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Measuring Educational Institutional Diversity: External Differentiation, Vocational Orientation and Standardization

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Abstract

In distinguishing between educational systems three main dimensions stand out: the differentiation of students in different educational programmes, the extent to which a system provides vocationally specific skills, and the extent to which an educational system is nationally standardized. However, existing conceptualizations are rather fragmented. Each study uses its own indicators, sometimes developed by authors themselves, sometimes based on indicators provided by statistical agencies. In this article we develop new indicators for a large number of countries, based on various sources of data (OECD, UNESCO, TIMSS, PISA and Eurydice). By so doing, research on the effects of educational systems becomes comparable and replicable. Furthermore, we examine the relationships between these three dimensions of educational systems and what we see as four core functions of schooling: the enhancement of equality of opportunity, the efficient sorting of students, the allocation of students to the labor market, and the preparation for active participation in society at large. We find that in countries with a strong vocational education youth unemployment is relatively low and the school to work transition takes less time. In externally differentiated educational systems the inequality of educational opportunity is on average higher. In addition we find that some aspects of standardization negatively influence average performance in education and that in countries with little external differentiation participation in voluntary organizations is higher.

Key words

Education, educational system, central examination, stratification, citizenship

Introduction

Comparative research on education has taken a tremendous development in the past decade. We have come to learn a lot about cross-national differences in the effect of education on labor market outcomes (Shavit & Müller 1998; Breen & Buchmann 2002; Müller & Gangl 2003), in levels of student achievement (Hanushek & Woessmann 2006; Jenkins et al. 2008) and in effects of social origin on educational achievement (Brunello & Checchi 2007, AUTHOR 2010).

In understanding cross-national variation, researchers have proposed three different institutional characteristics that drive these outcomes: the differentiation of students in different educational programmes¹, the extent and the specificity of the vocational skills provided by a system, and the extent to which an educational system is standardized (Allmendinger 1989; Shavit & Müller 1998; Kerckhoff 2006). However, there are two issues on which improvement can be made. First, the conceptualizations and operationalizations of (elements of) these three dimensions are rather fragmented. For each study new indicators are used, sometimes developed for the specific study, sometimes based on already existing indicators provided by statistical agencies. Often the used classifications of educational systems are poorly documented so that other researchers can not replicate the findings or use the classifications of educational systems in other research. With the increased availability of institutional data of educational systems such as provided by the OECD, Eurydice, UNESCO, or other international organizations, it is now possible to rank countries on the three institutional dimensions based on available data, and make our classifications available to the field.

A second issue on which improvement can be made is the relationship between the three institutional characteristics and four central functions of education. Functions, in this understanding, should be seen as correlates of education on which basis one may judge the extent to which education is functional to the tasks that are set to them. Typically comparative research has examined educational inequality, efficiency of learning and the allocation to the labor market as central functions of education. Given the aims of educational systems to improve equal opportunities, to optimize sorting so that the attained skill level in a country is maximized, and to provide skills relevant for work, these are three important correlates on which we should want to know the impact of institutions. In addition to these three functions, we examine the impact of educational institutions on a fourth central function of education: to create active citizens who actively participate in society.

In this paper we address both issues. First we give an overview of the three institutional characteristics of education that are relevant for cross national comparisons. In comparison to other data now used in the field our indicators are an

¹ In defining what an educational programme is we follow UNESCO: “Educational programmes are defined on the basis of their educational content as an array or sequence of educational activities which are organized to accomplish a pre-determined objective or a specified set of educational tasks.” (UNESCO 2006, 11)

improvement with respect to transparency of our sources and the number of countries for the data is available. A total of 59, predominantly Western, countries have a score on one or more of the indicators. Secondly we describe the four central tasks of education and formulate hypotheses on the relation between the institutional characteristics and these four tasks. After this we will describe our data and method and discuss the results. In the final section we conclude.

Three institutional characteristics of education

Comparative stratification research has proposed three dimensions on which educational systems can be classified cross-nationally: the level of differentiation of students with different levels of scholastic ability (or stratification), the extent to which systems provide vocationally specific skills, and the level of nation-wide standardization of regulations, funding, and examinations (Allmendinger 1989; Kerckhoff 1995; Shavit & Müller 1998; Horn 2009). We follow this literature and classify educational systems on these dimensions (albeit sometimes with two indicators for one dimension).

Level of external differentiation

Educational systems firstly differ to the extent to which educational programmes are differentiated. Our main focus here is on external differentiation; the existence of different educational programmes at the same time point in an educational trajectory. Moreover, between these different programmes it is clear which is the “higher” and which is the “lower” (Allmendinger 1989). External differentiation, in earlier research also phrased as the level of stratification of an educational system (e.g. Shavit & Müller 1998; Kerckhoff 2001), mainly takes place in secondary education, although differentiation between educational programmes occurs in post-secondary education as well. It is important that our focus for this dimension is on external differentiation as opposed to internal differentiation of students in different streams or tracks within the same educational programme. Arguably, externally differentiated systems have more manifest forms of separating students on the basis of ability than internally differentiated systems, because such systems are characterized by separation for the full curriculum, often in separate school organizations, and for the duration of multiple years.

For example, Canada is a country where all students are in the same educational programme during the majority of their secondary education. Although in Canada education is organized on the provincial level, at almost all regions the differentiation between programmes is relatively low. Students start in *Primary* or *Kindergarten* and end up in a *Secondary* or *Senior* programme. Other educational systems where there is a low level of differentiation can be found in the Scandinavian countries (Denmark, Sweden, Finland and especially Norway) and some of the Anglo-Saxon countries (United States, United Kingdom and Australia).

A country where external differentiation forms an important part of the educational system is Germany. In Germany 10 year old students face three options after primary education: *Hauptschule* (lowest level), *Realschule* (intermediate level), and *Gymnasium* (highest level)². Next to educational level these programmes differ in curricula and organization: the three options do not teach the same subjects and differ, for example, in length. It is however possible to start at *Hauptschule* and finally get an *Abitur* (the examination for the *Gymnasium*) but such transitions are relatively rare. Other countries that have a more differentiated educational system are the continental European countries (Netherlands, Belgium, Austria and Luxembourg) as well as some Eastern European countries (Slovenia and Hungary) and Turkey.

Level of vocational orientation

A second dimension on which educational systems differ is the level of vocational orientation: the extent to which education provides students with vocational skills, and the specificity of these skills. Education can supply students with general and specific skills, and the balance between these two differs across educational systems. The specificity of skills in education is mainly associated with vocational education: educational programmes where the emphasis lies on learning highly (work-)specific skills. While the prevalence of vocational education differs across educational systems, there is as much variation in the specificity of the skills that are taught in vocational educational programmes. Many educational systems provide vocational programmes in a few broad fields, while other educational systems provide students with job specific skills by offering a dual system in which institutionalized education

² German students can face a fourth choice: *Gesamtschule*, a combination of *Hauptschule* and *Realschule*, which arose out of egalitarian principles (i.e. a move against the separation of all educational programmes).

and working in firms are combined. Both are categorized as vocational education, however, the skills that are provided in the dual system are more specific than those in broad vocational programmes. On top of that, the dual system is said to be particularly relevant to provide students with specific work-relevant skills (Breen 2005).

Educational systems thus differ in the extent and the form of their vocational training programmes and whether they offer a dual system (Shavit & Muller 1998; Muller & Gangl 2003). Systems that are highly vocational provide (more) students with specific skills, while less vocational systems produce more generally skilled students.

While the United States and Canada are often mentioned as educational systems with little emphasis on vocational training, Brazil belongs to this group as well. Education takes place there in three main stages; fundamental, medium and higher education. While there are some possibilities in higher education to get vocational schooling, the majority of education is non-vocational (Gvirtz & Beech 2008). As a whole, the educational system in Brazil can be classified as non-vocational.

The Czech Republic on the other hand, has an educational system where there is quite some vocational education. Besides a Gymnasium programme there are several vocational programmes that students can participate in (e.g. *Stredni Skola* or *Konzervator*). Vocational education here does not only take place at the secondary but also on the tertiary level. This means that a high percentage of students is enrolled in some kind of vocational education. Next to broad vocational programmes the educational system of Czech Republic has a strongly developed dual system as well. Here students are working and participating in education at the same time. Continental European countries (Netherlands, Belgium, Austria, and Switzerland) as well as some eastern European countries (Hungary, Slovakia, and Slovenia) have educational systems that offer vocational programmes as well. The countries where vocational education is less important are more geographically dispersed (e.g. Australia, Ireland, and Uruguay).

Level of standardization

All educational systems in all countries are to a certain degree standardized: “the degree to which the quality of education meets the same standards nationwide” (Allmendinger 1989: 233). Standardization is achieved by institutions like the use of

central exams, uniform curricula, the same training for teachers, and standardized budgets. We distinguish between two forms of standardization: standardization of input and standardization of output (see Rowan 1990).

Standardization of input refers to the extent to which schools have limited control over the input in education. Examples of such standardization are a lack of: autonomy to decide whom they hire, what they teach and which books they use. The second dimension, the standardization of output, describes the extent to which educational performance (the output) is tested against external standards. It tells us the extent to which schools are held accountable for their performance (Horn 2009). This could for example be induced by a national inspectorate, or other regulatory institutes, but the most important institution concerns centralized exit examinations. Central examination leads to a standardization of the educational system as it obliges schools to learn their students what is examined in the central exams. Pioneering work on this topic has been done by Bishop (1997) and Woessmann (2000; 2005). Bishop argues that we must specifically look at curriculum-based external exit exams (CBEEEs) which guarantee a high level of standardization over the output of education.

Educational systems differ to a great extent on the dimension of standardization. A country where the educational system is not strongly standardized is Italy. In Italy the grading system and the commission that evaluate the exams are internally appointed by schools. This means that there is no external control on the quality of the exams. As an effect there are big disparities between regions; to obtain a degree in the Northern part of Italy probably more knowledge is expected than getting the same degree in the South. Since there is no nationwide external control educational degrees are hardly comparable.

In the Netherlands, on the other hand, the output of educational performance is highly standardized. There is a national commission who has the control over all the exams for secondary and vocational education. This means that everyone, regardless of the school attended, gets examined in the same way. Even at primary schools a standardized test (the CITO-test) is used. In the Netherlands the input of education is less standardized as schools have the freedom to choose study material³. Other standardized educational systems can be found in, for example, Iceland, New Zealand

³ This material is however certified by the Dutch government and the centralization of exams decreases the freedom of choice: because of the central exams all Dutch students are expected to know the same.

and South Africa whereas the educational systems in Switzerland, Belgium and Cyprus are characterized by lower levels of standardization.

Central functions of education

Education can be seen to have four central functions in contemporary societies (see also Fend 1974; Van Kemenade 1981; AUTHOR 2010): allocating students to the labor market, sort students efficiently to maximize learning, promote equality of opportunity, and to prepare youth for active civic engagement. An educational system that performs well on these aspects, is held to be a well-functioning educational system.

As a first domain, an educational system can be said to be well-functioning if graduates of different levels of education are *well-prepared for the labor market*. They have obtained relevant skills for working life, and employers are well-informed about those skills and are willing to reward these. This way, the labor market opportunities of school leavers are optimized, as well as the production of firms. A well-functioning educational system therefore adequately allocates students to the labor market.

The second function to which an educational system's performance can be assessed concerns the extent to which the system *sorts students efficiently* to different levels of attainment. It should be the best-performing students who reach highest in a well-functioning system. Students differ with regard to their learning abilities, and education can help to sort students in an efficient way if the placement in educational trajectories takes place in such a way that learning is maximized. An educational system can be seen as efficient if educational achievements of students are optimized, given a particular budget for education. The 'total' production of knowledge and skills is then optimized.

The third function of education is that it can optimize equal opportunities to children of different social or ethnic/racial backgrounds. Educational systems can be seen as well-functioning if they minimize inequality of educational opportunity. This is not to say that educational systems would be able to fully eliminate educational inequalities, as inequalities partly result from family processes in which educational policy cannot interfere. Yet, if two educational systems differ in the extent to which they either enlarge or reduce inequalities, the system that reduces inequalities can be seen as, *ceteris paribus*, a better functioning system. Although this function of

education highlights equality of opportunity rather than equality of outcomes, studies have shown that both forms of equality are strongly linked (Boudon 1974; Duru-Bellat & Suchaut 2005).

The fourth function of educational institutions is to prepare youth for active engagement with society at large. Through schooling, students get informed about regional, national and supranational institutions (e.g. legal or political), obtain knowledge on current affairs, develop democratic attitudes, and improve their social skills. All these qualities will help them to be involved with societal issues at large, helping them to become active citizens. A well-functioning educational system not only optimizes these qualities, but also minimizes variations between students in them. A common view in political philosophy is that the only legitimate justice criterion in relation to the state, or politics more specifically, is equality (e.g. Verba et al. 1995; Miller 1999). An educational system that increases inequalities in civic and political engagement is harmful to democratic equality, and may hence be seen as malperforming.

Within a given educational institutional structure, some of these four tasks may be more easily met than others. A system that optimizes on efficient learning may, for example perform less well when it comes to equality of opportunity (Brunello & Checchi 2007). This implies that, in the design of educational institutions, governments have to face policy trade-offs when a particular institution serves one task but harms another (AUTHOR 2010).

Another trade-off is that between labor market preparation and equality of opportunity. It is well-known that a strong vocational educational sector helps youngsters in the transition process from the educational system to the workplace. For instance, youth unemployment is lower in countries with a strong dual system (Breen 2005). On the other hand, several studies showed that the specific skills acquired in a dual system are not always beneficial. During the life course specific skills turn out to be one of the reasons of long unemployment. Furthermore, people from a dual system are more often stuck in poorly-paid jobs (Korpi et al. 2003). Yet, there still is a significant social class effect on choice for vocational versus generic types of schooling. If people enrolled in vocational secondary have fewer opportunities to enroll in tertiary education, strongly vocationally oriented systems may enlarge social class differences in the attainment of a tertiary-level degree.

Combining educational institutions and central tasks of schooling

In this paper we study the four goals of education and their connection to the three educational institutional dimensions. This helps us to find trade-offs that educational policy makers face. In table 1 we summarize the hypothesized relationships between educational institutions and four core tasks of education.

[Table 1 about here]

The first goal that we distinguished concerns the way that education allocates people to the labor market. As said above, more vocationally oriented educational systems provide students with specific skills which should make the education to work transition easier. We therefore, hypothesize that the more vocationally oriented a countries' educational system is, the lower the youth unemployment is. Although earlier research (Breen 2005) showed that especially the specificity of skills is important, we expect these effects for both the prevalence of vocational education (hypothesis 1a) and the vocational specificity (hypothesis 1b).

The second goal is efficient sorting, making sure that the attained skill level in a society is maximized. A simple measure of this goal is average academic achievement. Several studies showed that the level of standardization of output of an educational system enhances student performance (Bishop 1997; Horn 2009). A first rationale is that students are willing to work harder if they know that the degree they are working for has a higher value. This is believed to be the case in educational systems where the output is standardized by using, for example, exams (Spence 1975; Stiglitz 1975). A second reason is that because the government monitors the quality of education more in more standardized educational systems the performance increases. Earlier research found significant effects of the level of standardization of output on student performance (Bishop 1997; Fuchs & Woessmann 2007; Hanushek & Raymond 2004). We therefore expect that in educational systems in which output is standardized the average student performance is higher (*hypothesis 2a*). However, with regard to input, it has been argued that weak standardization leads to higher performance due to higher levels of competition between schools (Woessmann 2003). So *hypothesis 2b* reads that higher levels of standardization of input lead to lower average school performance.

The third goal of education is to promote the equality of opportunity. Research showed that the effect of external differentiation on equality of opportunities is negative (Erikson & Jonsson 1996; Lucas 2001; AUTHOR 2010): the more differentiated the educational system is, the lower the equality of opportunities. In systems where the choice of educational programme is made earlier, and has more severe consequences because of the rigid form of selection in separate school organizations for the duration of multiple years, it is likely that parents play a relatively large role in educational decision making. Given that the distribution of achievement is strongly related to school type, social origin is relatively important for one's place in the distribution of student performance in more strongly differentiated educational systems (*hypothesis 3*).

As said, a potential trade-off between equality and efficiency has been hypothesized concerning external differentiation of the system. While differentiation may hamper equality of opportunity, it may also enhance efficient sorting and thus maximize learning. Such a trade-off would appear if, in addition to support for hypothesis 3, we would also find that external differentiation is positively related to the average performance of students (*hypothesis 4*). It must, however be borne in mind that empirical support for this hypothesis is limited (AUTHOR 2010).

Finally, a goal of educational institutions is to prepare students for active civic participation in society. Thus far only limited evidence exists for the relation between this central task of and the educational institutional structure (AUTHOR 2011). It is however plausible that external differentiation has a negative impact on commitment to active citizenship. Differentiation prohibits communication between groups that are strongly separated on the basis of social and ethnic background, and communication is central to the development of critical citizens. Hyland (2006) has, for example, argued that a more heterogeneous composition of school classes lead to more equality in democratic attitudes and values on political participation. In homogeneous classes, it is likely that students in the academic programmes get trained in civic competences related to critical thinking, whereas students in the vocational programmes get little education with regard to skills that are relevant for political awareness, and knowledge on democratic institutions (Ten Dam & Volman 2003). Therefore, we expect that external differentiation leads to lower levels of active citizenship (*hypothesis 5*).

Data

A large share of this article is dedicated to the description of our measurements of the three dimensions of educational systems. While these dimensions are theoretically very relevant and often used in research, a clear overview of how they can be measured is missing in the literature. Most of the indicators we propose are derived from a principal component analysis. This means that the score of each country on a certain dimension is based on its relative position relative to all the other countries that are in the sample. Eventually we create standardized indicators on a maximum number of countries on which we were able to collect data. The score of a country on this standardized indicator is therefore fixed, and independent on whether a country is part of one particular empirical analysis or not.

While in a factor analysis all different variables showed three underlying factors (all three representing one of the dimensions of educational systems), we decided to perform separate factor analyses for each dimension. This allows us to increase the number of countries that have the available data for the specific dimension. The results of the overall factor analysis can be found in appendix A. All the specific references and sources of the data we use to create the indicators is summarized in appendix B.

Level of differentiation

The level of differentiation is constructed by performing a factor analysis on three country level variables that are good indicators for external differentiation. The first indicator that we use is the age of first selection. This indicator tells us when the actual differentiation starts. It is the most important indicator of external differentiation and often used as the only indicator (see e.g. Hanushek & Woessmann 2006). Data for this indicator is gathered by OECD (2005). The second indicator we use is the length of the differentiated curriculum. This indicator expresses the externally differentiated curriculum as a percentage of the total curriculum in primary and secondary educational programmes. The length of the differentiated curriculum is derived from Brunello and Checchi (2007) and tells us what share of educational programmes takes place in differentiated form. The third and final indicator that is used to construct the index is the number of distinct school types that are available for 15-year old students. The logic behind this indicator is that differentiation takes place, or at least starts, especially in secondary education and the number of different

educational programmes that are available for someone of the age of 15 indicate differentiation of an educational system best. It tells us something not on the time when differentiation starts or what share of the educational system is differentiated, but on the extent to which this is the case. The data for this indicator was derived from the OECD (2005). Together these three variables give a comprehensive view on external differentiation and pay attention to all theoretical aspects of the dimension.

On these three indicators a principal component analysis was performed and the factor loadings were saved as regression coefficients. In that way all countries got a relative score on the index of differentiation which has a mean of zero and a standard deviation of one.

Level of vocational orientation

The level of vocational orientation is divided in two variables: the prevalence of vocational enrolment and the specificity of the vocational education. The reason why we chose this less parsimonious way of summarizing the vocational orientation of educational systems has to do with the specific role of specific skills that are taught in the dual system (especially on the allocation of students in the labor market) that is emphasized by several studies (e.g. Breen 2005).

The first indicator of vocational orientation is the prevalence of vocational enrolment. There is a high level of between country variance with respect to the percentage of students that are enrolled in any kind of vocational education (the specificity of this vocational education is addressed by the next measure). Our focus is on the amount of students that are enrolled in vocational programmes in upper secondary education, as vocational schooling mostly takes place in upper secondary education. On top of this, it is especially vocational education in upper secondary educational programmes that provide the final schooling before entering the labor market. To measure the prevalence of vocational education we use two indicators: vocational enrolment as a percentage of upper secondary education as measured by the OECD (2006) and by UNESCO⁴. To reduce measurement error we use both indicators instead of just one and perform a principal component factor analysis to create a new index of enrolment in vocational programmes. One factor came out and

⁴ We accessed the online UNESCO database at May 16, 2011.

we saved the factor as regression scores. The new index, vocational enrolment, has a mean of zero and a standard deviation of one.

While enrolment in vocational programmes tells us the prevalence of vocational education, which is indicative of the extent to which vocational education is institutionalized in a country, another element of vocational education examines more deeply how the vocational training system is set up. In particular, vocational education and training systems differ in the extent to which learning takes place in a dual (school-based and work-based) form. The existence of a dual system tells us a lot on the provision of specific vocational skills. In a dual system students learn and work at the same time, based on the idea that the necessary skills for a job are best learned on the job. Instead of only focusing on learning in the context of a school, the context of the employer is at least as important. The strength of the dual system is measured by a single indicator; the percentage of students in upper secondary education that are in a dual system (OECD 2007).

Level of Standardization

In the theoretical section we discussed the level of standardization in two categories: standardization of input and standardization of output. Here we operationalize the level of standardization in these two categories.

Standardization of input deals with the autonomy of schools and the extent to which they can decide by themselves how and what they teach. This is an important category for the level of standardization: the more schools are alike in terms of teaching methods and curriculum, the more standardized an educational system is. When schools cannot decide themselves how they organize their education, there will be higher similarities in students' knowledge in different schools. In the 1995 and 1999 data of the Trends in Mathematical and Science Study (TIMSS), school principals were questioned on topics that concern the standardization of input.

We aggregated four questions to the country level (with the lowest score being the most autonomous and the highest score being the most standardized) and a factor analysis was performed on these variables. The four variables measure the extent to which schools are autonomous in choosing textbooks, the general school supplies, the

course content and the courses that are being offered⁵. These four variables give an accurate view on how much a school is standardized with respect to input. All variables range from zero (low level of standardization of input) to one (high level of standardization of input), which resembles the percentage of principals in a country who answered positive or negative to the questions. On these four variables a principal component factor analysis was performed and one factor stood out, interpreted by us as the level of standardization of input. The index has mean of zero and a standard deviation of one.

The second category of standardization is standardization of output. The indicator that is most important for this kind of standardization is the existence of centralized exit exams. In educational systems with nationally regulated exit exams the quality of the skills obtained in education are standardized. Although a national educational board, a national curriculum or national education inspectorate are other potentially relevant indicators, the existence of central examinations have the most direct bearing on the accountability of schools and thus the standardization of their output. In countries with a national curriculum, it remains unclear if the students are on the same level after attaining the same education. In the measurement of central examinations we follow the five criteria proposed by Bishop (1997, 260). Firstly exams should have real consequences and not only be symbolic. Secondly degrees issued after exams are tested against an external standard. Thirdly, the central examinations are organized by discipline. Fourthly, it is not only a pass and fail exam, but there is also some differentiation in the possible outcome. Finally it concerns secondary school students and covers almost the complete secondary student population. All these criteria ensure that it is standardization of output that is imposed by central exams.

Standardization of output is a dummy variable: when there are central exams in secondary education a country scores a one. Two sources of data were used in determining the existence of central exams. The first source for information, and used to code most European countries, was the section on examinations, qualifications and titles in the European Glossary on Education (Eurydice 2004). The second source uses earlier research on this topic by Woessmann (2005) and Woessmann et al. (2009,

⁵ Although in the original survey several answer options were possible (decided by principal, decided by school board, and so on), we recoded the variables in being 1 = decisions made at state or country level and 0 = decisions made at school level.

123). Their data is based on accounts of national experts and is not completely a dichotomous variable. In four countries (United States, Germany, Canada and Australia) the percentage of regions where central examination exists is used.

Summary

In Appendix C all five indicators are shown for as many countries as we could find data for. All sources and raw indicators are tabled in appendix B. To summarize this paragraph on the description of the data we will show scatter plots of the dimensions. Figure 1 shows the plot of the level of external differentiation and the prevalence of vocational education, measured in enrolment numbers, while in figure 2 external differentiation is plotted against the specificity of vocational education, measured by the participation level in the dual system. As we can see, there is a sizeable correlation between the level of differentiation and both indicators of vocational orientation ($r = 0.44$ and 0.38). However, these correlations are not so strong that it prohibits the inclusion of both dimensions in one model.

[Figure 1 about here]

[Figure 2 about here]

Substantially the figures tell us that in more differentiated educational systems there is more vocational education. This is not surprising: when there are multiple educational programmes it is often the case that at least one of the programmes is vocational by nature. Yet, there are educational systems, in particular in Scandinavian countries, England and Australia, that have a relatively high score on the vocational orientation index but not on the differentiation index. These systems are characterized by non-differentiated schooling until around the age of 16, after which vocational programmes are offered that are quite sizable in terms of student numbers. In Denmark the vocational specificity comes also in the form of a sizeable dual system.

[Figure 3 about here]

In figure 3 we plot both indicators of the dimension of vocational orientation; the prevalence of vocational enrolment and the vocational specificity. As expected we find a positive correlation between the two variables ($r = 0.56$). The correlation is

however not extremely high, indicating that it is indeed a relevant distinction. While in some countries (for example Slovenia) a large amount of students is enrolled in vocational education, the skills that they obtain are not highly specific. In other countries, for example Estonia or Hungary, the total percentage of students enrolled in vocational education is not extremely high; however, most of them are enrolled in a dual system.

[Figure 4 about here]

[Figure 5 about here]

[Figure 6 about here]

The final dimension is standardization and consists of two indicators: the standardization of input and the standardization of output (central examinations). Figures 4, 5 and 6 show the index of input standardization against the index of external differentiation, the index of the enrolment in vocational education and the specificity of the provided skills as measured by dual system participation. The correlations between the standardization of input and the two indicators of vocational orientation are moderate (-0.28 for vocational enrolment and -0.31 for vocational specificity). The most obvious explanation for these correlations is that in vocationally oriented educational systems educational programmes are so specialized that standardization of input is hardly possible. However, more research needs to be done to find support for this claim. Since the indicator of standardization of output comes close to being a dummy variable the graphs are not plotted here.

Methods

In the previous paragraph we presented the three dimensions of educational systems, the five variables that we created for these dimensions, and the ways in which these are related. Now we turn to the question to what extent these indicators are related to central functions of education: allocating students to the labor market, sort efficiently to maximize learning, to offer equal opportunities, and to prepare youngsters for active citizenship.

To study this we perform OLS regressions and use the indicators we established for the three different dimensions as independent variables. It is important to note that our analyses are carried out using country-level information. The analyses

are mainly aimed to test the external validity of our indicators, and to provide a broad picture of the relationship between the institutional variables and central outcomes of education systems.

To measure allocation function of education we use two variables. First, we focus on the level of youth unemployment as a ratio of adult unemployment. The youth unemployment ratio is derived from the UNESCO online database and is based on data from the year 2002. The second variable we use is the average duration of the school-to-work transition, as measured by the OECD in the Employment Outlook of 2008 (OECD 2008b, 72). When educational systems function well according to labor market allocation, this should be displayed by low youth unemployment and short duration spells between leaving school and entering the labor market.

Like other studies, the function of efficient selection is measured with the average country score on science (cf. Hanushek & Woessmann 2005). For the performance in science we use a country aggregate of data from the PISA 2006 study, a large country comparative performance survey.

The third function of education relating to equality of opportunities is measured with data from the PISA survey of 2006 as well. On the basis of that survey the OECD calculated the effect of social origin on performance. The indicator takes the difference between the average performance on the science test of children who grew up in a high social class environment (top decile) and the average performance on the science test of children who grew up in a low social class environment (bottom decile), as provided by the OECD (2007b, 158).

The final function of education, relating to preparing youth for active civic engagement, is measured by the level of participation in voluntary organizations other than a religious, sports, leisure, political organization or a trade union. We use the data of the International Social Survey Programme (ISSP) of 2004, where a special section was dedicated to citizenship. We aggregated individual scores of the dummy variable (participation = 1) by country means.

All results are controlled for the percentage of GDP per capita that is spent on each student in secondary education (World Bank Data⁶) to make sure that we are not measuring an effect of resources instead. A second control variable is the Employment Protection Legislation index by the OECD (2008b). This variable is used

⁶ Data is accessed via data.worldbank.org (May 17, 2011).

as a control in the design of allocation, to control for the in literature prevalent idea that high youth unemployment is due to a more strict employment protection for older workers (Nickell 1997). In appendix D the dependent variables, as well as their sources, can be found.

Results

In this section we discuss the regression results where the dimensions of educational systems are the independent variables and the four central tasks of education constitute the dependent variables. All regression equations were checked for multicollinearity and influential outliers but no irregularities were found.

Allocation function

The first function of education, assessed by the youth to adult unemployment rate , is regressed on educational institutional variables in table 2.

[Table 2 about here]

Table 2 shows that external differentiation and dual system enrolment improve youngsters' integration in the labor market. The function of education to prepare youth for the labor market is enhanced by these two dimensions of education. On the other hand the standardization of input deteriorates the position of young school leavers in the labor market. Plausibly more autonomous schools can implement tailor-made policies to enhance their graduates' entry into employment. In a model that includes all these significant factors, we see that the effects of the dual system indicator and standardization of input persist. Differentiation is no longer associated to youth unemployment once the dual system and school autonomy are controlled for.

Importantly, and similar to the findings of Breen (2005) who used a smaller number of countries, there does not seem to be a relationship between the prevalence of vocational enrolment and youth unemployment. Thus, only the dual system, not just any form of vocational education, enhances the integration of youngsters into employment. We confirm hypothesis 1b, while with this dependent variable we do not find evidence for hypothesis 1a.

[Table 3 about here]

In table 3 the results of the regression with average length of school-to-work transition as dependent variable is shown. Both indicators of vocational orientation have a negative effect on the average time it takes to find a job. When an educational system is more vocationally oriented the time it takes to find a job is lower. While in a full model both effects disappear, this might be due to the low number of observations. By using this dependent variable we partially confirm the idea that more vocationally oriented have a positive effect on labor market allocation. With the average length of school-to-work transition as indicator of the allocation task both hypothesis 1a and 1b are partially confirmed.

Efficient learning

The second task of education is to sort students efficiently, in order to enhance their achievement. There are several ideas on how educational systems influence the performance of students. Selection is said to increase performance as the best students learn faster if they are not slowed down by less talented peers, and weaker students can get more tailor-made education if they are placed in homogeneous groups – that is at least the common argument in favor of an externally differentiated educational system. On the other hand the equality of opportunities is lower in these kinds of systems. Table 4 shows the outcomes of the regression analysis.

[Table 4 about here]

With respect to standardization, we only find effects of standardization of input. When schools are more standardized, the average performance is lower. This is in line with our hypothesis 2b, where we argue that a high level of standardization of input decreases room for competition between schools. Our results confirm the findings by Woessmann (2003), although in the full model the effects disappear. Contrary to earlier findings we do not find support for hypothesis 2a, which assumed a positive effect of standardization of output on average performance. There could be different reasons why we do not fully confirm the results of earlier results with our data. One of the reasons is that the average score is equal across countries while the variation is much higher. This is something that has yet to be researched. The results also refute our hypothesis 4 which argues that more external differentiation leads to better

performances. An unexpected significant effect is found in educational systems where vocational enrolment is higher. This effect however disappears in later models where more variables are added. In short, there is very little evidence that any of the institutional variables that we present is related to efficiency of learning.

Equality of educational opportunity

The third task of education is to promote the equality of opportunity between social classes. In table 5 the regression results of educational dimensions on the difference between science performances of higher and lower class children are shown.

[Table 5 about here]

The results clearly show that external differentiation has a stable negative effect on equality of opportunity. The difference in performance between students from a higher social class and students from a lower social class increases as educational systems get more differentiated and stratified. This effect is strong and robust; in the multivariate model with all independent variables the effect remains significant. Our hypothesis 3 is hereby confirmed: more differentiation leads to less socioeconomic equality. We found no evidence for a trade off between equality of opportunity and performance: while less external differentiation leads to more equality, it does not lead to lower average performance.

Civic engagement

The final function of education is to prepare students for active civic engagement. We hypothesized that especially differentiated educational systems may be harmful to this function.

[Table 6 about here]

As expected we find a negative effect of external differentiation on the average participation in voluntary associations (model 1). This means that the more differentiated an educational system is, the less likely people are to be active citizens. For each one point increase on the differentiation scale the participation in voluntary organizations drop by almost five percent. This effect remains when we control for

other indicators in the final model. For all other education variables no effects were found. We therefore conclude that external differentiation acts in the way that we expected it to act: the more an educational system is externally differentiated, the less active citizens it produces. Our final hypothesis 5 is accepted.

Conclusion

For this paper we set two goals: (1) conceptualize the different dimensions of an educational system and (2) see how these dimensions are related to four central tasks of education. We argued that there are three dimensions that one can distinguish in educational systems: the extent to which they are externally differentiated, the vocational orientation and the level of standardization. These three dimensions turned out to be distinguishable with different sources of macro-data which led to five institutional variables that are useable in future research. The five variables are created for a large number of countries. We furthermore showed that dimensions of educational systems are related to four central tasks of education. Not all tasks are performed equally well by each educational system. This for example means that school leavers in educational systems with a strong vocational orientation on average will be allocated to the labor market sooner, and that in more externally differentiated educational systems the educational opportunities of lower class children are lower. We furthermore found a negative effect of the standardization of input on the performance of students. More autonomous schools seem to enhance the performance of students. Our final results showed that the level of differentiation within an educational system influences the civic behavior of citizens: in countries with a differentiated educational system the participation in voluntary associations is lower than in countries where educational programmes are not stratified. These results should, however, be interpreted with caution: no micro mechanisms were empirically tested and the regression results were mainly used as a way of validation of our indicators. They do however show the importance of several dimensions of educational systems. It is therefore as important to measure educational systems correctly and with more universal and replicable measures. Only then the studies of the importance of educational systems on differing outcomes can be compared.

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Table 1: Summary of Hypothesized Relationships between Educational Institutions and Four Central Tasks of Education.

		Central Tasks of Education			
		<u>Labor market allocation</u>	<u>Efficient sorting</u>	<u>Equality of opportunity</u>	<u>Civic participation</u>
Educational Institutions	<u>External Differentiation</u>		Hypothesis 4: +	Hypothesis 3:–	Hypothesis 5: –
	<u>Vocational orientation</u>	<i>Vocational enrolment</i>	Hypothesis 1a: +		
		<i>Vocational specificity</i>	Hypothesis 1b: +		
	<u>Standardization</u>	<i>Standardization of input</i>		Hypothesis 2b:–	
		<i>Standardization of output</i>		Hypothesis 2a: +	

-
- + : Evidence points to the task benefiting from strengthening this institutional variable.
 - : Evidence points to the task being impeded by strengthening this institutional variable.
 - +/- : Mixed or weak evidence regarding the relationship between institution and task.
 - ? : Under-investigated relationships between institution and task.

Table 2: Effects of educational indicators on the ratio youth/adult unemployment

	(1)	(2)	(3)	(4)	(5)	(6)
Expenditure per secondary education student (%GDP per capita)	-0.00313 [0.0173]	-0.0237 [0.0255]	0.00459 [0.0161]	-0.0301 [0.0274]	-0.0197 [0.0268]	0.00561 [0.0264]
Employment protection legislation	0.365** [0.174]	0.429 [0.271]	0.154 [0.156]	0.289 [0.333]	0.337 [0.252]	-0.181 [0.272]
External differentiation	-0.319** [0.127]					-0.155 [0.153]
Vocational enrolment		-0.191 [0.200]				0.252 [0.223]
Vocational specificity (dual system participation)			-0.0197*** [0.00611]			-0.0173* [0.00824]
Standardization of input				0.0536 [0.223]		0.279** [0.124]
Standardization of output (central examinations)					0.418 [0.378]	
Constant	1.903*** [0.601]	2.411** [0.920]	2.452*** [0.563]	2.776*** [0.976]	2.177** [0.975]	2.986** [1.126]
Observations	27	30	29	26	30	18
R-squared	0.247	0.140	0.306	0.099	0.135	0.607

Standard errors in brackets

*** p<0.01, ** p<0.05, * p<0.1

We tested the robustness of the results for a constant sample of only the countries for which all data is available and found the same results.

Table 3: Effects of educational indicators on the average transition time between school and work

	(1)	(2)	(3)	(4)	(5)	(6)
Expenditure per secondary education student (%GDP per capita)	-0.00231 [0.0463]	-0.00650 [0.0354]	-0.0269 [0.0376]	-0.00456 [0.0429]	-0.00190 [0.0387]	0.00782 [0.0872]
Employment protection legislation	0.440 [0.436]	0.221 [0.372]	-0.0207 [0.392]	0.321 [0.597]	0.214 [0.410]	0.550 [1.036]
External differentiation	-0.278 [0.269]					0.00739 [0.445]
Vocational enrolment		-0.468* [0.255]				-0.319 [0.676]
Vocational specificity (dual system participation)			-0.0263** [0.0123]			-0.0173 [0.0258]
Standardization of input				0.180 [0.280]		0.154 [0.370]
Standardization of output (central examinations)					0.00843 [0.472]	0.120 [0.870]
Constant	1.051 [1.670]	1.887 [1.363]	3.163* [1.552]	1.394 [1.749]	1.526 [1.520]	0.987 [4.143]
Observations	19	21	20	17	21	14
R-squared	0.104	0.179	0.232	0.063	0.016	0.377

Standard errors in brackets

*** p<0.01, ** p<0.05, * p<0.1

We tested the robustness of the results for a constant sample of only the countries for which all data is available and found the same results.

Table 4: Effects of educational indicators on average performance in science

	(1)	(2)	(3)	(4)	(5)	(6)
Expenditure per secondary education student (%GDP per capita)	1.641* [0.935]	2.455*** [0.784]	3.043*** [0.894]	2.232** [0.939]	1.904* [0.978]	1.693 [1.549]
External differentiation	-1.287 [6.092]					2.799 [9.912]
Vocational enrolment		15.70** [6.140]				5.050 [11.35]
Vocational specificity (dual system participation)			0.552 [0.385]			-0.0537 [0.471]
Standardization of input				-14.75** [7.118]		-6.802 [7.961]
Standardization of output (central examinations)					-4.994 [15.06]	13.97 [15.58]
Constant	459.8*** [23.73]	425.7*** [18.57]	411.0*** [21.17]	435.7*** [22.55]	451.9*** [28.06]	450.7*** [44.11]
Observations	28	36	33	32	37	19
R-squared	0.124	0.376	0.344	0.264	0.115	0.264

Standard errors in brackets

*** p<0.01, ** p<0.05, * p<0.1

We tested the robustness of the results for a constant sample of only the countries for which all data is available and found differing results. Holding the number of observations constant, we find no effects for standardization of input or vocational orientation.

Table 5: Effects of educational indicators on difference in science performance between higher and lower class students

	(1)	(2)	(3)	(4)	(5)	(6)
Expenditure per secondary education student (%GDP per capita)	0.0195 [0.487]	-0.149 [0.481]	0.213 [0.532]	0.0397 [0.527]	-0.441 [0.462]	0.0660 [0.544]
External differentiation	6.831** [3.176]					7.771** [3.582]
Vocational enrolment		5.445 [3.763]				-0.725 [3.830]
Vocational specificity (dual system participation)			2.774 [4.037]			
Standardization of input				-11.08 [8.120]		
Standardization of output (central examinations)					0.273 [0.199]	
Constant	90.68*** [12.37]	93.99*** [11.38]	86.44*** [12.79]	98.54*** [15.13]	99.84*** [10.95]	89.25*** [13.83]
Observations	28	36	32	37	33	26
R-squared	0.164	0.060	0.021	0.056	0.075	0.201

Standard errors in brackets

*** p<0.01, ** p<0.05, * p<0.1

We tested the robustness of the results for a constant sample of only the countries for which all data is available and found the same results. With a constant sample the effects of central examination were found to be positive and significant, resembling the findings of AUTHOR (2011b).

Table 6: Effects of educational indicators on participation in voluntary associations

	(1)	(2)	(3)	(4)	(5)	(6)
Expenditure per secondary education student (%GDP per capita)	0.00291 [0.00349]	0.00482* [0.00281]	0.00441 [0.00287]	0.00456 [0.00317]	0.00796** [0.00296]	0.00429 [0.00557]
External differentiation	-0.0445** [0.0211]					-0.0535* [0.0284]
Vocational enrolment		0.0164 [0.0194]				0.0144 [0.0325]
Vocational specificity (dual system participation)			-0.0155 [0.0254]			
Standardization of input				0.0356 [0.0429]		
Standardization of output (central examinations)					0.000714 [0.00111]	0.00185 [0.00145]
Constant	0.137 [0.0912]	0.0717 [0.0680]	0.0916 [0.0706]	0.0658 [0.0838]	0.00461 [0.0730]	0.0699 [0.146]
Observations	23	30	26	29	26	19
R-squared	0.235	0.152	0.117	0.097	0.265	0.388

Standard errors in brackets

*** p<0.01, ** p<0.05, * p<0.1

We tested the robustness of the results for a constant sample of only the countries for which all data is available and found the same results. In a constant sample all effects disappear. This is however mainly due to the fact that with in a constant sample only 12 observations are left.

Figure 1a: External differentiation and vocational enrollment

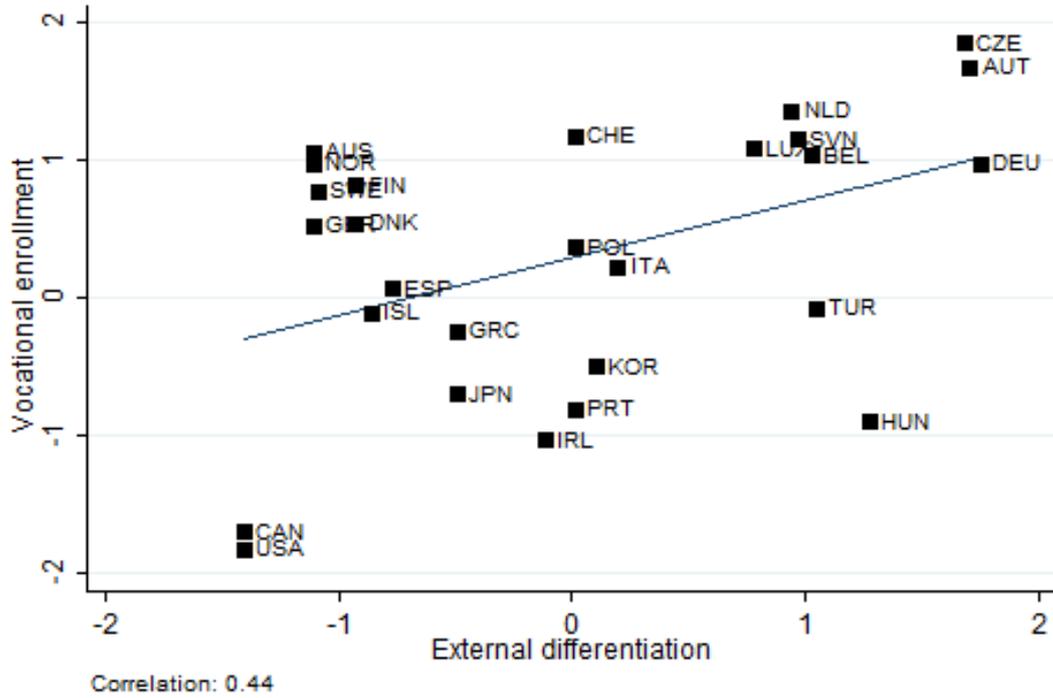


Figure 1b: External differentiation and vocational specificity

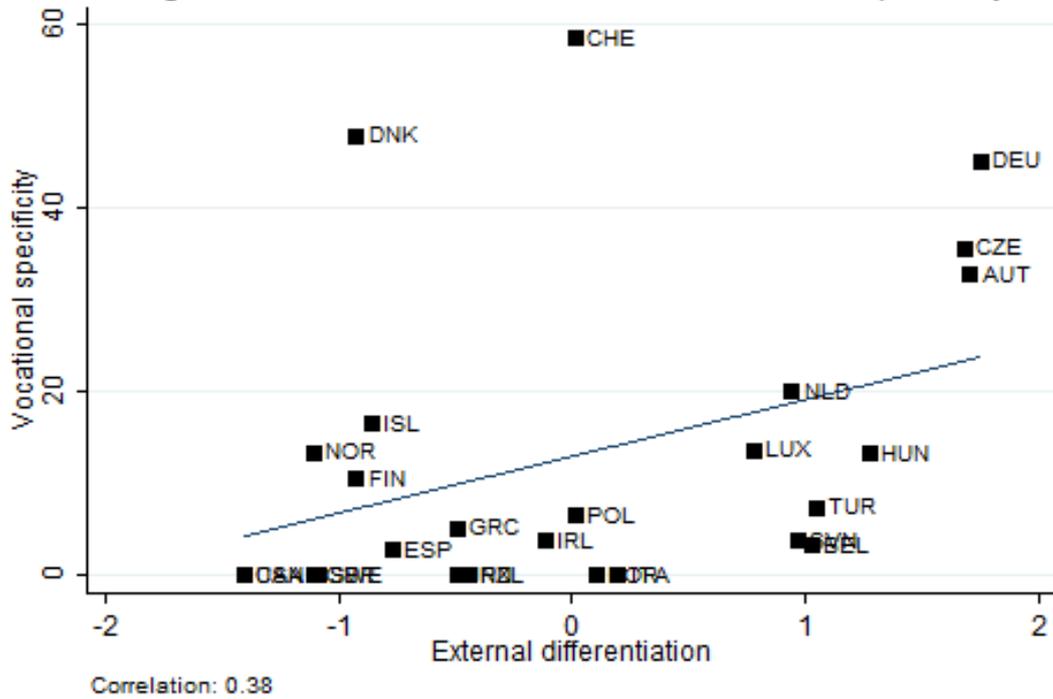


Figure 2: Vocational enrollment and vocational specificity

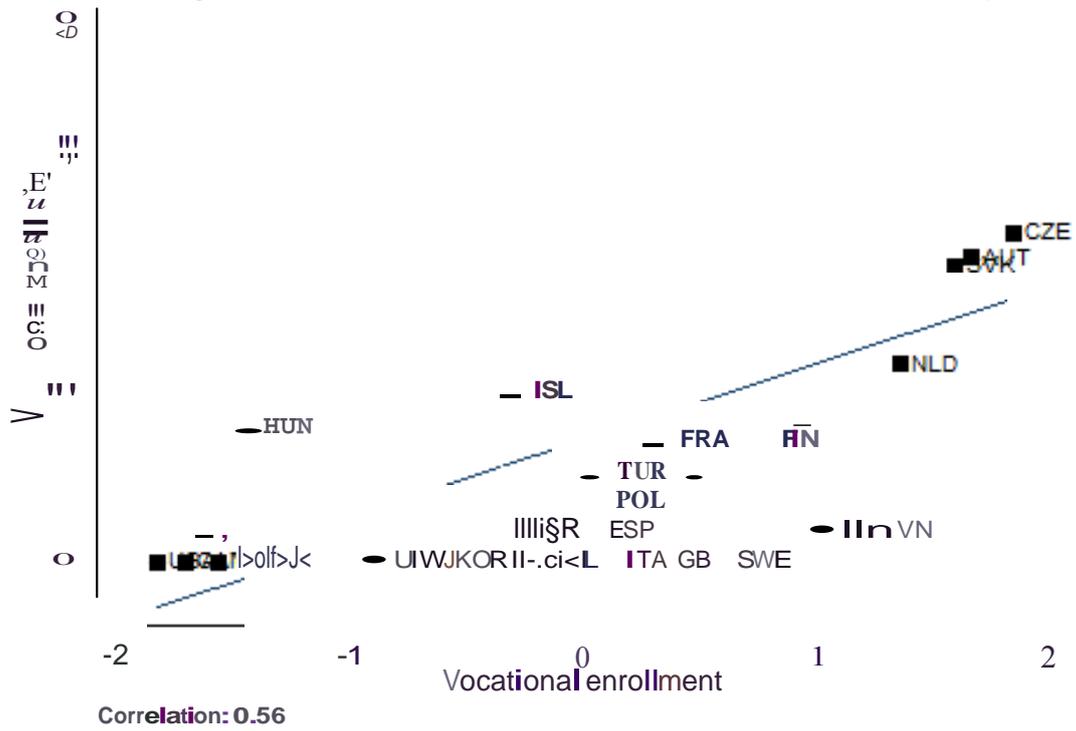


Figure 3a: Standardization of input and external differentiation

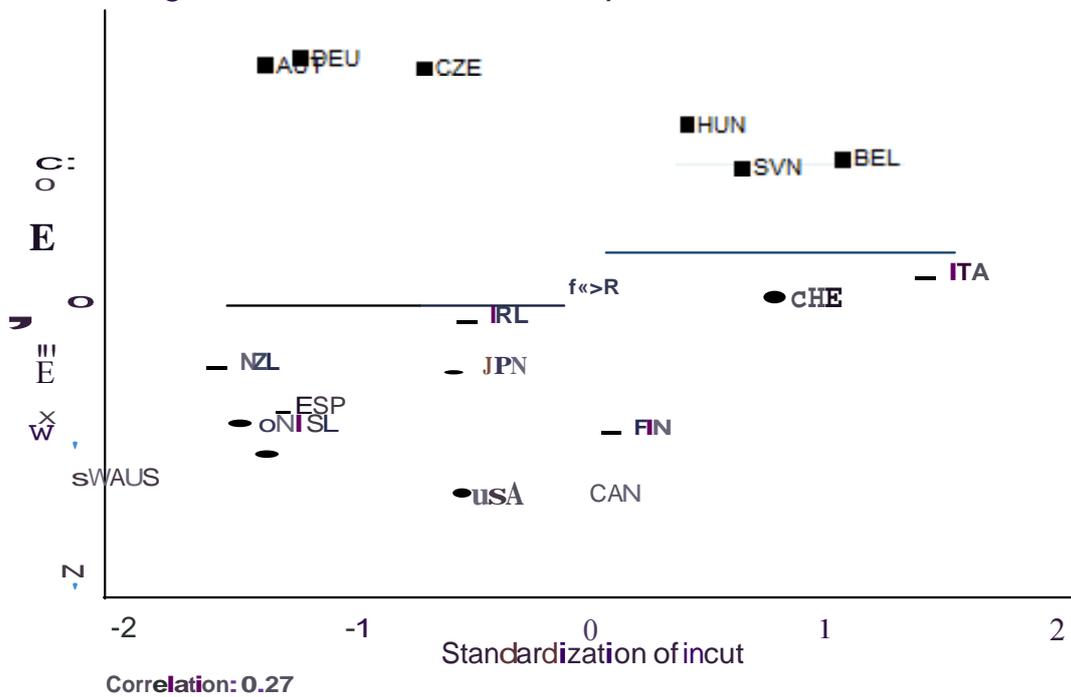


Figure 3b: Standardization of input and vocational enrollment

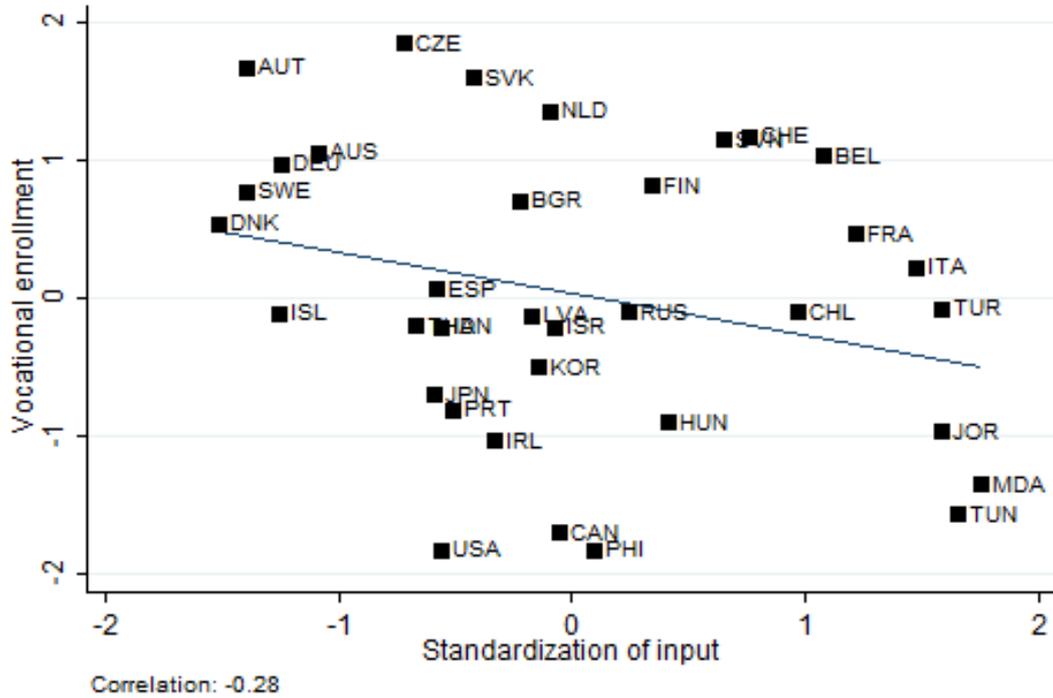
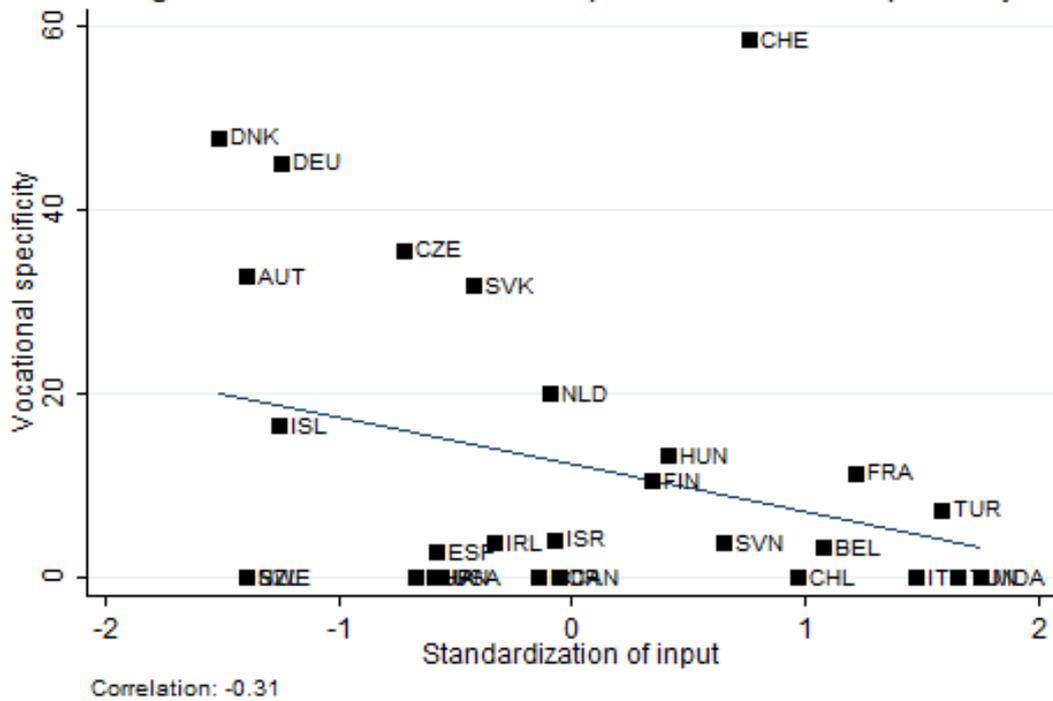


Figure 3c: Standardization of input and vocational specificity



Appendix A: Results from principal component analysis

	<i>Factor</i>			<i>Communalities</i>
	1	2	3	
Length of differentiated curriculum	0.920			0.87
Age of earliest selection into differentiated programmes	-0.933			0.87
Number of school type or distinct educational programmes available to 15-year-olds	0.877			0.77
% of upper sec. enrolled in vocational programmes (OECD)			0.975	0.95
% of upper sec. enrolled in vocational programmes (UNESCO)			.0.957	0.92
Determining supplies		0.701		0.55
Determine textbooks		0.907		0.83
Determine course content		0.857		0.78
Determine course offerings		0.740		0.59
<i>Eigenvalue</i>	3.43	2.67	1.03	

Extraction Method: Principal Component Analysis.

Rotation Method: Oblimin with Kaiser Normalization.

All empty cells indicate factor loadings between -0.5 and 0.5.

Appendix B: Tables with raw data.

These data become available when the article is published.

Appendix C: Summary of the indicators of educational systems*

These data become available when the article is published.

*All empty cells indicate missing values. For specific sources, see Appendix B.

Appendix D: Summary of dependent and control variables

Country	Youth unemployment ratio	Length of school-to-work transition	Aggregate score on science test	Difference in science score lower/higher class	Participation in voluntary organizations	% of GDP spent on secondary education	Employment Protection Legislation
Australia	2.6		527	88	0.28	14.64	1,38
Austria	1.7	1.2	511	97	0.25	26.92	2,41
Belgium	2.6	1.7	510	110	0.15	32.72	2,61
Brazil	2.9		390	91	0.07	18.02	2,27
Bulgaria	2.2		434	138	0.02	22.02	
Canada	2.1		534	68	0.35		1,02
Chile	3.4		438	116	0.11	12.40	1,93
Colombia						11.00	
Cyprus	2.8				0.07	23.51	
Czech Republic	2.6	2.9	513	99	0.13	23.06	2,32
Denmark	1.8	1.3	496	90	0.42	34.57	1,91
Estonia						23.87*	2,39
Finland	2.6	2.6	563	63	0.36	31.79	2,29
France	2.6	1.5	495	122	0.34	26.83	3
Germany	1.2	0.0	516	111	0.12	20.63	2,63
Greece	3.3	3.2	473	93		21.29	2,97
Hong Kong (China)	2.4		542	62		17.85*	
Hungary	2.5	3.9	504	108	0.04	23.21	2,11
Iceland	2.9	2.4	491	64		22.73	2,11
Indonesia	6.7		393	56		13.57*	3,02
Iran						18.60	
Ireland	2.2	1.3	508	88	0.27	22.50	1,39
Israel	2.4		454	99	0.21	20.19	1,88
Italy	3.7	3.0	475	76		28.45	2,58
Japan	2.1		531	69	0.07	22.37	1,73
Jordan						16.53	
Korea (Rep.)	.		522	64	0.29	22.16	2,13
Latvia	2.0		490	68	0.10	19.31	
Liechtenstein	.		522	117		16.78	
Lithuania						20.32	
Luxembourg	3.2	1.1	486	119		20.02	3,39
Macedonia							

Malaysia						14.29	
Malta						31.07*	
Mexico	3.0		410	87	0.08	13.73	3,23
Moldova						39.32*	
Morocco						38.74*	
Netherlands	2.3	1.0	525	100	0.25	24.91	2,23
New Zealand	3.0		530	109	0.30	20.52	1,16
Norway	4.1		487	69	0.38	26.02	2,65
Philippines	3.1		.	.	0.16	9.09*	
Poland	2.6	2.0	498	86	0.05	23.09	2,41
Portugal	2.8	2.7	474	93	0.09	33.93	3,05
Romania						16.65*	
Russian Federation	2.4		479	69	0.03		1,8
Singapore						12.87*	
Slovakia	2.4	2.7	488	103	0.14	14.84	2,13
Slovenia	3.2		519	106	0.21	24.86*	2,76
South Africa						16.68	1,35
Spain	2.3	2.7	488	87	0.14	23.88	3,11
Sweden	3.0	2.0	503	77	0.24	41.13	2,06
Switzerland	2.3	0.7	512	105	0.24	26.26	1,77
Taiwan			532	84	0.18		
Thailand			421	73		7.63*	
Tunisia			386	64		24.19*	
Turkey	2.4		424	84		10.95	3,46
United Kingdom	2.8	1.8	515	103	0.17	27.03	1,09
United States	2.6		489	117	0.26	24.19	0,85
Uruguay			428	103	0.10	10.52	
Mean	2.72	1.99	486.95	90.95	0.18	21.90	2.23
Standard deviation	0.84	0.96	43.59	20.02	0.11	7.62	0.68
Source	OECD Statbank, year 2007	OECD 2008b: 72	OECD 2007b; 27:	OECD 2007b: 158	ISSP 2004	World Bank data, year 2006**	OECD Statbank, year 2008**

For these countries data was not available for 2006. Instead we took the year closest to 2006. For most countries were data was not available for 2006 we took the 2007 data, other countries that missed information for 2006 were given data ranging from 2004 to 2008.

All online databanks were accessed May 19, 2011.

