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Educational systems and gender segregation in education:  
A three-country comparison of Germany, Norway and Canada

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### Abstract

How do institutional settings and their embedded policy principles affect gender-typed enrolment in educational programmes? Based on gender-sensitive theories on career choice, we hypothesised that gender segregation in education is higher with a wider range of offers of vocational programmes. By analysing youth survey and panel data, we tested this assumption for Germany, Norway and Canada, three countries whose educational systems represent a different mix of academic, vocational and universalistic education principles. We found that vocational programmes are considerably more gender-segregated than are academic (e.g., university) programmes. Men, more so than women, can avoid gender-typed programmes by passing on to a university education. This in turn means that as long as their secondary school achievement does not allow for a higher education career, they have a higher likelihood of being allocated to male-typed programmes in the vocational education and training (VET) system. In addition, social background and the age at which students have to choose educational offers mediate the transition to gendered educational programmes. Overall, gender segregation in education is highest in Germany and the lowest in Canada. We interpret the differences between these countries with respect to the constellations of educational principles and policies in the respective countries.

## Introduction

Young workers entering the European labour market begin jobs that are strongly gender-segregated both by occupation and by sector (see Triventi, Skopek, Kosyakova, Buchholz & Blossfeld, 2015, in this volume). Such horizontal gender differences – that is, the unequal distribution of jobs between men and women – explain vertical gender inequalities in employment to some extent. In some countries (e.g., Denmark, France), the feminised economic sectors are known for paying their employees lower wages compared to comparable male dominated economic sectors, although this is not the case in other countries (e.g., the USA). In addition, horizontal gender segregation may have an important impact on the life courses of men and women in the long run. In male-dominated occupations in particular, institutionalised expectations of long hours and less opportunities for part-time employment hinder the work–life balance for men; thus, family responsibilities may continue to be gendered (Imdorf & Hupka-Brunner, 2015). While women may have to cope with the double burden of family and work, men are still expected to primarily focus on work outside the home (Triventi et al., 2015). Thus, the horizontal gender segregation of occupations may have detrimental consequences for both men and women economically and socially.

Countries vary in terms of their level of occupational gender segregation. One explanation for these differences that has been proposed in previous research is the differential link between education and employment. For example, countries with well-established initial vocational education and training (VET) systems, such as Germany or Switzerland, are known for their marked horizontal gender segregation both in VET and in the labour market (Estevez-Abe, 2006). Thus, there are indications that the structure of the educational system in general, and VET in particular, sets the course for long-term gender-specific occupational trajectories and life courses and consequent horizontal segregation in the labour market (Krüger 1991; Trappe, 2006; Buchmann & Kriesi, 2012)

Still, little is known about how country-specific institutional characteristics (such as a prominent VET system) reproduce gender segregation in national educational systems. While studies on career choice (e.g., Buchmann & Kriesi, 2009; Cornelißen, 2009; Oechsle, Knauf, Maschetzke, & Rosowski, 2009) show that career orientations follow gender-typical patterns, they have paid little attention to the role of the institutional makeup of the educational systems for such patterns (Imdorf, Sacchi, Wohlgemuth, Cortesi, & Schoch, 2014). Until now, the structure of educational offers has not been considered as a variable in its own right to explain young people's occupational choices and gender-typical paths from school to post-compulsory education and, as a consequence, to employment. The institutional dimensions of educational systems (well known from school-to-work transition research) such as their stratification, vocational specificity, permeability of educational programmes as well as the institutional timing of educational and vocational decision making, may affect the reproduction of gender segregation in education (Buchmann & Charles, 1995).

These institutional dimensions vary significantly between different educational systems. Comparative studies are needed to understand this relationship and to investigate

country-specific educational systems and the way these systems shape gendered patterns in education. Therefore, in this paper, we examine how institutional settings and their embedded policy principles affect gender-typed enrolment in educational programmes.

### Horizontal gender segregation in vocational education and training: Theoretical considerations

What are the possible mechanisms that link the national institutional settings and the policy principles of educational systems to the reproduction of gender segregation in education? In what follows, we first describe the institutional dimensions and policy principles of the educational systems that frame the individual navigation of students through the educational systems of relevance for our study. Then, we focus on the possible links between educational offers, educational achievement and gendered educational transitions.

#### *Institutional dimensions and policy principles of educational systems*

The French sociologist Eric Verdier (2013) suggested that there are five basic educational policy principles that distinguish different national models of education and lifelong learning: the academic, the vocational, the universalistic and two market-based political principles that serve as the architectural foundations of a country's educational system. These principles should be interpreted as ideal types – in reality, a particular mix of these normative principles on how to organise education underlies a country's educational system. In the present study, we link the academic, vocational and universalistic principles of educational policies to the institutional dimensions that are well known from the comparative research on education and school-to-work transitions (Allmendinger, 1989; Shavit & Müller, 1998; Bol & van de Werfhorst, 2013). Although the market-based policy principles<sup>3</sup> are relevant for understanding the impact of national models of education in Germany, Norway and Canada, we abstain from taking them into account in this context because its country-specific strength is difficult to *measure* in comparable ways across the three countries we focus on in this paper.

An educational system significantly built on an *academic* principle favours general over occupational (specific) skill development and, in turn, fosters merit based on academic performance and school-based competition between individuals (Verdier, 2013). An empirical consequence of this principle is a widespread differentiation between levels of general studies in the education system, the separation of students on the basis of academic ability (e.g., implemented through hierarchical secondary educational tracks) and the pronounced amplitude of general educational programmes in upper secondary and higher education. The normativity of this principle lies in the conception of education as general education.

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<sup>3</sup> Verdier (2013) distinguished two market principles that may coordinate education and employment – the logics of pure markets and organised markets, respectively. Educational offers that are organised according to market logics stress the utility and the (fair) price of educational services. In this ideal type logic, skills development should meet labour market demands, and private actors pay for education.

In contrast, the *vocational* principle (*Berufsprinzip*) aims at the mastery of a trade or occupation. The central selection criterion in an educational system that is primarily regulated by this principle is not school achievement but vocation (in terms of being motivated to become a skilled worker in a specific trade). The vocational principle is especially prevalent in educational systems where educational programmes are geared directly toward labour market needs and award qualifications that are recognised by professional associations and employers. Hence, the normative reference of education according to the vocational policy principle is precisely the usability of education for labour market actors. VET systems vary with regard to both the extent and the organisation of their vocational programmes. Verdier's framework focuses in particular on the corporately governed 'dual system' that combines institutionalised education and working in firms. For this study, we also consider broader, school-based vocational programmes with less occupation-specific skills.

Finally, the *universalistic* principle of education is seen as effective if the educational system is capable of compensating for initial inequalities, of reconciling basic knowledge and practical skills, of respecting and allowing for the individual implementation of diverse expectations and career plans and of assigning national diplomas (Verdier, 2013). Empirically, the universalistic organisation of education, which is warranted by public authorities, is characterised by the openness, inclusiveness and permeability of educational programmes. These organisational features allow the addressees of education to navigate and (re-)orientate themselves in order to accomplish their educational ambitions. Universalistic education structures therefore avoid irreversible early tracking and institutional channelling that call into question their central principle of education.

#### *Educational offer and gendered choice of programmes*

The pronounced gender-typing of many VET programmes is usually attributed to the particularly gender-stereotyped career preferences of students at the end of lower secondary school (age 14–15). However, it can also be argued that VET programmes themselves impact self-selection by promoting gender-typed trajectories.<sup>4</sup> There are different theoretical arguments that we consider to be the most important for this. Identity theory claims that students may use vocationally oriented educational programmes for their own construction of gender identity and representation in adolescence (Gottfredsson, 2002; Brandt & Cornelißen, 2004; Birr, 2014). For boys, for instance,

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<sup>4</sup> Even though our theoretical considerations mainly highlight mechanisms of self-selection, we are aware that gender segregation in education may also result from the organisational and institutional assignment of students to different programmes. For instance, training companies offering apprenticeships may take gender into consideration when recruiting new apprentices (Fuller, Beck, & Unwin, 2005; Imdorf, 2013; Kergoat, 2014). However, especially in gender-typed occupational fields, the employers' scope to discriminate is restricted simply because there are hardly any apprenticeship candidates from the non-traditional gender. Similarly, gendered institutional assignments by schools might exist, but schools face increasing pressure to provide equality of opportunity (especially with regard to boys). However, schools offer less curricular options to students with low achievements, which may impact gendered educational enrolment. We take this into account later in the paper, where we consider how educational achievement may impact gendered choices. Finally, one should take both the impact of career or occupational counselling as an institutional actor at different educational transition points as well as how counselling may generate gender-typed educational choices to different degrees at lower secondary, upper secondary and tertiary levels into consideration.

enrolment in male-typed VET programmes could be a resource for the construction of masculine identities (Connell, 2005; Connell, 2008; Jørgensen, 2015). In this volume, Eberhard, Matthes and Ulrich (2015) argue that young people may use their vocational choice to shape the impression they make and increase the likelihood of receiving positive reactions from their social surroundings, thereby creating a positive self-concept. From another perspective, socialisation theory assumes that girls and boys internalise gender-typical values, preferences and social norms early on, which leads to gender-typed vocational choices (Hodkinson & Sparkes, 1997; Busch-Heizmann, 2015). Finally, rational choice theory claims that young women and men choose available occupational programmes by weighing costs and future benefits and that these differ for the two genders (Elster, 1986; Jonsson, 1999). Young women are assumed to choose occupations that enable a preferential work–life balance, work interruptions and part-time work, whereas young men are assumed to choose occupations that allow for a professional career and guarantee a breadwinner’s income (Busch-Heizmann, 2015). Despite the difference between these complementary theoretical arguments, they are all consistent with the assumption that the mere offering of vocational programmes (the predominance of the *vocational principle*) at the upper secondary level results in gender-typical career choices because vocational offers tend to be gender-typed. Academic education, on the other hand, is less gender-typed because the students have not yet been steered toward a specific occupation. We therefore hypothesise the following:

*H1: Gender-typed enrolment in educational programmes and gender segregation in education is more prevalent in educational system where the range of the ‘vocationalised’ educational programmes is more pronounced and where the vocational principle is stronger.*

However, two further issues need to be taken into account when analysing the potential of vocational programmes to trigger gender-typed career choices.

First, in European educational systems, vocational programmes are traditionally offered at the upper secondary level, whereas universities predominantly offer academic programmes. Hence, choosing a vocational education requires making a career choice at an earlier age compared to the timing of planning for a university education. It can be expected that educational offers trigger gendered trajectories, especially if they require occupational decisions at an early stage (i.e., during adolescence) when gender identity development is most salient and when challenging the gender boundaries by choosing a gender-atypical occupation is the hardest (Gottfredson, 2002; Buchmann & Kriesi, 2012). Hence, educational systems where the *vocational principle* is already very prominent at the upper secondary level may particularly foster gender segregation in education (Buchmann & Charles, 1995; Imdorf et al., 2014). Smyth (2005) found some evidence that gender segregation is lower in countries where a greater proportion of young people leave the upper secondary level having taken general rather than vocational courses. In contrast, in countries where general and higher education are more common (the *academic principle* of education), students can delay their occupational decision making to a period in life that is characterised by greater autonomy and independence from their significant social others (family and peers), whereby the latter’s gender stereotyped

expectations become less influential. However, research comparing gender segregation in education between upper secondary and tertiary levels remains scarce. Smyth (2005) reported as a commonality across European countries that social/business courses become more mixed in profile at tertiary level than at upper secondary level. Also, Buchmann and Kriesi (2009) show that female students with university entrance qualifications are more likely to make non-traditional career choices than women with lower educational attainment in female-dominated job careers. *Universalistic* educational systems that offer institutional opportunities to switch educational programmes and allow for another chance to choose their career may also provide more time for definite career decisions. Hence, the age of students needs to be taken into consideration when analysing the vocational effect on gender-typed educational trajectories.

Second, an alternative explanation of why university programmes might be less gender-segregated than vocational programmes is that students who enrol in university programmes come, on average, from more privileged social backgrounds compared to VET students. On the one hand, referring to socialisation theory, gender roles vary according to social origin and are less pronounced in the academically educated middle class than in working-class milieus (Koppetsch, 2001; Kriesi & Buchmann, 2014). On the other hand, according to rational choice theory, working-class women have options that enable upward mobility without transgressing gender boundaries (by moving up into a female job such as secretary or teacher), whereas women with middle-class backgrounds may have to enter traditionally male-dominated sectors that require higher education (management, law, medicine) in order to improve their income level (England, 2010). Indeed, research from Sweden and Norway, respectively, found that gender-atypical choices of upper secondary programmes (Dryler 1998) and in higher education (Støren & Arnesen, 2007) were more common for adolescents from more privileged social backgrounds. The effect of social origin therefore needs to be accounted for in the analysis of gender-typed career choices.

#### *Educational achievement and gendered choice of vocational programmes*

In addition to their gender-typing, vocational programmes also vary in terms of their academic requirements and the occupational status provided by the respective training profession (see Imdorf, 2005) and thus the cognitive and academic requirements of the programmes. Evidence from a Swiss study shows that academically more demanding vocational programmes are less gender-segregated than less demanding programmes (Abraham & Arpagaus, 2008). Eberhard et al. (2015, in this volume) illustrated that for Germany, students from lower *educational tracks* (*Hauptschule*) reject the thought of gender-atypical vocational choices more often than students from higher school tracks (*Realschule* or *Gymnasium*). Hence, the academic principle that underlies the *stratification* of tracked secondary education may *mediate* enrolment in (non-)gender-typed vocational programmes.

Beside the school track, *school grades* may additionally foster more or less gender-typed educational transitions. The differences in achievement between the sexes (Buchmann, DiPrete, & McDaniel, 2008, OECD 2012) may in turn contribute to the *allocation* of male students to more strongly gendered vocational tracks in secondary education.

Abraham and Arpagaus (2008) showed that poor overall grades also increase the likelihood of *choosing* a more gender-segregated training profession for school-leavers<sup>5</sup> who were heading for a vocational training place (apprenticeship) in Switzerland. The authors argued that gender-mixed programmes offer more attractive future occupational conditions and are therefore more in demand, which allows employers in a ‘dual system’ context to use school grades as a stronger screening criterion. In addition, advocates of the comparative advantage hypothesis argue that gender segregation in education may arise because boys and girls prefer to specialise in the subject area in which they have obtained their highest school marks (Jonsson, 1999; Støren & Arnesen, 2007). For instance, good lower secondary grades in maths may increase boys’ or male students’ tendency to choose a male-typed vocational programme in a technological field. It could also increase the likelihood of choosing a male-dominated STEM field of study, as they would expect a higher likelihood of successfully completing a programme where maths skills matter (compared to an alternative field where language skills matter more).

Therefore, one may expect that *school tracking* and *school achievement in general* mediate the level of *gender-typed enrolment* in upper-secondary VET programmes.

*H2: The lower the prior academic achievement of students, the more gender-typed the upper secondary study programmes chosen by the respective students are.*

This assumption might be less obvious in more *universalistic* educational systems that do not implement tracking at the lower secondary level. As yet, evidence on how gendered VET trajectories are affected by characteristics of educational systems is so far restricted to findings from German-speaking countries. The assumption that vocational rather than general educational offers account for gender segregation in education, and that educational stratification matters for gender-typed enrolment in educational programmes, requires further empirical validation. In the following sections, we present an international comparative approach in order to provide further evidence for the hypotheses outlined above.

### Comparing the educational systems of Germany, Norway and Canada

In the present study, Germany, Norway and Canada represent particular and different mixes of the educational principles described above (cf. Verdier, 2013), which may have particular consequences with regard to gender segregation in education. We will investigate how the institutional characteristics of the respective educational systems affect the allocation of students into gender-typed upper secondary and tertiary (general versus vocational) programmes.

The three countries are comparable in terms of their relatively high upper secondary attainment rates in 2001 (85% to 94% of those aged 25–34 according to the OECD, 2003,

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<sup>5</sup> We use the term ‘school-leavers’ to indicate students who finished compulsory education (the term does not refer to ‘early school-leavers’, for example, students who dropped out from school).

p. 41).<sup>6</sup> However, they differ significantly in terms of the mix of educational policies that underlie their educational systems, which, according to H1, should result in diverging patterns of gender segregation in education.

The educational systems of Germany and Canada differ the most. On the one hand, according to data from the OECD (2003, p. 271), the vocational education enrolment rate in 2001 at the upper secondary level (an indicator for the vocational principle) was 63.3% in Germany (general education: 36.7%), whereas Canada had a much lower share at only 15.2% (general education: 84.8%). Correspondingly, the academic policy principle is much stronger in Canada than in Germany, where the vocational principle prevails. On the other hand, the universalistic principle is stronger in Canada than in Germany. While all Canadian students attend the same educational programmes during most of their secondary education, tracking is an important part of the educational system in Germany (Bol & van de Werfhorst, 2013).

Norway has put considerable emphasis on the vocational principle (57.6% vocational education versus 42.4% general education in 2001, OECD, 2003)<sup>7</sup>, but in contrast to Germany, a strong universalistic principle underlies the makeup of the Norwegian educational system. This is evidenced by Norwegian comprehensive lower secondary schools, which are similar to Canada's, and the relatively high tertiary education enrolment rates. The tertiary entry rates in 2001 stood at 68% in Norway (males: 55%; females: 81%) versus 46% in Germany (males: 42%; females: 52%) (there was no comparable information available for Canada) (OECD, 2003, p. 267). Next, we give a short description of each country's educational system in order to elaborate upon the institutional differences in more detail.

### *Germany*

In Germany, all children attend mixed-ability classes at the primary school level (grades one to four – in Berlin and Brandenburg, this is grades one to six). Thereafter, for their subsequent lower secondary education, students are selected for various educational levels with different leaving certificates (Lohmar & Eckhart, 2013) before being allocated to or choosing an upper secondary educational track at age 15 or 16.<sup>8</sup> Traditionally, the *Gymnasium* provides an intensified general education that provides access to higher education. The *Realschule*, as an intermediate school, offers extensive general education that enables students to continue their education in courses that mainly lead to a vocational qualification, with subsequent options to gain professional higher education entry qualifications. Finally, the *Hauptschule* provides students with a basic general education enabling them to continue their education in academically less demanding

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<sup>6</sup> We intentionally display older upper secondary attainment and enrolment figures in order to contextualise the three educational systems, as our empirical study covers individual transitions to post-secondary programmes from the late nineties until the mid-2000s.

<sup>7</sup> According to recent OECD figures (2012, p. 332), the importance of the vocational principle has declined in all three countries over the past decade, especially in Germany and Canada. In 2010, vocational education enrolment was 51.5% in Germany, 53.9% in Norway and 5.6% in Canada.

<sup>8</sup> This is due to a lack of training places in VET, a so-called transition system expanded in Germany in the mid-1990s. The system encompasses a huge variety of different programmes that aim at facilitating the transition to VET, but they do not provide approved vocational qualifications.

vocational courses.<sup>9</sup> As already mentioned, VET programmes, especially dual-tracked ones, predominated upper secondary education in the early 2000s. The German VET system offers approximately 500 vocational programmes with low permeability between tracks. These features point toward a strong presence of the vocational principle of education, whereas the universalistic principle remains weak. Moreover, Germany's entry rates for higher education are on the rise but remain below the OECD average. Thus, from an educational policy perspective (Verdier, 2013), vocational and increasingly academic principles underlie the German educational system.

### *Norway*

In Norway, compulsory education is provided in single-structure comprehensive schools. Beginning in 1997, children in Norway have attended primary level schools from age six (grades 1–7) before starting lower secondary education (grades 8–10). All students have the right to attend upper secondary education, and nearly all students (97%) do enter this school level, typically starting at age 16; it lasts for three or four years (OECD, 2011). The standard model for upper secondary VET is two years in school followed by two years of apprenticeship in a company. School-based practical training is also available (OECD, 2008). The first year of upper secondary education is divided into 13 educational programmes, of which ten are vocational programmes. The first year provides general education while also introducing knowledge from the vocational area. During the second year, VET students choose their specialisations and the courses become more trade-specific (OECD, 2008). In the third year, approximately 280 programmes are on offer. Upper secondary VET ends with a final examination that leads to a craftsman/journeyman certificate (OECD, 2008). After the second year, however, the students may also choose a third year that includes general studies that will give them access to university programmes. Likewise, after the completion of VET, adding a few general courses also provides access to university education.

From an educational policy perspective, the importance of VET, the significant involvement of labour market stakeholders in its organisation and the strong link between vocational education and employment point to the importance of the vocational policy principle, which makes the case of Norway comparable to that of Germany. The evident inclusion of general education, even in vocational study programmes, and the high rate of higher education enrolment in Norway point to the importance of the academic principle. At the same time, the comprehensive school system, the right to upper secondary education and the openness of general and higher education reflect the distinct universalistic principle that underlies Norwegian education. This principle is further institutionalised by the statutory right to education (Youth Right), which was granted by the 1994 reform (OECD, 1997). Norway's upper secondary education system therefore represents a compromise between vocational, academic and universalistic principles.

### *Canada*

Similar to Norway, Canada has a federal (provincial) comprehensive school system at the elementary level (grades 1–6) and on the secondary level (grades 7–12), which is

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<sup>9</sup> Beside the tripartite system, there are other, less common systems, such as comprehensive schools (*Gesamtschule*), that integrate the different tracks.

reflected by the absence of any academic selection at transitional points between the school levels. However, math and English classes at high schools can be internally differentiated ('university level' versus 'applied'). Even though there is only one school-leaving certificate (the high school diploma), admission to some university programmes may depend on the number and the kind of 'university-level' classes taken (Lehmann, 2012). In Canada, post-secondary<sup>10</sup> education is comprised of university, college<sup>11</sup> and vocational programmes. The programmes are offered in parallel (and not consecutively) in modular ways and allow for flexible educational trajectories. Moreover, the vocational principle that coordinates education and employment in Germany and Norway is very weak in Canada in comparison (Pullman & Andres, 2015, in this volume). This principle only exists at the two poles of Canada's educational range: in highly qualified professions (law, medicine and engineering) and in the handcraft sector, where apprenticeships are offered (Lehmann, 2012).

The low degree of institutionalisation of vocational education results in its invisibility in official figures (e.g., in the above-mentioned OECD figures for Canada). However, data from the 2006 Canadian census shows that 42% of 20 to 40-year-old Canadian residents who finished their studies in Canada reported a trade or apprenticeship certificate or a short labour market-oriented college course of two years or less as their highest educational degree.<sup>12</sup> Yet various college programmes in the Canadian post-secondary system prepare for labour market entry and may therefore be considered, together with apprenticeship programmes, as a functional equivalent of VET in Germany and Norway.

With regard to its main educational policy principles, the Canadian educational system is firmly based on the academic principle, with the vocational principle remaining very weak. While the universalistic principle prevails in primary and secondary education, the market principle matters in Canadian post-secondary education, where tuition fees are much higher than in Germany and Norway.

To sum up, Germany and Norway are similar in terms of the considerable share of vocational programmes among their upper secondary educational offers, as well as in terms of the fact that some students have to make a choice in the midst of their adolescence (around age 15 or 16). In contrast to Germany, with approximately 500 vocational programmes on offer, school-leavers in Norway first choose from a limited number of broadly defined vocational (or general) study programmes before narrowing down their initial choice. The apprenticeship system as a primary indicator of the vocational principle is most prominent and starts the earliest in Germany, is moderate and starts with some delay in Norway and is both weak and starts late in Canada. Canada contrasts with both Germany and Norway when it comes to the mainly general nature of its post-secondary programmes as well as the prolonged point in time when students make their first career decision (starting from age 17 or 18, with manifold opportunities

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<sup>10</sup> In Canada, the distinction of secondary versus post-secondary education matters, whereas the term 'upper secondary education' is not common. Secondary education (e.g., junior and senior high school), which lasts until grade 12 (grade 11 in Quebec), leads directly to university, college or vocational (post-secondary) programmes (again, the case of Quebec is different).

<sup>11</sup> College programmes range from school-based professional education to university transfer programmes.

<sup>12</sup> The authors performed the analysis of the Canadian census 2006 data.

to switch programmes later on). In line with Norway, the educational programmes in Canada are more permeable than those in Germany.

The three selected countries with their distinct educational policy mix allow us to analyse how educational system characteristics affect gendered educational transitions. We assume that upper secondary, post-secondary (Canada) and tertiary programmes are more gender-typed the more ‘vocationalised’ they are and the earlier students have to decide between them. Hence, as vocational programmes are more prevalent in Germany and Norway than in Canada, we expect lower overall gender segregation of educational programmes in the case of the latter. We further expect that in Germany, less gender-typed vocational programmes require higher prior academic achievement. In addition, we will explore the impact of academic achievement in secondary education on gender-typical transitions in the more universalistic systems of Norway and Canada, where tracking is introduced at a later stage.

### Research design, data and variables

We use a comparative case study design to test H1 – the more vocationalised educational programmes are, the more gender-typed the enrolment in educational programmes is and the more gender-segregated the respective educational system is (vocational effect). For the tracked German educational system, we test H2 – the lower the prior academic achievement of students, the more gender-typed the post-secondary programmes they choose (academic effect). We also explore the relevance of early academic achievement for gender-typed educational transitions in Canada and Norway. Furthermore, we are interested in the effect of age and social origin on gender-typed career choices, and we control for these two variables in our analysis.

We test our hypotheses by comparing the gendered nature of individual transitions to upper-secondary versus tertiary programmes (Germany, Norway) and different kinds of post-secondary programmes (Canada). Due to the different architecture of the educational systems resulting in different national classifications of educational programmes, but also due to the different measurements of some variables, it is difficult to compare the three countries directly. We therefore apply an analytical (rather than an empirical) generalisation strategy (Yin, 2009) in order to compare the vocational and the academic effects on gender-typed programmes across countries. In other words, we apply comparable theoretical concepts in all three country studies, but we test our hypotheses countrywise.

#### *Data*

For all three countries, we use youth survey data to analyse both the vocational and the academic effects on gender-typed educational careers. While longitudinal data is available for Canada and Norway, we rely on retrospective data of school-leavers for Germany.

For Germany, we analyse data from the BIBB Transition Survey 2006 (BIBB 2006), a representative German cross-sectional youth survey on the educational and occupational attainment process of the cohort that was born between 1982 and 1988. The main topic of the survey was the transition from school to vocational education. Information on individuals' achievement processes was collected retrospectively in the summer of 2006. From the total 7,230 cases covered by the survey, 4,465 cases offered information on the first educational programme they had enrolled in after completing lower secondary school. Design weights and redressment weights were applied to control for selection probabilities due to the sampling design and to adjust the profile of the sample to the marginal distribution with regard to gender, year of birth, highest school attainment and county of the official data.

For Norway, the data was gathered as part of the Young in Norway Longitudinal (YINL) study (Strand & von Soest, 2008) – a representative sample of Norwegian adolescents and young adults. Originally launched in 1992 with a national sample of 12,287 students of lower and upper secondary school (ages 12 to 20), YIN includes four data collections (1992, 1994, 1999, 2005) over thirteen years. From the initial sample, only the 3,844 students still in school in 1994 were followed up, most of whom were born in the second half of the seventies. We use data from the first three data collections. There are no design weights available, but panel mortality was resolved by merging data with national register data on the students' educational programmes.

For Canada, the analysed data is drawn from the Youth in Transition Survey (YITS), a longitudinal study conducted by Statistics Canada and Human Resources and Skills Development Canada as a Programme for International Student Assessment (PISA) 2000 follow up (Cohort A).<sup>13</sup> Launched in 1999, YITS spanned six time points over eight years. In December 1999, data collection referred to one year only; the subsequent data collections 2–6 covered two-year periods until 2008–2009. Our analysis is based on a subsample of 16,404 students born in 1985 who had started their first post-secondary programme by 2004–2005; they were between the ages of 17 and 20 (cycles 2–4). YITS provides straightforward weighting procedures to control for panel mortality.

The three national samples vary with regard to the youth cohorts under study. While the Canadian data cover the birth cohort of 1985, youth cohorts surveyed by the German data were born between 1982 and 1988 (mean year of birth: 1985). The adolescents studied in Norway were born almost a decade earlier (mean year of birth: 1977). Thus, the timing when the students enrolled in their first upper secondary/post-secondary programme varies between the three selected countries. In the Norwegian sample, 90% of the respondents started their upper secondary education during the 1990s, the respondents in the German sample from the late 1990s to the mid-2000s and the respondents in the Canadian sample during the first half of the 2000s.

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<sup>13</sup> The analysis of the Canadian YITS data presented in this paper was conducted at the Quebec Interuniversity Centre for Social Statistics, which is part of the Canadian Research Data Centre Network (CRDCN). The services and activities provided by the QICSS are made possible by the financial or in-kind support of the SSHRC, the CIHR, the CFI, Statistics Canada, the FRQSC and the Quebec universities. The views expressed in this paper are those of the authors and not necessarily those of the CRDCN or its partners.

### *Variables*

The *dependent variable* of this three-country analysis is the *gender type of the educational programme*, measured by the percentage of women in each programme category according to the national figures of educational statistics. Following an international convention of measuring horizontal gender segregation (e.g., Busch-Heizmann, 2015), programmes with less than 30% women were defined as male-typed, programmes with 30% to 70% women as mixed and programmes with over 70% women as female-typed. It is important to note that the number of educational categories available to determine robust shares of females differ from country to country due to the different population sizes (Canada having the largest population and Norway the smallest) as well as due to different national educational system characteristics and classification systems. In the case of Germany and Norway, the tertiary study programmes were coded for all students who enrolled in tertiary education, independent of whether they had started their post-compulsory education in a general or vocational track. In Canada, we use the students' first main field of study that was covered by the YITS survey to determine the national share of women.

The national statistics for Germany we used to define the gender type of the various educational programmes were comprised of the vocational statistics from the year 2006 (BIBB Dazubi statistics)<sup>14</sup> and statistics on vocational education at vocational schools as well as on higher education, which were both from 2005–2006 (both from Destatis), with the calculated percentages of women based on 75 vocational programme categories<sup>15</sup> and 46 fields of studies (first tertiary undergraduate programmes).<sup>16</sup> For Norway, the assigned gender type of the educational programmes is based on the NUDB Norwegian Education Statistics from 1994–1995 (reforms on the VG2 level were taken into account). Because upper secondary education in 1994–1995 only comprised 13 programmes (of which ten are of vocational orientation), higher education programmes (areas of study) were aggregated in order to allow for a within-country comparison (based on the one-digit NUS2000 categories). In the case of Canada, a much more detailed classification of educational programmes was used based on the 2006 census data (for 15- to 34-year-olds). Over 200 programme categories can be distinguished based on the Classification of Instructional Programmes 2000 (four-digit level), which applies to all (university, college and trade) programme levels.

The *independent variables* comprise information on academic achievement at the lower secondary education level (CA: junior high school), information on the vocational orientation of educational programmes (whose gender-type is used as the dependent variable indicated above), control variables and gender. Dummy coding was used for all variables except for individual age at the start of the educational programme.

### Academic achievement in lower secondary school

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<sup>14</sup> The authors thank Dr Alexandra Uhly for providing the data.

<sup>15</sup> The different VET programmes have been summarised into occupational groups (two-digit code) according to KldB 1992.

<sup>16</sup> The percentage of women per programme had hardly changed in the preceding years.

Lower secondary school grades in (the respective local) language and maths are available for Germany and Canada. For Norway, we use the average grade scores, which are based on grades in maths, Norwegian and English. For each grade variable, two dummies are provided, distinguishing between either *good/very good* or *rather bad* (reference category: medium/average). The Canadian YITS survey additionally provides a measure of/for reading proficiency, which is accounted for with two dummy variables – one representing low proficiency and the other high proficiency (reference category: ‘medium proficiency’). For Germany, school track information is available that is based on the lower secondary degrees the students have achieved, and we account for students with a lower secondary school certificate that is higher than *Hauptschule* with a dummy variable (*higher track level*).

#### Information on the vocational orientation of the educational programmes

Three variables were specified to account for the country-specific educational offers: *vocational programme*, *workplace experience*, and *university programme*. The variable *vocational programme* identifies whether the first educational programme attended is occupationally specific. In Germany and Norway, we identified whether the first upper secondary programme was of a general or vocational orientation. For Canada, we used a straightforward measure to detect the vocational (versus academic) orientation of post-secondary programmes. The measure includes information on two different aspects: the programme level (amongst others: attestation of vocational specialisation, private business school/training institute diploma/certificate, registered apprenticeship programme, diploma/certificate/license from a professional association), together with the corresponding type of post-secondary institution (amongst others: community college, technical institute, trade/vocational school, business school, training institute). The variable *workplace experience* accounts for educational programmes with an integral part of on-the-job training. In the case of Germany, vocational programmes that are subject to the Vocational Training Act (BBiG) or Crafts Code (HwO) were coded as programmes with workplace experience.<sup>17</sup> No respective information is available for Norway, mainly because the first year of VET programmes is fully school-based. In the Canadian YITS survey, respondents had to answer the question of whether the educational programme they were attending included on-the-job experience. The third variable, *university programme*, measures whether a tertiary programme is equal to a university-level programme. For Germany, the dummy variable accounts for respondents who started a tertiary programme at a university or at a university of technology (reference category: study programmes at universities of applied sciences). In the Norwegian data, respondents who started a higher education undergraduate programme were coded as having enrolled in a university programme. In the Canadian data, all post-secondary programmes that correspond to non-university institutions (e.g., technical, vocational or trade schools or colleges) are compared to university programmes (note that non-university rather than university programmes are the reference category in the Canadian case).

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<sup>17</sup> We also included programmes that do not fall under BBiG/HwO but can be characterised as VET programmes with workplace experience, for example, nursing.

Control variables: The Norwegian and the German data allowed for the reconstruction of the individual *age at the start of an educational programme*. The mean age is 17.8 years (SD = 1.7, range: 14–24) in Germany and 20.1 years (SD = 2.5, range: 15–37) in Norway. This difference is mainly due to the different rates of enrolment in tertiary education in the two countries. Unfortunately, in the case of Canada, the individual age at the beginning of the various programmes is not available. However, based on the information from the different data collection points that are used to code programmes, an unweighted mean age of 18.5 years can be calculated. Social class was measured by calculating the highest *socioeconomic status (SES)* of both parents' occupations in all three countries (median split with 1 = above median). Finally, a dummy variable measures whether respondents live in a *rural area*. In the case of Germany, we additionally control for respondents who live in New Laender (eastern Germany).<sup>18</sup>

### *Strategy of analysis*

In a first step, we use cross tabulations to describe how educational pathways of women and men correspond with gender-typed programmes in each country. In a second step, we apply multinomial logistic regression models for each country, with the gender type of the educational programme as the dependent variable and the above-mentioned indicators as independent variables, in order to analyse the factors that affect men's and women's enrolment in gender-typed educational programmes. Four models were estimated for men and women per country: Model 1 tests the effect of the control variables (*age at programme start, SES, rural area, New Laender* for Germany) on the likelihood of having enrolled in a gender-typed (male-typed for men, female-typed for women) versus a gender-mixed programme. Model 2 adds variables that represent academic achievement at the lower secondary education level: *grades, school track* (Germany) and *reading literacy* (Canada). Model 3 accounts for information on the vocational orientation of an educational programme irrespective of previous academic achievement: *vocational programme, workplace experience* (Canada, Germany) and whether the course is offered at the *university* level. Model 4 represents the full model containing the complete set of variables.

## Results

### *Gender type of educational programme by educational offers*

How do the offers of 'vocalised' educational programmes affect gendered educational enrolment and gender segregation in education in the three countries?

Starting with Germany, Table 1 shows the distribution of men and women across upper secondary VET programmes and university programmes respectively (vertical distribution). It also shows how their respective programmes are male-typed, mixed or female-typed (horizontal distribution). The vertical patterns show a considerably higher percentage of men and women (84% and 72%) in VET programmes than in university

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<sup>18</sup> We control for the respondents' residence due to the considerable regional differences in terms of the number and the kind of educational programmes, especially in the case of the states of the former German Democratic Republic (GDR) and the western parts of Germany.

programmes (9% and 15%). Even if we account for the remaining higher education programmes, these figures point to a considerable underrepresentation of university enrolments in the data (tertiary entry rates in Germany stood at 42% for males and 52% for females in 2001)<sup>19</sup>.

[Table 1 here]

Still, the descriptive results show considerably higher shares of respondents in gender-typed upper secondary VET programmes (75% for men and 76% for women) than in university programmes (29% for men and 40% for women). In contrast, the majority of women and men have entered gender-mixed educational programmes (56% and 64%, respectively) if they made it to the university level. Because of the relatively high prevalence of VET programmes in Germany and considerably segregated programmes at universities of applied sciences and universities of cooperative education (*Tertiäre Berufsakademien*), the overall gender segregation across all programmes remains relatively high.

Table 2 shows a similar pattern for the mid-nineties in Norway, but with a somewhat different dynamic for men and women<sup>20</sup>. Again, young women showed higher entry rates for university studies than young men (77% and 66%, respectively). Young males, on the other hand, more often reported upper secondary VET (19%) as their highest enrolled<sup>21</sup> education than young women (11%), which is very low compared to upper secondary enrolment rates at age 16 (48% overall in 1995) (SSB, 1997, p. 153). Thus, in the years from enrolment to survey data collection, a substantial share of the original VET students of this sample must have transferred to general education or completed additional education to allow them to enter university-level programmes. This illustrates the permeability of the Norwegian educational system.

Young males much more frequently enrol in male-typed programmes in upper secondary VET (67%) compared to in undergraduate studies (7%), where male students mainly enrol in gender-mixed programme. Interestingly, compared to the figures for male undergraduate students, the enrolment of female undergraduate students in female-typed tertiary programmes is only slightly smaller (33%) than that of VET students (51%). This

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<sup>19</sup> The underrepresentation is due to two reasons. First, the BIBB Transition Survey 2006 is representative for the age group of the 18 to 24 year olds, whereas the mean age of university entrants in Germany is above 21,5 years (Feuerstein 2008). Second, the survey focuses on the first educational programme that fully qualifies for the labour market. Hence, students who have accomplished any vocational education and training previous to their tertiary studies are accounted for as upper secondary students. However, 54% of students who entered a university of applied science and 16% of university entrants already completed a vocational programme in 2003 (Scheller, Isleib, & Sommer, 2013). Despite the underrepresentation of tertiary level programmes in the sample, the *distribution* of tertiary students across male-typed, mixed and female-typed university programmes can be considered unbiased.

<sup>20</sup> Note that figures should only be compared within countries, but not accross countries (e.g. between Germany and Norway), due to different categorisations of educational programmes across countries.

<sup>21</sup> We are primarily interested in the gender-type of those educational programmes students have first enrolled in. Therefore, the two categories *upper secondary VET* (Table 2) and *general upper secondary courses of respondents without tertiary enrolment* (not shown) also account for students who did not complete their upper secondary programme (drop-outs).

could be due to the high number of young women in higher education programmes accommodating the female-typed occupations in the large public welfare sector of Norway (Hansen, 1997; Smyth & Steinmetz, 2008).

[Table 2 about here]

However, the modest number of ten upper secondary VET programmes and the respective broadly defined fields of study at the tertiary level must be taken into account (compared to the 75 VET programmes and 46 fields of study underlying the German figures in Table 1). The limited number of programme categories certainly masks gender segregation when it comes to the tertiary programmes. Other studies from Norway report a more pronounced level of gender segregation in higher education. Støren and Arnesen (2007, p. 260) distinguished between higher education programmes on a much more detailed level.<sup>22</sup> They found that 43% of men and 42% of women were enrolled in gender-typed tertiary programmes, using a wider definition of gender-typed programmes (35%/65% threshold). Still, even their gender segregation indicators for higher education are still below our figures for upper secondary VET, especially for men, which confirms that gender segregation is more pronounced in VET than in higher education in Norway.

In contrast to Germany, tertiary education in Norway is more easily accessible after the completion of a VET programme. This may represent a chance, especially for the many young men in VET, to switch from a male-typed VET programme to a mixed-gender study programme. Because of the high rate of enrolment in the less segregated tertiary education, the overall gender segregation in education in Norway is considerably lower than the segregation in VET specifically.

Finally, Table 3 shows the gender segregation of post-secondary educational programmes in Canada categorised according to whether the programme has a stronger vocational or academic orientation. In Canada, the students do not necessarily make an earlier decision regarding vocational programmes than regarding university-level programmes, which is contrary to Germany and Norway. Hence, any interpretation of the higher level of gender-typed post-secondary vocational programmes (66% for men, 61% for women) compared to academic programmes (29% for men, 42% for women) as shown in *Table 3* cannot draw on age differences of the respective students. Rather, explanations related to age based on identity theory and socialisation theory or on rational choice theory need to be supplied by institutional features. First, the degree of individual autonomy that students are given in their choice of their first post-secondary programme, and second the potential that vocational programmes may offer in way of representing one's gender identity. However, as a pronounced majority of post-secondary programmes are of an academic orientation (90% for men, 93% for women), the overall gender segregation in post-secondary education is moderate, with a majority of both men and women in mixed-gender programmes.

[Table 3 about here]

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<sup>22</sup> Using a four-digit NUS code according to Statistics Norway's Classification for Competence (SSB).

Similar to the Norwegian case, the lower proportion of men in Canada that enrol in gender-typed programmes when moving into academic programmes compared to vocational programmes is more substantial than that of women. However, the figures from the two countries should not be compared directly. Because of the high number of categories of Canadian educational programmes (> 200), gender segregation is more visible in the Canadian data than in Norway, where only a dozen very broad fields of study were taken into account.

Gender segregation between tertiary study programmes can be pronounced (Charles & Bradley, 2002; Smyth, 2005). Still, based on insights from Germany and Norway, our findings allow for the analytical generalisation that academic programmes are considerably less gender-segregated compared to early vocational programmes. While both types of programmes basically provide students with institutional opportunities for gendered career choices, this process seems to be more pronounced with respect to early vocational programmes. The Canadian case confirms that the same holds true even when vocational and academic programmes are offered at the same point in time rather than consecutively.

Gender segregation between tertiary study programmes can be pronounced (Charles & Bradley, 2002; Smyth, 2005). Still, based on insights from Germany and Norway, our findings allow for the analytical generalisation that academic programmes are considerably less gender-segregated than early vocational programmes. While both types of programmes basically provide students with institutional opportunities for gendered career choices, this process seems to be more pronounced with respect to early vocational programmes. The Canadian case confirms that the same holds true even when vocational and academic programmes are offered at the same point in time rather than consecutively.

However, even though our findings lend support to our hypothesis that gender segregation in education is more prevalent in educational system where the range of vocational programmes is more pronounced (H1), a multivariate analysis is necessary to disentangle the potential effects of age and social class behind the descriptive findings. Furthermore, we are interested in investigating how academic attainment on the lower secondary school level (junior high school) mediates individual transitions into gender-typed educational programmes.

#### *Factors behind the enrolment in gender-segregated educational programmes*

As we are primarily interested in understanding the factors behind gender-typed educational enrolment in this paper, and in the interest of space, we have restricted the presentation of the estimated multinomial regression models to the comparison of having enrolled in a gender-typed versus a gender-mixed programme.<sup>23</sup> The respective outputs (multinomial logistic regression coefficients, significance levels and odds ratios) are displayed in Appendices A1 (for Germany), A2 (for Norway) and A3 (for Canada). Table 4 summarises the information of the full models (Model 4). The results should not be compared directly across countries due to different country-specific measurements.

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<sup>23</sup> Hence, the results for enrolment in gender-atypical programmes compared to enrolment in gender-mixed programmes are not given.

Rather, theoretical arguments can be verified for each country, and a cross-country comparison will be done on a theoretical level. In Table 4, P stands for a positive relation (the variable fosters enrolment in gender-typed programmes as opposed to mixed-gender programmes) and N for a negative relation (the variable inhibits enrolment in gender-typed programmes as opposed to mixed-gender programmes) between the respective factors and enrolment in gender-typed programmes. (P) and (N) indicate that the respective effects were significant in prior models, but they lose their explanatory power when adding complete information in the full model (Model 4).

[Table 4 about here]

Our results provide evidence for the existence of a vocational effect on students' enrolment in gender-typed programmes, primarily for men. When controlling for social status, age at the start of a programme and geography, vocational programmes that men have enrolled in are more male-typed than academic programmes in all three countries. In the case of Germany, the vocational effect loses its strength for men once information on lower secondary schooling (especially track information) is controlled for. Furthermore, educational programmes that provide workplace experience (another indicator for 'vocationalised' programmes) are more male-typed than gender-mixed for men in Germany and Canada. Finally, men choose less male-typed study programmes at the university level in Germany and Canada.

The overall picture is somewhat more complex for women: On the one hand, similar to the pattern observed for men, educational programmes that women enrol in are more gender-typed the more vocational they are. On the other hand, at the university level, women enrol in female-typed programmes more often than in gender-mixed programmes in Norway and Canada. In Germany however, women have a lower probability of attending female-typed education at university level. Finally, we find a positive effect of workplace experience on female-typed programmes in Canada, but a negative effect in Germany. Hence, in the case of men, the three country studies initially support H1: the larger the amount of 'vocationalised' educational programmes there are, the higher the gender segregation in education.

These findings are robust when we control for age at the start of the respective individual programme and for social status. Consistent with earlier research, a higher social status is negatively correlated with enrolment in gender-typed programmes for both women and men in all three countries. The same holds true for the age effect for men in the cases of Germany and Norway: the older respondents are when they start their programme, the less likely it is that they enrol in gender-typed programmes. A similar correlation with age can be found for women in Germany, whereas the opposite can be observed for women in Norway: the older the latter are, the more often they enrol in female-typed programmes. Finally, living in a rural area is initially positively correlated with enrolment in a gender-typed programme in Norway and Canada. The effect of a student's place of residence disappears in Norway once the vocational orientation of programmes on offer is taken into account, while in the Canadian case, the effect size of the geography indicator decreases under the same condition. This may be related to the availability of

vocational programmes and lack of university programmes in rural areas; when more students choose vocational programmes in these areas, this leads to more gender-typed career decisions.

Lastly, we asked how academic achievement in lower secondary school fosters gender-typed transitions to upper secondary and post-secondary programmes. Above-average maths grades correlate positively with men's enrolment in male-typed programmes and negatively with women's enrolment in female-typed programmes in Germany and in Canada. Inversely, men with above-average language grades (and reading skills in the case of Canada) enrolled less frequently in male-typed programmes in Germany and Canada, whereas the relationship between language skills and programme enrolment remains less clear for women. These findings are consistent with the comparative advantage hypothesis, which states that boys' and girls' different scholastic achievement profiles lead to comparative advantages in sex-typical fields of education and occupation because their expectations (of the probability) of success in male-typical and female-typical study programmes differ (Jonsson, 1999; Støren & Arnesen, 2007). For Norway, we find negative direct effects of average grade points on enrolment in/for gender-typed programmes for both sexes. In other words, the higher the grades the lower the probability of enrolling in gender-typed programmes. Once the information on the vocational orientation of the educational programmes is controlled for, the effects disappear, especially for boys.

Consistent with previous research, school tracking in Germany mediates gender-typed educational careers, with both male and female students from higher tracks being allocated to more mixed-gender programmes than students from lower tracks who enrol in gender-typed programmes more often. We can therefore confirm H2 for the case of Germany.

To summarise, our hypotheses on how educational offers structure gender-typed educational trajectories seem to be more robust for men than women. The model fit indicators support this conclusion. The statistical models fit the data for men best, especially in Norway and in Germany.

### Discussion and conclusion

We asked how institutional settings and their embedded policy principles affect gender-typed educational enrolment. Based on different gender-sensitive theories on career choice (identity theory, socialisation theory, rational choice theory), we hypothesised that gender segregation in education is more prevalent in educational system where the range of vocational programmes is more pronounced. By analysing youth survey and youth panel data, we tested this assumption for Germany and Canada in the early 2000s and for Norway in the 1990s – three countries whose educational systems each represented a different mix of academic, vocational and universalistic educational principles at that time. In all three countries, we found that vocational programmes were considerably more gender-segregated than academic (e.g., university), programmes. Because of the high prevalence of VET programmes in Germany, and a lower higher education share

compared to both Norway and Canada, we expected the overall gender segregation across all programmes to be the highest in Germany. Our theoretical model however, show a better model fitness to the observations for men than women and the hypothesis that gender segregation in education is higher when the number of vocational programmes on offer is higher, can therefore mainly be supported in the case of men. Men, more so than women, have a greater probability to choose programmes that are not gender-typed (in the case of men, male-typed) once they enrol in a university programme. This underlines the importance of differences in gendered achievement and attainment in early schooling for explaining the gender segregation of subsequent educational trajectories. Due to their weaker school achievement in comparison to female students, male students may more often be allocated to vocational educational settings where gender segregation is the strongest.

These findings are robust when controlling for the students' social background and for the age at which they started their respective upper secondary or post-secondary programmes. In addition however, both variables contribute to the explanation of the gendered choices of educational programmes. On the one hand, the older male respondents are when they start their educational programme, the less likely they are to enrol in gender-typed programmes; we found a similar pattern for women in Germany and a reversed pattern for women in Norway. Social identity theory seems well suited for understanding this phenomenon in the case of male students. The pressure on youth to align their gender identity according to gender stereotypes is highest during adolescence, when many students in countries like Germany and Norway, especially boys, are urged by the educational system to choose a vocational programme. In this situation, vocational programmes provide an opportunity to express adolescent gender identity. With age, students gain more independence from their family and peers, and concepts of gender identity of both young men and women become more diverse. Hence, the architecture of a country's educational system institutionally defines and determines the biographical point in time of occupational career choices, which has an impact on whether career decisions are more or less gender-typed.

Still, open questions remain when it comes to the underlying mechanisms of the relatively strong gendering of the vocational programmes compared to the academic programmes in Canada, where both types of programmes are offered in parallel and permeably. Comparably, Pullmann and Andres (2015), in their gender-sensitive analysis of applied versus general higher education in the Canadian province of British Columbia in this volume, showed that general fields of study appear to be more gender-‘neutral’ compared to the more segregated applied fields of study. These findings encourage considering the gender typing of more applied vocational versus academic/general programmes from a theoretical perspective beyond gendered individual career choice, taking into account the suitability of different educational programs for gender stereotyping. Hence, it might be that vocational programmes are marked by a stronger technical–social divide compared to academic programmes, and that this could make the former more vulnerable to gender stereotyping.

Pullmann and Andres (2015) also demonstrated that for Canada, its lengthy higher education engagement is flexible and fluid, and as such, fosters similar transition patterns for both males and females. Perhaps the case of Norway, where a considerable share of students enrolled in upper secondary VET seem to go on to a less gender-segregated tertiary education sector later, illustrates how permeable programmes can allow for the readjustment of gendered career decisions. While they allow young men in particular to correct their initially chosen male-typed educational trajectories, vertical permeability rather enables women to move to female-typed university programmes and occupations in the large public welfare sector in Norway. In their case, arguments claiming that the stronger actualisation of gender-typed identities in adolescence is the primary explanation for their gender-typed educational trajectories are not convincing. Rather, it may be the combination of gender identities and an expanded female-typed labour market that is at work. The highly skilled welfare sector offers more promising revenues than the skilled female-typed work accessible through the VET system does. In conclusion, it therefore seems important for countries that demand early vocational career decisions to offer both vertically and laterally permeable vocational programmes. This would enable adolescents to adjust their educational trajectories according to changes in their gender identity as well as changes in the impact that gender identities are given in the choices they make over their life course.

Our findings also show that a student's social background is an important contextual factor for understanding gender-typed educational careers. A high social status is negatively correlated with the likelihood of enrolling in gender-typed programmes for both women and men in all three countries. Students with working-class backgrounds are more frequently enrolled in gender-typed vocational programmes than their non-working-class peers. There are several explanations for this. Research has shown that the meaning of traditional gender roles varies across social milieus and that the latter are less pronounced when more educational and socio-economic resources are accessible. One consequence of this might be that an individual's limited occupational status is compensated by the expression of gender status in less privileged milieus. Alternatively, working-class women have options for upward mobility without transgressing gender boundaries, whereas women with a middle-class background might have to enter less female-dominated sectors that require higher education in order to improve their income level (England, 2010).

Our results imply that the intersections of gender, class and age need to be taken into account in research on gendered career decisions in general and when testing the impact of the institutionally defined timing of educational choices on gender-typed career choices in particular. What we learned from our analysis is the necessity to bring gender-sensitive research on both career choice and school-to-work transition systems together in order to explain gender-typed school-to-work transitions from an educational perspective.

Finally, our results show that academic achievement in lower secondary school (junior high school) affects gender-typed career decisions. In tracked school systems, such as Germany's, students from lower achievement school tracks tend to choose more gender-typed (vocational) programmes than their peers from higher achievement school tracks,

even after controlling for the students' social background. This might be due to the fact that students from lower school tracks are not only inhibited in accessing the academic path to higher education, but they also have limited chances of starting vocational programmes in more prestigious occupations and may therefore compensate their missing occupational (and social) status by choosing a gender-typed occupation in order to achieve social approval (Eberhard et al., 2015).

We explain the differences between the countries regarding gender segregation in education with the unique constellation of different educational principles and policies (more vocationally oriented in Germany and Norway, more academically oriented in Canada, more universalistic in Norway and Canada). The more vocationalised the upper secondary and post-secondary programmes are, the more gender-segregated the respective programmes are. Because of the strong link between education and employment in Germany, for instance, these choices may translate into different jobs for women and men later on. Therefore, the national educational policies at the upper secondary level may result in conflicting outcomes. While the early implementation of VET programmes integrates low school achievers most efficiently, it may simultaneously contribute to the reproduction of educational gender segregation. Hence, more social equality regarding access to post-compulsory education seems to be achieved at the cost of gender equality. When it comes to the universalistic features of the educational systems, our results remain mixed. The Norwegian case shows that a strong universalistic principle that underlies an educational system does not necessarily reduce gender segregation in upper secondary education. However, the permeability between vocational education and higher education in Norway seems to at least have the potential to reduce gender-typed educational careers of the young men originally enrolled in VET who later make it to the tertiary level.

## Appendix

A1: Multinomial logistic regressions for men and women, explaining the odds of enrolling for a gender-typed educational programme (ref.: enrolment in mixed-gender programme), in Germany

\*\*\* Table GERMANY about here\*\*\*

A2: Multinomial logistic regressions for men and women, explaining the odds of enrolling for a gender-typed educational programme (ref.: enrolment in mixed-gender programme), in Norway

\*\*\* Table NORWAY about here\*\*\*

A3: Multinomial logistic regressions for men and women, explaining the odds of enrolling for a gender-typed post-secondary programme (ref.: enrolment in mixed-gender programme), in Canada

\*\*\* Table CANADA about here\*\*\*

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## Tables

Table 1: Vertical and horizontal distribution of men and women across educational programmes in Germany (weighted %, N = 4,386)

Gender	Educational programme	Vertical distribution	Horizontal distribution Gender type of educational programme			
			Male-typed	Mixed	Female-typed	Total
Male	Upper secondary VET	83.9%	74.8%	15.2%	10.1%	100%
	University programme	9.2%	29.2%	63.6%	7.2%	100%
	Total*	100%*	68.6%*	21.0%*	10.4%*	100%
Female	Upper secondary VET	72.0%	6.4%	17.2%	76.3%	100%
	University programme	15.0%	4.7%	55.7%	39.6%	100%
	Total*	100%*	6.4%*	26.1%*	67.4%*	100%

\*All programmes, including universities of applied sciences and universities of cooperative education

Table 2: Vertical and horizontal distribution of men and women across educational programmes in Norway (non-weighted %, N = 2,469)

Gender	Educational programme	Vertical distribution	Horizontal distribution Gender type of educational programme			
			Male-typed	Mixed	Female-typed	Total
Male	Upper secondary VET	18.9%	67.2%	27.0%	5.9%	100%
	University programme	65.7%	7.0%	81.0%	12.0%	100%
	Total*	100%*	17.3%*	72.9%*	9.8%*	100%*
Female	Upper secondary VET	11.4%	3.2%	45.6%	51.3%	100%
	University programme	77.4%	0.6%	66.4%	33.1%	100%
	Total*	100%*	0.8%*	66.8%*	32.4%*	100%*

\*Including general upper secondary courses of respondents without tertiary enrolment

Table 3: Vertical and horizontal distribution of men and women across educational programmes in Canada (weighted %, N = 10,867)

Gender	Post-secondary programme	Vertical distribution	Horizontal distribution Gender type of educational programme			
			Male-typed	Mixed	Female-typed	Total
Male	Vocational programme	9.6%	65.9%	26.6%	7.5%	100%
	Academic programme	90.4%	29.1%	59.5%	11.3%	100%
	Total	100%	32.7%	56.4%	11.0%	100%
Female	Vocational programme	7.0%	5.3%	33.5%	61.1%	100%
	Academic programme	93.0%	2.9%	55.2%	41.9%	100%
	Total	100%	3.0%	53.7%	43.3%	100%

Table 4: Direction of significant factors regarding individual enrolment in gender-typed educational programmes (weighted analysis for Germany and Canada, unweighted analysis for Norway)

<i>Dependent variable: Gender-typed educational programme (ref. gender-mixed)</i>	Germany		Norway		Canada	
	<i>Men</i>	<i>Women</i>	<i>Men</i>	<i>Women</i>	<i>Men</i>	<i>Women</i>
Upper sec./post-secondary						
Vocational programme	(P)	P	P	P	P	P
Workplace experience	P	N	--	--	P	P
University programme	N	N		P	N	P
Lower secondary schooling						
Maths grade	P	N	--	--	(P)	N
Language grade	N		--	--	N	∨
Average grade points (m/l/e)	--	--	(N)	(N)	--	--
Reading literacy	--	--	--	--	N	∧
Higher track level	N	N	--	--	--	--
Control variables						
Age at start of programme	N	N	N	P	--	--
SES high (ref. low)	N	N	N	N	N	N
Rural area (ref. urban)			(P)	(P)	P	P
East Germany (New Laender)	P		--	--	--	--
<i>Nagelkerke</i>	<i>0.24</i>	<i>0.18</i>	<i>0.34</i>	<i>0.13</i>	<i>0.12</i>	<i>0.12</i>
<i>N</i>	<i>3,654</i>		<i>2,023</i>		<i>14,078</i>	

P: Positive effect ( $p < 0.05$ ;  $p \leq 0.01$ ); N: Negative effect ( $p < 0.05$ ;  $p \leq 0.01$ ); (P), (N): Positive/negative direct effect in Model 2 or 3;  $\wedge$ ,  $\vee$ : Non-linear relationship; -- : Variable not available