Educational Evaluation
and Policy Analysis

Inclusive Education in Soviet-Inherited Exclusive School System: The Effects of Student Background Factors on School Efficiency

Journal:	*EEPA*
Manuscript ID	Draft
Manuscript Type:	Original Manuscript

Abstract:	We estimate the ‘environmental effect’ on schools' efficiency for two consecutive years after COVID-19 and evaluate the effects of inclusive education reform. We adopt a two-stage Data Envelopment Analysis and calculate school-level efficiency scores in the first, and the effects of nondiscretionary school market variables in the second stage. Our findings show that for schools with limited autonomy over student selection, school efficiency scores are negatively affected by the share of special educational needs (SEN) students and student’s low parental income. Our policy implications indicate that the autonomy of schools over student admission combined accountability works contrary to the inclusive reform aims – schools are incentivized not to admit SEN students and use decentralized admission interviews for selecting advantageous students.

Inclusive Education in Soviet-Inherited Exclusive School System: The Effects of Student Background Factors on School Efficiency

Abstract: We estimate the 'environmental effect' on schools' efficiency for two consecutive years after COVID-19 and evaluate the effects of inclusive education turn. We adopt a two-stage double Data Envelopment Analysis and calculate school-level efficiency scores in the first, and the effects of nondiscretionary school market variables in the second stage. Our findings show that for schools with limited autonomy over student selection, school efficiency scores are negatively affected by the share of special educational needs (SEN) students and student's low parental income. Our policy implications indicate that the autonomy of schools over student admission combined accountability works contrary to the inclusive reform aims – schools are incentivised not to admit SEN students and use decentralised admission interviews for selecting advantageous students.

Keywords: school efficiency, special educational needs, family background, double bootstrap DEA, autonomy of schools.

JEL codes: H52, I20, I21

1. Introduction

The concept of inclusion has taken a pivotal role in the education of students with special educational needs (SEN) and has evolved into a crucial international educational policy concern after the Salamanca Statement, which urged governments worldwide to adopt the idea of inclusive education, enrolling all children in regular schools (UNESCO 1994). The implementation of inclusive education systems calls for educational policies that have efficiency, effectiveness and equity goals (United Nations 2006). It can be argued, hence, that three elements are underpinning factors for ensuring quality education for all learners that promote longer-term social inclusion. The argument is that inclusive environments facilitate social interactions among all children and thus have positive peer effects (Allen and Cowdery 2015).

We contribute to the studies related to the implementation of inclusive education; however, we define inclusion more broadly, referring to promises of comprehensive education that do not select its intake based on academic achievement or aptitude, in contrast to a selective school system where admission is restricted based on selection criteria, usually academic performance. So, for us, the promise of inclusive education coincides with the pledges of comprehensive schooling – schools have no autonomy to select students based on their educational needs, parental background or home language. We show the efficiency outcomes of the inclusion for schools, specifically whether schools are incentivised to remain comprehensive if parental school choice is exercised.

We are asking about the effect of non-discretionary factors, indicating the factors that schools give up direct control under comprehensive schooling, on school efficiency, which we perceive as a latent variable correlated with school financing and thus financial incentives. We pose three hypotheses: *(i)* students' parental income as a non-discretionary factor for schools is positively correlated with school efficiency; *(ii)* migrant students, operationalised by the share of the students with a different home language than school language, are negatively correlated with school efficiency; *(iii)* share of regular (not SEN) students as a non-discretionary variable is positively correlated with schools' efficiency.

Those hypotheses are embedded in the case specificity of comprehensive schooling mixed with an uncontrolled school (choice) market at the basic education level, where most parents can choose schools (even outside of the municipal boundaries) and popular schools can choose students. We assume, however, that nonselective schools cannot choose students by information which is not revealed, e.g. parental income, home language and SEN.

We are using the school-level registered data from the Ministry of Education and Research of Estonia (HTM 2023) and matching them with tax register data regarding parental income.

Dataset is consisting of more than 300 basic schools in the lower secondary level for two school years, after COVID-19. Resting on the analysis of efficiency, which has gained momentum during the last years and has had an increasing number of applications in education (Silva et al. 2020; Aparicio et al. 2018; De Witte and Lopez-Torres 2017), we apply the two-stage double DEA bootstrap (Simar and Wilson 2007). The estimation of the efficiency scores (first step), where outputs and inputs often rely on the standard literature in the field (cited above). Our focus is, however, on the covariates included in the "second step" and the robustness of our results.

By our model identification strategy, we contribute to the debate over school-level discretionary-non-discretionary variables, arguing that even within one education system, comprehensive by law, these can differ by the schools. While in urban settings popular schools can decide over student admission rules and skim the cream, in rural settings there is no such discretion. In addition to the methodological debate, we aim our contribution to the policy implications of the study. Based on our results, we argue that under the deregulated school market with the autonomy of schools over student admission and unregulated school choice, the implementation of inclusive education within a comprehensive system is a challenge, where school incentives have to be designed to mitigate cream-skimming and competitive reputation-building incentives.

The paper is structured as follows. In Section 1, we give theoretical premises revealing the literature on the promises of inclusive education. In the same Section, we also give background knowledge to the reader regarding the school (choice) markets and how our case is embedded into the empirical literature. In Section 2, we identify the model and describe the estimation strategy. The following section presents the data and results. Finally, we give findings in the context of policy debate.

2. Literature Review and Case Specificity

2.1 What are the premises of inclusive education and how to govern them?

Over the last thirty years, the concept of inclusion has emerged as a central principle in policy and practice within the realm of SEN students. However, there are not only differences in the extent to which countries have progressed in developing inclusive education, there is also confusion about how to define, achieve and research inclusive education (Buli-Holmber et al. 2023; Paulsrud and Nilolm 2020). There is, at the same time, a growing awareness of the need for the development of the evaluation toolbox of inclusive education (Mezzanotte and Calvel 2023). Hence, we face a challenge to turn diversity in its various dimensions into an asset that drives overall quality and performance (Burns and Van Damme 2018). In general, there is scarce conclusive evidence that implementing inclusive education results in improving academic achievements (Syrjämäki et al. 2018).

This also entails the revision of the educational governance models of comprehensive schooling and their capability to support the governance of diversity in the era of increasing marketization of schools. So, the dimensions of the educational governance "model" which determine the characteristics of the school market are related to the scope of autonomy of schools, pedagogical diversity and the flexibility of curriculum; but also, to the variety of ownership.

Autonomy is considered to be an important element of successful educational governance by educational epistemic and scholarly communities (i.e. OECD, EU, Wössmann et al. 2009). Countries with the highest level of mean school autonomy indices, score also high in international comparison of educational performance measured by average PISA scores (OECD 2023), including our case country Estonia. The advocacy for schools' autonomy in educational governance is often based on the belief that granting decision-making authority to educational institutions can lead to higher effectiveness and efficiency (ibid.). School autonomy, at the same time, is often also the tool to create marketization and competition in education (Ball and Yodell 2008).

While countries' readiness and rationale to accept marketization and school choice in education have varied (Gingrich 2011; Santalova and Põder 2024), there has been a long and well-researched criticism (Cornelisz 2017; Wilson and Bridge 2019; Eurydice 2020; Zancajo and Bonal 2021) against equity-harming outcomes of some features of choice. Mainly, the selective and competitive entrance in the case of basic schooling leads to 'cream-skimming' and the accumulation of advantages and disadvantages in different schools – school segregation. Not only are selective practices at the basic school level harmful in terms of equity but these are also considered inefficient as prohibit students from learning from each other (unrealised positive peer effects).

Those inefficiencies become more relevant the more school funding is dependent on school performance that relies entirely on outputs (e.g. exam results) without considering inputs (e.g. teacher and student qualifications or numbers). However, while autonomy over school management is one of the key cornerstones in implementing inclusive education and managing schools efficiently (Fryer, 2014) there are well-documented drawbacks in comprehensive systems when autonomy extends to selecting students (Põder et al. 2017; Põder and Lauri 2014), leading to the marketization of education with inequities even within comprehensive systems.

2.2. The role of school autonomy in implementing inclusion and efficiency?

Theoretically, it is difficult to argue against school autonomy for better absorbing local information for managing schools, and the arguments supporting it are well known such as tailoring the programs to local needs (Wössmann 2003) or even regarding curriculum design

(Hanushek and Wöessmann 2015), not only managing teachers and organising school (Steinberg 2014). However, often the devil is in details, and a closer look at practices and evidence, reveals some weaknesses. Inequalities among schools are highlighted (e.g. Baker and Wiseman 2016), or as Keddie et al. (2022) put it, "the question has to be rephrased to whether school autonomy is good for inclusion and makes schooling more equitable". It has led to a consensus that autonomy has to be complemented by accountability (Wössmann et al. 2009) to enable different stakeholders to make informed decisions. However, not all educational systems are feasible to accommodate school autonomy (Hanushek et al. 2013). We argue that even in the comprehensive system, autonomy over admission complemented by the narrow model of accountability which takes the forms of public school leaderboards or league tables, can have harmful consequences for the inclusion.

So, we are not questioning the autonomy of schools (and teachers) over the "content" (e.g. curriculum), even not whether the parents should have the freedom to choose a school for their children, but instead, whether schools can have the autonomy to govern the inclusiveness by student admission design. There is strong evidence (Agasisti and Ferraro 2024) that private schools operate more efficiently, which suggests that their effectiveness is not solely due to the "quality" of students, i.e. given that in most countries the intake of private schools is still the social selection of advantaged background students. Instead, it likely stems from other managerial factors such as the use of technology, the ability to combine resources effectively, and possibly better management practices. So, the key question is whether school autonomy in the comprehensive system can boost efficiency by minimising costs even if the school's autonomy over admission and "pricing" of their "goods" is removed.

Emphasising compositional effects on educational production functions, including teacher and peer effects, in addition to individual-level background effects, literature (e.g., Cobb and Glass

2009; Musset 2012; Lauri and Põder 2013; Le Grand 2007) underscores the importance of "controlled choice", i.e. centrally designed allocation of school places. This recommendation is more relevant as school markets differ (from strictly comprehensive or more choice-prone indicating varying degrees of demand-pushing factors) and in some markets demand pushes toward higher diversification (Lauri and Põder 2024) and supply reacts to more selection and "cream skimming".

The selectivity poses a challenge for a variety of disadvantages: socio-economic, SEN-based, and immigrant-background-based. The mechanism is argued to be similar – disadvantaged students and their parents may lack the country-specific social capital to navigate the system (Leopold and Shavit 2013). Controlled choice can keep those challenges in mind, setting specific quotas or priorities for disadvantaged students that apply to all schools in the area (Eurydice 2020). The alternative approach is to compensate schools for disadvantaged backgrounds. School "resource management" such as incentive pay for teachers, which allows the reduction of inequality by keeping good teachers in minority schools is discussed by de Witte et al. (2024). Also, de Witte et al. (ibid) showed that vertical differentiation or between school outcome differences can be handled by designing additional financial instruments for low-performing schools. Moreover, surprisingly financing the increase of compulsory education (by one more year) is increasing the equity of educational outcomes, so benefitting disadvantaged students more (ibid).

2.3. Case specificities: school market characteristics

Overall, the Estonian school market can be characterized as one of high schools' autonomy and (the relatively narrow use of) accountability – a relatively strong reliance on external assessment in terms of state exams (OECD 2023). Those exam results are salient in official statistics and in the media. Regarding school market characteristics, Estonia is a country with a subtle or concealed choice policy (Põder et al. 2017; Põder and Lauri 2014), i.e. while choice and private schooling have not been incentivised by funding or legal acts (approximately 5-7% of students attend private schools and these schools have the right to set tuition fees), regulations allow parents to apply to schools beyond their neighbourhood. While the principle of neighbourhood schooling generally applies, some public schools can de-centrally select students without proximity criteria, conducting academic tests and interviews for admission (public elite schools hereinafter). See Table 1 for the characteristics of three groups of schools – private schools account for less than 10% of schools, and public elite schools less than 3%, but being large by size accommodating approximately 5% of the student body.

Despite regulations emphasizing comprehensive schooling, there are both elements of implicit (selective vs non-selective public schools, inclusion/exclusion of SEN students) and explicit tracking (separate tracks of Russian schools) starting from elementary schools. This means that parents in urban settlements actively exercise choice (based on recent PISA 30% of school heads admit that they often or sometimes rely on academic testing in admitting students). These schools perform better than private schools (see Table 1). Public elite schools exercise decentralized school choice and have complete school-level autonomy in admission. This means that 7-year-old children take aptitude tests and have interviews with the teacher committee. Due to its decentralised nature, these tests and interviews are school-specific, so children may participate in several. Statistically, we can show (Table 1) that these schools have considerably richer students and very few SEN students. We argue that they have the discretion to select students based on background characteristics and consider it a phenomenon of implicit tracking.

[Table 1]

Among public non-selective schools, there are large unpopular urban and rural schools, mostly municipal but also state run. Approximately 25% of students go to schools in rural areas where there is only one, typically small, school in the area. While the state compensates for remoteness quite generously (there are remoteness coefficients for small schools), parents might still “vote” with legs and apply for other schools in fearing school closures and deteriorating quality due to small size (Haugas et al. 2023) but also based on well-known information of school performance gap demonstrated in Table 1 – these schools perform considerably worse compared to public elite or private schools.

In addition to implicit tracking, there is a strong element of explicit tracking in terms of Russian language schools, second or third-generation soviet-time migrants have sustained their native language and go to separate schools (Lauri et al. 2022). While there has been an incremental bottom-up turn (10% of migrant background students go to Estonian language schools) meaning that Russian parents growingly applying for a place in Estonian language schools or language immersion classes, which has not been incentivised explicitly. Thus, schools operate in different markets, operationalised by the language background of students (in Russian language schools there are 20% of students with different school and home language while only 5% in Estonian language schools.

Moreover, since 2010, the leading principle of Estonia's educational organization has been the implementation of inclusive education. There is an increasing ratio of SEN students (approximately 10% of students) and the inclusion of SENs is mandatory in public schools, and as mentioned very few of them are in public elite or private schools. However, schools receive special funding for each SEN student to cover additional resources needed to adapt studies for differences in need. Nevertheless, studies indicate that attitudes, knowledge, and resources for implementing support measures pose obstacles to the effective implementation of inclusive education (e.g., Santiago et al. 2016; Haaristo et al. 2016), hinting at the stigmatisation of SEN students and the parent's avoidance of schools with the high share of SEN students.

3. Methodology

3.1 Model Identification and Data

Evaluating school effectiveness is challenging as it revolves around measuring outcomes given the costs associated with school resources which cannot be easily calculated in monetary terms. Typically, outcomes are identified by test scores or high-stakes exam results and inputs indicate resources available for schools.

The main source of information is the Estonian basics schools in lower secondary level (ISCED 2) for the academic years 2020/2021 and 2021/2022. The register-based data from the Estonian Education Information System (EHIS) which collects information on students and teachers is matched with the Income Register of Statistics Estonia generating a unique school-level dataset (HTM 2023 hereinafter) containing school-level SES indicator - family median income of students. Once the dataset was merged, cleaning from missing values and some errors, we obtained roughly 300 observations. Also, for estimation outliers such as schools which have different market conditions are removed, e.g. schools which still have student body similar to special SEN schools or elite schools with very high parental incomes or language immersion or International English language schools.

By determining school inputs and environmental variables – discretionary or non-discretionary factors our model identification is partially driven by data availability but mostly by context-specific arguments inherent to the school market as Section 2.3 describes. In school efficiency analysis using techniques like Data Envelopment Analysis (DEA) and double bootstrap, the choice of discretionary and non-discretionary variables is crucial. Discretionary variables are those that schools have control over and can be managed to improve efficiency, while non-discretionary variables are typically outside the control of schools. The summary statistics of outputs, inputs and non-discretionary variables are presented in Table 2 and variable description is given in Appendix 1.

[Table 2]

Our considerations and arguments for selecting discretionary and non-discretionary variables in school efficiency analysis are as follows. Firstly, discretionary variables for schools pertain to management decisions regarding teaching resources, such as teacher-student ratios and class sizes, teacher qualifications, and expenditure on teacher professional development, including in-service training. All curriculum-related issues are considered non-discretionary and homogeneous in our case and are therefore excluded from the analysis. Non-discretionary variables primarily concern student background, including parental income, SEN status of students, language spoken at home, and community or school characteristics, such as ownership, type of settlement (urban or rural), and school type (basic 9-grades or basic 12-grades). As shown in the dynamics of the two academic years (Table 2) there has not been considerable changes regarding school market non-discretionary variables.

3.2 Estimation strategy

The main two approaches to assess the relative efficiency of comparable decision-making units (DMUs) are the stochastic frontier analysis (SFA), which is a parametric model and data envelopment analysis (DEA), a non-parametric method. In this work, we use the non-parametric method DEA as a linear programming method that allows for the assessment of the relative efficiency of decision-making units (DMUs). We adopt the input-oriented variable returns to scale (VRS) DEA method to estimate the spending efficiency scores for Estonian schools.

We estimate the efficiency following the baseline input-oriented model (Eq.1):

$$\min_{\theta,\ \lambda} \theta \text{ subject to } \theta_{x_0} - X\lambda \geq 0, \ - y_0 + Y\lambda \geq 0, \qquad (1)$$

$$\lambda \geq 0, \sum \lambda_0 = 1$$

where θ is a scalar of efficiency scores for DMUs, λ is a vector of intensity variables denoting linear combinations of DMUs, x_0 is a vector of inputs, y_0 is a vector of outputs, X is the input matrix $(n \times m)$ and Y is the output matrix $(n \times u)$ for all DMUs. For $\theta = 1$, the DMU is technically efficient, whereas $\theta < 1$ is inefficient. The convexity constraint for VRS is $\sum \lambda_0 = 1$ meaning, the sum of the intensity variables, λ's equal to one.

The conventional DEA analysis provides only a point estimate for the technical efficiency (TE) scores that might be biased and the explanatory variables correlated with the input and output variables. A decision-making unit (DMU) is considered technically efficient if, from the basket of inputs it holds, it produces the maximum of outputs possible or if, to produce a given quantity of outputs it uses the smaller quantities possible of inputs. The advanced DEA bootstrap proposed selects "pseudo samples" at random from the observed sample data. For each of the samples, "pseudo estimates" are estimated by constructing an empirical distribution for the efficiency scores, to approximate the estimator's sampling distribution. In this way, an observed sample distribution is provided.

The bias in the DEA efficiencies can then be evaluated, and a 95% confidence interval can be calculated using this empirical distribution because the model allows for creating a confidence interval around the efficiency score. Coelli et al. (2005) suggest this approach as robust regarding the confidence interval bandwidth but, the model itself does not account for determinants of the efficiency scores. Often, Tobit (truncated) regressions have been adopted but this approach has also been criticized (Simar and Wilson 2007) because the efficiency estimates are, by construction, serially correlated and do not permit valid inference.

For those reasons, this study employs the two-stage double bootstrap DEA by Simar and Wilson (2007). The method accounts for the efficiency scores being bounded (above or below 1 depending on how inefficiency is defined) and allows for overcoming the unknown correlation pattern among estimated efficiency scores. It simultaneously evaluates levels of efficiency and the influence of environmental (external) variables Z on the efficiency levels. (ibid.) The two-stage double bootstrap DEA consists of several steps: it estimates the radial measure of TE, runs a truncated regression analysis using the efficiency scores as the dependent variable, simulates the unknown error correlation, and calculates bootstrap standard errors and confidence intervals (CIs).

Those steps are performed by uncorrected efficiency scores (algorithm 1) or bias-corrected efficiency scores (algorithm 2). The latter is used in this study. By the bias-corrected efficiency scores, the method internally computes the efficiency scores, in two stages: in the first stage, the "naive" input-oriented efficiency scores are estimated for each school using the bootstrap method (100 bootstraps). Then, the truncated regression for each school is performed, using VRS, and regressed on the potential efficiency environmental variables. The truncated regression runs in the first and second stages (in the second stage with 1,000 bootstraps).

The following equation gives the first stage of the truncated regression model:

$$\theta_i = Z_i\beta + \varepsilon_i, \qquad (2)$$

where θ is the efficiency score for schools i, Z represents the environmental variables and ε is the error term. A bootstrap is applied to correct the bias in the standard DEA efficiency scores and the truncated regression is re-estimated in order to obtain the bias-corrected reciprocals of input-oriented efficiency scores $\hat{\theta}_i$, in the second stage. The reciprocal of the efficiency scores is used as the dependent variable. The second stage equation is as follows:

$$\hat{\theta}_i^* = Z_i\hat{\beta} + \varepsilon_i \qquad (3)$$

The second truncated regression estimates the robust coefficients of the environmental variables as well as the lower and upper bounds for the β_i coefficients. We apply this methodology to our full sample and also in one of the two robustness checks that we perform. For the second robustness check, we use a conditional efficiency approach and order-m (partial) estimator. This methodology follows Cazals et al. (2002), Daraio & Simar (2005) and the application at university level by Agasisti et al. (2024). This method combines the conditional efficiency tool with a partial frontier approach eliminating the effect of outliers on the construction of the efficiency frontier. Each school is not anymore benchmarked with the best performing school (peer) but it is benchmarked by the expected best performance in a sample of m random peers. We are interested in obtaining the efficiency scores and in assessing the relationship between them and the exogenous variables used. The efficiency scores are drawn by the Monte Carlo simulation (Daraio & Simar 2005) using $m = 100$ and 1,000 bootstraps. Once the efficiency scores are obtained, we plot the conditional efficiency plots graphically and perform the non-parametric Racine test (Racine 1997).

4. Results

4.1. Baseline Results

The traditional DEA analysis allows to identification of the best combination of inputs and outputs and benchmarking the DMUs against the best ones but has some limitations. Adopting Simar and Wilson's (2007) second algorithm in the double-bootstrap analysis enables us to improve the accuracy of the efficiency scores and to use the robust scores as dependent variables in the truncated regression analysis, to assess the covariates that might affect those scores. First, we eliminate outliers, in both ends of distribution and loose approximately 30 observations for both years – all exclusive schools for SEN students (more than 80% of SEN students), less than 25% same language students (some language immersion schools, i.e. Estonian schools with the remarkable share of Russian language students to support their language studies) and schools where parents are above median rich (out of 3/2 of interquartile range), indicated by family median income over 41 000 euros (median annual income in 2022 was slightly over 16 000 euros).

Second, calculation of the efficiency scores (technical efficiency of bias-corrected estimation) between the two academic years. There is an increase from 0.736 (s.d. 0.114) to 0.770 (s.d. 0.115). This indicates that schools in general are moderately efficient in utilizing resources at the same level of output, with few outliers with low scores (min 0.47 and 0.39 respectively to years). In our analysis, however, the years considered are also connected with the COVID-19 pandemic. Moreover, a school is considered as technically efficient if to produce a given quantity of outputs it uses the smaller quantities possible of inputs. In this way, it is possible to determine if one school is able to reduce the use of at least one input while maintaining the same level of output (Farrell 1957).

Table 3 reports the baseline results by the coefficients that are corrected for bias using the method described above after the second-step analysis that considers the factors that might affect the values of those efficiency levels. The biased-corrected efficiency scores are used as dependent variables in a truncated regression on the non-discretionary variables (Table 2).

[Table 3]

The non-discretionary variable that measures the share of regular students in school shows that the more these students are enrolled, the higher the efficiency level. In other words, as expected, the smaller the share of SEN students, the higher the efficiency level of the school. The result is consistent across two years. The school median income of the family – which we interpret as home resources of a student – also contributes positively to the efficiency levels. Even though the effect size might seem marginal, it is measured in 1000 euros per year, so regarding mean gross salaries in Estonia, and constituting that families consisting of either 1 or 2 wage earners, the effect is not that insignificant in size.

Finally, the language spoken at the school, if different compared to the language spoken at home, does not affect school efficiency. In other words, the bottom-up initiative of some Russian families to apply for a school place in Estonian language school (e.g. home and school language are different) does not harm the school efficiency. So, from the three hypotheses that we posed, only two of them - e.g. the share of regular students indicated as the reverse share of SEN students and the median income of the family affecting the school efficiency – are confirmed but not the hypothesis related to the migrant students.

Among other non-discretionary variables included in the model, the type of school identified as K9 school (compared to K12) has a negative correlation with the efficiency levels in both academic years. That can be interpreted as the ability to use teachers more efficiently in case of more levels in school. However, in the latest year 2021/2022 its contribution is decreasing. Concerning the ownership of the school, schools that belong to the municipality perform better compared to the state or private schools, so after controlling for students' educational resources at home by family income, private schools are not performing better as the literature suggested.

Ultimately, both small-town and country schools are less efficient than the city (Tallinn, Tartu) or Harjumaa (rich counties around the capital city) schools. The location of schools – as a geographical dimension of school market -- might hence play an important role in determining how good the school is in minimizing the costs. Such settings show that schools located in specific areas might need more resources or their lack competitive pressure for optimization of costs.

4.2. Robustness check: two school markets in one education system

As we argue in Section 2.3 and show in Table 1, within one education system there are three types of schools where private and selective schools operate in different school markets compared to neighbourhood non-selective public schools. Due to the small number of selective schools – private and public elite schools – we are unable to run a model on them. So, our estimation strategy was to exclude outliers from the baseline model. However, this does not test for the explicit tracking between different language schools. To address this, our strategy is to control for school language by running the baseline model in two subsets for the academic year 2021/2022 – Estonian (n=262) and Russian language schools (n = 58).

[Table 4]

As the robustness test in Table 4 shows the covariates are similar in sign and size (compared to Table 3). However, the income effect of Russian language schools is bigger on the school's efficiency. Moreover, the regular student effect is much more significant and larger in case of Russian schools, indicating that the disincentives for Russian schools to admit SEN students are smaller than those for Estonian schools.

4.3. Robustness check: Nonlinearity of outcomes

In Tables 3 and 4 we reported linear mean effects of the covariates, showing that schools benefit highly from parental resources and excluding SEN students, while surprisingly language at home as an educational resource is not affecting their efficiency. There could be two explanations. First, the particularity of school market, which segregates students by home language – Russian and Estonian – to the same language schools – can absorb linguistic differences. Second, the effects of the coefficients are nonlinear. For the latter, we employ the alternative estimation strategy which consists of two steps. Second, we estimated the model by conditional efficiency order-m estimation and report results in Appendix 2, and then finally test and visualise the non-linear effects (Figure 1) of the covariates by showing the level of the covariate in x-axis and ratio of conditional over unconditional efficiency scores. Ratio below one indicates that non-discretionary variables affect efficiency scores negatively.

[Figure 1]

The graphical representation of the analysis results indicates a marginally positive effect of non-SEN in a certain range only, which means that the share of SEN students above around 10% will decrease efficiency (however the mean effect in Appendix 2 is reported as insignificant). Regarding a school median income of over 20,000 will increase efficiency, lower than that has the reverse effect. Seemingly the average effect size is still positive, but insignificant (Appendix 2). Home-school language mix has no significant nonlinear effects.

5. Conclusion and policy debate

This paper was triggered by the debate over the autonomy and accountability of schools within a comprehensive education system. We discussed that despite of the comprehensive education principle by design and the strong rhetorical strive for the inclusive education in educational strategy documents, the loosely governed implementation of school choice policies in interplay with high autonomy of schools and narrowly defined accountability, will bring 'hybrid' school market where public elite schools benefit by selecting out low income and SEN students and the rest – non-selective regular schools – not.

Our analysis revealed that school-level efficiency of non-selective schools is positively correlated with student's parental income (educational monetary resources at home) and the proportion of regular (non-SEN) students, while the share migrant students (measured as the similarity/difference between home and school language) is insignificant.

Our results indicated that under the outcome-driven accountability system where the standardised state exam is saliently reported to the public (school league tables) by both, official policy statistics and media, schools are disincentivized to admit diverse student body in terms of both, family background and SEN status. This suggests a lack of a self-enforcing mechanism for inclusion.

Our policy debate focuses on incentivizing inclusion in the context of semi-autonomous schools—schools that are autonomous in their professional and managerial practices but cannot select students based on their SEN or SES status or home languages, non-selective or regular schools in our analysis. So, under uncontrolled choice, where the reputation mechanism is linked to reported league tables of schools and that does not account for school inputs such as differences in the need of educational resources in teaching diverse body of students, schools are disincentivized to implement inclusive practices. That means that inclusive aims may remain unachievable as the implementation practices work against it.

As recognized in institutional economics, self-enforcement is the most efficient way of governing choices. Therefore, we argue that we can centralise "diversity governance" by either centrally providing financial incentives to schools or centralising student admission (restrict choices of schools over admission). We begin with arguments that rely on the insight that money can make schools better/more efficient, by providing the right incentives for investment. Firstly, we propose a compensating mechanism to incentivize inclusion through student-level financing or "per-capita financing", similar to approaches in Germany, the Netherlands, and Switzerland. In our current case, we support the SEN financing system but also advocate for the coefficient for SES students.

Does this money have to go directly to schools, or to municipalities as school owners? The argument is that it has to go to a municipality, justified by evidence of “strategic” behaviour by schools (De Witte et al. 2014) to find “problems” in children if they know additional funding is attached to such problems. Whether there should be some restrictions on how to use this money remains open. The case-specific experience from Estonia, where most basic schools are owned by municipalities, has shown that when school heads have a high level of autonomy but the level of funding is decided at state level (ministry) and distributed at municipal level, managing a school becomes tricky. This is not only because of the high variety in non-discretionary variables influence school efficiency, as shown also by our analysis, but also because the operational management and funding are entirely detached for the “decision-making unit”, i.e. school management board.

The other avenue for the improvement of enforcement on inclusive schools is related to the policies which can alleviate school inequality ex-ante and not fight school segregation ex-post. Centralisation versus decentralisation of admission policies is debated in this context, without inconclusive policy agenda. We argue that reform – either integrating large minority and/or SEN students demands centralisation regarding school choice supported by the arguments in the literature (e.g. Echenique and Yenmez 2015; Põder et al. 2013; Musset 2012). Context-specificity enters into the policy advice regarding the design of school priorities, which must reflect contra-mechanisms to the ones that segregate the student body, e.g. family income-related urban segregation generating segregated neighbourhoods based on migrant status or similar. So, the controlled part of the policy is reflected in well-designed priorities over students and the centralized part of it bears two meanings. It gives no autonomy to schools over the design of admission policies and uses a central warehouse of student applications accompanied by some algorithm (e.g. Gale-Shapley or similar) to be able to make a stable matching of students and schools without violating student rights.

How the hybrid school market – selective and private versus non-selective schools' harms inclusion and inclusive educational reform, remains an open question. In general, selective and private schools are efficient in using their resources. We speculate that autonomy and accountability practices incentivize them to apply efficient management tools in addition to marginal negative effects from the disadvantaged student body.

Our conclusions must be taken bearing limitations in mind – all data is non-financial and thus our policy recommendations related to financing of schools are grounded to the literature assuming that inputs are automatically attached to the costs (more inputs, the higher the costs). Also, non-discretionary inputs (student characteristics such as SEN status or home language and parental income) are indicating educational resources at home. Schooling becomes cheaper if resources at home are higher.

References

Agasisti, T. and Ferraro, S. (2024). Measuring the Efficiency of Private Schools: Conceptual Issues and Empirical Evidence. In: Santalova, A; Põder, K. (Ed.). Privatization in and of Public Education New York: Oxford University Press. (Chapter 3).

Allen, E. K. and Cowdery, G. E. (2015). The exceptional child: Inclusion in early childhood education (8th ed.). Stamford: Cengage Learning.

Aparicio, J., Cordero, J. M., Gonzalez, M. and Lopez-Espin, J. J. (2018). Using non-radial dea to assess school efficiency in a cross-country perspective: An empirical analysis of OECD countries. *Omega*, vol. 79, pp. 9–20.

Ball, S. J. and Youdell, D. (2008). Hidden Privatization in Education. Brussels: Education International.

Buli-Holmberg, J., Sigstad, H. M. H., Morken, I. and Hjörne, E. (2023). From the idea of inclusion into practice in the Nordic countries: a qualitative literature review, *European Journal of Special Needs Education*, vol. 38, no. 1, pp. 79-94.

Burns, T., & Van Damme, D. (2018). Education and diversity: Challenges and opportunities. B. Lanvin, & P. Evans, The Global Talent Competitiveness Index, 53.

Cobb, C. D. and Glass, G. V. (2009). School Choice in a Post-Desegregation World. *Peabody Journal of Education*, vol. 84, no. 2, pp. 262-278, DOI: 10.1080/01619560902810187.

Coelli, T. J., Prasada Rao, D. S., O'Donnell, C. J., & Battese, G. E. (2005). Productivity and efficiency measurement concepts. *An introduction to efficiency and productivity analysis*, 41-83.

Cornelisz, I. (2017). Theory versus empirics: a review of the international school choice literature. In Johnes, G., Johnes J. Gasisti, T. and Lopez-Torres, L., eds. Handbook of Contemporary Education Economics. Cheltenham: Edward Elgar, pp. 289-317.

De Witte, K., & Lopez-Torres, L. (2017). Efficiency in education: A review of literature and a way forward. *Journal of the Operational Research Society*, vol. 68, no. 4, pp. 339–363.

De Witte, K., Geys, B., & Solondz, C. (2014). Public expenditures, educational outcomes and grade inflation: Theory and evidence from a policy intervention in the Netherlands. Economics of Education Review, 40, 152-166.

De Witte, K., Smet, M., & Van Assche, R. (2024). School financing and equal educational opportunity. Privatization in and of Public Education, eds. Santalova A & Põder; k. Ch 7.

Ehlers, L., Hafalir, I. E., Yenmez, M. B., & Yildirim, M. A. (2014). School choice with controlled choice constraints: Hard bounds versus soft bounds. Journal of Economic theory, 153, 648-683.

Eurydice. (2020). Equity in school education in Europe: Structures, policies and student performance. Eurydice report. Luxembourg: Publications Office of the European Union.

Farrell, M. J. (1957). The measurement of productive efficiency. *Journal of the royal statistical society: series A (General)*, vol. 120, no. 3, pp. 253-281.

Frank, E. & Nicaise, I. (2017). The effectiveness of equity funding in education in Western countries, NESET II Ad Hoc Question No. 2. [pdf] https://nesetweb.eu/en/resources/library/theeffectiveness-of-equity-funding-in-education-in-westerncountries-literature-review/.

Gingrich, J. (2011). Making Markets in the Welfare State: The Politics of Varying Market Reforms. Cambridge: Cambridge University Press.

Hanushek, E. A., Link, S., & Woessmann, L. (2013). Does school autonomy make sense everywhere? Panel estimates from PISA. Journal of Development Economics, 104, 212-232.

Haaristo, H.-S.; Masso, M.; Veldre, V. (2016) Terviseseisundist või puudest tingitud erivajadustega noorte siirdumine koolist tööle. Tallinn:Poliitikauuringute Keskus Praxis. URL: http://www.praxis.ee/wp-content/uploads/2015/06/Erivajadusteganoorte-siirdumine-koolist-toole.pdf (8.03.2016).

Haugas, S. … Põder, K.; Lauri, T. (2023). Ühtekuuluvuspoliitika fondide rakenduskava 2014–2020 prioriteetse suuna „Ühiskonna vajadustele vastav haridus ja hea ettevalmistus osalemaks tööturul“ tulemuslikkuse ja mõju hindamine. Praxis 2023. https://www.praxis.ee/tood/ukphindamine/.

Keddie, A., Claire MacDonald, K., Blackmore, J., Eacott, S., Gobby, B., Mahoney, C., ... & Wilkinson, J. (2020). School autonomy, marketisation and social justice: The plight of principals and schools. *Journal of Educational Administration and History*, vol. 52, no. 4, pp. 432-447.

Lauri, T., and Põder, K. (2024). The Moral Economy of Diversification of Educational Options in Four European ’Choice’ Countries. In: Santalova, A; Põder, K. (Ed.). Privatization in and of Public Education New York: Oxford University Press. (Chapter 2).

Lauri, T.; Põder, K.; Kunitsõn, N. (2022). Discrimination or explained differences: individual and school-level effects explaining the minority achievement gap. *Journal of Baltic Studies*, vol. 54, no. 3, pp. 553−480. DOI: 10.1080/01629778.2022.2103579.

Lauri, T. and Põder, K. (2013). School choice policy: seeking to balance educational efficiency and equity. A comparative analysis of 20 European countries. *European Educational Research Journal*, vol. 12, no. 4, pp. 534−552. DOI: 10.2304/eerj.2013.12.4.534.

Le Grand, J. (2007). The politics of choice and competition in public services. *The Political Quarterly*, vol. 78, no. 2, pp. 207-213.

Leopold, L., and Shavit, Y. (2013). Cultural capital does not travel well: Immigrants, natives and achievement in Israeli schools. *European sociological review*, vol. 29, no. 3, pp. 450-463.

Mezzanotte, C. and Calvel, C. (2023). Indicators of inclusion in education: A framework for analysis, OECD Education Working Papers, No. 300, OECD Publishing, Paris, https://doi.org/10.1787/d94f3bd8-en.

Musset, P. (2012). School choice and equity: Current policies in OECD countries and a literature review.

OECD (2023), *PISA 2022 Results (Volume I): The State of Learning and Equity in Education*, PISA, OECD Publishing, Paris, https://doi.org/10.1787/53f23881-en.

Põder, K.; Lauri, T.; and Rahnu, L. (2017). Eesti koolisüsteemi väljakutsed: õpiedukuse erinevus erikeelsetes koolides ja sisserändajate koolivalikud. Tammaru, Tiit; Eamets, Raul; Kallas, Kristina (Toim.). Estonia in the Migration Era. Human Development Report 2016/2017. (155−162). Eesti Koostöö Kogu.

Põder, K.; Lauri, T.; Veski, A. (2017). Does school admission by zoning affect Educational Inequality? A Study of Family Background Effect in Estonia, Finland, and Sweden. Scandinavian Journal of Educational Research, 61 (6), 668−688. DOI: 10.1080/00313831.2016.1173094.

Põder, K. and Lauri, T. (2014). When Public Acts Like Private: the failure of Estonia's school choice mechanism. *European Educational Research Journal*, vol. 13, no. 2, pp. 220−234. DOI: 10.2304/eerj.2014.13.2.220.

Põder, K.; Kerem, K.; Lauri, T. (2013). Efficiency and equity within European education systems and school choice policy: Bridging qualitative and quantitative approaches. *Journal of School Choice*, vol. 7, no. 1, pp. 1 −36.

Ryan, R. M., and Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, vol. 55, no. 1, pp. 68–78. https://doi.org/10.1037/0003-066X.55.1.68.

Santalova, A., and Põder, K. (Eds.). (2024). Privatization in and of Public Education. Oxford University Press.

Santiago, P; Levitas, A.; Rado, P.; Shewbridge, C. (2016), OECD Reviews of School Resources: Estonia 2016. OECD Reviews of School Resources, Paris: OECD Publishing.

Silva, M., Camanho, A. and Barbosa, F. (2020). Benchmarking of secondary schools based on students' results in higher education. *Omega*, vol. 95, 102119.

Simar, L. and Wilson, P. W. (2007). Estimation and inference in two-stage, semi-parametric models of production processes. *Journal of econometrics*, vol. 136, no. 1, pp. 31-64.

Spreitzer, G. M. (1995). Psychological Empowerment in the Workplace: Dimensions, Measurement, and Validation. *The Academy of Management Journal*, vol. 38, no. 5, pp. 1442-1465.

Steinberg, M. P. (2014). Does greater autonomy improve school performance? Evidence from a regression discontinuity analysis in Chicago. *Education Finance and Policy*, vol. 9, no. 1, pp. 1-35.

Syrjämäki, M., Pihlaja, P. and Sajaniemi, N. (2018). Enhancing peer interaction during guided play in Finnish integrated special groups. *European Early Childhood Education Research Journal*, vol. 26, no. 3, pp. 418-431.

United Nations Educational, Scientific and Cultural Organisation (UNESCO), 1994. *The Salamanca Statement and Framework for Action on Special Needs Education*. Paris: UNESCO.

United Nations. (2006). Convention on the rights of persons with disabilities. New York, NY: United Nations.

HTM (2023). School Register data (EHIS) and Statistics Estonian data merged. Data are currently in the private hands of the authors and will be uploaded in the public repository after the meta-data are generated.

Verelst, S., Bakelants, H., Vandevoort, L. and Nicaise, I. (eds.) (2020). The governance of equity funding schemes for disadvantaged schools: lessons from national case studies, NESET report, Luxembourg: Publications Office of the European Union.

West, A. (2006). School choice, equity and social justice: the case for more control. British Journal of Educational Studies, 54(1), 15-33.

Wilson, D., and Bridge, G. (2019). School choice and the city: Geographies of allocation and segregation. *Urban Studies*, vol. 56, no. 15, pp. 3198-3215. doi:10.1177/0042098019843481.

Wössmann, L., Lüdemann, E., Schütz, G., and West, M. R. (2009). School Accountability, Autonomy, and Choice Around the World. Cheltenham: Edward Elgar.

Wössmann, L. (2003). Schooling resources, educational institutions and student performance: the international evidence. *Oxford bulletin of economics and statistics*, vol. 65, no. 2, pp. 117-170.

Zancajo, A. and Bonal, X. (2022). Education markets and school segregation: a mechanism-based explanation. Compare: *A Journal of Comparative and International Education*, vol. 52, no. 8, pp. 1241-1258. https://doi.org/10.1080/03057925.2020.1858272.

Table 1: Summary statistics of the Estonian school market (2021-2022 school year)

	Private schools (n = 30)		**Public elite schools (n = 8)**		**Public non-selective (n = 319)**	
School performance:	Mean	sd	Mean	sd	Mean	sd
Mathematics (max = 50)	32.12	(7.13)	39.98	(5.98)	27.57	(6.40)
Estonian language (max = 100)	72.78	(11.55)	79.83	(6.12)	69.75	(9.18)
Continuing studies (share of total students)	94.93	(1.26)	98.06	(1.61)	95.14	(6.73)
Reverse dropout (share of total students)	99.38	(1.26)	99.96	(0.19)	99.57	(1.27)
Teacher inputs of schools:	Mean	sd	Mean	sd	Mean	sd
Teacher in-service training (share of total teachers)	27.67	(19.30)	33.63	(18.83)	44.23	(20.50)
Teacher qualification (share of teacher meeting the required qualifications)	76.85	(17.19)	91.61	(6.03)	81.68	(12.29)
Teacher-student ratio	0.10	(0.03)	0.07	(0.02)	0.11	(0.05)
Background of the students:	Mean	sd	Mean	sd	Mean	sd
Median family income (in 1000 euro)	34.95	(11.24)	47.61	(10.55)	26.10	(6.45)
Share of students with the same home and school language	94.75	(15.92)	91.73	(10.09)	92.10	(15.70)
Share of regular students (reverse share of SEN students)	96.00	(4.63)	97.49	(5.79)	92.84	(5.98)
School size	262.00	(230)	675.25	(263)	336.00	(299)

Source: HTM (2023)

Table 2. Descriptive statistics of the school-level dataset of two academic years

	2020/2021			2021/2022			Test of difference
	N	Mean	SD	N	Mean	SD	
Outputs:							
Mathematics	348	28	6.4	357	28	6.8	F=0.162
Estonian language	348	68	9.2	357	70	9.5	F=13.726***
Continuing studies	348	96	6.4	357	95	7	F=4.641**
Reverse dropout	348	100	1.5	357	100	1.3	F=0.159
Inputs:							
Teacher in-service training	348	47	20	357	43	21	F=9.249***
Teacher qualification	348	83	12	357	81	13	F=2.465
Teacher-student ratio	348	0.11	0.04	357	0.11	0.044	F=0.117
Non-discretionary variables:							
Family income	348	25,403	7,546	357	27323	8070	F=10.633***
Language	348	93	15	357	92	16	F=0.064
Regular students	348	94	6.1	357	93	6	F=2.856*
Type (K12= reference)	113			115			X2=0
K9	235	68%		242	68%		
Ownership (private=reference)	25			33			X2=1.011
Municipality	323	93%		324	91%		
State	2	1%		3	1%		
Location (Harjumaa=reference)	11			12			X2=0.149
Small town	103	30%		108	30%		
Rural	155	45%		154	43%		
Tallinn	59	17%		62	17%		
Tartu	20	6%		21	6%		

Source: HTM (2023)

Notes: All data descriptions and scales are given in Appendix 1. For further analysis, outliers are removed, so the total number of schools is decreased to 320 schools and 319 schools respectively for the academic year. Outliers are considered variables which are out of the interquartile range (more than 1.5 IQR below Q1 or more than 1.5 IQR above Q3), so we "lose" previous special schools with more than 20% of SEN students; most of elite schools (family median income more than 41 000) and some language immersion schools and international schools with diverse student body and instruction language English. Authors' calculations.

Table 3. Biased-corrected estimates Double Bootstrap (DB) DEA

Dependent variable = score of school efficiency	(3.1) 2020/2021	(3.2) 2021/2022
Regular students	0.004***	0.004**
	(0.001)	(0.001)
Family income (in 1000 euro)	0.006***	0.006***
	(0.001)	(0.001)
Language	0.000	-0.000
	(0.000)	(0.000)
Type (K12 = reference)		
K9	-0.042**	-0.016
	(0.012)	(0.012)
Ownership (private = reference)		
Municipality	0.069**	0.060**
	(0.022)	(0.021)
State	-0.013	-0.121*
	(-)	(0.068)
Location (Harjumaa = reference)		
Small town	0.015	-0.022
	(0.036)	(0.036)
Rural	-0.032	-0.071**
	(0.036)	(0.036)
Tallinn	0.103**	0.063*
	(0.038)	(0.038)
Tartu	0.104**	0.026
	(0.040)	(0.039)
N. obs	321	320
Wald X2	--	236.57
Prob > X2	--	0.000
Sigma	0.082	0.087

Source: HTM (2023), authors' calculations

*Notes: * p < 0.1, ** < 0.05, and *** p < 0.01. K9 refers to a school which has only 9 grades, K12 refers to a single structure school which has 12 grades. Harjumaa refers to the relatively rich counties around the capital city of Tallinn increasing in population and popular among young families, Tartu is the second biggest university town.*

Table 4. Subsample of Estonian and Russian language schools and biased-corrected estimates Double Bootstrap (DB) DEA for academic year 2021/2022

Dependent variable = score of school efficiency	(4.1) Estonian language schools	(4.2) Russian language schools
Regular students	0.002*	0.008***
	(0.001)	(0.001)
Family income (in 1000 euro)	0.005***	0.006***
	(0.001)	(0.001)
Language	0.000	-0.000
	(0.000)	(0.000)
Type K9 (K12 = reference)	-0.008	-0.046*
	(0.013)	(0.026)
Ownership Municipality (private = reference for Estonian, state = reference for Russian)	0.058**	-0.044
	(0.024)	(0.052)
Location (Harjumaa = reference)		
Small town	-0.019	0.002
	(0.035)	(0.055)
Rural	-0.084**	0.067
	(0.037)	(0.065)
Tallinn	0.059	0.050
	(0.039)	(0.057)
Tartu	0.037	-
	(0.040)	
N. obs	262	58

Source: HTM (2023), authors' calculations

*Notes: * p < 0.1, ** < 0.05, and *** p < 0.01. K9 refers to a school which has only 9 grades, K12 refers to a single structure school which has 12 grades. Harjumaa refers to the relatively rich counties around the capital city of Tallinn increasing in population and popularity among young families, Tartu is the second biggest university town. There are no state-run Estonian Language schools in lower-secondary education.*

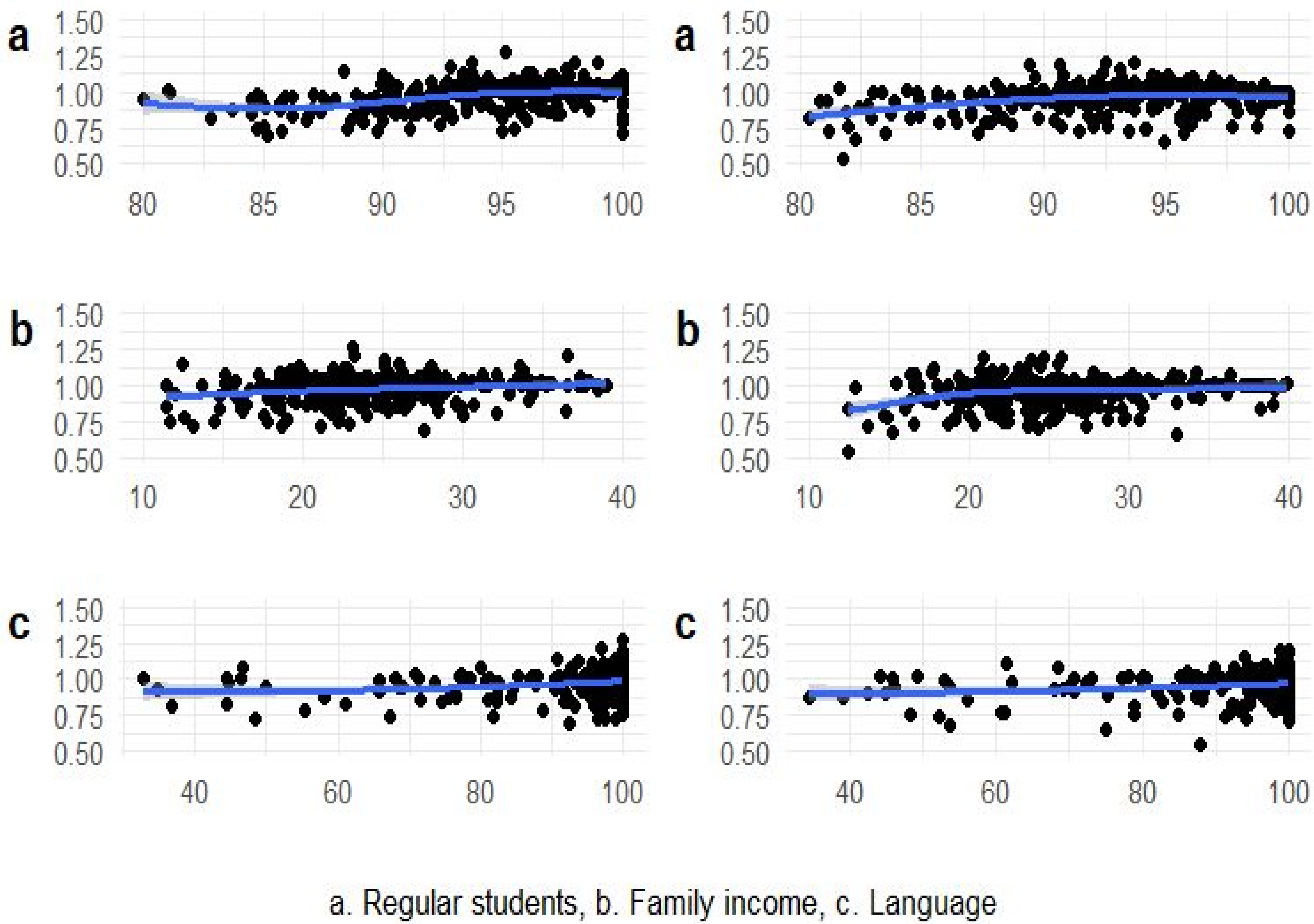

Figure 1: Nonlinear effect of non-discretionary variables (left panel 2020/2021, right panel 2021/2022), ratio of conditional over unconditional efficiency scores

Appendix 1: Variable description and scales

Abbreviation	Variable name	Description	Scales
Outputs:			
Mathematics	Mathematics test score	Externally implemented low-stake test, scores obtained at the end of the 9th grade	0-50
Estonian language	Estonian language (or Estonian as a second language for Russian language schools) test	Externally implemented low-stake test, scores obtained at the end of the 9th grade	0-100
Continuing studies	Share of students who continue in education	The share of students who continue their studies, in both general and vocational education, after graduation from lower secondary school (mandatory education)	0-100%
Reverse dropout	Share of who dropped out during studies (reversed scale)	One hundred minus the share of students who have dropped out from studies, independently from the grade	0-100%
Inputs:			
Teacher training	Share of teachers attended training within the academic year	The share of teachers who attended training financed by the school	0-100%
Teachers qualification	Share of teachers with pedagogical qualification	the share of teachers with a pedagogical Master's degree	0-100%
Teacher-student ratio	Teacher-student ratio	Measured the number of teachers per student	0-…
Environmental (non-discretionary) variables:			
Family income	Background of the students (home educational resources) measured by mean family income	School mean annual family income (both parents even if not living together) from all sources including transfers and financial income	0-…
Language	Migrant background variable: share of students with the same home and school language	Indicates whether the student's home language is Estonian and she is enrolled in an Estonian school or whether the student's home language is Russian and she is enrolled in a Russian school	0-100%
Regular students	Inclusiveness of the school	One hundred minus the share of SEN students in the school	0-100%

School market characteristics:

Type	Type of the school	The dummy variable for K-9, reference is K-12.	0/1
Ownership	Owner of the school	Categorical nominal variable indicating whether the school is private, municipal or state-run	1-3
Location	• Socio-economic aspect of geographical location	Categorical nominal variable indicating whether the school is rural, small town, Harjumaa (rich counties around the capital city), Tartu (2nd largest city), Tallinn (capital city) school	1-5

Appendix 2: Kernel Regression Significance Test

	2020/2021 (n = 321)	2021/2022 (n=322)
Share of regular students	0.9699	0.1028
Median parental income of a school	0.0326 *	0.1178
Share of students with the same language as the school language	0.0000 ***	0.0000***

*Comments: Type I Test with IID Bootstrap, m = 100. Explanatory variables tested for significance. * p < 0.1, ** < 0.05, and *** p < 0.01.*