.26	0.0013	0.39	0.0345	2.74	-0.0248	-2.42	-0.0037	-0.60	-0.0014	-0.67	-0.0014	-0.32	-0.0085	-1.16	0.0010	0.22
average prob	0.2630		0.0176		0.3524		0.1758		0.0629		0.0060		0.0321		0.0651		0.0250	
N	25729																	
chi2 (all DID coefficients=0)	14.86																	
Prob > chi2	0.0620																	
University																		
DID(mlogit)	0.0052	0.36	0.0031	0.63	0.0112	0.83	-0.0157	-1.21	-0.0010	-0.12	-0.0016	-0.56	0.0068	1.50	-0.0039	-0.68	-0.0041	-0.91
DID(separate OLS)	0.0044	0.30	0.0022	0.49	0.0098	0.73	-0.0166	-1.29	-0.0013	-0.16	-0.0016	-0.56	0.0066	1.47	0.0005	0.06	-0.0040	-0.83
average prob	0.3248		0.0242		0.2554		0.2175		0.0854		0.0082		0.0219		0.0404		0.0222	
N	19021																	
chi2 (all DID coefficients=0)	5.90																	
Prob > chi2	0.6587																	

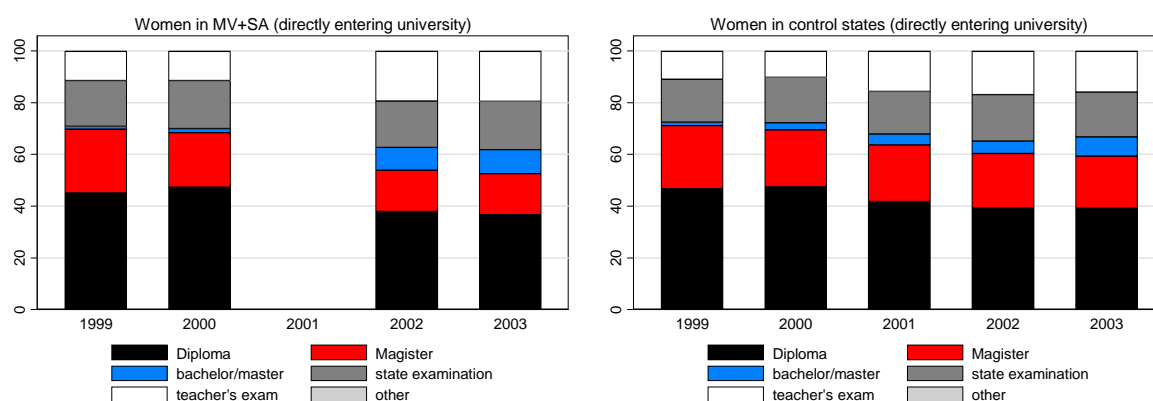
Table 5b – Field of study (entry within 5 years after graduation)

	Languages/arts		Sports		Law/economics/ social sciences		Math/natural sciences		Human medicine		Veterinary medicine		Agricultural and food sciences		Engineering sciences		Fine arts	
	marg eff	t-stat	marg eff	t-stat	marg eff	t-stat	marg eff	t-stat	marg eff	t-stat	marg eff	t-stat	marg eff	t-stat	marg eff	t-stat	marg eff	t-stat
Conditional on entry within 5 years after graduation from high school																		
Any college																		
DID(mlogit)	0.0034	0.36	0.0020	0.76	0.0210	2.01	-0.0101	-1.30	-0.0028	-0.51	-0.0017	-1.12	-0.0008	-0.20	-0.0113	-2.28	0.0002	0.05
DID(separate OLS)	0.0029	0.30	0.0020	0.79	<i>0.0189</i>	1.84	-0.0097	-1.25	-0.0022	-0.43	-0.0017	-1.12	-0.0006	-0.16	<i>-0.0100</i>	-1.76	0.0005	0.12
average prob	0.2715		0.0145		0.3674		0.1522		0.0650		0.0050		0.0324		0.0608		0.0311	
N	39761																	
chi2 (all DID coefficients=0)	11.07																	
Prob > chi2	0.1977																	
University																		
DID(mlogit)	0.0054	0.45	0.0032	0.88	-0.0008	-0.07	-0.0012	-0.11	-0.0017	-0.23	-0.0023	-1.05	0.0027	0.67	-0.0039	-0.89	-0.0016	-0.42
DID(separate OLS)	0.0054	0.45	0.0031	0.88	-0.0018	-0.16	-0.0007	-0.07	-0.0020	-0.29	-0.0023	-1.05	0.0027	0.70	-0.0038	-0.68	-0.0007	-0.16
average prob	0.3487		0.0205		0.2622		0.1922		0.0870		0.0070		0.0242		0.0343		0.0238	
N	28636																	
chi2 (all DID coefficients=0)	3.47																	
Prob > chi2	0.9015																	

What kind of degree do students aim for?

- German colleges offer different degrees to students. We distinguish 5 main types of degrees, which are diploma, bachelor/master, *Magister*, state examination (e.g. in law, medicine), examinations for teachers and other degrees. During the period under observation Germany followed the Bologna accord of EU countries and experienced a steady decline of studies aiming at diploma or *Magister* degrees and an increase of courses aiming at bachelor/master degrees. Figures 5a and 5b show degrees aimed for of high school graduation cohorts in the treatment and control states for those entering university directly after high school graduation.

Figures 5a and 5b – College degrees aimed for (university students only)



- Concerning the choice of first degree the students go for, we find that among students at university there are significant changes over time between treatment and control states (Table 6). There increase in the proportion of students aiming at bachelor/master degrees is significantly higher in the treatment states and less students aim at magister degrees.
- Universities of applied science and colleges are not accounted for in this analysis, given that they mostly award diploma degrees.
- Placebo test: Placebo test for the choice of first degree the students go for show no significant effects when comparing 1999 and 2000 but they do show significant results when comparing 2002 and 2003 (the share of students aiming at bachelor/master degrees falls compared with the control states).

Table 6 – College degrees aimed for (university students only)

	diploma		magister		state examination		bachelor/master		teacher's exam		other degree	
	marg eff	t-stat	marg eff	t-stat	marg eff	t-stat	marg eff	t-stat	marg eff	t-stat	marg eff	t-stat
Conditional on entry directly after graduating from high school												
University												
DID(mlogit)	-0.0074	-0.47	-0.0396	-3.28	-0.0079	-0.65	0.0494	7.67	0.0056	0.47	-0.0001	-0.10
DID(separate OLS)	-0.0193	-1.56	-0.0351	-3.67	-0.0130	-1.44	0.0399	8.33	0.0194	2.32	0.0081	0.70
average prob	0.4290		0.1852		0.1866		0.0419		0.1561		0.0012	
N	19021											
chi2 (all DID coefficients=C	49.21											
Prob > chi2	0.0000											
Conditional on entry within 5 years after graduating from high school												
University												
DID(mlogit)	0.0085	0.68	-0.0310	-3.12	-0.0043	-0.44	0.0264	3.97	0.0016	0.17	-0.0012	-1.11
DID(OLS separate)	-0.0128	-0.83	-0.0407	-3.25	-0.0107	-0.90	0.0522	8.19	0.0122	1.13	-0.0002	-0.16
average prob	0.4040		0.1927		0.1771		0.0669		0.1575		0.0018	
N	28637											
chi2 (all DID coefficients=C	22.95											
Prob > chi2	0.0003											
Outcome: Degree aimed for (university only)												
Treatment states: MV, SA; control states: BB, SN, TH												
Years: Female high school graduates from 2000 and 2002												

Who studies in the home region?

- Overall the share of students entering college within their home region (i.e. in the same state where they received their high school degree) is relatively high with around 60 percent.
- Among students entering university or university of applied science there is no significant change in probability to study in the home region (Table 7).
- Students entering other college significantly increase the probability to study in the home region. Yet, for other college the comparison group is not appropriate. The treatment states experience an increase from as low as 1.4% to 7.1%. The control states start with much higher levels and experience a decrease from 49.7% to 33.2%.
- For all students in higher education there is a significant decrease in probability to study in the home region that is mainly due to the increase in proportion of students attending other colleges who display a much lower probability to study in the home region, due to lack of supply of other colleges.
- Placebo test: Placebo tests for studying in the home region are not convincing. When focusing on students directly entering higher education, there are significant differences for students attending university and for those attending university of applied science when comparing 2002 and 2003. And when focusing on students entering higher education within

5 years after receiving their high school degree, there are significant differences for students attending university and for those attending university of applied science when comparing 1999 and 2000.

Table 7 – Probability to study in the home region

	Any college		Uni		FH		other college	
	marg eff	t-stat	marg eff	t-stat	marg eff	t-stat	marg eff	t-stat
Conditional on entry directly after graduating from high school								
DID (Probit)	-0.0313	-2.36	-0.0159	-1.03	-0.0467	-1.52	0.4166	4.65
DID (OLS)	-0.0316	-2.40	-0.0163	-1.06	-0.0290	-0.99	0.2228	5.36
N	25732		19021		4706		2005	
Conditional on entry within 5 years after graduating from high school								
DID (Probit)	-0.0305	-2.83	-0.0196	-1.54	-0.0337	-1.41	0.1963	3.94
DID (OLS)	-0.0304	-2.83	-0.0196	-1.54	-0.0263	-1.14	0.1492	4.44
N	39765		28637		8262		2866	

Outcome: Studying in home region, i.e. in the state of high school graduation (conditional on studying)

Treatment states: MV, SA; control states: BB, SN, TH

Years: Female high school graduates from 2000 and 2002

*) The large difference between OLS and Probit for other college is due to the proportion being very close to zero.

4.3 Performance in college

In the third subsection we focus on the impact of the reform on performance in. We analyze dropout rates, rates of students passing a final exam within 5 years after entering college and grades in final exam.

Proportion of students dropping out.

[To be completed]

Proportion of students with Erasmus year (i.e. holiday semester).

[To be completed]

Proportion of students passing an exam within 5 years after entering college. (Only manageable for those entering college within one year after graduating from high school. Alternatively: Passing exam within 6 years for those entering college directly after graduating from high school.)

[To be completed]

Grades at final exam (conditional on passing exam within 5 years after entering college)

- The German grade system ranges from 1 to 4 with 1 being the best grade and 4 being the worst grade that still implies a "passed".
- Focus is on those students taking an exam within 5 years after entering university. Overall there is a trend that students receiving their high school degree in 2002 receive slightly worse grades than those who left high school in 2000 (this would be in line with the increase in the share of high school graduates entering university being composed of less able students). This trend is similar for students from all states however, i.e. the DID estimate is insignificant.

Table 8 – Grades at final exam

	Model 1		Model 2		Model 3	
	marg eff	t-stat	marg eff	t-stat	marg eff	t-stat
DID (OLS)	-0.0838	-1.30	-0.0838	-1.30	0.0527	-0.88
after	0.1335	3.71	0.1335	3.70	0.1720	5.08
with controls	No		No		Field, year of exam	
includes students from other states (for more robust estimation of year, field dummies etc)	No		Yes		Yes	
N	3724		25885		25885	

Outcome: grade (1=excellent, 4=passed)
 Treatment states: MV, SA; control states: BB, SN, TH
 Years: Female high school graduates from 2000 and 2002

[To be completed]

5. Conclusions

Analyzing an increase in high school duration in East Germany by one year we find that the reform did not change school children's track choice or choice of school degree aimed at. In contrast, for entry into university we find that more women enter university directly after graduation from high school, while there is no significant difference in entry within 5 years after graduation, i.e. entry into university takes place faster after the reform. Focusing on entry into any college we find that more high school graduates enter directly after graduation and that there are also more graduates entering college in the long run. This increase in (long run) college entry rates by 2.5 percentage points is mainly driven by more students entering other colleges (e.g. Verwaltungsfachhochschulen).

[To be completed]

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