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Regulating Publicly Funded Private Schools: A Literature Review on Equity and Effectiveness

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REGULATING PUBLICLY FUNDED PRIVATE SCHOOLS: A REVIEW OF THE LITERATURE ON EQUITY AND EFFECTIVENESS

by Luka Boeskens

OECD Education Working Paper No. 147

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The purpose of the OECD School Resources Review is to analyse how resource inputs in school systems should best be distributed, utilised and managed to optimise school outputs, encourage successful teaching and learning and promote continuous improvement. The Review provides analysis and policy advice to help governments and schools achieve effectiveness and efficiency objectives in education. More information is available at: www.oecd.org/edu/school/schoolresourcesreview.htm.

This working paper has been authorised by Andreas Schleicher, Director of the Directorate for Education and Skills, OECD.

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REGULATING PUBLICLY FUNDED PRIVATE SCHOOLS: A REVIEW OF THE LITERATURE ON EQUITY AND EFFECTIVENESS

ABSTRACT

As school choice is an increasingly common feature of OECD education systems, the regulation of publicly funded private schools has become a salient concern for researchers and policy makers alike. Focussing on three areas of regulation – selective admission, add-on tuition fees and for-profit ownership – this paper provides a review of the theoretical and empirical literature concerning their effects on equity and educational effectiveness. It also offers an overview of different countries' approaches to the funding of private education and the methodological challenges involved in their empirical evaluation. The available evidence confirms that the funding of private schools has yielded widely different results across educational systems and suggests that regulatory frameworks are an important factor shaping these outcomes. Selective admission and substantial add-on tuition fees in particular are likely to exacerbate social segregation and can undermine schools' incentives to compete on the basis of educational quality. The evidence on subsidised for-profit schools is equally divergent across countries but evidence points to the importance of rigorous accreditation processes and clear conditions concerning selectivity and fees to guide allocation of public funds. Although important questions are yet to be conclusively addressed, including the interaction of different regulatory devices and their effect on specific student groups, the existing literature suggests that private school regulation can make an important contribution to the equity and effectiveness of school choice programmes.

RÉSUMÉ

À mesure que le choix scolaire est une caractéristique des systèmes éducatifs de l'OCDE de plus en plus commune, la réglementation des écoles privées subventionnées par l'État est devenue une préoccupation saillante pour les chercheurs et les décideurs. En se concentrant sur trois domaines de la réglementation – l'admission sélective, les frais de scolarité et les établissements à but lucratif – ce rapport présente une revue de la littérature théorique et empirique concernant leurs effets sur l'équité et l'efficacité pédagogique. Il énumère également des approches différentes au financement des écoles privées et les défis méthodologiques impliqués dans leur évaluation empirique. Les données disponibles confirment que le financement de l'enseignement privé a donné des résultats très différents à travers les systèmes éducatifs et suggère que les cadres réglementaires sont un principal facteur affectant ces résultats. L'admission sélective et les frais de scolarité substantiels en particulier sont susceptibles d'aggraver la ségrégation sociale et de réduire les incitations des écoles de concourir sur la base de leur qualité éducative. Les données sur les écoles subventionnées à but lucratif sont également divergentes à travers des pays, mais ils soulignent l'importance d'un processus d'accréditation rigoureux et des conditions réglementaires en ce qui concerne leur qualité et sélectivité. Bien que des questions importantes doivent encore être abordées définitivement, la littérature existante suggère que la réglementation des écoles privées peut constituer une contribution importante à l'équité et l'efficacité des programmes de choix scolaire.

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1. INTRODUCTION

1.1 Publicly funded private schools and the design of school choice programmes

Publicly funded private schools have become a prominent feature of many education systems across the OECD. More than two-thirds of OECD member countries have undertaken steps to increase parental school choice over the past 25 years (Musset, 2012) and by 2012, 13 OECD countries had a publicly funded private sector enrolling more than 10% of their 15-year-old students (OECD, 2013a, Table IV.4.7).

Proponents of school choice consider the public funding of private education to be an effective way of expanding parental choice and enabling students to attend high-quality schools regardless of their financial means. Furthermore, publicly funding private schools has been suggested to stimulate inter-school competition and offer incentives for public and private schools alike to innovate, increase their quality, and become more efficient. Critics, on the other hand, have argued that school choice induces high-achieving and economically well-off students to leave the public sector, thereby exacerbating the stratification of students with respect to their socio-economic background and ability. As a consequence, funding private education might deplete the public sector of vital resources, leaving the schools unable to maintain an adequate educational quality.

Reviews of the empirical literature on publicly funded private provision across different countries have usually found school choice to have small or insignificant mean effects on the achievement of students who make use of it (see Musset, 2012; Epple, Romano and Urquiola, 2015; Andersen, 2008). Evidence on the systemic effect of school choice on public school performance has been more favourable at times, but failed to establish a persistent relationship between competition and performance across different contexts (Sandström and Bergström, 2005; Rouse and Barrow, 2009; Dijkgraaf et al., 2012; Böhlmark and Lindahl, 2015). At the same time, both the theoretical and empirical literature has consistently stressed that the design of school choice programmes is critical for their success in generating effective competition while ensuring that all students can benefit from them regardless of their socio-economic situation (Epple, Romano and Urquiola, 2015: 40).

A central question that has emerged in this debate is whether or not publicly funded private schools should be allowed to practice selective admission, charge add-on tuition fees, or operate for profit. Although the theoretical literature has generated strong hypotheses regarding all three aspects of school choice design, the empirical evidence on the subject has remained fragmented and largely confined to the study of funding schemes within a single country. By reviewing the empirical evidence on the subject from a cross-national perspective, this paper aims to show how the regulation of selective admission, tuition fees and for-profit ownership affects the success of school choice programmes.

Section 2 of this review provides background information on the role of government-dependent private schools in OECD countries and the different mechanisms countries use to fund them. Drawing on theoretical and computational literature, Section 3 reviews the arguments surrounding school choice programmes and their hypothesised effects on student achievement in private and public schools, the aggregate performance of the school system, and student segregation. As this review will show, even the theoretical expectations regarding the effect of school choice are heavily dependent on the types of private schools that are eligible for public support.

Section 4 highlights some of the methodological challenges in the study of school choice and describes different techniques to address them. Sections 5 to 7 provide a review of the theoretical and computational research, individual countries' policies, and the empirical evidence across three potential areas of private school regulation: selective admission, add-on tuition fees and for-profit ownership. Each of the three sections concludes with a summary of the empirical literature's main findings, open questions and issues that merit the attention of future research.

The empirical literature reviewed for this paper primarily draws on evidence from school choice programmes in OECD countries, particularly Chile and the United States, as well as Australia, Denmark and Sweden. The review focuses on studies published in English.

1.2. Definitions

1.2.1 Private schools

In keeping with the OECD's definition, this review distinguishes between private and public schools on the basis of their management control, as opposed to the source of their funding or the ownership over their buildings and site. Consistent with the UNESCO/OECD/EUROSTAT (UOE) data collection on educational statistics,[1] the OECD classifies an educational institution as private if it is "controlled and managed by a non-governmental organisation (e.g. a church, a trade union or a business enterprise, foreign or international agency), or its governing board consists mostly of members not selected by a public agency" (UOE, 2015: 24). The decisive factor in determining the status of schools is therefore the actor who has "overall control" over the school, which is defined as "the power to determine the general policies and activities of the institution and to appoint the officers managing the school." This control usually extends to the decision of opening or closing an institution (OECD, 2004: 58).

Classifying public and private schools across countries is complicated by the varying extent of public and private involvement in the management of schools. In some countries, the hiring practices, curricula, examinations and admission of privately managed schools are regulated to nearly the same extent as those of public schools. In other countries, public schools have extensive educational and fiscal autonomy, vested in school governing boards with private members. Nevertheless, for the purpose of this review, these schools will be classified as privately and publicly managed respectively.

The US Department of Education's National Center for Education Statistics employs a different definition of private schools based on their primary source of funding. A private school is thus defined as "a school that is not supported primarily by public funds" (Broughman and Swaim, 2013, Appendix A). Data on private schools in the United States drawn from the questionnaire of the 2009 Programme for International Student Assessment (PISA) therefore does not reflect their management model, but refer to privately funded schools (OECD, 2012a: 23).

This is particularly significant considering the growing number of charter schools, which were permitted to operate in 41 US states and the District of Columbia by August 2015 (Epple, Romano and Zimmer, 2015: 2). Charter schools are primarily funded with public resources and subject to oversight by state-designated charter school authorisers but may be privately managed (Epple, Romano and Urquiola, 2015: 2). In line with US state requirements, charter schools are considered as public schools by the

[1] The UOE data collection is jointly administered by the United Nations Educational, Scientific and Cultural Organisation Institute for Statistics (UNESCO-UIS), the Organisation for Economic Co-operation and Development (OECD), and the Statistical Office of the European Union (EUROSTAT).

OECD, although they can be managed by private institutions and operate under similar restrictions to admission and tuition fees as private schools under voucher programmes[2] elsewhere (ibid.).

In order to make use of OECD's comparative international data and remain consistent with previous reports on private education as well as the majority of existing scientific literature, the UOE classification will be used throughout this review. Although charter schools will therefore be considered as public schools, the paper will draw on selected studies of charter schools given the important characteristics they share with publicly funded private schools elsewhere.

1.2.2 Publicly funded private schools

Since – according to the management-based definition – the status of private schools is conceptually independent of their funding,[3] they can receive financial resources from both private and public sources. The UOE therefore further distinguishes between government-independent and government-dependent private schools. *Government-independent private schools* are those that receive less than half of their core funding from government agencies and whose teaching personnel are not paid by a government agency, while *government-dependent private schools* are the ones that either receive 50% or more of their core funding from government agencies *or* whose teaching personnel is funded by a government agency (OECD, 2004: 59). In this context, core funding refers to "the funds that support the basic or core educational services of the institutions", excluding the funding of research projects, services purchased or contracted by private organisations, and any fees or subsidies received for ancillary services (e.g. meals or lodging in boarding schools). Tuition fees that are paid by students fall under the scope of public funding as long as they are financed by conditional government vouchers or loans (OECD, 2004: 59).

[2] School vouchers are "certificates issued by the government with which parents can pay for the education of their children at a school of their choice" (OECD, 2012a: 34). They are one of the most common mechanisms for the public funding of private providers and school choice in general.

[3] Leaving aside the aforementioned exception of schools in the United States.

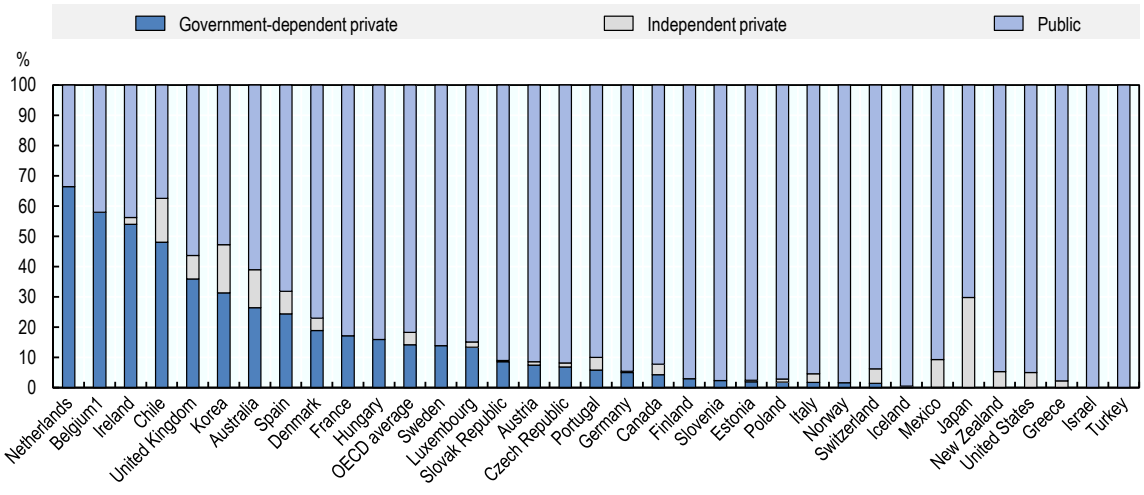
2. APPROACHES TO FUNDING PRIVATE SCHOOLS IN OECD COUNTRIES

2.1 The extent of public funding for private education

2.1.1 Size of the government-dependent private sector

On average across OECD countries in 2012, 14.2% of 15-year-old students attended government-dependent private schools, 81.7% attended public schools and 4.1% attended independent private schools (see Figure 1). The publicly funded private sector comprises more than 10% of the student population of 13 OECD countries (the Netherlands, Belgium, Ireland, Chile, the United Kingdom, Korea, Australia, Spain, Denmark, France, Hungary, Sweden and Luxembourg). Notably, in the Netherlands, Belgium, Ireland and Chile, more students are enrolled in government-dependent private schools than in public schools (OECD, 2013a, Table IV.4.7).

Figure 1. Percentage of students at age 15, by type of institution, 2012



Note: 1. Excluding independent private schools.

Countries are ranked in descending order of the percentage of students enrolled in government-dependent private education.

Source: OECD (2013a), *PISA 2012 Results: What Makes a School Successful? (Volume IV): Resources, Policies and Practices*, http://dx.doi.org/10.1787/9789264201156-en.

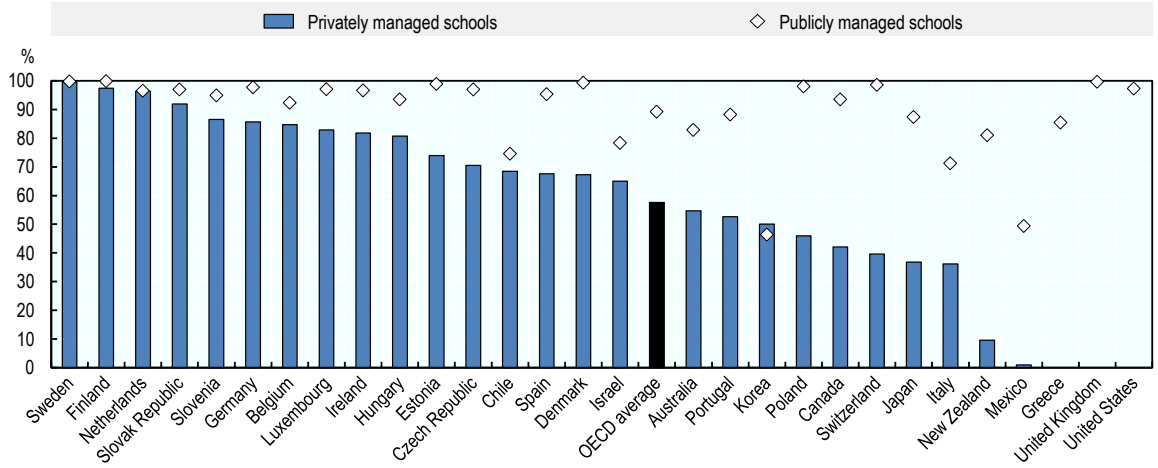
Between 2003 and 2012, several OECD countries saw an increase in government-dependent private school enrolment. Most notably, Sweden experienced a ten percentage point drop in the share of 15-year-old public school students and a corresponding increase in the share of students attending government-dependent private schools. In Poland, government-dependent private schools quadrupled their share of students between 2003 and 2012, increasing their market share from 0.4% to 1.9% with a corresponding decrease in public school enrolment. In the OECD partner country Indonesia, the independent private school sector shrunk at the expense of a 13 percentage point increase in the student share of government-dependent private schools. Government-dependent private schools in Hungary made

gains of six percentage points at the expense of both public and independent private schools. By contrast, Finland, the Slovak Republic and Spain saw a four percentage point drop in the proportion of students attending government-dependent private schools, while the enrolment in public schools increased by the same magnitude (OECD, 2014: 408, Tables C7.2, C7.3).

2.1.2 Level of public funding for privately managed schools

Given the cross-country variation in the relative size of the government-dependent and government-independent private school sectors, there are also pronounced differences in the amount of public funding received by the average private school. Across OECD countries, the principals of privately managed schools (including government-independent private schools) reported to receive on average 57.6% of their total school funding from government sources, including departments, local, regional state and national authorities, compared to 89.2% among publicly managed schools (see Figure 2). In 10 out of 29 OECD countries, privately managed schools receive on average more than 80% of their funding from the government and an additional 8 member states receive more than 50% from public sources. Countries with very high levels of public funding among privately managed schools include Sweden (99.6%), Finland (97.4%), the Netherlands (96.4%) and the Slovak Republic (91.9%) as well as the partner economy Hong Kong, China (91.3%). By contrast, countries in which private schools receive low levels of public funding include New Zealand (9.6%), Greece, Mexico, the United Kingdom and the United States (all below 1.0%) as well as partner countries and economies such as Colombia (20.4%); Chinese Taipei (8.8%); Kazakhstan (3.6%); and Shanghai, China (3.4%) (OECD, 2012a, Table B1.4: 83).

Figure 2. Proportion of school funding from government sources, by type of institution, 2009



Note: Countries are ranked in descending order of the percentage of private school funding from government sources.

Source: OECD (2012a), *Public and Private Schools: How Management and Funding Relate to their Socio-economic Profile*, http://dx.doi.org/10.1787/9789264175006-en.

2.1.3 Level of public funding per student

The amount of public funding private schools receive has important implications for the financial incentives informing their behaviour. In order to provide schools with financial incentives to attract more students by improving their quality, the amount of public contributions must depend on the number of enrolled students (Goldhaber, 2009: 313). Many countries condition the funding for government-dependent private schools on the number of students they serve as well as the average or estimated cost of educating a

student in public schools. In other countries, government-dependent private schools receive considerably less funding than their public counterparts and are sometimes allowed to charge parents tuition fees in order to make up for this discrepancy.

In order to induce school competition, Goldhaber (2009) argues, the contributions private schools receive per student must be greater or equal to the marginal cost of educating a student so as to not make the school benefit financially from reducing its student number. At the same time, if vouchers exceed the variable cost of education, "loosing students will leave public schools with diminished financial capacity to educate the students who remain" and potentially unable to implement the changes necessary to improve their teaching quality (Goldhaber, 2009: 313).

In the United States, many regional voucher programmes provide private schools with grants that are considerably below the average spending per student and therefore "far less than would provide financial incentives of any consequence to schools that are losing students" (Goldhaber: 2009: 316). These voucher programmes therefore do not provide ideal conditions to test the effect of vouchers on marked-based competition.

2.2 The governance and distribution of funding for private education

There is considerable variation in the governance of school funding both across and within OECD countries. Financial resources for schools can be levied at different administrative levels and stem from tax revenues, foregone revenues (e.g. in the form of tax reductions), or private contributions. Public funding can be allocated to individual schools based on funding formulas, targeted programmes, historic funding mechanisms, or the exercise of administrative discretion (see Fazekas, 2012). The funding can be used to cover selected components of the school budget, such as operating expenditure, maintenance cost, or capital investments.

In most systems, schools receive their funding through a combination of these pathways and many countries use different mechanisms to distribute resources among public schools and government-dependent private schools. In countries where private schools receive less public funding than is needed to fund their teaching activities, they might – subject to the countries' legal regulations – supplement their resources by charging tuition fees, receiving donations and voluntary parents' contributions, or with the financial support of denominational providers.

Mechanisms for the public financing of private education can be classified as either demand-side or supply-side oriented. Both supply-side and demand-side subsidies can be a means to expand parental choice and to introduce market-based competition between schools by tying the amount of funding they receive (either directly or via parents) to the number of students each school can attract.

- **Supply-side subsidies** are directly provided to the operators of private schools. Examples for supply-side subsidies include tax reductions or exemptions for private school operators as well as public grants for operating and personnel expenses or capital investments.

- **Demand-side subsidies** are provided to households taking advantage of private education. Examples for demand-side subsidies include universal and targeted vouchers as well as tax credits or tax deductions used to reimburse families for their expenditure on private education.

Funding mechanisms for private schools can be further distinguished based on the scale at which they operate and whether they are universal or targeted. The scale and universality of school choice programmes has important consequences for their expected impact on individual student groups as well as their system level effects which will be elaborated in Section 3.

- **Local and national programmes**: Some funding mechanisms are geographically restricted, limiting the schools and students who are eligible for public subsidies to those in a given city, municipality or state. In other cases, school choice schemes have been implemented countrywide.

- **Universal and targeted subsidies**: Funding schemes also differ with respect to the criteria they use to define students' and schools' eligibility for public subsidies. Some funding arrangements restrict or vary the amount of public funding based on student characteristics (e.g. their socio-economic status) or allocate public subsidies conditional on schools characteristics (e.g. vouchers might be restricted to students in underperforming schools). Open enrolment and universal voucher programmes, on the other hand, place minimal or no restrictions on the children and schools eligible for public support.

The empirical evaluation of small and large scale financing programmes are each associated with specific advantages and drawbacks, which need to be considered when drawing on evidence from either of the two: "Small scale experiments are appealing in providing strong statistical identification, but do not always isolate mechanisms (e.g. peer effects, differences in expenditure per student) and leave open the issue of scalability. Large scale programmes provide scope for assessment of the effects of vouchers in practice, but identification is a greater challenge due to potential selection effects and associated differential peer effects (and, sometimes, to potential confounding effects of contemporaneous policy changes)" (Epple, Romano and Urquiola, 2015: 56).

2.2.1 Vouchers and tuition tax credits in OECD countries

Vouchers are a commonly used instrument to finance private education at all school levels. As of 2009, 9 out of 22 OECD countries with available data reported to facilitate the attendance of government-dependent private primary schools with vouchers. In five of these, the voucher programme was restricted to students with lower socio-economic background. At the lower secondary level, 11 out of 24 countries reported to operate voucher schemes, 7 of which targeted disadvantaged students. At the upper secondary level, 5 of 11 voucher programmes were means tested. Of the surveyed OECD countries, 7 reported to provide vouchers all the way from primary through to upper secondary education (OECD, 2011, Table D5.14).

Tuition tax credits, which allow parents to deduct expenses on private school tuition from their tax liabilities, are used less frequently than vouchers. As of 2009, only 3 out of 26 OECD countries with available data reported to use tax credits to facilitate the attendance of government-dependent private schools (OECD, 2011, Table D5.16). The advantages and drawbacks of different tax reduction programmes are discussed below.

2.2.2 Tax reduction programmes and equity

In general, tax reduction programmes allow parents to reduce their taxes to make up for expenses on private school tuition. This provides governments with an instrument to finance private education through forgone revenue by incentivising parents to send their children to private schools and pay tuition when they would not have otherwise chosen or been able to do so (OECD, 2012a: 34). A distinction can be made between programmes based on tax credits, which directly reduce the claimant's tax liability by a specified amount, and those based on tax deductions, which indirectly reduce the tax burden by decreasing the amount of taxable income.

The effect of tax deductions and tax credits varies according to the claimants' level of income, which has important implications for the equitability of funding programmes. Since tax credits directly reduce the claimants' payable tax by a specified amount, they benefit everyone to the same extent as long as their tax

liability is at least the size of the credit. Tax deductions, on the other hand, reduce the claimants' taxable income, which means that the actual savings are a function of their marginal income tax rate. Since – under progressive taxation regimes – the marginal tax rate increases with income, deductions will benefit high-income taxpayers more than those with lower incomes.

In their study of tax deduction and tax credit programmes in Minnesota, Darling-Hammond et al. (1985) find that tax deductions disproportionately benefited parents with higher incomes and educational levels while contributing little to widening private school access: "Rather than expanding choice for those parents at the margin, the deduction appears to subsidise the choices of those who have already selected private schools" (Darling-Hammond et al., 1985: 51). Based on a parent survey, they argue that the educational choices of low-income families were more likely to be affected by policies such as transportation subsidies, which are less complex and address the immediate cost of private school attendance (Darling-Hammond et al., 1985). Reviewing more recent empirical evidence on the effects of tax credit and tax deduction programmes, Huerta and d'Entremont confirm that "tax deduction programs disproportionately benefit wealthier families" whereas Minnesota's tax credit programme was more equitable, benefiting particularly low-income families, although it came with a higher per-participant cost and a relatively modest take-up (Huerta and d'Entremont, 2007: 97).

2.2.3 Policies regulating eligibility for public subsidies

The design of school choice programmes – in particular the eligibility requirements for participating private schools – has been identified as a key determinant of their success (Epple, Romano and Urquiola, 2015: 40; Ladd, 2002: 20). Regardless of whether public subsidies are allocated to private schools using demand-side or supply-side instruments, governments can impose conditions that schools must fulfil in order to be eligible for financial support. Some of these conditions, such as the providers' official recognition or accreditation, can in turn be subject to various requirements pertaining to quality (e.g. staff-child ratios or staff qualifications), curricula, parental involvement, and the participation in assessment and evaluation practices.[4]

Restricting the eligibility of private schools to receive public support may serve explicit policy objectives, such as diminishing inequities arising from school choice or ensuring that inter-school competition leads to an increase in school quality. A World Bank report by Lewis and Patrinos (2011), for example, recommends that school choice should be "accompanied by mitigating factors to ensure choice does not lead to segregation", including, for example, non-selective admission criteria and no compulsory add-on fees (Lewis and Patrinos, 2011: 8). Similarly, Alves et al. (2015) suggest that the regulation of tuition fees and student selection may explain the different degrees of inequity observed in the Brazilian and Chilean school choice programmes. Epple, Romano and Urquiola (2015) equally conclude that "the details of program design clearly matter" for ensuring the positive outcomes of school choice (2015: 40), supporting simulation studies that have highlighted the importance of regulating private school pricing and admission (Epple and Romano, 2012).

An alternative to restricting private schools' eligibility for public support is to adjust the *amount* of funding they receive. The size of voucher might, for example, be adjusted to reflect its students' characteristics (e.g. disadvantaged students receiving larger vouchers) or features of the school they attend

[4] According to *Education at a Glance 2015: OECD Indicators*, of 23 countries with available data, 17 "reported that all government-dependent private schools participate in national examinations and another three countries reported that between 76% and 99% of their government-dependent private schools participate" and even where participation is optional "the vast majority" of publicly funded private schools tend to take part (OECD, 2015a, p. 476 and Table D6.1). Likewise, there is widespread participation in national assessments without stakes for students (OECD, 2015a, Table D6.10).

(e.g. rewarding schools with an economically integrated student body) (Ladd, 2002: 19). These two approaches – restricting the use of vouchers or adjusting their amount – should not be considered as mutually exclusive. Indeed, Ladd (2002: 20) stresses that "even for means-tested programs […], design matters", since disadvantaged families may not benefit from vouchers if they are exceeded by tuition fees or if parental interviews and other selection mechanisms restrict the entry of disadvantaged students.

In particular, three areas have received extensive attention in the theoretical and empirical literature: selective admission, add-on tuition fees and for-profit ownership. An overview of different country practices in each of these areas and a review of their impact on efficiency and equity is presented in Sections 5, 6 and 7.

3. ARGUMENTS FOR AND AGAINST PUBLICLY FUNDING PRIVATE SCHOOLS

The argument for school choice was most prominently put forward by Friedman (1962), who suggested that providing each student with a specified amount of money to spend at a public or private school of their choice "would make for more effective competition among various types of schools and for a more efficient utilisation of their resources" as schools would try to attract students (Friedman, 1962). At the same time, school choice was argued to reduce inequalities stemming from residential segregation and allow students from poor neighbourhoods to attend high-quality schools outside of their district or private institutions that they could not have otherwise afforded.

Opponents of school choice programmes criticise their negative impact on public schools, warning that students leaving public schools for private alternatives would replete them of vital resources and impede their ability to provide adequate teaching services for the remaining students. Furthermore, the literature suggests that market incentives and competitive pressures alone might not be sufficient to increase public schools' standards where structural factors such as weak district and school leadership limit their capacity to implement reforms (Goldhaber, 2009: 311). Critics also point out that the students making use of school choice will, on average, be of higher ability and socio-economic background than those who do not. This could not only exacerbate student segregation, but also aggravate existing resource imbalances since disadvantaged students are more costly to educate and public schools already more frequently report resource shortages than government-dependent private schools.[5]

3.1 Educational effectiveness and efficiency

In this review, the concept of effectiveness refers to a school system's capacity to accomplish a given set of educational objectives (e.g. improving student achievement) while efficiency refers to the ability to achieve these objectives at the lowest possible cost. Other things being equal, a school system is therefore considered to be more efficient if it generates a higher output level using a given set of resource inputs or achieves the same results using fewer resources (see Lockheed and Hanushek, 1994).

3.1.1 Effects on school systems' effectiveness

The public funding of private education has been suggested to increase the effectiveness of school systems through at least three distinct mechanisms: by altering the relative size of the private and public school sectors, by increasing student segregation, and by fostering school competition.

First, using public funding to facilitate access to private schools is likely to lead to a movement of students from the public to the private sector. If private schools are more effective than public schools, increasing the relative size of the private sector is expected to yield a system-wide improvement in school effectiveness.

Second, particularly where schools can select students based on their ability, expanding parental choice is likely to increase the stratification of students across schools. Depending on the way peer effects

[5] PISA data from 2012 shows that principals of public schools more frequently reported teacher shortages than those of government-dependent private schools in 15 of 24 OECD countries, with principals in 3 countries reporting similar levels (OECD, 2014, Table C7.4).

condition the achievement of students at different points of the ability distribution, the aggregate effect of ability segregation on student performance and school effectiveness can be positive or negative. Although empirical evidence on peer effects suggests that low-achieving students tend to suffer from increased sorting, research on the system-wide net effect of sorting has been largely inconclusive (see Section 5.5). Distinct from these peer effects, increased student homogeneity through ability sorting has been argued to improve student outcomes across the ability spectrum since it allows teaching practices to be more effectively tailored to the learners' needs (see Duflo et al., 2011).

Third, increasing parental choice might lead to performance gains by inducing market pressures and competition into the school system. It is suggested that public schools would employ their resources more effectively or increase their effort and – by extension – their quality, if threatened with the loss of students and resources to private schools. This mechanism is based on the assumption that parents opt for higher-quality schools and thereby incentivise providers to compete for students by improving their quality. However, school quality (here understood as the value added to their students' educational outcomes) is difficult to observe in practice. Parents might therefore rely on heuristics such as choosing the school with the highest average test score or an intake of students with high socio-economic status, thereby incentivising schools to engage in selective admission practices, rather than improving their quality. Although not all parents need to make perfectly informed school choices to generate effective competition, the fact that information about school quality is unevenly distributed may exacerbate social inequalities (see Schneider et al., 1998, 2000). Furthermore, factors besides educational quality, such as the schools' location, non-educational amenities, curricula with a cultural or linguistic focus and particular pedagogical approaches may also play an important role in parents' school choices. While competition can thus in theory result in higher quality and diversity, not all grounds on which schools may compete for students are aligned with education policy objectives.

3.1.2 Effects on school systems' efficiency

Proponents of school choice have argued that injecting competition into the school system would put an end to local public schools' monopoly on compulsory education and thereby force them to use their resources more efficiently. In a widely cited study, Hoxby (2000a) reported increased competition among public schools in the United States to lower public spending while simultaneously raising student achievement. However, these findings have since been challenged both theoretically and empirically. Subsequent analyses of the same data have found the cost-reducing effects to be highly sensitive to methodological choices and the specification of key variables (Rothstein, 2007). Looking specifically at the competition between private and public schools, Andersen and Serritzlew (2007) also found that Danish districts *increased* their expenditure per student when faced with private school competition without causing a corresponding rise in student performance. Similar findings have been reported from Sweden (see Lindbohm [2010] for a review), although several methodological difficulties render the assessment of educational cost efficiency difficult in practice (see Section 4.3).

Houlberg et al. (2016: 79) provide three reasons why the public funding of private schools may have perverse effects on public spending: One reason for the higher expenditure level may be that public schools face difficulties in planning and organising their provision if they can no longer count on stable student numbers. Reductions in public school attendance might leave public schools with overcapacities and high fixed costs. Another reason could be an increase in staff expenditure if public and private schools have to compete for teachers. Finally, public schools may need to allocate more resources to sending costly signals to parents when faced with competition, including investments into school buildings or lower class sizes, which do not necessarily translate into higher student performance.

Publicly funding private schools might also give rise to inefficiencies in the school network. Providing financial incentives for the entry of private schools can lead to a reduction in the average class

and school size both due to school fragmentation as well as the smaller average class size in lower secondary government-dependent private schools (OECD, 2014, Table D2.1). This is likely to increase per-student expenditure due to the relative increase in fixed costs without necessarily improving student learning outcomes – an effect that has, for example, been observed in Estonia (Santiago et al., 2016).

Depending on the criteria governing the opening and closing of public and private schools, the funding of private schools may also undermine efforts to increase efficiency through school consolidation. Municipal leaders in Denmark, for example, have reported that the closure of public schools in some rural areas has prompted parents to set up a new private school in the same location. Additionally, where students respond to mergers or school closures by moving to private schools, the number of students in the newly consolidated public schools might be lower than anticipated and therefore fail to generate the desired efficiency gains (Houlberg et al., 2016: 60). Lowering the entry barriers for private schools might thereby "affect […] the possibilities for establishing an economically efficient municipal school structure" (ibid.: 106), which is a particularly pertinent concern in systems that are already characterised by overcapacity (Santiago et al., 2016: 139).

Other potential inefficiencies arising from the financing of private schools largely depend on the particular programme's regulatory characteristics and funding arrangements. Potential concerns, especially for non-means tested programmes include, for example, the deadweight loss of financing the private school expenses of families who would have paid for their children's attendance, even in the absence of public support.

3.1.3 Effects on pedagogical innovation and diversity in the school offer

Proponents of publicly financing private schools argue that intensifying competition between public and private schools would result in a more diverse offer of educational institutions and pedagogical strategies as schools specialise and cater to more narrowly defined educational preferences. In addition, this sorting by preferences has been suggested to make it easier for schools to resolve conflicts among stakeholders, which in turn allows them to focus on their teaching activities (Chubb and Moe, 1990; Hill et al., 1997).

Relatively little research has investigated the effect of private school funding on educational innovation, yet a review of market-based reforms by Lubienski (2009) concluded that economic forces have tended to promote standardisation rather than experimentation with regards to classroom practices. Although market pressures may lead schools to adopt new management and marketing techniques and to be more responsive to parents' preferences, many of them appear to favour traditional over innovative curricular and pedagogical approaches. If a diversification of the educational offer did take place, Lubienski concludes, it often resulted in a "hierarchical ordering of institutions, rather than a horizontal range of equally valued, but substantively different […] approaches" (Lubienski, 2009: 43).

Others have pointed to the limited capacity of low-performing schools to improve their competitiveness by means of innovation. Hirsch (2002) argues that schools that fail to attract sufficient numbers of students and would therefore have the most to gain from innovation often lack the resources to implement them. School choice, he suggests, might therefore be "just as likely to discourage educational innovation for fear of losing support from parents who are wary about risking their children's futures on educational experiments whose results are uncertain" (Hirsch, 2002: 33). Alternative strategies to foster innovation could aim to "embolden schools to specialise and experiment" and "encourage diversity among schools that are succeeding, rather than those that are failing" by facilitating inter-school collaboration and "rewarding schools that pioneer curriculum or other initiatives and which have benefits across the system" (Hirsch, 2002: 33).

3.1.4 Effects on parental involvement

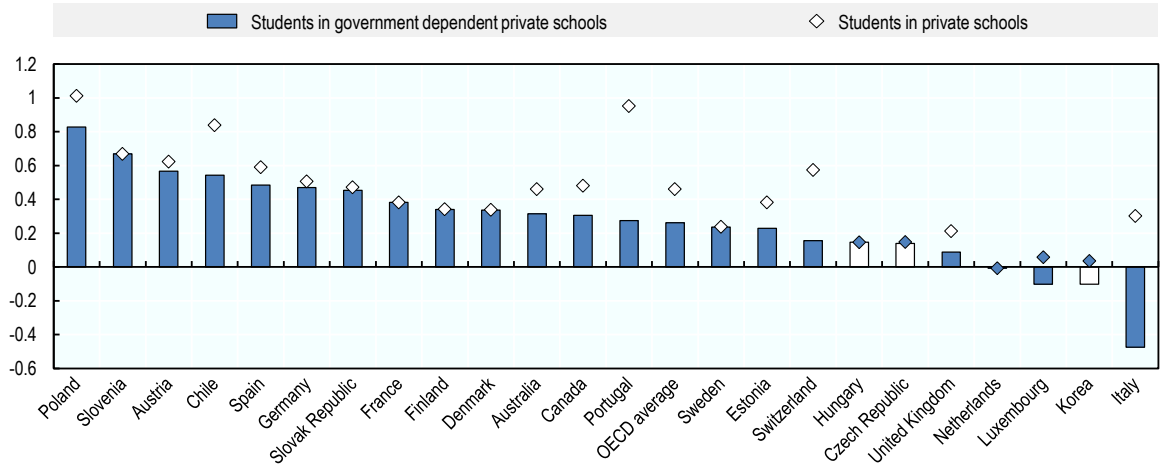
Hill et al. (1997) point to another desirable consequence of publicly funding private schools, arguing that the act of school choice itself can improve students and parents' relationship towards educational institutions. Although the empirical evidence remains scant they identified a number of mechanisms through which this effect might operate, which Schneider et al. (2000) summarise as follows: "1) Schools of choice can influence students' attitudes, effort and motivation in ways that "regular" schools cannot. 2) Schools of choice have more authority and legitimacy. 3) Choice holds schools accountable to promises made, thereby allowing the development of effective school communities that link teachers and administrators together. 4) Through their act of choice, parents have endorsed the school they have chosen as better than the alternatives, leading to higher levels of satisfaction and a stronger commitment to the school."

3.2 Socio-economic stratification

In theory, vouchers and other school choice programmes enable students from families of low socio-economic status who are stuck in poorly-performing public schools to seek out more highly performing educational alternatives and thereby allowing them a form of mobility that might otherwise be restricted to families who can afford private schools or residential mobility (Neal, 2002; Sugarman, 1999).

Figure 3. Differences in socio-economic status between public and private schools students, 2012

As measured by the PISA index of economic, social and cultural status, students in public schools = 0



Notes: Statistically significant differences are marked by darker bars and lighter markers.

Countries are ranked in descending order of the difference between government-dependent private and public schools' score on the PISA index of economic, social and cultural status

Only countries with available data on government-dependent private schools all are displayed. The OECD average takes into account all countries with available data on private schools.

Source: OECD (2014), *Education at a Glance 2014: OECD Indicators*, http://dx.doi.org/10.1787/eag-2014-en.

Nevertheless, as shown in Figure 3, government-dependent private schools tend to serve more socio-economically advantaged students than public schools in nearly all OECD countries – as is the case for private schools more generally. Across OECD countries, results from PISA 2012 show that, on average, the students of privately managed schools had a more favourable economic, social and cultural status (ESCS) than students of public schools (by around 0.5 points in the PISA index of ESCS, which is

based on parents' years of education, occupational status and home possessions). The same pattern – although slightly less pronounced – can be observed for publicly funded private schools: on average, the value for students attending government-dependent private schools was 0.3 points higher than for public school students. Only in 2 of 23 OECD countries with available data did public school students have a higher socio-economic status than those of publicly funded private schools.

This pattern of student stratification threatens to undermine the role of education in advancing equity and social cohesion. To explain this phenomenon, studies have put forward a range of mechanisms pertaining to both demand-side and supply-side responses to school choice.

3.2.1 Stratification due to differential take-up rates and preferences

On the demand side, several factors may dispose better-informed and socio-economically advantaged families to make use of school choice systems more frequently or in a more competent way (Schneider et al., 2000). Interviews with public high school students in Chicago suggest that many of them failed to take advantage of school choice programmes either because they were discouraged by travelling costs or because they faced difficulties in the application process, missed deadlines, failed to meet entrance requirements, and submitted incomplete or too few applications to selective schools (Stevens et al., 2011). Parental involvement and school counselling was therefore shown to drastically improve students' engagement in the choice programme, which highlights the importance of tackling information deficiencies and the inequities arising from parents' varying capacity to help their children navigate complex application procedures.

In response to these concerns, some countries publicly disclose information on school performance in order to empower students and parents to make informed choices based on the quality of schools. In Estonia, for example, the Ministry of Education and Research publishes key data on schools using a public Internet portal (Santiago et al., 2016). Since raw achievement data can be difficult to interpret in terms of a school's value added (i.e. its contribution to students' performance net of their initial ability), some reporting systems try to increase comparability by accounting for factors that lie beyond the schools' control. The My School website (www.myschool.edu.au), launched in 2010 by the Australian Curriculum Assessment and Reporting Authority (ACARA), therefore allows parents to compare a school's performance in the national assessment (NAPLAN) and their students' gains over time to both the national average and a group of comparable schools. This reference group consist of schools with statistically similar student characteristics (parental education and occupation) and school community factors (proportion of indigenous students, remoteness of the school and a measure of educational disadvantage for students with a language background other than English) (OECD, 2013b: 462). Nevertheless, parents' responses to the release of school quality information have been shown to vary by socio-economic status and to be constrained by existing spatial inequalities in the access to high-quality schooling (Rich and Jennings, 2015).

3.2.2 Stratification due to implicit and explicit student selection

On the supply side, stratification may arise if publicly funded private schools engage in implicit or explicit student selection at the point of admission to save costs and attract other students hoping to benefit from a high-achieving peer group (Hsieh and Urqiuola, 2006; Levin, 2002). As will be further discussed in Section 5, this practice can increase student segregation and might occur for a number of reasons unless appropriate restrictions are put in place: in the absence of perfect information on school quality, parents are likely to use student composition as a heuristic for a school's value added, which in turn incentivises schools to select high-performing students. In addition, high-performing and socio-economically advantaged students are less costly to educate and therefore provide schools with an opportunity to cut costs if they receive the same amount of funding for each student regardless of their ability.

3.3 Simulation-based literature

The debate on publicly funded private schools and the design of school vouchers has given rise to a rich literature using theoretical models and simulations to explore the potential effects of different funding regimes. In their review of recent advances in the computational literature on vouchers, Epple and Romano (2012) highlight the short-comings of "laissez-faire flat-rate vouchers", arguing that voucher design (including restrictions on private school pricing and admission) plays a critical role in ensuring that school choice policies improve educational outcomes for all. A number of theoretical works, including MacLeod and Urquiola, (2009) and Epple and Romano (1998 and 2008) have demonstrated that the public funding of private schools may – unless targeted at particular student groups or accompanied by restrictions on private schools' admission and tuition policies – increase educational inequality and even reduce aggregate student achievement, rather than improving access and increasing school quality through competition. Insights from these theoretical models will be reviewed and discussed in more detail in Sections 5, 6 and 7. When interpreting the results of such theoretical models, though, it is important to bear in mind limitations to their external validity, given that their findings rest on assumptions which may not fully hold in all or any of the countries under study.

4. METHODOLOGICAL CHALLENGES IN THE STUDY OF SCHOOL CHOICE

Generating robust evidence on the effect of publicly funding private schools is complicated by a range of methodological challenges. Before reviewing the empirical literature, we therefore draw attention to some of these difficulties and provide examples of strategies to address them. This section thereby introduces some of the criteria against which the quality of existing studies will be assessed, while also providing an overview of terms and methods that will be referred to throughout the remainder of the review.

4.1 Identifying the impact of private, for-profit, or selective education on student performance

Discussions on the desirability of private education often appeal to their positive effects on student achievement. As Vandenberghe and Robin (2004) point out, this "effect of education" can either refer to the "average treatment effect" (ATE) which denotes the average effect private school attendance has or *would have* on a random individual, and the "average effect of treatment on the treated" (ATT), which denotes the average effect of private schools on those who actually attended one. Most empirical studies of private school effects are designed to identify the ATT, rather than the ATE – which is challenging enough, as will be discussed in the following. However, policy makers are often not only interested in the population that received a certain treatment such as private school attendance, but also those which *might* receive it. When considering expanding the private sector, for example, it may not be safe to assume that private school attendance will have the same effect on those who newly join as it does on those who already attend a private school. Hypothetically, if private schools are mainly attended by students with high expected gains from such provisions, the ATT would not provide a good estimate of the ATE – even if the latter were correctly identified – and overestimate the expected impact of private sector expansion (Vandenberghe and Robin, 2004: 489).

Estimating the effect of private school attendance usually involves comparisons between students attending such schools and those who do not. If the only initial difference between these two groups were the type of school they chose to attend, any divergence in their later learning outcomes could be ascribed to the effect of private schooling. Yet, students enrolled in different school types tend to differ with regards to a range of both observed and unobserved characteristics.

4.1.1 Observed differences between private and public school students

If differences between the student populations of private and public schools are systematically correlated with their performance, comparing the raw data of student achievement across school types and attributing any differences to the effect of schools will yield biased estimates. For instance, although 15-year-old private school students had significantly higher PISA mathematics scores in 27 of 45 countries and economies with available data, this advantage "is no longer observed in most countries/economies when the socio-economic status of students and schools are taken into account" (OECD, 2014: 410). The same concerns apply to the comparison of expenditures across school types since private schools tend to cater to fewer students with special educational needs or socio-economic disadvantages, who are more costly to educate (Ladd, 2002: 12).

Standard regression techniques allow researchers to control for observed variables that might confound the relationship between the independent (school type) and the dependent variable

(e.g. performance). Many studies using ordinary least squares regressions (OLS) control for observed differences among student characteristics at the individual level, or – where individual achievement data is not available, e.g. in Chile prior to 1997 – aggregate characteristics at the school level (e.g. McEwan and Carnoy, 2000). However, these techniques do not address the problem of unobserved confounders and selection bias.

4.1.2 Selection on unobserved student characteristics

When using regression techniques to estimate the effect of school attendance on performance, coefficients may be subject to omitted variable bias if the equation's error term is correlated with one or more of the independent variables (here, the choice of a particular school type). This problem may arise wherever private schools select their students on the basis of socio-economic status (e.g. through tuition fees) or ability (e.g. through admission tests) but also where the selection is more subtle or based on choices made by parents. The decision to send children to private schools might, for example, be an expression of the importance parents attach to their children's education. If these unobserved factors are positively correlated with students' academic performance and remain uncontrolled for, any positive effects of private school attendance are likely to be overestimated. Even if studies could control for students' performance prior to attending private school, which is rarely possible, unobserved differences affecting their future performance may remain.

Vandenberghe and Robin (2004) discuss three methods to address selection bias caused by unobserved confounders: instrumental variables, Heckman correction models and propensity score matching. In their review of studies analysing the impact of public-private partnerships in education, Patrinos et al. (2009: 36) discuss three more strategies: randomisation, regression discontinuity analysis and difference-in-differences estimators. Some studies have used combinations of two or more of these methods to address selection bias, using cross-sectional or longitudinal data. Box 4.1 provides an overview of these methods.

Box. 4.1. Techniques to addressing selection on unobserved student characteristics

Empirical strategies using cross-sectional data

- **Randomisation**: where oversubscribed government-dependent private schools are required to assign places to applicants using a lottery, they generate natural treatment and control groups, which are stochastically equivalent and only differ from each other with respect to the treatment (i.e. private school attendance). Peterson et al. (2005) made use of such voucher lotteries in three American cities and compare the recipients with those who had remained in public schools. This allows them to control for any unobserved differences between the two groups and to thereby isolate the effect of private school attendance. Yet, studying lottery systems limits the study population to students who have chosen to apply to selective schools to begin with. Inferences regarding the potential effect of private school attendance may therefore not extend to students who have not chosen to or failed to apply.

- **Instrumental variables**: in the absence of randomised assignment, the use of instrumental variables can provide an alternative source of variation and a means to control for unobserved confounders. Valid instruments are correlated with the relevant independent variable without influencing the dependent variable by any other means. Since it is free of endogeneity, the instrumental variable's association with the dependent variable (passing through the independent variable of interest) provides us with an unbiased causal estimator. This approach has been used in studies of Swedish and Chilean private schools (Sahlgren, 2011, Hsieh and Urquiola 2006) but is limited by the availability of strong and valid instruments.

Box. 4.1. Techniques to addressing selection on unobserved student characteristics (cont.)

- **Heckman's two-stage correction models**: Heckman correction allows researchers to correct for selection bias by explicitly modelling the process of selection and, in a second step, controlling for the correlation between the residuals of the selection and the outcome variable. This approach relies on the strong assumption that the residuals that jointly influence selection and outcomes follow a specified distribution, and also requires the researchers to identify an instrumental variable to include in the selection equation (Heckman, 1979; Vandenberghe and Robin, 2004: 491). The Heckman strategy has been used, for example, by Mizala and Torche (2012), Sapelli and Vial (2002), and Elacqua (2011). The limitations of this method have been addressed by Lara et al. (2011), who reproduce Heckman correction models, demonstrating that the positive estimates of private school effects produced by these methods disappear once prior achievement is controlled for.

- **Matching**: another strategy to address the problem of self-selection is to compare the treatment group with a synthetic control group that is matched on observable characteristics to resemble the individuals who received the treatment. Some studies have compared the achievement of private school students with that of public school students showing similar baseline test scores prior to enrolment (e.g. Oeterson and Chingos, 2008). More sophisticated studies match their control group with regards to multiple variables and avoid the problem of multidimensionality by reducing a vector of covariates into a single scalar representing the estimated propensity of attending a particular school type. Propensity score matching requires a large number of observations in order to ensure that the compared groups are sufficiently similar. Even then, the technique relies on the assumption that differences between treatment and control group are fully captured by the observed variables. In contrast to strategies relying on instrumental variables, matching is a non-parametric method which does not require the researcher to specify which form the relationship between the dependent and control variables takes. It therefore avoids the assumption that effects are uniform across the distribution of covariates (Vandenberghe and Robin, 2004). As Vandenberghe and Robin demonstrate using PISA data from Austria, France and Ireland, the choice between parametric and non-parametric techniques can yield diverging estimates of the effect of private education (2004: 491f.). Propensity score matching has also been used by Dronkers and Avram (2009), Lara et al. (2011), and Krueger and Zhu (2004).

Empirical strategies using longitudinal data

- **Regression discontinuity**: regression discontinuity (RD) offers a quasi-experimental design for longitudinal studies in case students are assigned to a particular school type based on a clear threshold on a continuous variable, such as their residence or their score in an entrance exam. If there is some random variation in the assignment variable, the candidates just above and below the threshold can be used as a treatment and control group respectively. The use of RD techniques is based on the assumption that subjects cannot self-select into the treatment by actively manipulating whether or not they fall above or below the threshold (an example might be the practice of postponing entrance by one year). Furthermore, the external validity of estimated effects might be restricted to students around the margins of the cut-off, especially where the treatment effect is expected to be heterogeneous across the distribution of the assignment variable. RD methods have been used, for example, by Clark (2010) and Abdulkadiroglu et al. (2014).

- **Student fixed effects**: in the research on private schooling, fixed effects estimators allow to control for time-invariant student characteristics (both observed and unobserved) by restricting the analysis to multiple observations of individual students and their association with the dependent variable. For example, fixed effects models may estimate the effectiveness of school types by measuring the change in performance associated with a student moving from one provider to another. It is important to bear in mind that fixed effects estimates are based on an exclusive sub-sample of students who moved between school types. The validity of the estimates may therefore be subject to "mover bias" if students who switched schools systematically differ from those who did not. For example, changing schools can indicate a prior mismatch which may in turn be reflected in the student's performance (Loveless and Field, 2009). Furthermore, switching schools is a disruptive event in itself, which can cause a student's achievement to drop in the short-term as they adjust to the new environment (Lara et al., 2011: 134). Examples of studies using student fixed effects are Ballou et al. (2008) and Sass (2006).

Box. 4.1. Techniques to addressing selection on unobserved student characteristics (cont.)

- **Difference-in-differences analysis**: a special case of fixed effects models, difference-in-difference analyses make use of observations before and after an intervention (such as a change to the school system) in order to compare the treatment and control groups' *change* in the dependent variable. By focussing on changes, rather than absolute levels, the method controls for baseline differences in the two non-randomly selected groups. Assuming that the treatment and control groups would have followed the same trend had the intervention not taken place ("parallel trend assumption"), the method implicitly controls for unobserved variables affecting both the treatment and the control group during the period under study. Lara et al. (2011), for example, compares the performance of Chilean students who switched to private schools after their primary education with similar students remaining in the public school system and find a small positive effect of voucher school attendance. See Peterson and Chingos (2008) for another application of this method.

4.1.3 Regression toward the mean in longitudinal studies

In longitudinal studies, estimates of private school effects may also be biased upward if the choice of moving to a private school is caused by or systematically associated with a temporary drop in student-performance due to factors that are unrelated to the type of school they attend. For example, a public school student might be assigned a particularly strict teacher, perform worse than in previous years, and decide to move to a charter school as a consequence. In this case, Sass (2006) suggests that "[i]f the student's performance would have rebounded in the next year (even if they had stayed in a traditional public school), then the measured effect of charter schools will be biased upward" (Sass, 2006: 103). To address this type of bias, Sass (2006) estimates a probit model to rule out that switches from public to charter schools are determined by prior drops in student performance or other factors.

4.1.4 Clustered student-data and violations of the conditional independence assumption

Most studies of student achievement are based on data exhibiting a hierarchical or nested structure. That is, data in which individual observations are clustered in groups whose constituent members can be expected to have a certain similarity by virtue of belonging to the same group. In this case, students are nested in classrooms, which are in turn nested in schools. Both schools and classes may affect their students' achievement in one way or another, which violates the assumption or ordinary regression techniques that observations on students in the same class or school are conditionally independent. Nevertheless, many studies comparing student performance across school types still employ ordinary regression techniques and disaggregate higher-level variables (such as school resources), treating them as individual-level student characteristics. This will result in underestimated standard errors for regression coefficients and lead researchers to overstate the statistical significance of effects related to classroom or school characteristics.

Multilevel analysis is the natural method of choice to address these issues when dealing with nested data. It allows to control for both ecological and individual-level variables, identifying and taking into account the different variance at each distinct level of analysis. Bellei (2008), for example, uses a multilevel regression model to control for both individual and school characteristics that might affect the achievement of Year 10 students in Chile. Mizala and Torche (2012) use a two-level hierarchical linear model to investigate the relationship between add-on fees and student achievement in Chile, controlling for school and student characteristics.

4.2 Identifying the impact of school competition on student performance

Studies examining the effect of public-private school competition on the quality of public schools or aggregate student achievement are vulnerable to endogeneity arising from the fact that the proportion of students attending private schools in any given area may be a result of the poor quality of public schools, rather than the other way around. Sandström and Bergström (2005), for example, find low average marks in Swedish school districts to be a strong predictor of independent schools entering the market. Some studies address this problem using instrumental variables, such as the proportion of Catholic residents in US school districts, which Dee (1998) hypothesised would increase the number of private schools independent of student achievement. Hsieh and Urquiola (2006), on the other hand, suggest addressing the threat of endogeneity by controlling for pre-existing trends that are correlated with private sector growth.

4.3 Estimating the cost and efficiency of different school types

Comparing the efficiency of schools or school types requires the analysis of both their output and inputs, i.e. the extent to which they fulfil their objectives and the cost at which they do so. Data limitations and methodological challenges make the identification of either of these factors difficult in practice. This is one of the reasons for the dearth of empirical research comparing the efficiency of different school types or analysing the effect of private school funding on system-level efficiency.

Unobserved school inputs

Not all "inputs" commonly featured in educational production functions, such as teacher quality, school resources and student background, can be easily observed and measured, which makes it difficult to compare the economic cost of education across school types. This is particularly true since private schools tend to educate fewer students with special educational needs or low socio-economic status (see Figure 3), who tend to be more costly to educate. Furthermore, the value of vouchers and even the expenditure of private schools might give us an incomplete picture of their true costs since many (especially religious) private schools receive additional resources in the form of "special fees, church subsidies, teachers working at below-market wages and donations of money, time, land and buildings" (Ladd, 2002: 12).

Heterogeneous input prices

Empirical studies rarely have data on the prices providers need to pay for educational inputs and therefore fail to account for their heterogeneity across schools. This is particularly relevant to the study of private education since – unlike public schools – independent schools are not obliged to provide universal services regardless of factors like geographical remoteness and are therefore likely to open in locations with favourable circumstances. In their study of Chilean voucher schools in the 1990s, McEwan and Carnoy (2000) try to address this heterogeneity with the use of municipality dummies to control at least for "unobserved determinants of costs that are constant across the municipality, such as local market prices" (p. 220).

Exogeneity of school inputs

Contrary to the assumption of conventional education production functions, most schools cannot freely adjust the absolute or relative level of their inputs in order to minimise costs. Government regulations and contracts constrain schools in their ability to appoint and dismiss staff, decide on the allocation of budgets, or expand class sizes, while other inputs take a long time to adjust. The fact that public and private schools may differ with regards to the control they have over these inputs further complicates the matter: PISA 2012 shows that the average government-dependent private school has more autonomy over the allocation of resources than public schools across all OECD countries with available data (OECD, 2014: Table C7.5). As a consequence, to the extent that they are exogenously determined,

educational inputs should be controlled for when assessing a school's efficiency. In their analysis of school costs in Chile, McEwan and Carnoy (2000) treat school inputs as endogenous, while acknowledging the pitfalls of this research design (p. 220).

Unobserved school outputs

Most studies of educational efficiency measure school outputs on a single dimension, such as students' scores in standardised tests. However, "[s]chools are complex institutions with multiple objectives, many of which are not captured by exam results alone" (Muir, 2012: 12). For example, private schools may give their students an advantage in college admissions or the labour market by offering special training or access to social networks (see McEwan and Carnoy, 2000). Unless such outputs are controlled for, estimates of the relative efficiency of private and public schools are likely to be biased.

5. THE REGULATION OF SELECTIVE ADMISSION AND ITS IMPACT ON EQUITY AND EFFICIENCY

5.1 The prevalence of selective admission in OECD countries

Of the 36 countries surveyed for *Education at a Glance 2011: OECD Indicators*, 7 allow government-dependent private schools to exercise selective admission based on academic criteria at the primary level, 13 at the lower secondary level, and 15 at the upper secondary level. Of the countries with available data, 16 do not permit their government-dependent private schools to select students based on academic criteria at the primary level, compared to 11 at the lower secondary level, and 8 at the upper secondary level (OECD, 2011, Table D5.13). In multiple countries, government-dependent private schools select their students based on academic criteria while public schools do not. As of 2011, this was the case in France across all levels of school education, in Switzerland at the primary and lower secondary levels, in Chile at the primary level, and in New Zealand at the lower secondary level (OECD, 2011, Table D5.13).

5.2 Theoretical intuition

While most OECD countries afford private schools some discretion over their curricula and other aspects of their operation, countries differ widely in the extent to which they regulate the admission practices of publicly funded private schools.

In the Flemish Community of Belgium, for example, private schools are not permitted to select students on the basis of their academic achievement as a means to guarantee parents the right to free school choice. Some countries permit oversubscribed private schools to take into account non-academic factors in the admission process, including geographic proximity, the presence of siblings in the school, or the timing of applications. By contrast, countries such as (until 2015) Chile permit publicly funded private schools to select students based on academic criteria using prior marks, aptitude tests, or other methods such as parental interviews, which are likely to give households with higher educational attainment or socio-economic status an advantage.

Effects of selective admission on student stratification

Differential admission practices across school sectors can lead to student stratification along the lines of both academic achievement and socio-economic status and might explain some of the differences in the student composition of public and government-dependent private schools discussed above. If privately managed schools have more freedom to select their students than public schools, they might try to prioritise access for or exclusively select students of higher socio-economic status or ability both because they are less costly to educate and because parents might use a school's student composition and achievement to judge its quality (Ladd, 2002: 13). This process of "cream skimming" threatens to deprive the public school system of high-ability students, which – in the presence of peer effects – is likely to disadvantage the students who remain in public schools. Since student performance is correlated with socio-economic advantage across the OECD and its partner countries and economies (OECD, 2010), cream skimming based on ability also means that "privately managed schools will tend to have more socio-economically advantaged students enrolled than publicly managed schools" – a phenomenon that can be observed in nearly all OECD countries (OECD, 2012a: 40).

Effect of selection on school competition and overall achievement

Allowing schools to select students can alter the dynamics of inter-school competition, which might in turn affect the education system's aggregate level of achievement. If private schools are allowed to use academic or socio-economic criteria in their admission process, they might – rather than trying to increase students' learning outcomes by improving their teaching quality– simply compete by selecting students who are easier to teach. This strategy of cream skimming can not only undermine the intended benefits of school competition on quality, but also result in a concentration of disadvantaged students in public schools and deplete them of vital resources. Empirical evidence from Chile (Bellei, 2008), for example, appears to confirm that private schools used academic admission criteria as a means to compete with other schools on the basis of selectivity (potentially at the expense of quality). Selective admission practices have also been argued to negatively affect the effort and motivation of students. If students can signal their educational ability by gaining admission to a selective school, they have less of an incentive to work hard and advance their skills once they are enrolled (MacLeod and Urquiola, 2009).

Indirect selection and self-selection effects

It should be noted that student sorting based on ability or socio-economic status can also occur in the absence of explicit admission criteria since socio-economic advantaged parents find it easier to successfully navigate the process of school choice and are more likely to take academic criteria into account when choosing a school (Hastings et al., 2005). Given these information asymmetries, the OECD has recommended "raising awareness, improving disadvantaged families' access to information about schools and supporting them to make better-informed choices" (OECD, 2012b: 64). Even private schools' discretion over their registration times can result in cream skimming since well-informed parents are more likely to register their children early and thereby obtain an advantage over parents who are not aware of these deadlines. Centrally determined admissions times across schools can serve as a means to prevent this (OECD, 2012b: 70).

"Selective expulsion" of students

Although school selectivity is most commonly observed at the point of admission, student selection may continue throughout the schooling process. Based on a 2002 survey for the Chilean Education Quality Measurement System (SIMCE) , the parents of 31% of students in Year 4 of subsidised private schools report that they expel retained students (compared to 14% of the parents in municipal schools) (Bellei, 2008). As will be discussed further below, this implies that private voucher schools more commonly engage in the selection of students not only based on their predicted ability, but the academic capacity they demonstrate later on (Bellei, 2008: 176). If expelled students are likely to switch to public schools, this selective expulsion could contribute to cream skimming at the level of individual schools and the private sector more widely.

5.3 Formal models and simulations

In formal models and simulations incorporating peer group or reputation effects, schools have an incentive to select their students based on ability. Although this is rarely taken into account in the computational literature, this effect could also occur if students' ability was assumed to be inversely related to the cost of their educating. Modelling the interaction between free, open public schools and fee-charging, selective private schools, Epple and Romano (1998) suggest that the ability to select students would incentivise profit-oriented private schools to cream skim high-ability students from the public sector to improve their average student ability and attract high-income students with the prospect of positive peer effects.

Allowing schools in a competitive education system to select their students may not only increase stratification but also lower aggregate achievement. Using a sophisticated model that accounts for the importance of school reputation, MacLeod and Urquiola (2009) simulate the effect of selective admission in conjunction with school voucher schemes. In a labour market where employers have imperfect information on applicants' skills, it is assumed that students have an incentive to signal their ability by attending a school with a good reputation (i.e. with high average student skills). To improve their success in the labour market, students therefore face a choice between improving their own skills by exerting more effort, attending a school with a high teaching quality, or attending a school with a high student quality and reputation, regardless of its value added.

While the entry of for-profit private schools in a non-selective system might create efficient competition if the schools' only way of attracting students is by providing them a high-quality education, allowing them to select students based on ability could have severe negative consequences for equity and achievement, based on MacLeod and Urquiola's model. Since selectivity allows schools to increase their reputation and attractiveness even without improving their value added, the model predicts the emergence of a "strict hierarchy of schools, with the highest ability students going to the most selective for-profit schools, and the low ability ones remaining in the non-selective public sector" (MacLeod and Urquiola, 2009: 5). This stratification across schools increases the significance of school reputation relative to students' test scores as a skill-signalling strategy in the labour market. As a consequence, students might be less inclined to exert effort at school, which could lead to a reduction of aggregate student achievement. Furthermore, the ability stratification of schools means that students with lower ability would be even less successful in the labour market compared to a non-selective system where school reputation would be a less reliable proxy for student ability.

The introduction of vouchers covering tuition fees would, according to this model, exacerbate the positive features of non-selective systems and the negative features of selective systems respectively. Under an open enrolment regime, vouchers would increase the likelihood of poor students attending non-selective fee-paying schools with a high value added. In a selective system, all students with higher ability than the average public school student would take advantage of the voucher to attend selective schools with students of higher ability, leading to a gradual diminishment of the non-selective sector and the stratification of schools across the entire system. MacLeod and Urquiola's simulation does not take into account the correlation between income and ability, but in the absence of vouchers or restrictions on add-on fees, student-selection would most likely lead to stratification by income as much as by ability.

Other models have simulated the likely effects of *restricting* student-selection. Using a two-phase simulation of school choice that separately considers the application and the enrolment, Chakrabathi (2013) predicts that "random private school selection alone cannot obviate sorting by income" at the application stage, unless it is accompanied by the absence of add-on tuition fees (Chakrabathi, 2013: 215). Even in the absence of selective admission, however, Chakrabathi's model predicts that sorting by ability will be "considerably difficult to prevent" (ibid.), if the parental preference for educational quality is assumed to increase with their "household ability", thus leading highly-educated households to more readily accept the opportunity costs of applying for higher-quality private schools.

5.4 Countries' approaches to selective admission in publicly funded private schools

In **Chile**, which has been operating an extensive voucher programme since the early 1980s, publicly funded private schools used to extensively engage in selective admission. Although Epple, Romano and Urquiola (2015: 14) report that educational legislation had repeatedly spoken out against selection practices in private schools, schools were not required to operate admission lotteries and empirical evidence documented the wide-spread use of selection practices. A survey of 726 Chilean parents found that the majority of private schools made use of parental interviews or admission tests to select their

students (Gauri, 1998). In a more recent survey carried out as part of SIMCE, 44% of Year 4 parents reported that their voucher school selected students based on admission exams, and 36% reported the use of parental interviews (SIMCE, 2006).

With the introduction of targeted vouchers under the 2008 Preferential School Subsidy Act (*Ley de Subvención Escolar Preferencial*, SEP), schools in Chile that admitted students from disadvantaged backgrounds (around 40% of the student population in participating schools) were given substantial extra funding. In addition, the government introduced a smaller subsidy for schools with a high proportion of poor students, the Grant for the Concentration of Priority Students (*Subvención por Concentración de Alumnos Prioritarios*). To receive any of the targeted funds, public and private voucher schools had to agree not to charge eligible students any fees and not to select their students based on ability or socio-economic background. Nearly all public schools and around 66% of government-dependent private schools took part in this voluntary scheme (OECD, 2013c: 8). The Inclusion Law (*Ley de Inclusion*) introduced in 2016 went even further, prohibiting all private voucher schools to practice selective admission based on parental interviews, prior academic achievement, or characteristics such as their marital status. Only some schools with special academic status (e.g. "emblematic" schools) or requiring early specialisation (e.g. vocational schools) are partially exempt from these rules. The consequences of these new regulations are not yet apparent and all empirical studies considered for this review were conducted at a time when subsidised private schools in Chile made extensive use of selective admission.

Under the **Swedish** voucher system, "independent" private schools receiving public funding must be approved by the School Inspectorate, are not allowed to charge add-on tuition fees and must not engage in selective admission based on ability or family background at the primary and lower secondary levels. Instead, oversubscribed independent schools determine students' priority based on the time of application, their proximity to the school and enrolled siblings. Although schools may be religious or focus on a particular ethnic group or language, they must be open to all students (Epple, Romano and Urquiola, 2015: 17).

In the **Netherlands**, more than two thirds of 15-year-olds attend publicly funded private schools. Most of these are religious, including Protestant and Catholic schools, which enrol about 27% and 29% of the student population, respectively. Although publicly funded private schools are not allowed to charge mandatory add-on tuition fees or operate for profit, state-funded schools can supplement their funding with voluntary contributions from parents or businesses and private schools receive significantly more of them than the public ones do (OECD, 2014b: 16). Publicly funded private schools are not allowed to engage in selective admission but parents of prospective students may be required to subscribe to the school's profile or principles (Epple, Romano and Urquiola, 2015: 16). Public and private schools receive the same amount of public funding in the form of a lump sum allocation based on the number of enrolled students. Since the mid-1980s, additional subsidies were assigned for disadvantaged students to reflect the higher cost of teaching them (OECD, 2014b: 16). Since 2006, these voucher weights have been based on parental educational attainment, replacing previous criteria based on students' immigration background (Ladd, Fisk and Ruijs, 2011).

Spain makes use of a "controlled choice" system which allows parents to freely choose among schools but includes mechanisms to ensure that disadvantaged students are not crowded out of popular schools. Oversubscribed schools therefore take into account factors such as low family income and disabilities alongside previously enrolled siblings and the proximity of the parents' home or workplace. In addition, regional education authorities can prescribe quotas to ensure a balanced distribution of students. Nevertheless, since the students' residence plays an important role in the admission process and some schools charge complementary fees or deviate from the prescribed admission process, publicly subsidised private schools have been observed to enrol a disproportionately small number of disadvantaged students (OECD, 2012b: 69).

The **Flemish Community** (Belgium) operates a system of extensive school choice, funding both public and private schools based on the number of students they enrol. Private schools are not allowed to charge add-on tuition fees but were permitted to use selective admission criteria until enrolment procedures were regulated by the 2002 Decree on Equal Educational Opportunities and its subsequent revisions (Musset, 2012). Oversubscribed schools are now only permitted to use a limited set of selection criteria such as the presence of siblings at the school and – in the case of primary schools – the school's position on the parents' list of preferences and its distance to the parents' residence or workplace (Cantillon, 2013).

5.5 Empirical evidence on the effect of selective admission

5.5.1 Effect on student stratification and school performance

Effect of selective admission on student stratification

Selective admission procedures have been suggested as a possible cause for the stratification of students across schools and school sectors. In a comparison of school choice programmes in Rio de Janeiro, Brazil and Santiago, Chile, Alves et al. (2015) find both the use of school choice as well as the quality of schools chosen to be more strongly associated with students' socio-economic status in Chile than in Brazil. One explanation for this difference, according to the authors, is the fact that Chilean schools were permitted to restrict access by imposing add-on tuition fees and employing selective admission procedures. Yet, empirically isolating the effect of selective admission on stratification from country-specific contexts and other barriers to entry is difficult in cross-national research designs.

McEwan (2001) uses the local density of educational providers across Chilean municipalities as an instrumental variable for students' likelihood to attend government-dependent private schools. Controlling for self-selection in this way, the author finds that students with higher socio-economic status, higher income and more educated parents are significantly more likely to attend mostly selective private schools.

Hsieh and Urquiola (2006) investigate the effect of selectivity on student segregation from 1982 to 1996 in Chile. During this period, publicly funded private schools were not allowed to charge add-on tuition fees (ibid.: 1480), which might have otherwise confounded the relationship between selective admission and segregation. Employing a difference-in-differences design to exploit variation in the opening of new private schools across municipalities, the authors find the expansion of the selective private sector to be associated with a "middle-class flight into private schools" (p. 1499). The relationship between private school entry and the exodus of high-ability students from public schools is robust to the use of instrumental variables for private school growth, which could be endogenously caused by pre-existing trends in municipalities' school performance.

Studies of selective admission in other contexts have yielded similar results. For example, Bygren (2016) finds that academic selection criteria have significantly increased achievement sorting among Swedish public schools. The longitudinal study makes use of a quasi-natural experiment, which occurred in 2000 when the municipality of Stockholm introduced academic admission criteria for oversubscribed upper-secondary schools, while prohibiting add-on tuition fees.

Academic selection criteria can increase student stratification not only along the lines of ability and achievement, but also along other dimensions such as socio-economic status, immigration history, or ethnicity. This can be due to the statistical correlation between these different dimensions of stratification, or due to schools' implicit or explicit selection on these characteristics. In Chile, early small-scale survey studies suggested that a students' socio-economic background played an important role in getting admitted to selective private schools, net of their academic ability (see also Bellei, 2008). In the case of Stockholm, Söderström and Uusitalo (2010) find that the introduction of academically selective admission has led to

ethnic segregation beyond the level that would have been expected based on the increase in socio-economic and ability sorting, while Bygren (2016) finds no evidence of segregation on other dimensions than ability.

Arguably, different selection criteria should be expected to cause different forms of student sorting and it is therefore important to take into account country-specific regulations when comparing patterns of segregation across educational systems. While upper-secondary students in Stockholm, for example, were selected based on their high-school marks, parents in Chile report that many schools employed criteria that were explicitly based on socio-economic status, like parental interviews or the provision of income certificates (Contreras et al., 2010).

Nevertheless, as discussed before, it should be noted that expanding school choice through private school funding might be associated with increased levels of segregation, even in the absence of selective admission criteria. The experience of school choice among non-selective public and private schools in Sweden (to be distinguished from the admission system in Stockholm) might be instructive here. Regions with more independent voucher schools have experienced higher levels of school segregation based on parental education and between immigrants and natives, controlling for residential segregation (Böhlmark et al., 2016), although some studies find this "white flight" phenomenon to be confined to Metropolitan areas (Yang Hansen and Gustaffson, 2016). Empirical studies on Sweden tend to agree, though, that residential segregation has had a greater impact on the rise in school segregation than school choice alone (Lindbom, 2010; Böhlmark et al., 2016; Lindbom and Almgren, 2007). In contrast to the experience of Chile, the evidence from Sweden might therefore suggest that non-selective admission among publicly funded private schools can ameliorate at least some of the segregation that comes with school choice policies.

Effects of selective admission on aggregate and school-level achievement

Schools that select their students based on ability tend to attain higher test scores than those practicing open admission (Gauri, 1998). Selectivity can increase a school's performance both directly, by raising the average ability of their student population, and indirectly through the peer effects that may accrue to students by virtue of being surrounded by high-ability classmates (see Section 5.5 below). Furthermore, sorting students based on their ability might make it easier for schools to cater to their students' educational needs by gearing their provision to students of a particular ability level. On the other hand, if the marginal benefit of high-ability peers is larger at the lower than the upper end of the ability distribution, the aggregate effects of student sorting on performance may be negative.

Empirically identifying these effects requires researchers to isolate the effect of ability-based selection from the educational benefits that selective schools might impart on students regardless of their selection practices. In addition, research designs need to address the problem of reverse causality since schools might be able to choose among a large number of applicants because they are known for providing a high academic quality. Conversely, schools might also be able to choose talented students because they are in high demand for features unrelated to their academic performance (e.g. location or special amenities) (Contreras et al., 2010).

In general, empirical evidence suggests that selective schools do not always provide students with a higher-quality education and that allowing for selective admission could indeed lead to a situation in which, "rather than striving to increase their students' learning outcomes, private schools might simply compete by trying to attract children who are easier to teach" (Brandt, 2010: 18). In order to avoid cream skimming from the public sector and provide schools with incentives to compete on the basis of quality rather than selectivity, Brandt (2010: 20) highlighted the importance of ensuring "equal conditions to compete for schools, including regarding selective procedures" across sectors.

As discussed above, some studies of Chilean voucher schools have suggested that their higher performance is mainly a result of their selectivity, rather than the quality of their provision. Early analyses by Gauri (1998) suggested that "creaming accounts for at least a proportion of the variation in achievement levels among subsidized schools" (1998: 72). Using more sophisticated multivariate regression, Contreras et al. (2010) arrive at the same conclusion and find that selection criteria considerably contribute to the performance gap between public and private schools in Chile, controlling for socio-economic characteristics at the school and individual levels. However, the estimates of ordinary regression methods are likely to confound the relative effectiveness of selective schools with unobserved characteristics of their students. As a consequence, such research designs cannot distinguish the net effect of attending a selective school from factors such as motivation or ability which may have played a role in the admission process.

Some studies have used more sophisticated techniques to isolate the effect of attending a selective school from unobserved characteristics, such as innate ability or educational ambition, on the basis of which students may have been selected or self-selected into these schools. Clark (2010), for example, uses a regression discontinuity design to test the effect of attending selective public grammar schools in the United Kingdom. The author exploits the "sharp change in the possibility of attending selective school over a narrow range of assignment test scores" to identify the effect of grammar school attendance by following the achievement trajectories of students who fell narrowly on either side of the cut-off point. The attendance of selective schools was found to only have a small effect on standardised test scores and positive peer effects were subtler than implied by previous studies using linear-in-means specifications of educational production functions.

Using a similar regression discontinuity design, Abdulkadiroglu et al. (2014) find that the attendance of heavily oversubscribed exam schools in Boston and New York was not associated with a significant improvement in exam scores or the colleges students moved on to attend. In the absence of higher educational quality or strong peer effects, the high demand for selective schools, suggests that parents mistakenly equate high-ability peers with educational quality, or that they value selective schools for reasons other than their educational quality. According to the authors, either of the two would "reduce the likelihood that school choice in and of itself has strong salutary demand-side effects in education production" (Abdulkadiroglu et al., 2014: 179).

These regression discontinuity designs might be limited in their external validity since they only measure the treatment effect on students at a particular level of ability and one should be careful in extrapolating their results to other student groups. Nevertheless, their design allows for relatively robust causal inferences. Although not all regression-discontinuity studies come to the same empirical conclusions (Pop-Eleches and Urquiola [2013] find that admission to selective schools in Romania improved cognitive skills and students' effort while reducing that of their parents) it is clear that selective schools do not always provide the students they target with a higher quality education than non-selective schools.

Particularly where private schools do not provide a higher value added than public schools, students may be attracted to selective schools for a number of reasons: First, since passing the selective admission procedure provides a signal of their ability in the labour market, second, since a school's student composition is often assumed to proxy for its quality and finally, due to the promise of positive peer effects. Schools, in turn, have an incentive to compete on the basis of selectivity to signal higher quality to parents and the labour market, and to attract students that are less costly to educate. Allowing schools to select students may therefore provide perverse incentives that can undermine the positive effects competition may otherwise have on school quality (MacLeod and Urquiola, 2009).

In some cases, student selection also occurs beyond the point of admission in the form of selective expulsion. At least up to 2005, private voucher schools in Chile have not only exercised selective admission more often than public schools, but have also more frequently expelled year repeaters. Controlling for student and school characteristics, Bellei (2008) has demonstrated this practice to be associated with a 0.19 standard deviation increase in test scores. It may therefore constitute another means for private schools to engage in cream skimming and undermine potential restrictions on selective admission.

5.5.2 Student stratification and peer effects

Increased student stratification is considered one of the major consequences of selective admission among publicly funded private schools. Since its consequences on both individual and aggregate learning outcomes largely depend on peer effects, the following section provides a brief discussion of the way in which individuals' performance is affected by that of their classmates. From a theoretical point of view, the aggregate effect of ability sorting on educational achievement is ambiguous since it depends on the way in which these peer effects accrue to students at different points on the ability distribution. Empirical studies of ability grouping usually find changes to the peer composition to have little or no effect on system-wide performance but to widen the achievement differentials between students of high and low ability, thus contributing to educational inequity (see Hattie [2009] for meta-analyses of empirical studies). Furthermore, Bygren (2016) finds the long- and short-term effects of ability sorting on student achievement-gaps to vary considerably across social groups. Future research will be needed to identify and find means to effectively address the potential inequities arising from these differential effects.

Peer effects, student sorting and school choice

Many arguments, both for and against policies to increase school choice, are based on assumptions about the nature of peer effects and their consequences for educational outcomes and equity. In the context of school education, the existence of peer effects suggests that students' educational achievement and aspiration are not only a function of their own, but also their peers' characteristics.

Opponents of school choice cite peer effects as a reason why school choice might disadvantage low-achieving students if their higher-performing peers leave for better schools (Hanushek et al., 2003: 527). Others suggest this increased ability sorting could also reduce aggregate achievement if high-ability students benefit from the exposure to talented peers less than low-ability students or if the variance in peer achievement has a positive effect on educational outcomes in and of itself. Proponents of school choice, on the other hand, argue that increased sorting can improve global performance if peer effects are such that high-achievers benefit more from high-ability peers than low-achievers do.

Evaluating the strength and prevalence of peer effects also has important implications for other educational policies. For example, improving individual students' performance through targeted programmes or tutoring could – in the presence of positive peer effects – generate positive externalities by raising their peers' performance as well (Hanushek et al., 2003: 542).

Theoretical intuition of peer effects

Peer effects can operate at the level of schools or classrooms and affect different educational outputs including students' educational achievement, their school choices and their educational aspirations. There are multiple theoretical hypotheses regarding the direction and relative strength of peer effects for different student groups.

Most studies assume that peer effects cause students to assimilate each other, particularly with respect to their achievement (Hoxby, 2000b; Hanushek et al., 2003). A number of mechanisms related to social

interaction and identification have been hypothesised to drive these effects, including normative pressures to conform with one's social environment, students helping one another out, peers affecting the classroom atmosphere and students bringing resources from their home to the classroom (Hoxby, 2000b: 28). Much empirical research has assumed this effect to be linear while others have relaxed this assumption and allowed it to vary across the achievement distribution:

1. **Linear models** assume that "a student's own achievement is affected linearly by the mean achievement of his peers" (Hoxby, 2000b: 28). According to this model, the mean student achievement is expected to remain constant regardless of how students are distributed across the school system since weak students suffer from ability segregation to the same extent that good students benefit from it.

2. **Non-linear models** allow for peer effects to vary across the achievement distribution. In general, non-linear models can support arguments both for and against increased student sorting, depending on the relative strength of peer effects across the student distribution. If, for example, high-ability students benefit more from being surrounded by strong peers than low-ability students, increased student sorting would be expected to raise the aggregate performance. Another example of non-linear peer effects would be performance gains caused by a high or low *variance* in peer achievement. In this case, all students could equally gain or suffer from an increase in student segregation (Hoxby, 2000b, pp. 2f.).

Other theories suggest that peer effects could also work in the opposite direction and exacerbate differences through mechanisms of social contrast. Being exposed to and comparing themselves with peers of high ability can lead students to develop a lower estimation of their own capacity. A lower sense of self-worth and academic ability might reasonably be expected to depress a student's achievement and lower their educational aspirations. Nevertheless, this strand of the theory has received considerably less attention in the recent literature (for an exception, see Jonsson and Mood, 2008).

Methodological challenges

The greatest challenge in identifying peer effects is to circumvent selection bias. Much of the variation in students' peer ability is generated by selection on the part of schools or parents. Parental school choice is influenced by their level of education, their income, workplace, or residence, which are correlated with their child's ability while selective admission procedures may explicitly sort students based on their ability. In some schools, students are then further allocated to classes and programmes based on their interests, past achievement, or other characteristics. As a result, a student's position in a particular school and classroom is subject to a host of unobserved characteristics which may affect their achievement and are not controlled for in ordinary least squares regressions. Some studies have addressed this problem by exploiting endogenous variation in students' classroom composition using instrumental variables (e.g. Hoxby, 2000b). Another way to address selection bias is to make use of natural experiments in which students are randomly allocated to their peers (for example, Sacerdote, 2001 studies peer effects among freshmen at Dartmouth College who were randomly assigned a roommate). In any case, controlling for the effects of peer achievement remains difficult, not least given the theoretical ambiguity surrounding the functional form they should take.

Empirical evidence on peer effects

Studies employing more sophisticated statistical techniques to identify the effect of peer group influence have yielded a positive relationship between students' achievement and that of their peers. Hoxby (2000b) identifies positive peer effects in Texas public schools by exploiting idiosyncratic variation in adjacent cohorts' peer group composition along the lines of gender and ethnicity (assuming that parents

and schools cannot *perfectly* predict or manage a cohort's ability composition). The findings suggest that a 1 point increase in the average test score of their peers increases a student's test scores by an estimated 0.10 to 0.55 points. Hanushek et al. (2003) also find evidence of positive peer effects using student and school-by-mark fixed effects to control for unobserved variables. In their estimation, the exposure to peers who score 0.1 standard deviation higher increases students' test scores by 0.02 standard deviations, while tests for the presence of non-linear peer effects and the benefits of high variance in peer achievement yielded no systematic evidence.

Although the aggregate effect of student sorting on educational outcomes is usually estimated to be low or insignificant (see Hanushek et al. [2003] for Texas and Bygren [2016] for Sweden), most studies using achievement as the dependent variable have found that students in high-ability contexts benefit from positive peer effects while those in low-achievement contexts suffer. In this context, increased student sorting, although it might not alter overall achievement, is likely to exacerbate existing inequities related to educational stratification and increase the association of school outcomes and socio-economic background. Although experimental studies based on random assignment in Kenya have found student sorting to benefit all students (possibly by allowing teachers to focus their attention and resources on low-achieving students), the authors caution that these findings might not apply in developed countries with a narrower ability distribution and different teacher incentives (Duflo et al., 2011: 1770).

Whether and how peer effects vary across different dimensions of social stratification is contested. Some studies find peer effects to be more pronounced among students of lower socio-economic status or ability (Levin, 2001a; Zimmer and Toma, 2000). However, well-designed studies of non-linearity and asymmetrical peer effects remain small in number and most of them are inconclusive, finding no or only partial evidence for asymmetries based on students' achievement or socio-economic status (see Ladd 2002: 13f.). While Hanushek et al. (2003) find peer effects to be linear across Texas public schools and therefore do not expect redistribution or sorting to affect the aggregate level of achievement, Hoxby (2000b) statistically rejects the assumption of linearity but finds no generalisable support for any particular non-linear specification of peer effects either. Her results rather suggest that peer effects may operate in a more complex interaction with peers' gender and ethnic composition as well as their achievement.

Evidence on the influence of peer groups on outcomes such as educational choices or aspirations remains scarce but suggests that the peer effects operating in these contexts might be quite different from those affecting achievement. Making use of a natural experiment to control for selection bias, Sacerdote (2001) finds positive peer effects among randomly assigned college roommates for academic achievement, but no significant effects on their choice of academic subjects. Jonsson and Mood (2008), using a model with school level fixed-effects and controlling for students' social characteristics, identify peer effects in Swedish comprehensive schools, indicating small but significant *negative* peer effects on students' aspirations when choosing upper secondary schools. This suggests that the exposure to more successful peers may diminish students' educational self-image or confidence.

5.6 Limitations and future research

Despite important advances in the empirical analysis of student selection among publicly funded private schools, important questions remain to be addressed. Empirical evidence on the use of different selection criteria (e.g. parental interviews versus test scores) and their respective effects on stratification along social dimensions other than ability is still disparate or inconclusive. Likewise, determining the relative impact of selection in contexts where private schools also charge add-on tuition fees remains a challenge for future research. We are also only beginning to understand the impact of stratification on equity, efficiency and learning outcomes. Most research on peer effects and the consequences of student sorting has focussed on their effect on academic achievement. Particularly in the longer term, though, students' attainment also critically depends on their educational choices and aspirations. Furthermore,

countervailing mechanisms of social contrast have received little attention in previous research and few studies have convincingly investigated how peer effects operate at different levels of achievement and how they might differ across students with different socio-economic characteristics. The relative dearth of empirical research on these outcomes means that we do not yet have a complete picture of the complex mechanisms of social influence contributing to the effects of school choice and increased student sorting.

5.7 Conclusion: Selective admission

Empirical evidence strongly suggests that publicly funded private schools use admission policies to select students of higher ability and socio-economic status, where they are allowed to do so. This increases the ability stratification of students across the education system and gives private schools a means to cream skim high-achieving students from the public sector. Depending on the criteria used in selection processes, school selectivity may also increase stratification along other socio-economic dimensions.

There is little evidence that student sorting could improve aggregate student performance but it can be expected to widen the gap between low-achieving and high-achieving students and schools due to peer effects. Since selective private schools do not generally appear to provide students with a higher value added than non-selective or public schools, the relative expansion of the selective school sector is also unlikely to raise aggregate achievement based on compositional effects.

Allowing private schools to select their students also provides them with incentives that might undermine the positive effects that school competition may otherwise have on educational quality. Consistent with theoretical models accounting for school reputation, providers that are allowed to select their students are likely to compete on the basis of exclusiveness, rather than quality. Extending public funding to selective private schools is therefore not only likely to exacerbate student stratification; it may also interfere with other policy objectives of school choice programmes.

The literature on school choice strongly suggests student selection occurs not only at the point of admission, but also through parental self-selection throughout the application process and selective expulsion. Education systems differ in the extent to which they regulate these points of selection, for example, by standardising application deadlines or restricting the expulsion of retained students. Both policy-makers and future research should therefore pay close attention to sources of student selection both before and after the point of admission.

6. THE REGULATION OF ADD-ON TUITION FEES AND ITS IMPACT ON EQUITY AND EFFICIENCY

6.1 The prevalence of add-on tuition fees in OECD countries

Across OECD countries, government-dependent private schools demand financial contributions from parents in 15 education systems at the primary level, 15 at the lower secondary level and 14 at the upper secondary level. By contrast, parents sending their children to government-dependent private schools do not have to pay fees in 7 school systems at the primary level, and in 9 systems at the lower and upper secondary levels. Tuition fees are much less common among public schools, with only 2 school systems demanding such contributions at the primary and lower secondary levels and 3 at the upper secondary level (OECD, 2011, Table D5.17).

6.2 Theoretical intuition

In most countries, government-dependent private schools are not allowed to charge any tuition fees, or – in voucher systems – no fees exceeding the sum of the parental vouchers. Restricting add-on tuition fees serves multiple purposes. On the one hand, it is meant to guarantee that private schools use public funds to substitute parental contributions, i.e. to widen access to students from financially disadvantaged backgrounds and prevent higher-income students from sorting into separate schools (Epple and Romano, 2012).

On the other hand, restricting private schools' ability to charge tuition fees prevents them from obtaining a competitive advantage over free public schools. In the absence of such regulations, Jacobs (1980) predicted that public subsidies might stimulate private schools to raise their fees above the sum of the voucher and top-up the funding with parental contributions. Such additional resources might be used to attract and further deplete public schools of high-ability or high-income students, which could widen the socio-economic and achievement gaps between public and private schools.

Since students of high socio-economic status tend to be less expensive to educate, private schools have an incentive to use tuition fees as a means to restrict access to disadvantaged students. Given the correlation of socio-economic status and ability, charging add-on tuition fees can also be a means to cream skim high-achieving students from the public sector without explicitly selecting them based on academic criteria. The practice of charging add-on tuition fees can therefore be considered an indirect selection mechanism (OECD, 2012a: 64) and considered within the wider context of a school system's policies on selective admission procedures. As Epple, Romano and Urquiola argue, "requiring a school to admit all voucher applicants but letting it discriminate in tuition can render the former restriction moot" (2015: 22).

Countries that allow publicly funded private schools to charge tuition fees may or may not permit them to discriminate in the amount they charge individual students. Schools might, for example, offer tuition fee deductions, fee waivers, or scholarships to attract high-ability students from low-income households. Depending on these aspects of policy design, add-on tuition fees may give rise to different patterns of segregation, which will be further discussed below.

In some cases, publicly funded private schools do not receive the same amount of financial resources as public schools and are expected to supplement them with tuition fees or other contributions. In

Lithuania, for example, private schools are entitled to the same amount of central government funding as public schools to cover their teaching costs, which tend to be the budget's largest component. However, they are expected to raise their own funds for school maintenance expenses including maintenance staff, student transportation and repair works (Shewbridge et al., 2016: 96). Charging tuition fees that are not fully covered by vouchers always constitutes a potential entry barrier for low-income students and may restrict parental choice. Nevertheless, it is important to distinguish fees that merely cover a specific type of expenditure not included in the public subsidy from those that far exceed the gap between public and private school funding.

Partial funding and add-on tuition fees

In some countries, government-dependent private schools do not receive the same level of government funding as public schools. In some of these systems, private schools are allowed to charge tuition fees in order to make up for this difference between public and private financial resources. The practice of "topping up" may here be seen as a legitimate means to level the playing field between private and public schools. In multiple US states, such as Minnesota, for example, private school attendance were subsidised with tax credits or tax deductions without imposing restrictions on tuition fees. Similarly, in Denmark only about 70% to 80% of the average municipal school funding follows student when switching to the private sector. Private schools charge parents an annual tuition fee intended to roughly put them on equal financial footing with the municipal schools.

While this arrangement results in an equal level of funding between public and private schools without giving either side a competitive advantage, it may still prevent low-income students from making full use of school choice. Furthermore, in the absence of any upper limit, private schools in such mixed-funding systems may charge parents considerably more than would be necessary to cover the funding gap between the private and public sector.

Partial public funding, paired with a high tuition price elasticity of demand, may also fail to provide sufficient incentives for private schools to enter the market or expand. Huerta and d'Entremont, for example, cast doubt on the effectiveness of Minnesota's partial tax deduction programme in stimulating supply. Reviewing enrolment levels between 1975 and 2005, they conclude that it "has not increased the demand for private schooling in Minnesota, nor has it prompted a substantial increase in private school capacity" (2007: 95).

6.3 Formal models and simulations

Effect of add-on tuition fees

Theoretical hypotheses concerning the effect of tuition fees have been complemented with formal econometric models, simulating their impact based on a set of assumptions about the behaviour of students and schools under in a given educational and regulatory environment.

Epple and Romano (1998) model a school system with free, non-selective public schools and selective private schools charging add-on tuition fees and price-discriminating between individual students. Under these conditions, introducing flat-rate vouchers of a certain size yields a considerable growth in the private school sector and significant cream skimming. Private voucher schools would be expected to draw both high-income and high-ability students from public schools since they could let well-off students pay higher tuition fees to cross-subsidise students with high ability in return for positive peer effects. If each student was charged their reservation price, tuition would be higher for students with low ability while highly able students might even face negative effective marginal cost. Public schools – drained of their best students – would experience a loss in educational quality due to negative peer effects. Like many simulations

focussing on the distributional consequences and peer effects of vouchers or add-on tuition fees, Epple and Romano's (1998) model does not take into account the improvements in technical efficiency that voucher proponents claim to result from competition. Since school quality is assumed to only be a function of student inputs, evaluating claims regarding different schools' efficiency or effectiveness remain open to empirical investigation.

In a similar model simulating the interaction between selective, price-discriminating private schools and free, non-selective public schools, Epple and Romano (2008) allow for the schools' quality to vary with both the ability of their student body and the schools' expenditure. While private schools adjust their expenditure so as to maximise profit, the quality of public schools is assumed to be homogenous. Students are assumed to differ in their ability and income along a continuous distribution while their academic achievement is a function of their ability and school quality. Calibrated to US data from 1999, the model predicts that flat vouchers under these laissez-faire conditions would create a hierarchy of private schools, stratified by quality as well as their students' income and ability. The public sector would lose students of both high ability and high income. If the amount of the voucher is high enough to cover the minimal fixed and variable costs of education, the model also expects the entry of bottom-feeder private schools offering a lower quality of education than the public schools and attracting poor students with monetary kickbacks, rebating some of the voucher amount.

Although the model's assumptions may not hold in practice (particularly concerning the permissibility of kickbacks in the form of negative fees), it highlights the difficulty of implementing vouchers while allowing schools to select their students and charge fees. Even if selection were banned, the model shows that schools would have an incentive to undermine the restrictions, thus requiring significant efforts to ensure compliance, unless the amount of the voucher closely reflects each student's effective marginal cost of education.

It should also be noted that both models by Epple and Romano (1998, 2008) assume schools to be profit-maximising. Yet, the authors suggest that the models would predict add-on tuition fees to have a similar effect if schools were to pursue a different objective, such as quality- maximisation as opposed to profit-maximisation (Epple and Romano, 2008: 1399). The simulations therefore nevertheless provide an insight into the effects of add-on tuition fees on school behaviour under different school choice regimes.

Nechyba (1999) adds another layer of complexity by taking into account the role of residential mobility in the effect of voucher programmes. The model assumes homogenous public schools with open enrolment and selective private schools charging add-on tuition fees. Other than in Epple and Romano (1998, 2008), schools are not allowed to discriminate in their tuition policy and therefore charge all students the same price. The model assumes households to differ in income and simultaneously choose whether to send their children to a private or public school, which neighbourhood to reside in (taking into account the quality of housing and schools) and whether to vote for a property tax to be added to the district's public school funding. A school's perceived quality is a function of its socio-economic composition and expenditure per student. Calibrating the model to New Jersey data, Nechyba's simulation predicts that the provision of vouchers would cause public schools to experience a drop in peer-quality as higher-income students would relocate to better quality public schools in other districts. At the same time, private schools are expected to open in poorer neighbourhoods, catering to high-income households that emigrated from other districts. The result is a declining peer quality in the public education system, although some of it may be offset by a reduction in residential stratification and the fiscal benefits this brings to locally funded public schools in poorer neighbourhoods.

Effect of indirect costs associated with school choice

Chakrabarti (2013) presents one of the few models simulating private school behaviour and student sorting in a system where private schools are not allowed to select students or charge add-on tuition fees. Eliminating tuition fees, the author suggests, can be reasonably expected to reduce student sorting at the application stage, but additional means-tested subsidies would need to be in place to also prevent sorting at the point of enrolment. The model identifies two distinct mechanisms that might cause student sorting even under a regime of free and non-selective private schools. Based on the assumption that high-ability students value education more and are therefore more likely to bear the opportunity costs of applying, the model predicts ability-sorting at the application stage. At the enrolment stage, even in the absence of tuition fees, additional costs associated with school attendance may be disclosed (e.g. for transportation and extracurricular activities), causing student sorting based on income unless the voucher takes these additional costs into account. Under these conditions, the authors show that – in a system of non-selective admission – a "full payment of tuition by vouchers can preclude sorting by income in the application stage and perhaps also in the enrolment stage, if subsidiary monetary costs in the enrolment stage are also paid for by the voucher or the policymaker" (Chakrabarti, 2013: 215). The ability-based sorting at the application stage, however, is harder to prevent since it is the result of parental self-selection. The model's observable implications are congruent with evidence from the 1990 Milwaukee voucher programme. Using a logit model and student-level data for the first five years of the voucher programme, the author confirms ability sorting at the application stage and income sorting at the enrolment stage.

6.4 Countries' approaches to add-on tuition fees in publicly funded private schools

In **Australia**, government-dependent private schools (both Catholic and independent) are allowed to charge tuition fees (Watson and Ryan, 2010: 87). With the implementation of the Australian Education Act in 2014, a new funding system was introduced, providing all schools with recurrent per-student funding based on a needs-based Schooling Resource Standard (SRS) benchmark. Additional targeted funds are available for small and rural schools as well as schools teaching disadvantaged students (OECD, 2015c: 195). Private schools receive between 20% and 90% of the funding public schools receive, depending on their school communities' "capacity to contribute", which is assessed based on parents' socio-economic status, the level of parental contributions and other private sources of income. Private schools serving remote areas or student populations with special resource needs are exempt from this rule.

The **Milwaukee** Parental Choice Program, introduced in 1990, provided eligible private school students with the lesser of the district's average cost per public school student and the private school's tuition fees.[6] Initially, private schools were not allowed to charge fees exceeding the voucher amount. However, starting in 2011, schools could demand add-on fees from households with an income exceeding 220% of the poverty line. The cost of transportation within a defined catchment area is covered by the district (Epple, Romano and Urquiola, 2015: 9).

Denmark has a long tradition of publicly funded independent schools and a large and growing private sector, enrolling 23% of 15-year-olds in 2009 (OECD, 2013a). Since 1992, the amount of funding per students that private schools receive depends on their size and the students' age distribution. All private schools are required to charge parents at least a small tuition fee of about EUR 500 per year as a means to ensure that parents have a financial stake and therefore maintain a high level of involvement in their chosen private school. Publicly funded private schools are allowed to charge additional tuition fees exceeding this baseline contribution (for which low-income households may receive waivers). To ensure that private and public schools enjoy similar levels of funding, the public grant for operational

[6] The income threshold for eligibility initially stood as 175% of the federal poverty level, but has been raised to 300% over the years.

expenditures amounts to about 70%-80% of the public schools' funding. Total parental contributions vary between schools, averaging about DKK 1 000-2 000 per month (ca. EUR 130-260) (Houlberg et al., 2016: 58f.). While public schools must accept all students, Danish private schools are also allowed to practice selective admission (Andersen, 2008), although not all of them make use of this right.

Since 1994, elementary and secondary private voucher schools and municipal secondary schools in **Chile** have been allowed to charge limited tuition fees. Under the system of shared financing (*financiamiento compartido*), schools could charge additional fees of up to 1.6 times the public expenditure per student. Even though fee-charging schools received fewer public subsidies, these reductions only applied if the fees exceeded 50% of the public voucher and only lowered the voucher amount by a fraction of the schools' additional income. Schools were required to spend up to 10% of their income from fees to finance scholarships though (OECD, 2012a: 53). In 1996, private contributions (including tuition payments, "Parent Center" fees, and the cost of uniforms and textbooks) accounted for 59% of the funding in non-religious voucher schools and around 38% in the ostensibly free public schools run by the *Departmento de Administración de la Educación Municipal* (DAEM) (McEwan and Carnoy, 2000: 223). However, since the introduction of the Inclusion Law in 2016, all private schools are required to phase out their tuition fees and other obligatory parental contributions (e.g. for school material) over the coming years in order to continue receiving public funding. The consequences of these new regulations are not yet apparent and all empirical studies considered for this review draw on Chile for examples of subsidised private schools charging add-on tuition fees.

Independent schools in **Sweden** receive the same amount of funding as public schools and have been prohibited from charging additional fees since 1997. Prior to this, Swedish independent schools only received 85% of the average cost per student in public schools and were allowed to make up for this discrepancy by charging a small fee.

6.5 Empirical evidence on the effect of add-on tuition fees

Tuition fees and student segregation

Tuition fees, much like selective admission, have been argued to restrict access to schools and exacerbate socio-economic stratification. Although tuition fees are well-documented to deter school attendance among low-income students in developing countries (Alderman et al. 2001; Deininger, 2003; Al-Samarrai and Zaman, 2007), evidence from OECD countries is comparatively scarce. Comparing enrolment patterns across different school types in Chile, Elacqua (2012) finds fee-charging private voucher schools to serve less than half as many students of indigenous descent or low socio-economic status as free private schools (14.2% compared to 37.0% in 2006). Whether or not schools charge add-on tuition fees emerges as the most important characteristic in explaining varying levels of socio-economic segregation across private voucher school sectors (ibid.: 450). According to the author, this suggests that "tuition-charging private voucher schools select student populations based on ability to pay" and that policies providing schools with incentives to charge tuition "even if it is only limited, can have a negative impact on school segregation" (ibid.: 450).

Yet, the study's descriptive design makes it impossible to ascribe causality to the observed association of tuition fees and student segregation with any certainty. Neither does the study control for factors such as the schools' geographic location, which might affect their student population due to residential segregation regardless of financial barriers to entry. The same goes for academic selection criteria, which can contribute to socio-economic segregation due to the correlation between household income and academic achievement. Nevertheless, the study does show that the "adjusted voucher law" of 2008 – which increased the voucher size for disadvantaged students by 50% and prohibited schools from charging eligible students fees – was associated with a slight decrease in student segregation across all sectors (Elacqua, 2012).

Similar issues of causal attribution are found in the case of Denmark where students attending private schools tend to be of higher socio-economic background (Tornhøj Christensen and Ladenburg, 2012, cited in Houlberg et al., 2016), yet the extent to which this is caused by tuition fees, selective admission, self-selection or other factors is difficult to determine, not least given the great heterogeneity of private school providers and their respective student intakes.

Alves et al. (2015) investigate the effect of voucher design in a comparative study of school choice programmes in Rio de Janeiro, Brazil and Santiago, Chile. Controlling for student ability and the availability of high-quality schools, students of higher socio-economic status were significantly more likely to make use of school choice by attending a school outside of their district. Even among the students who made use of vouchers, these patterns of stratification persisted, since well-off students were more likely to attend high-quality private schools. Notably, these socio-economic differences were more strongly pronounced in Chile than in Brazil – a phenomenon which the authors suggest could be explained by the fact that Chilean voucher schools were allowed to practice selective admission and charge add-on tuition fees. It is not clear, however, which of the policies had a greater impact on student segregation and whether additional factors, such as the greater diversity of Chilean school providers, might have contributed to the differences between the two countries.

To more rigorously identify how add-on tuition fees impact student sorting and achievement, researchers have moved beyond cross-sectional research designs, not only investigating the introduction of tuition fees, but also their abolition in contemporary and historical contexts. Riphahn (2012), for example, exploits temporal variation in the abolition of public schools fees over a period of 15 years across 16 German federal states. Based on individual-level census data from 1989, 1993 and 1997, she tests the impact of fee abolition on educational attainment across cohorts and states. The study addresses the threat of self-selection into treatment, excluding families who recently moved to states that abolished fees, and plausibly rejects the alternative hypothesis that changes in student attainment led to an abolition of fees, rather than the other way around. The study concludes that abolishing fees increased upper secondary school attainment by an average of at least 8% and that women's demand for education was more sensitive to fees than men's (possibly a consequence of their lower marginal returns to education in the labour market). Although differences in the price elasticity of educational demand would have been expected to deter low-income students from taking advantage of educational opportunities, Riphahn's study shows that add-on fees also have the potential to exacerbate gender inequalities.

The equity-improvements resulting from a ban on add-on tuition fees were also investigated by Neilson (2013), who shows that restricting add-on tuition fees for disadvantaged students in Chile and increasing their voucher significantly raised their test scores. Using a difference-in-differences analysis, the author compares the change in student achievement among the poorest 40% of students with the rest of the student population, following the introduction of targeted vouchers in 2008. The targeted voucher programme prohibited the participating schools from charging the poorest 40% of students tuition fees and mandated them to refrain from selective admission. Compared to the rest of the student population, those who benefited from the voucher are estimated to have improved their academic outcomes by 0.2 standard deviations, thereby narrowing their achievement gap by one third (Neilson, 2013: 45).

The mechanism by which this improvement came about is not straight-forward. Other than might be assumed, the effect was not a result of low-income students relocating to better, previously unaffordable schools. Rather, as predicted by Neilson's (2013) theoretical model, schools serving low-income students appear to have improved their quality (possibly because the targeted voucher increased their resources and incentivised them to compete for low-income students). It is thus not clear whether banning add-on tuition fees without simultaneously raising the voucher amount for low-income students would have improved their outcomes to the same extent.

The effect of public funding in the context of add-on tuition fees

Providing vouchers for the attendance of fee-charging private schools has been suggested as a means to open them up to students who could not otherwise afford them. For this strategy to be successful, the public funding would need to cover all or a substantial proportion of the tuition fees, which is usually achieved by prohibiting eligible schools from charging fees that exceed the sum of the voucher. In the absence of such regulations, schools could either use the public subsidies to reduce their barriers to entry while maintaining a given level of quality, or to keep their tuition fees at a given level while investing the public funding to increase their quality.

In 1974, Australia started providing low-income families with school vouchers without restricting private schools' ability to charge add-on fees, which provides an opportunity to empirically investigate the effect of subsidies in the absence of tuition fee regulations. Watson and Ryan (2010) examine the effect of the reform using historical administrative and participation data from three cohorts (1975, 1995 and 2006). Their findings confirm that private schools used public subsidies to increase their perceived quality (operationalised as the student-teacher ratio), rather than to reduce their tuition fees. Since barriers to entry remained high, the voucher programme hardly altered the socio-economic composition of private schools. Even though vouchers were restricted to lower-income families, students of higher socio-economic status continued to be much more likely to make use of school choice. As a consequence, the programme led to a decrease in the average socio-economic status of public school students. Although the study can only point to temporal correlations, it strongly suggests that the voucher reform failed to improve equity since it did not restrict add-on tuition fees, leading the authors to conclude that "[s]trong government regulation in respect of tuition fees and an independent mechanism governing the selection of students who receive government subsidies would be the minimum regulatory requirement for any funding system aiming to expand educational opportunities through supporting private school choice" (Watson and Ryan, 2010: 105).

The problem of elastic tuition prices was already raised by Jacobs (1980), who suggested that substantial public funding for private schools would "offer a significant opportunity for schools to raise tuitions and thereby prevent a lowering in actual costs to parents" (Jacobs, 1980: 243f.). Long (2004) finds empirical support for this hypothesis in the context of higher education and demonstrates that tuition vouchers introduced with the 1993 Georgia HOPE Scholarships prompted both public and private four-year colleges to increase their student charges at a faster rate than similar institutions in nearby states. While public colleges raised room and board prices, private ones increased their tuition fees and reduced financial aid, recouping up to 30% of the scholarship and increasing the financial burden for students who did not qualify.

There is some evidence that private schools in Chile used add-on tuition fees to cream skim students of higher socio-economic status without investing the additional resources to raise their educational quality. Analysing SIMCE data from 2002, prior to the introduction of targeted vouchers, Mizala and Torche (2012) find "virtually no association between parental add-on fees and test scores after the school-level socio-economic status is accounted for" (Mizala and Torche, 2012: 133).[7] The study uses a multilevel regression model to account for students' clustering within schools and a two-step Heckman model to control for non-random self-selection into private schools, using the municipality's supply of different school types as an instrument. These findings substantiate concerns that uncapped tuition fees in a flat voucher system may serve as means for schools to select students based on socio-economic status,

[7] A study using SIMCE data from 2005, controlling for school, individual, and household characteristics, found a positive relationship between parental fees and student achievement (net of students' socio-economic background) which disappears when controlling for selective admission criteria (Contreras et al., 2010: 1362).

which "contributes to the inequality in test scores without improving the overall level of educational achievement" (Mizala and Torche, 2012: 142).

6.6 Limitations and future research

Due to both endemic data limitations and the small number of cases, most studies of add-on tuition fees have distinguished between schools that charge fees and those that do not, rather than comparing the effect of different levels of tuition fees. As a consequence, we have limited knowledge regarding the point at which parental contributions begin to deter families from lower socio-economic background in high-income countries from attending publicly funded private schools.

As is the case with regulations on selective admission, the success of policies restricting add-on tuition fees depends on the development and implementation of monitoring and compliance mechanisms. Unless private schools are effectively held to account and prevented from subverting accreditation and funding requirements, restricting their eligibility for public financing is unlikely to yield the desired results. The cost of operating compliance systems should therefore receive careful attention when considering the efficiency and potential financial gains from publicly funding private providers, even though it has – as of yet – received little attention in the debate on school choice.

6.7 Conclusion: Add-on tuition fees

Allowing publicly funded private schools to charge add-on tuition fees exceeding the amount of the voucher can limit the extent to which disadvantaged students make use of school choice programmes. This may be reflected in the underrepresentation of low-income students among fee-charging private schools, but studies that convincingly test the causality of this relationship are rare – not least due to the scarcity of empirical examples. Nevertheless, studies of historical cases and the more recent targeted voucher reform in Chile suggest that targeted vouchers and fee abolition are an effective means to reduce the achievement gap between students of higher and lower socio-economic status, while also highlighting the inequities that pertained under a system permitting add-on tuition fees.

Existing research also points at ways in which add-on tuition fees can undermine the policy objectives of school choice programmes. As predicted by theoretical simulations, allowing schools to charge add-on tuition fees means that public subsidies are unlikely to widen access to private schools. Rather, voucher schools have been shown to use public funding to increase their quality which threatens to widen existing achievement gaps between students who can afford them and those who cannot. If regulations permit private voucher schools to run for profit, schools may retain part of the public subsidies and use fees to compete based on selectivity without increasing their educational quality. This is what the research suggests was the case in Australia and Chile respectively.

7. THE REGULATION OF FOR-PROFIT SCHOOLS AND ITS IMPACT ON EQUITY AND EFFICIENCY

7.1 The prevalence of for-profit schools in OECD countries

Few OECD countries allow publicly funded private schools to operate for profit. Notable exceptions over the past decades have included Chile, where for-profit schools were eligible for public subsidies until the introduction of a new Inclusion Law in 2016, Columbia (from 1992 to 1996), Estonia, New Zealand, Sweden (since 1992) and a number of US states that allow for-profit organisations to operate charter schools. A detailed description of the respective policies is provided in Section 7.4. Of these countries, only Chile and Sweden had a substantial commercial school sector and have therefore been studied the most extensively, alongside smaller US charter school programmes, e.g. in Florida and Michigan.

7.2 Theoretical intuition

Most countries that publicly fund private education prohibit subsidised schools from operating for profit. Under these conditions, for-profit education providers are placed at a disadvantage compared to public schools or non-profit private schools and face a high barrier to entry. Even if non-profit private institutions are not publicly subsidised, they are likely to be more successful at raising donations or employing personnel at below-market prices than for-profit providers. As Levin argues, in a market where "even the most expensive private schools with the most elite clientele fail to cover their costs with tuition", trying to do so while making a profit constitutes a formidable challenge (Levin, 2001b: 6).

In order to facilitate the entry of for-profit private schools, some have therefore advanced the idea of publicly subsidising commercial providers on the same terms as their non-profit counterparts. Subsidising for-profit schools has been argued to invigorate competition, increase the diversity of providers and attract private capital to finance the creation of new school buildings, particularly in school systems facing a shortage of school places. A 2011 World Bank report suggests that extending financial support to for-profit schools is a necessary step to progress towards a "mature" competitive environment that "[r]eflects international best practice, or full engagement with the private sector" (Lewis and Patrinos, 2011, Figure 9: 29). Rather than restricting public funding to non-profit schools, market entry and exit could be determined by "high levels of accountability" and whether or not for-profit providers are "delivering high-quality outcomes for the students that they serve" (Lewis and Patrinos, 2011: 7). Others have urged governments to restrict public funding to non-profit institutions or "give priority in access to publicly funded school improvement programs and other public resources (texts, computers, teaching materials, teacher training, etc.) to schools serving the public good" (Bellei, 2008: 190). The remainder of this section will lay out some of the theoretical arguments for and against the public funding of for-profit schools before reviewing and discussing the relevant empirical evidence.

Publicly funding for-profit schools is commonly objected to on the basis that their motives might not align with the public good. Other things being equal, for-profit schools can be expected to spend fewer resources on their educational provision than non-profit schools since part of their revenue is retained in the form of profit. This retained revenue, which could have otherwise been used to improve or expand their educational offer, constitutes a deadweight loss, which might discourage policy makers from publicly funding for-profit schools. In practice, this inherent inefficiency of for-profit providers might be outweighed by the quality of their educational provision or their effect on school competition. Much of the

discussion on the permissibility of publicly funded for-profit schools is therefore based on the question how they would behave in a competitive environment and how their provision might differ from that of non-profit schools. Another concern frequently raised regarding for-profit providers is the risk of financial corruption (Baum et al., 2014) and the difficulty of effectively monitoring their use of public resources. Given the small number of countries that provide public funding for private for-profit school, many contributions to the literature have been of a theoretical or computational nature, yet the following discussion will draw on relevant empirical evidence whenever possible.

Competitive behaviour of for-profit schools

Proponents of subsidising for-profit schools argue that competitive pressures would force commercial providers to offer high-quality educational services, consistent with the general argument for school choice (see Section 3). If for-profit schools fail to compete with other subsidised schools by offering lower attendance costs, they would be expected to do so based on their superior performance or by appealing to the preferences of a particular clientele. Some also argue that the strong financial incentive to attract students could lead for-profit schools to develop innovative management structures and educational techniques or be particularly responsive to the needs of parents and students. Proponents of for-profit schools expect their presence to lead to improvements in other school sectors too – either by intensifying competition or by encouraging public and non-profit schools to adopt successful practices emanating from the for-profits sector.

Besides the inherent deadweight loss involved in financing for-profit schools, the main concern of their opponents is that commercial providers might prioritise driving down costs over their students' educational outcomes in order to maximise profit. Even though they would be subject to competitive pressure, for-profit schools might not compete on the basis of educational quality alone but rather seek to distinguish themselves based on non-educational amenities or marketing campaigns. Intensified inter-school competition in the absence of appropriate regulations might thereby cause a diversion of resources away from the provision of educational services. Especially among for-profit schools seeking to establish a strong brand identity, critics have warned that "marketing and promotion inevitably will absorb resources that could have gone to instruction" (Levin, 2001b: 11).

The competitive behaviour of for-profit private schools is expected to be shaped by their regulatory environment. For example, provided that schools are allowed to practice selective admission, for-profit schools might try to increase their perceived effectiveness or value added by cream skimming students of high ability or those with the greatest expected performance gains (possibly students in the lower-middle of the ability distribution) from the public and non-profit sector (Levin, 2001b: 10). Another factor which is likely to influence the behaviour of for-profit schools, is the time-horizon with respect to which they seek to maximise their gains: while some may try to develop high-quality schools aimed at long-term profitability, others might focus on short-term profits and turn out to provide a lower quality (Böhlmark and Lindahl, 2015: 536).

Teaching and employment practices

If schools are evaluated in standardised tests and compete on the basis of student performance, for-profit schools with more flexible managerial and personnel policies might try to attract and retain teachers based on their performance. If commercial providers are allowed to diverge from national salary or staffing regulations, they might offer performance-related bonuses (or punish low-performers), speed up teachers' career progression, and offer training programmes or other benefits to attract the most able teachers. By contrast, since wages tend to account for 80% or more of an average school budget, Levin (2001b) anticipated commercial schools to reduce their personnel costs by hiring less experienced teachers with lower salaries, employing part-time staff, increasing class sizes, or reducing the length of the school day. In

the case of the United States, Levin suggests that "[w]here the laws have granted them flexibility, for-profit schools have tended to hire their teachers with less concern for whether they have met certification requirements. In some states they need not meet conventional certification requirements at all" (Levin, 2001b: 8).

Experience from for-profit Education Management Organization (EMOs) in the United States seems to confirm that for-profit schools tend to introduce stronger incentive structures (implying a higher performance pressure) but also more extensive development opportunities for teachers than public schools. Some for-profits, such as Edison Schools "emphasize strong professional development by providing as much as three weeks of training a year for teaching staff. By contrast, public schools typically provide only three to four days of staff development a year, with little follow-up or assessment of results" (Levin, 2001b: 8f.). Levin also (2001) reports that for-profit EMO schools often employ teachers on fixed term contracts and renew them based on performance evaluations. Other strategies to retain valued teachers in for-profit schools include the provision of rewards for substantive specialisation and more extensive career ladders than public schools can offer.

The extent to which for-profit schools can compete and distinguish themselves based on teaching and employment practices depends not only on a country's regulatory framework but also the relative size of the for-profit sector. A report by Laird and Wilson (2012), for instance, notes that it "is difficult to deviate from national pay and staffing norms when only a minority of schools have such freedoms" and that they might not be able to make use of them "until there is a critical mass of independent state schools" (Laird and Wilson, 2012: 17).

Innovative educational practices

Proponents of subsidising for-profit education argue that the entry of private sector providers would foster educational innovation. These claims are difficult to test robustly, yet anecdotal evidence suggests that US for-profit schools distinguish themselves from non-profit institutions mainly through their personnel practices, professional development and management style, rather than innovative instructional practices (Levin, 2001b). In other contexts, the innovations fostered by market-based reforms have been observed to be primarily concerned with marketing, rather than teaching (Lubienski, 2009: 23). According to Lubienski, this phenomenon "points to the inherent tension facing schools with the freedom to innovate, but the requirement to be accountable for results as judged on a uni-dimensional standard of academic achievement and consumer approval", which may lead for-profit operations to privilege the minimisation of costs over the risk of experimentation (Lubienski, 2009: 40). In some cases, for-profit providers may also face more specific institutional constraints impeding their capacity to innovate. As Levin reports, principals of US for-profit schools are equipped with more decision-making power in the realm of personnel practices than their non-profit counterparts, but not necessarily with respect to instruction, which tends to follow centrally determined corporate guidelines, particularly if for-profit franchises seek to develop a "brand identity" across multiple sites (Levin, 2001b: 9).

7.3 Formal models and simulations

Objective functions of for-profit and non-profit schools

Given the relative scarcity of for-profit providers among OECD countries, a number of formal econometric models have been proposed to test theoretical hypotheses regarding their effect, based on a series of assumptions about the behaviour of students and schools under a given set of regulatory constraints. In fact, the majority of models simulating the effect of school choice are based on the simplifying assumption that all schools maximise profit (see Epple and Romano, 1998, 2008; Neilson, 2013; Tapia, 2010). Apart from the fact that publicly funded for-profit providers are absent from most

school systems, this raises the question how to characterise the behaviour and incentives of non-profit providers in comparison.

In some models' simulated equilibria, schools pursuing non-profit objectives such as maximising student achievement or satisfaction have been shown to behave in a similar way as for-profit schools since neither would provide students with more than their equilibrium reservation utility (Epple and Romano, 1998: 38). If certain assumptions hold, competitive pressures could thus lead profit maximising schools to provide a similar standard as quality maximising ones (Epple and Romano, 2008: 1399). Exploring the differences between for-profit and non-profit schools under less restrictive assumptions would be an important extension to this literature.

Computational models

In a computational model calibrated to features of Chile's education market, Tapia (2010) simulates the behaviour for-profit and non-profit schools under a universal flat-voucher system that allows schools to select students but prohibits add-on tuition fees. Students are assumed to differ in ability and income while schools differ in productivity, investment decisions and their objective functions. Education outcomes are considered a function of student ability and school quality, which in turn is a function of the school's productivity and its level of investment. In this scenario, Tapia argues, allowing for-profit schools to enter the market would not decrease the system's productive efficiency or students' achievement. The model assumes that non-profit schools exhaust their entire budget, aiming to maximise their students' outcomes, while for-profit schools will only invest enough of their budget to prevent the marginal school from entering the market. Despite the fact that for-profit schools, by definition, do not exhaust their budget and reinvest the full voucher amount, their survival in the market should imply that there are no non-profit schools which could provide a higher level of productivity even though they would make use of the entire voucher (Tapia, 2010: 51). Since the model is based on a one-to-one matching design, pairing each school with only one student, it precludes the analysis of peer effects as well as incentives to expand and attract more students, which might affect the simulation's results.

A simulation by Epple and Romano (1998) suggests that the introduction of universal vouchers in a system with for-profit private schools charging add-on tuition fees and practicing selective admission would have concerning consequences for equity. The authors assume public schools to be free, of homogenous quality and open to all students, while private schools are assumed to be equally effective, to maximise profit, and to set their admission and tuition policies to select students based on their income and ability. Private schools can price-discriminate between students by offering tuition discounts to high-ability students with low income. In a competitive equilibrium, the model predicts a considerable redistribution of students towards the private sector, leaving low-ability and low-income students behind in public schools, which would experience a loss in educational quality due to negative peer effects. In the private sector, schools are expected to be segregated by student ability and income. Up to a certain voucher amount, the funding of private schools is expected to have a positive effect on aggregate student achievement and the cost of education. Any voucher amount above this size (calculated to range from USD 0 to USD 4 200) is expected to negatively affect aggregate outcomes. However, the vouchers' positive effect on aggregate achievement relies on the strong assumption that high-ability students would gain more from an improved peer quality than low-ability students would suffer from a reduction in theirs. The authors acknowledge that there is very little evidence to support this assumption and the opposite scenario, in which increased segregation would not only harm public school students but also reduce aggregate student achievement, seems equally plausible.

In a counter-factual simulation, Neilson (2013) compares the predictions of a computational model with the observed effects of the Chilean voucher reform. The model relaxes the assumption of perfectly competitive markets and adds complexity by accounting for geographical variation in household incomes

and the supply-side response to policy initiatives. Private schools are assumed to endogenously set their educational quality (e.g. by using better teachers and material or by exerting more effort) and charge tuition fees to maximise profit. Student achievement is not subject to peer effects and schools are spread across neighbourhoods with varying levels of income. Households differ by income, residence, educational preferences, as well as their sensitivity to the price of education and the distance of schools. Under these conditions, Neilson's model predicts that profit-maximising schools funded by a flat voucher and permitted to charge add-on tuition fees would provide lower-quality education in poor neighbourhood and thereby exacerbate social and geographical inequities.

By treating the quality of schools as an endogenous variable, Neilson's model shows that profit-maximising schools could take advantage of the fact that lower-income families are more price sensitive and less willing to travel, which gives schools more local market power and allows them to mark down their quality further below the perfect competition level in poor neighbourhoods (Neilson, 2013: 45). This echoes concerns regarding both the equity and quality implications of subsidising for-profit schools. Means-tested vouchers are shown to ameliorate some of these problems. Under the model's assumptions, providing low-income families with additional funding would reduce their price sensitivity and allow them to be more sensitive to the quality of education. This intensifies the competition between schools in low-income neighbourhoods by diminishing their market power and forces them to improve their quality. The observable implications of Neilson's theoretical model are consistent with empirical evidence from Chile, suggesting that the positive effects of targeted vouchers might in part be explained by a reduction in the market power of for-profit providers in poor neighbourhoods.

Although the results yielded by these computational models should be considered in the light of their assumptions, they highlight some of the potential consequences of funding for-profit schools. If commercial providers are forced to operate under the same conditions as public schools, their remaining in the market would confirm that they are as effective as their competitors despite their failure to fully reinvest their revenue to improve their provision. Yet, allowing for-profit schools to charge add-on tuition fees is likely to exacerbate the stratification of the school system and lead to cream skimming from the public sector. The models also highlight the risk that for-profit schools might exploit regional variations in students' price sensitivity if they possess a significant market share, which can reinforce existing economic and geographical inequities. Of course, theoretical models of this kind are based on simplifying assumptions about, for example, the way in which students and parents choose between schools and the quality of information they can base their decision on. Furthermore, simulations necessarily focus on a narrow set of educational outcomes and dimensions of equity. Although they provide powerful tools to generate and test our intuitions regarding the funding of for-profit education, empirical analyses are indispensable to evaluate its effects in practice.

7.4 Countries' approaches to funding for-profit private schools

Until recently, private for-profit voucher schools constituted a substantial part of the school system in **Chile**. For-profit voucher schools tended to be relatively small in size and accounted for 27% of primary schools, serving 29% of primary school students in 2006, compared to non-profit voucher schools, which accounted for 9% of schools and enrolled 15% of the student population (Elacqua, 2012: 448). The number of for-profit schools rapidly increased following the 1981 voucher reform, which matched the public funding for private schools with that for public schools. Other than non-profit private schools, which are predominantly Catholic, for-profit schools tend to be non-denominational. Many of them were set up by former public school teachers and intended to serve the local community with only about 20% of them belonging to a school network (Elacqua, 2012: 447). Like other subsidised private schools in Chile, for profit voucher schools could practice selective admission and charge add-on tuition fees (Mizala and Torche, 2012: 134). In 2015, the government put an end to the public funding of for-profit private schools when passing the Inclusion Law, which will be gradually implemented over the coming years. The new

law also requires voucher schools to phase out obligatory tuition fees and stop selecting students based on parental interviews or prior academic achievement. The consequences of these new regulations are not yet apparent and the empirical studies considered for this review draw on Chile as an example of a school system with an extensive, publicly funded for-profit sector.

In 1992, **Sweden** implemented a voucher system under which every school – private or public – is entitled to public funding. Private schools are entitled to receive subsidies of equivalent size to the local municipality's average spending per public school student. The government imposes no restrictions on the ownership structure of accredited government-dependent private schools, allowing them to be operated by religious organisations, non-profit co-operatives, or for-profit corporations. The reform has led to a sharp increase in the share of independent schools, from about 1% to 10% of student enrolment at the primary and lower secondary levels and more than 20% at the upper secondary level in 2010. 65% of all independent schools are operated for profit, accounting for 13% of all schools (Sahlgren, 2011: 28). Publicly funded private schools must be approved and regularly evaluated by the Schools Inspectorate, and need to follow the national curriculum. Furthermore, they are not allowed to charge tuition fees or to select students in compulsory education based their ability (OECD, 2015b: 93, 159).

In **Estonia**, 49 out of 544 general education schools are privately managed, while the other schools are predominantly provided by municipalities and to a lesser extent by the state. Private schools in Estonia are entitled to the same amount of public funding as municipal schools. The national government therefore allocates the same per-student grant for teacher salaries to private general schools as it does to municipalities. In addition, local governments provide them with funding for operating expenses such as school lunch, textbooks and study aids (Santiago et al., 2016; Eurydice, 2016). Private schools in Estonia are allowed to operate for profit and top-up the public funding by charging tuition fees, which parents can deduct from their taxable income. Furthermore, private schools' teacher councils can introduce criteria for the selective admission of students (Eurydice, 2016).

7.5 Empirical evidence on the funding of for-profit private schools

7.5.1 Performance of for-profit providers

For-profit charter schools in the United States

Several US states permit publicly funded charter schools to be operated by for-profit providers, which has motivated a number of studies comparing the performance of students under different ownership models. Comparing for-profit and non-profit charter schools in Florida, Sass (2006) finds no difference in their respective effectiveness. Students attending recently established charter schools (less than five years old) regardless of their non-profit or for-profit status performed worse in mathematics and reading than comparable students in public schools. If the charter school was more than five years old, students performed as well in mathematics and better in reading than those attending public schools, which might indicate that charter schools improve as they gain more experience. The study convincingly addresses selection bias with a student fixed-effects model, drawing on the effect of school switches and thereby controlling for unobserved, time-invariant differences between students that might be related with their attendance of for-profit charter schools. At the same time, Sass uses longitudinal data (1999-2002) to control for students' prior achievement and rule out that the observed relationship between school switches and performance is endogenous. The author does so by estimating the causes of switching with a probit model, controlling for four years of prior achievement, student characteristics and charter school competition, finding no correlation between prior changes in student achievement and school switches.

In 2002, a significant number of underperforming public schools in Philadelphia were contracted out to for-profit and non-profit Education Management Organisations (EMOs) and funded through public

vouchers. Multiple studies have assessed the reform's results, arriving at different conclusions regarding the performance of for-profit schools. Conducting a difference-in-differences analysis using student and school fixed effects, Peterson and Chingos (2008), find that students whose schools were taken over by for-profit providers improved their mathematics performance compared to those remaining in public schools three to four years after the reform, while students whose schools were given to non-profit managers did worse. Using individual-level, rather than school-level achievement data, Byrnes (2009) studied the same intervention in Philadelphia. Like Peterson and Chingos (2008), the study compares differences between the pre- and post-intervention performance across school types. In contrast to the previous study, Byrnes (2009) concludes that students whose schools were taken over by private non-profit or for-profit providers improved less in both reading and mathematics than students in public or district-managed (ORS) schools.

Given that the privatised schools in Philadelphia were not chosen at random and had a significantly lower baseline-achievement than other public schools, the impact of the reform could easily be overstated since schools that are already doing well have less room for improvement. Peterson and Chingos (2008) try to adjust for these baseline-differences by restricting the public comparison group to district schools in the lower-half of the achievement scale. However, important uncontrolled differences between for-profit, non-profit and the selected district schools remain regarding their ethnic composition and their proportion of disadvantaged students. Furthermore, differences in the schools' characteristics are only measured at the start of the intervention, which means that differential changes in the schools' student composition over time remain uncontrolled.

Byrnes (2009), on the other hand, does not select a comparison group of similar public schools but adds time-varying controls for school characteristics such as the proportion of minority and low-income students. Furthermore, Byrnes uses a longer period of time (6 compared to 2 years) to calculate the public schools' achievement growth rate prior to the intervention, which puts him in a better position to draw valid inferences from the difference-in-differences analysis.

Neither of the two studies can fully account the fact that both EMOs and ORS received higher per student funding than the regular district schools, which means that the different providers' results cannot easily be compared in terms of cost-efficiency. It should also be taken into account that Philadelphia's for-profit providers were large organisations operating in multiple states, while the non-profit providers had much less experience in running schools (Muir, 2012: 13f.). Although the findings of the Philadelphia reforms should be considered in the light of this specific context, neither of the two studies provides convincing evidence that for-profit providers systematically provide higher-quality education than public schools. Yet, neither do for-profit providers appear to fare worse than their non-profit counterparts.

These results are congruent with a study of charter schools in Michigan, which yielded "virtually no evidence to suggest that the type of ownership of a charter school (profit or not-for-profit) affects the delivery of education services" (Hill and Welsch, 2009: 157). Since the analysis is conducted at the school level and the main explanatory variable (the ownership type) is time-invariant, the authors cannot use fixed effects to control for unobserved school characteristics affecting performance. Instead, they control for a number of observable features including the proportion of minority, female and low-income students, school size, and the student-teacher ratio. The study also takes into account the schools' expenditure per student, finding no difference in the efficiency of non-profit and for-profit schools. Both types of educational providers led a similar proportion of Year 4 and 8 students to reach achievement level 1 or 2 in state-wide mathematics test between 2001 and 2004. The study suggests, however, that the quality of for-profit providers may differ according to their size. While there is some evidence that small for-profit companies (EMOs) are less efficient than non-profit voucher schools, the results of large for-profit companies were not significantly different from those of non-profit schools. Although these findings could theoretically be explained by unobserved student differences, it should be noted that for-profit charter

schools in Michigan are not allowed to engage in selective admission but have to assign places using a lottery system if they are oversubscribed.

For-profit voucher schools in Sweden

In a cross-sectional school-level analysis, Sahlgren (2011) finds Swedish for-profit and non-profit voucher schools to achieve higher average GPAs than public schools in Year 9. Controlling for characteristics of schools (student-teacher ratio, proportion of boys, level of parental education, proportion of immigrants, school size) and municipalities (average income, population density and average cost per student), the author argues that "non-profit independent schools raise the average GPA by 5.74 points, whereas the for-profit schools raise it by 4.50 points" compared to municipal schools (Sahlgren, 2011: 33). The study cannot control for the achievement of students prior to joining a for-profit school, which makes it difficult to estimate the value added by the school and to tackle the problems of endogeneity and selection bias.

To address the problem of self-selection, the author adds a set of instrumental variables that are hypothesised to be exogenously related to the local availability of private schools, such as the proportion of children in private childcare and the proportion of 'low-educated' inhabitants (Sahlgren, 2011). Adding instrumental variables further increases the difference between municipal and private schools, while for-profit and non-profit schools were no longer different from each other. Since the dependent variable (GPA) reflects scores from national standardised tests as well as teacher-assigned marks, the results may be affected by differential mark inflation or marking standards across school sectors. Indeed, these concerns have been substantiated by Vlachos (2010) who finds mark inflation to be more pronounced in for-profit private schools than elsewhere when comparing upper-secondary school marks with standardised test scores (cited in Wondratschek et al., 2013). A recent study also found more general evidence of mark inflation among independent schools since their marks were more likely to be lowered upon re-examination by independent markers (Hinnerich and Vlachos, 2013, cited in Epple, Romano and Urquiola, 2015). This corroborates earlier findings by Wikström and Wikström (2005), who found strong evidence of mark inflation when comparing the marks of independent school students with scores from the standardised SweSAT test in the late 1990s.

For-profit voucher schools in Chile

Most studies of for-profit school performance in Chile have been conducted prior to recent reforms, at a time when for-profit schools were eligible for public funding, while at the same time engaging in selective admission and charging add-on tuition fees. Chumacero and Paredes (2008) compare student achievement in for-profit, private non-profit and public schools in Chile using 2005 SIMCE test results of Year 4 students. 34% of the students in the sample went to mostly subsidised for-profit schools and 17% went to subsidised private non-profit schools. In terms of raw test data, non-profit schools perform on average 13 points better than subsidised for-profit schools, although for-profit schools still outperform public schools by an average of 16 points and unsubsidised private schools have the highest test scores of all school types. Controlling for students' socio-economic characteristics (including parental education, income and expenditure on education) as well as school characteristics (including location and selectivity), the differences become smaller but remain significant.

Other studies using similar OLS regression techniques with school or individual level controls have generally shown the for-profit sector to perform worse than both the public and the non-profit voucher sector. Controlling for school location and aggregate student characteristics (parental attainment and socio-economic background), McEwan and Carnoy (2000) find non-religious voucher schools (most of which are run for profit) to perform worse in Spanish and mathematics between 1990 and 1996 than public DAEM schools. Since the study does not effectively address the potential bias resulting from private

schools' selection on ability, the authors consider their estimates to be an "upper bound to private school effects" and thus a conservative estimate of the public school advantage (McEwan and Carnoy, 2000: 223).

McEwan and Carnoy's (2000) study is one of the few to take into account measures of the schools' resource inputs and approximate expenditure per student, which allows them to analyse differences in cost-efficiency across school types: Holding achievement and student background constant, non-religious (for-profit) voucher schools cost 13% to 17% less than public schools, which might be explained by their greater autonomy to set teacher wages, class sizes and manage infrastructure investments. The authors also show that resource decisions concerning the number of teacher hours per class, the proportion of contracting staff and teachers without university degree or holding a second job elsewhere account for the lower performance of for-profit schools. This lends some support to the concern that commercial providers compete in the educational market primarily "by cutting costs, rather than significantly raising academic achievement" (McEwan and Carnoy, 2000: 228).

McEwan (2001) addresses the potential bias stemming from the selection of students on unobserved variables by applying a two-stage correction model modified for the choice between six alternative school types. In addition to individual-level controls for student and peer attributes, the study therefore adds an instrumental variable (the density of different school types in each municipality), which is hypothesised to affect the likelihood of school attendance independent of the students' ability. Controlling for individual and peer socio-economic characteristics, the author finds for-profit non-religious voucher schools to fare worse in Year 8 Spanish and mathematics assessments than the public DAEM schools, while Catholic voucher schools score slightly higher (McEwan, 2001: 124). Accounting for the effect of selectivity (although it is not always statistically significant itself) further reduces the differences between private and public schools.

Using a similar method to addresses the issue of selectivity, Elacqua (2011) uses a Heckman two-stage procedure to correct for parental self-selection on unobserved characteristics. Based on Spanish and mathematics SIMCE test scores of Year 4 students (2002, 2005 and 2006) and Year 8 students (2004), the study yields mixed results on the for-profit sector's performance. For-profit private schools do not consistently outperform either non-profit private or public schools. Instead, the author finds significant variation across different types of commercial providers, depending on whether they were run as part of a franchise or independently. While franchise schools perform better than public schools, independent for-profit providers do not and are outperformed by most non-profit private schools. These differences may reflect that franchise schools benefit from economies of scale and that "being embedded in a larger organization reduces and facilitates the flow of information (such as research on best practices) between the schools in a franchise" (Elacqua, 2011: 24). As the author acknowledges, though, it could also be the case that high-achieving schools were more likely to join a franchise or attract enough students and resources to expand their operation in the first place.

7.5.2 Competition from for-profit schools

Allowing government-dependent schools to operate for profit would create additional incentives for private providers to enter the market or expand their capacity. Depending on the performance of the for-profit, non-profit and public sectors, changes to their relative size could have a positive or negative effect on the school system's aggregate performance. In addition to these compositional changes, proponents of for-profit schools argue that their entry into the educational market would introduce educational and managerial innovations, stimulate inter-school competition, and improve school quality across sectors through the spread of successful practices.

Böhlmark and Lindahl (2015) test the effect of competition using Swedish regional-level data from the Trends in International Mathematics and Science Study (TIMSS) for Year 8 students in 1995, 2003 and

2007. The authors exploit regional variation in the expansion of independent schools across Swedish municipalities following the 1992 reform in order to identify the effect of competition from different school providers. Controlling for mark inflation and pre-reform trends, they find that the effect on public schools' performance does not vary depending on the ownership-type of the schools they are competing with. Higher levels of competition from both for-profit and non-profit private schools are shown to have a positive effect on the outputs and outcomes of public schools. Yet, these effects are much smaller than estimated in previous studies and were only visible around a decade after the 1992 reform (Böhlmark and Lindahl, 2015).

Competition effects in Sweden have tended to be more positive than those observed in Chile (Hsieh and Urquiola, 2006), which is consistent with the theoretical expectations elaborated above. Since restrictions on admission practices and add-on tuition fees make it more difficult for Swedish for-profit schools to cream skim high-ability students, they are more likely to compete on the basis of educational quality. At the same time, as predicted by formal school choice models that incorporate reputation effects (e.g. MacLeod and Urquiola, 2009) Swedish parents might have therefore attached greater importance to a school's value added than its peer composition.

7.5.3 Inequities of for-profit schooling

The theoretical literature has generated different hypotheses regarding the implications of the profit-motive for selection practices and student sorting. Where for-profit schools can manipulate their student intake using tuition fees or selective admission, they may cream skim high-ability and high-income students in order to gain a competitive advantage over public schools, increase their revenues and lower their expenditure per student. By contrast, others have predicted for-profit schools to act as "bottom feeders", offering low-quality education to economically disadvantaged students with high price sensitivity.

Analysing panel data of Chilean students across schools and school sectors, Elacqua (2012) observes that public schools serve a larger proportion of students considered socio-economically "at risk" than non-profit or for-profit voucher schools, suggesting that "private voucher schools, particularly Catholic schools, respond to market incentives by focusing on a more elite student body" (Elacqua, 2012: 452). In addition, disadvantaged students are more segregated between for-profit schools than they are between non-profit schools, which suggests a stratification of student populations within the commercial sector. This is consistent with several theoretical simulations predicting for-profit schools to form a hierarchy with each targeting a specific segment of the student population (e.g. Epple and Romano, 2008).

Since Elacqua (2012) does not take into account the effect of residential segregation, it remains unclear how much of the observed student sorting is caused by parents' and schools' selection practices, and how much of it merely reflects pre-existing patterns of socio-economic inequality. However, a longitudinal analysis indicates that the introduction of targeted vouchers in 2008 led to a decrease in between-school segregation across all sectors, which suggests that disadvantaged students were now more likely to take up places in school from which they had previously been excluded. Nevertheless, the authors find schools' tuition policies to be a stronger predictor of student segregation than their profit-motive, which indicates that fees constitute the more significant barrier to entry than a school's profit incentive alone, although the further may of course be a consequence of the latter.

Several other studies have made use of instrumental variables to identify the role of student selection in the performance of for-profit schools. Although McEwan (2001) cannot convincingly reject the null-hypothesis of no selection bias due to large standard errors, accounting for the effect of selectivity reduced the performance of for-profit and most other private schools relative to public schools. Another study, using the Heckman two-stage procedure and private school density as an instrumental variable to

control for demand-side selectivity, yields no significant differences between the "parental selection bias" in for-profit and non-profit private schools (Elacqua, 2011: 21).

7.6 Limitations and future research

Even in school systems with a significant commercial sector, most studies of private education fail to distinguish between non-profit and for-profit providers. Future research should address this shortcoming and investigate variation across these sub-sectors whenever possible. Furthermore, few studies have investigated differences in schools' expenditure per student by ownership types, as well as the effect of competition from for-profit schools on aggregate educational expenditure. Although there is some evidence vindicating the concern that for-profit schools may cut costs at the expense of educational quality, more research along these lines will be necessary to evaluate arguments concerning the efficiency of for-profit schools and to estimate the systemic cost of funding for-profit education. To better understand the performance variation across different types of commercial providers, we would also need to know more about their reasons and incentives for entering the market and creating specific arrangements such as chains or franchises.

It should also be noted that studies comparing the effectiveness of for-profit and non-profit schools have so far squarely focussed on student test-scores and other measures of achievement reflecting the schools' short-term educational outputs. As is the case in the wider literature on school choice, there is little evidence on the longer term outcomes of for-profit schooling such as graduation rates, transitions to tertiary education, or returns in the labour market. Particularly since for-profit schools have sometimes been accused of privileging short-term profit over their students' long-term returns to education, it would be important for future research to investigate a wider range of educational outcomes.

7.7 Conclusion: For-profit providers

Although there is a growing and increasingly sophisticated literature comparing private and public schools in general, empirically robust insights into the performance and competitive behaviour of for-profit schools remain scarce. Based on our review, the international evidence on the performance of for-profit schools is both limited and mixed. In contexts where they were allowed to employ selective admission criteria, as seen in pre-reform Chile, for-profit schools have tended to be outperformed by non-profit private schools and have not performed considerably better than traditional public schools. Where for-profit schools were not allowed to select students, e.g. in Sweden, differences in the effectiveness of for-profit and non-profit schools have tended to be less pronounced and early studies have suggested for-profit schools to outperform public schools. Yet, the observed differences are rather small and potentially confounded by differential grading practices.

Most studies of for-profit US charter schools with open enrolment policies, have found little or no differences between their performance and that of non-profit or public schools. Yet, both in Chile and the United States, some evidence suggests that the capacity of for-profit schools to deliver high quality education may be contingent on their organisational structure and experience. Given the small number of cases and significant variation across country-specific contexts, one should be careful when trying to generalise the conclusions that can be drawn based on these findings. However, it is clear that there is no consistent evidence for the claim that funding for-profit schools alone is an effective and reliable way to increase student achievement.

8. CONCLUSION

As school choice is an increasingly common feature of OECD education systems, the regulation of publicly funded private schools has become a salient concern for researchers and policy makers alike. Focussing on three areas of regulation – selective admission, add-on tuition fees and for-profit ownership – this paper provides a review of the theoretical and empirical literature concerning their implications for equity and educational effectiveness. Although important questions are yet to be addressed, existing research indicates great variation in the success of school choice programmes and confirms that regulatory policies can make an important contribution to the equity and educational effectiveness of publicly funding private schools.

The international evidence suggests that schools practicing selective admission tend to attract students with higher ability and socio-economic status, regardless of their educational quality. Given that high-ability students are less costly to educate and can increase a school's attractiveness to parents, controlling their intake can provide schools with a competitive advantage. Allowing private schools to select their students therefore provides them with an incentive to compete on the basis of exclusiveness rather than their value added, which can undermine the dynamics of competition diminish the positive effects it may otherwise have on quality. The evidence also points to selective admission as a source of increased inequality and stratification. There are, however, few studies investigating whether these effects vary across different selection criteria, for example parental interviews compared to aptitude tests. Likewise, the relative impact of selective admission policies and their interaction with other barriers to entry remain to be explored in more depth. Another important finding borne out by the literature is that student sorting occurs not only based on explicit admission criteria but also based on parental self-selection, selective expulsion and more subtle barriers to entry. Policies seeking to reduce segregation should therefore also identify and address overly complex application procedures, expulsion practices, information deficits and other factors that prevent some students from exercising school choice.

Allowing publicly funded private schools to charge add-on tuition fees has been argued to give them an unfair advantage over public schools and undermine the principle of free school choice. Like selective admission, substantial add-on fees among private schools threaten to cream skim students from the public sector and increase educational inequalities. However, although some policy interventions that limited fees for low-income families have proven effective in reducing segregation, few empirical studies in developed countries have isolated the effect of fees from that of selective admission and other confounding factors. Furthermore, relatively little is known about the amount at which parental contributions start to deter lower-income families from attending subsidised private schools. However, both simulations and empirical evidence confirm that public funding may fail to widen access to private schools unless it is accompanied by restrictions on tuition fees. If private schools invest public resources to improve their quality – rather than to widen access – subsidies can exacerbate inequities across school sectors. This is one of the reasons why abolishing substantial add-on fees, alongside measures such as targeted vouchers, can be an effective means to reduce achievement gaps between students of higher and lower socio-economic status.

As predicted by theoretical models, the performance of publicly funded for-profit schools appears to be highly dependent on the regulatory framework in which they are embedded. Based on the limited empirical evidence from OECD countries, for-profit schools that were allowed to select their students (e.g. in pre-reform Chile) did not consistently outperform public schools and had lower average results than their private non-profit counterparts. Where for-profit schools practiced open admissions

(e.g. in Sweden), differences in their effectiveness were less pronounced and early studies even suggested that they exceeded public schools, although these results may have been caused by differential grading practices. Well-identified studies have also found little or no differences between the performance of US non-selective charter schools running for profit and that of non-profit private or public schools. However, both in Chile and the United States, evidence suggests that the capacity of for-profit schools to deliver high-quality education may be contingent on factors such as their organisational structure and experience, which highlights the importance of well-designed accountability and accreditation mechanisms. While the evidence on the performance of for-profit schools is not as equivocally negative as their critics suggest, there is no strong evidence to support the claim that funding for-profit providers in itself constitutes an effective way to increase aggregate student achievement.

The study of school choice programmes faces a range of methodological challenges from self-selection bias and unobserved school inputs to endemic data limitations regarding tuition and admission practices. These difficulties are exacerbated by the fact that the three substantive areas of this review – selective admission, add-on tuition fees and for-profit ownership – are closely interconnected: Allowing publicly funded for-profit schools to charge tuition fees can result in the retention of public subsidies and parental resources, rather than a corresponding increase in educational access or quality. Likewise, allowing subsidised private schools to engage in selective admission can subvert efforts to improve equity by restricting add-on tuition fees. While this constitutes a challenge for the empirical identification of individual policies' effects, it highlights the importance of taking a holistic approach to the regulation of publicly funded private schools. Given the considerable heterogeneity within the subsidised private sector, a meaningful expansion of the evidence base would also benefit from more consistently investigating variation across schools with different tuition policies, admission processes and ownership models.

Despite recent methodological advances and a growing body of research, it is clear that some central questions concerning the funding of private education are yet to be convincingly addressed. So far, the majority of studies have evaluated the regulation of private schools with respect to a rather narrow set of outputs, focusing on standardised test scores and other measures of short-term student outcomes. Investigating how selective admission and for-profit provision affect longer-term outputs, such as graduation rates, educational transitions or returns in the labour market, but also behavioural and non-cognitive outcomes, remains an important research issue. The same goes for exploring how regulatory policies impact students at different points on the socio-economic or ability distribution, minorities and students with special educational needs. While the literature has become increasingly sophisticated in comparing the relative performance of public and private schools under different regulatory regimes, the system-wide costs of such policies and their aggregate impact on educational outcomes are subject to complex dynamics which have largely evaded empirical analysis. Addressing these gaps in the literature calls for the continued improvement of theoretical models, empirical evidence and identification strategies.

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