ERASMUS UNIVERSITY ROTTERDAM

Erasmus School of Economics

Master thesis Accounting & Control

A massive school board; a massive success?

Name student: L.P.J. van der Boon

Student ID number: 545701

Supervisor: S. Renes, Ph.D. LL.M.

Second assessor: J. Bae, dr.

Table of contents

Abstract

During the past decades, the scale of Dutch primary school boards continuously increases. This trend provides a public discussion on whether larger school boards affect educational governance positively. Educational governance is allocated to optimizing school operations and, as ultimate purpose, school performances which are meant as the contribution of school boards to pupil performances. This research finds that school board size affects educational governance. Larger school boards operate more efficiently through economies of scale and invest more in personnel to support the organization with more professionalism and specialism. Although, the social-economic background of pupils in a school board affects these associations. In general, school boards that teach pupils from a low socio-economic background require more expenses. However, the research does not find strong evidence that the school board size affects school performances. So, larger school boards achieve organizational benefits, yet it will not reflect the school performances. This provides implications for the government whether to formalize policy aimed at school board scale. The findings also provide new insight for school boards to decide on a certain scale since school boards are very autonomous to choose.

Keywords: *Educational governance; Economies of scale; School board and Efficiency.*

1. Introduction

Education in the Netherlands which is coordinated by the government through laws is established in 1801 by Van der Palm with the first education law. From 1801 to now, educational governance is discussed in public policy and debate. A distinctive element of Dutch educational governance is originated in article 23 of the Dutch Constitution. With this, the Dutch system is decentralized and characterized by a high level of autonomy and responsibility for school boards. This allows all school boards to establish education based on a particular philosophy of life or education concept, but it also allows school boards to choose for a particular scale size. These scale sizes are very different between the Dutch school boards, which the OECD[1] (2016) also reported. While most school boards govern one school institution, there exist school boards with tens of school institutions. A trend of the past decades is that an increasing amount of school boards choose to increase the education scale, which is legally permitted. This trend was directly encouraged through governmental decisions from the '80s. An example is the integration of pre-primary education into primary education by the 'Wet op het Basisonderwijs' in 1985 which cut the number of primary schools into halve (Hulst & Urlings, 2012). Another example is the SBK-regulation[2] in 1997, which financially encouraged a larger scale. Also, the government indirectly encouraged larger scale through elements such as the lump-sum funding system, a legally required number of pupils, and administrative requirements for the professionalism of school boards (Dijkgraaf et al., 2010). A tipping point starts in 2005 through a report ''Variëteit in schaal'' of the Onderwijsraad (2005) that argued disadvantages of larger education scale, such as a larger distance between school (parents, pupils, and personnel) and school board. Three years later, again, the Onderwijsraad (2008) was critical about a larger education scale and advised the government to implement a fusietoets[3]. It was ratified in 2011[4]. However, in the coalition agreement (Rutte et al., 2017) appears an intention to abolish the fusietoets. Although the Tweede Kamer[5] accepted the abolishment, the Eerste Kamer[6] has rejected it, so today the fusietoets still exists. This parliamentary contradiction shows the ambiguity of the education scale in the Netherlands. Assuming that every Member of Parliament aims for the highest

[1] The Organization for Economic Co-operation and Development is an international organization with 37 member countries, which work on establishing evidence-based international standards and finding solutions to a range of social, economic and environmental challenges (OECD, n.d.).
[2] Stimuleringsregeling bestuurlijke krachtenbundeling, PO/PJ-97008394, enacted April, 4, 1997.
[3] The fusietoets should compose various requirements before a school merger, and contains a commission (CFTO: Commissie Fusietoets Onderwijs, as advisory body school mergers) that assess a merger.
[4] Stb. 2011, 95; inwtr. Stb. 2011, 388.
[5] The lower house of the bicameral parliament of the Netherlands with 150 members (House of Representatives)
[6] The upper house of the bicameral parliament of the Netherlands with 75 members (Senate)

educational governance, there is no consistency in how the school board scale is related to it. Therefore this research will examine the research question; is educational governance affected by school board scale? Important addition is that the research is mainly intended for primary schools.

The term ‘educational governance’ is not highly recognized in the literature. To avoid particular interpretations (related to ‘general’ governance literature such as corporate governance) a strict definition is essential. Educational governance entails the extent to which educational organizations succeed in optimizing school operations, and, ultimately, pupil performance. Optimizing school operations and pupil performance follow as the two important control purposes. From this definition, it follows that both governmental institutions and school boards can participate in educational governance.

The terms ‘school board’ and ‘scale’ from the research question are interrelated and can be interpreted in different ways, so a clear definition is necessary. A ‘school board’ is the authorized organization that governs (a) school institution(s) for which they are ultimately responsible. It follows that a school board can govern multiple school institutions, as locations where the actual education took place. Every school institution belongs to a school board. ‘Scale’ is, in this research, about how large or small an organization is organized, on the board level (school board). The school board level is a distinctive element. Therefore ‘school board’ and ‘scale’ together signify an intention of the board organization size, which is often used as school board size. As an indicator, this research refers to the school board scale (or size) based on two methods. The number of governed school institutions and the number of pupils of governed school institution(s).

The research results are important whether to formalize a public policy that is focused on a large or small scale in Dutch primary education. There follow two key stakeholders from the educational governance definition. The first stakeholders are the governmental institutions, as broad understanding that formalizes educational governance through laws and regulations for school boards. The second stakeholders are the school boards, which are individually allowed to formulate educational governance for their school institutions. This includes that a school board can decide for a particular scale through, for example, a merger with (an) other school board(s) or acquisition of (a) school institution(s). Another, not key, group of stakeholders are parents (for their pupils) and personnel (for their employment) who will choose a school institution.

A distinctive element within the research question is the board level. This allows me to examine educational governance since school boards are financially accountable and

ultimately responsible for their school institution(s). School boards are therefore the financial and organizational managers of school operations, as an element of educational governance. Via school boards' annual report per year, I examine whether economies of scale arise in larger school boards. Subsequently, I examine whether larger school boards do invest more to improve education quality. I separate investments into school and personnel investments. These investments and school board size will be examined whether it increases school performance. School performance is defined and measured as schools' contribution to pupil performances, which is the ultimate purpose of educational governance. Since the increased transparency in education data (Rijksoverheid, n.d.-a), it becomes possible to gather much information about school boards. DUO[7] provides data about, for example, schools' finance (annual reports), pupils, schools, and personnel. The Inspectorate of Education and CBS provide information about, for example, the school characteristics and performance.

In the analysis, I find that educational governance is affected by the school board scale. However, the scale effects are ambiguous since educational governance is a broad term and school board scale can affect multiple elements. I find evidence that larger school boards achieve more efficiency through economies of scale if it teaches pupils with a relatively advantaged socio-economic background. For school boards with disadvantaged pupils, I find less efficiency through diseconomies of scale. A larger (smaller) school board achieves therefore more efficiency in simple (complex) school boards that teach advantaged (disadvantaged) socio-economic pupils. Further, I fail to find any evidence that school board size influences school investments per pupil, and that school investments per pupil influence school performances. But I do find that school board size influences personnel investments per pupil. Larger school boards do invest more in personnel per pupil than smaller school boards. Especially, supporting staff investments per pupil are higher in larger school boards, which enhance governance professionalism and specialism. I find little evidence that more personnel investments per pupil affect school performance positively. However, I fail to find strong evidence for school board scale effects on school performances. The size of the boards does not influence their performances, despite operational benefits that larger school boards perceive. So, I find evidence for school operation effect as an element of educational governance, but fail to find school performance evidence.

[7] The Education Executive Agency (DUO) implements educational laws and regulations on behalf of the Minister of Education, Culture, and Science (DUO, n.d.-a).

Via a motion[8] during the fusietoets considerations, the government was requested to compile the advantages and disadvantages of different education scales. However, the following report of Heijsters et al. (2020) is a literature review without empirical elements for Dutch primary school boards. Therefore, this research extends their literature results into empirical tests. In the existing literature, Heijsters et al. (2020) evidenced economies of scale in larger school institutions, but evidence lacks on the board level. Governance is essential on the board level, also for school boards that become more professional and businesslike through the increasing education and administrative responsibilities. However, governance literature is mainly focused on the corporate field, such as Shleifer and Vishny (1997) and Coles et al. (2008). Therefore, this research aims to contribute to the existing governance literature, by extending it with educational governance. Through the findings, I provide a concrete perspective into the research of Honingh et al. (2018). They indicate school board context as essential within educational governance, yet my findings evidence school board size as one context factor that affects educational governance. Beyond other potential context factors, educational governance literature should take school board size into account in the context of a school board. The efficiency effect between school board sizes is important since Fama and Jensen (1983) argue that non-profit organizations are operated inefficiently. Whether inefficiency is applied to education is not examined, yet the findings do provide evidence that efficiency is different across school boards, due to scale. Through these efficiency effects, the government and school boards could reason to formalize policy to enlarge the board scale since I fail to find strong school performance effects. The government can encourage larger school boards through laws and regulations, and school boards can decide for a larger scale through a merger, acquisition, etc.

2. Theoretical background

Education in the Netherlands is of the government's interest, according to article 23 of the Dutch Constitution. This constitutional 'freedom of education' article also implies that everyone (religious organizations, associations of citizens, etc.) is allowed to start and govern a primary school. Also, the government has to fund that school with a budget for all their costs, known as the lump-sum payment. Lump-sum applies to all types of schools (both public and private)[9], which is typical for the Dutch system. School boards are able to decide, besides some rules, autonomously how they spend their money. But every individual school

[8] Kamerstukken II, 2018/2019, 35104, nr. 16

[9] The general equivalence between public and private education was the result of the strongly ideological 'school struggle' in the Netherlands.

has to prepare an annual report through their educational and financial policy and is supervised by the Inspectorate of Education, to whom they are accountable. So, a certain school board is entirely responsible for their educational governance regarding the quality of education to their schools.

Seeing the decentralized and open Dutch school system, every school board develops its educational governance. I assume that all school boards aim the same (improve school performance) but have another vision and method to achieve that. Also, school boards will not pose the same knowledge, professionalism, and experience to implement educational governance. Therefore, there would be some differences between primary school boards' educational governance. School board size may influence these differences.

2.1 **Differences between school boards**

According to the report of OECD (2016), the Dutch school system performs very well due to the high level of decentralization, freedom, and autonomy of schools, in combination with a strong set of accountability national mechanisms. While the Dutch school system belongs to one of the best in the OECD, some challenges arise to greater excellence. They addressed six areas for further improvement in six chapters. The chapters 'Putting the spotlight on school leaders in the Netherlands' and 'Strengthening accountability and capacity in Dutch school boards' are relevant for this research.

Because of the high decentralized Dutch school system, school leadership is especially critical. The Inspectorate of Education (2014) found that lessons at schools with an effective school leader are of better quality, and therefore conclude that school directors play a key role in ensuring educational quality. However, not all school boards adequately play a role in respect of the professional development of school directors, which may result in the big differences in school leadership quality between primary schools (Inspectorate of Education, 2014). The factor time and money pose the biggest obstacle for professionalizing, according to an investigation of the General Association for School leaders (AVS, 2012).

Because of the high autonomy, school boards are highly responsible for the quality of education. The Inspectorate of Education (2016) found that school boards seem to be increasingly aware that educational quality is more than a set of regulations and agreements, and are devoting greater attention to the association between educational quality and the effective allocation of financial resources. However, not every school board improved their governance while others did, which result in big differences between school boards. School board members may be volunteers (parents, local community, religious organizations, etc.) or

professionals (with specific expertise), and therefore differences in (lack of) democratic accountability and capacity exist between school boards, which leads to professionalization and competence standard differences (OECD, 2016).

In response to the OECD (2016) report, (former) Minister and State Secretary of Education, Culture, and Science Bussemaker and Dekker recognized in a letter to parliament[10] that there are too big differences in the quality of school directors and quality of school boards in capacity, scale, and accountability.

Further, the report of Heijsters et al. (2020) investigates the advantages and disadvantages of different scales for Dutch primary and secondary education. They conclude a positive association between board scale and governance professionalism, that larger school boards utilize pupil data better, facilitate internal supervision better, obtain more visitations, and occur stronger formalization of meetings. Also, they conclude a positive association between board scale and legitimation of decisions, that larger school boards face stronger internal accountability and external dialogue with stakeholders. Also, they conclude a positive association between board scale and professionalization of the organization, that larger school boards face specialization to support the school (board). Lastly, they conclude no association between board scale and economies of scale and school performance. The practical part of the report follows that school boards are satisfied with their current scale (small and large school boards) and do not notice benefits to change their scale. Moreover, small school boards are critical about large school boards and large school boards vice versa.

In the corporate governance literature, there are several studies that investigate differences between board structures. Klein (1998) finds that complex firms have greater advisory needs. Subsequently, Coles et al. (2008) argue and find that complex firms, which have greater advisory needs, have larger boards with more outside directors. These differences between complex and simple firms arise as important factor in the relation between board size and Tobin's Q (firm value measurement).

2.2 **Economies of scale in education**

In the article of Stigler (1958, p. 54), he starts to define economies of scale as "the theory of the relationship between the scale of use of a properly chosen combination of all productive services and the rate of output of the enterprise.'' Cost benefits could arise due to the chosen scale regarding the output. However, at a certain size of scale, the organization could operate inefficiently and entails costs of operating the hierarchy, which is known as diseconomies of

[10] Kamerstukken II, 2015/2016, 32293, nr. 314 (Kamerbrief)

scale (McAfee & McMillan, 1995). Also, in education, economies of scale are a current topic, where school size effects arise, which is the focus of this research.

School size effects on school performance are discussed in previous literature. Cotton (2001) argued in her literature review with primarily U.S. secondary education school research, that research evidence supports decreasing the size of schools to improve student outcomes, school safety, and equity, and, teacher and parent attitudes. However, Opdenakker and Damme (2007) found in their research with 57 mainstream secondary education schools in Flanders, that school size affects school outcomes positively and that this effect is mediated by school characteristics such as more teacher cooperation in larger schools. Literature is inconsistent with the positive or negative effects of school size and substantially differs in method and setting. But there is consistent evidence in review studies and meta-analysis that very small and very large schools perceive less quality of education (Newman, et al., 2006; Leithwood & Jantzi, 2009)

Also, school finance literature exists about school size effects on costs and cost efficiency, due to economies of scale. Barnett et al. (2002) analyzed the costs associated with school performance to assess cost constraint performance for secondary schools in Northern Ireland. The largest schools in their sample had the highest scores, suggesting that larger schools perform relatively better than smaller school when measured relative to cost-constrained best-practice benchmarks. More detailed research by Bowles and Bosworth (2002) for 17 secondary schools in the U.S. focused on the effects of changes in school size on costs. Bowles and Bosworth (2002) found that a 10% increase in school size is associated with a 2% decrease in costs per pupil, so economies of scale for larger schools.

Beyond a pure reduction in costs due to economies of scale, educational efficiency exceeds it because of the comparison of the input to the output. More efficiency means more output for a given set of inputs, or equal output for fewer inputs (Rossmiller & Geske, 1976). In comparison with profit organizations, Fama and Jensen (1983) state that non-profit organizations are generally inefficient, due to absent proper incentives to monitor managerial activities and reduce wastage. Williamson (1983) responds that monitoring non-profit managements is costly, since the monitoring activities in non-profit organizations are more complicated, as inputs and output are qualitative in nature. Monitoring through the traditional periodic financial report, as for businesses, is therefore limited. These problems and complications also arise in education (=non-profit organization) as explained by Lockheed and Hanushek (1994), who classify efficiency in educational systems according to non-monetary and monetary terms for inputs and outputs.

In school effectiveness models from Scheerens and Bosker (1997) for example, school size is usually included as a context variable at the school level, which implies that school size is more or less perceived as a given condition. Therefore Scheerens et al. (2014) recommended better insights into the other preconditions, school characteristics, and instruction characteristics that facilitate or impede the effects of school size on outcomes.

2.3 **Educational governance**

To understand why governance exists, the tenor of agency theory is essential. Jensen and Meckling (1976, p. 308) define agency relationship as "a contract under which one or more persons (the principal(s)) engage another person (the agent) to perform some service on their behalf which involves delegating some decision making authority to the agent.'' In practical terminology, agency theory is the 'separation of ownership and control' which arises when decision managers do not bear a major share of the wealth effects of their decisions (Fama & Jensen, 1983). Managers may initiate and implement important decisions that deviate from the interest of the investors. For this research, the government is the investor who grants money but has little contribution within the organization. The Dutch school boards are the managers that initiate and implement important decisions and practically run the organization with granted money of the government as an investor. So, there exists a type of agency theory in the Dutch education field. To effectively control school boards' decisions, the government should formalize governance.

Governance literature is primarily corporate orientated. Therefore, I start to define corporate governance. According to Shleifer and Vishny (1997, p. 738), corporate governance "deals with the ways in which suppliers of finance to corporations assure themselves of getting a return on their investments." This definition, in the light of the research, implies the government as the 'supplier of finance' to 'corporations' which are school boards. Further, the definition suggests 'a return on investment' for the government. A return on investment is usually associated with an amount of money for profit-organization together with their shareholder(s). However, the government (=non-profit organization) also demands a return on investments. The recent coalition agreement (Rutte et al., 2017) addresses the importance of good education for a healthy and successful society, so continue to supply finance to school boards. In response to their supplied finance to school boards, the government demands good education of school boards. This is another 'return on investments' in the form of social benefits. So, there exists a type of governance in the Dutch education field.

In this research, governance is always referred to the education field. Therefore, the term 'educational governance' strongly fits the research. According to Hofman et al. (2013), this broad term refers to control educational organizations, through optimizing school operations and pupil performance as the ultimate purpose. They argue that various parties are involved, such as school managers, directors, teachers, and also parents and pupils themselves. Educational governance in this research entails the extent to which educational organizations successes optimizing school operations, and, as ultimately purpose, pupil performance. Two important control purposes follow from this definition. First, optimizing school operating that deals with how school boards are (financially) governed. Second, optimizing pupil performance can be achieved by school boards, which is summed as school performance. Through this definition both the government as school boards recognize educational governance, from their perspective. Governments' perspective entails all school operations and school performance in the country, while a school boards' perspective only entails their school operation and school performance. So, school boards have a central position in educational governance, which is also stated in the literature review of Honingh et al. (2018). However, in the literature about school boards and educational governance, Honingh et al. (2018) cannot come up with general findings on how school boards can contribute to educational governance because of the various factors, which are considerably different between school boards. One mentioned factor is the school board size, measured as the number of governed school institutions. Together with other mentioned factors, it becomes difficult to come up with general findings of school boards' effects on educational governance. Therefore, this research only focused on one factor; the school board size.

There is little research on 'educational governance' compared with all research on 'corporate governance' and, more generally, 'governance' research. It follows from Table 1 that only 0,55% of all governance-literature, notices 'educational governance', while the notice for 'corporate governance' is substantially higher (53 times more, 28,79%). Honingh et al. (2018) also notice that empirical studies on educational governance and school board level are small, compared with school institution-level studies.

Table 1 Number of research result per research topic

Research topic	Results	% of the total governance literature
Governance	3.460.000	100,00%
Corporate governance	996.000	28,79%
Educational governance	18.900	0,55%

Note. Table 1 presents the number of results per research topic as exact phrase anywhere in the article. The articles were at any time, and searched in data source Google Scholar on 19 January 2021.

3. Hypothesis development

From the educational governance definition follows school operations and school performance as important control purposes of school boards. According to these elements, the school board size is argued to be an educational governance context factor.

3.1 School operation

The size of the school has, in the Dutch school system, a huge effect on the income of school boards since the lump-sum depends mainly on the number of pupils and their characteristics. In Appendix A, an overview is given how a lump-sum is determined per school board. Approximately 96% (see Appendix B) of primary school boards' income comes from the government. These incomes apply to all school boards, while the 4% other income[11] is a potential income source that differs across school boards. Generally applicable; more pupils cause higher school boards' income.

On the other hand, school boards have expenditures to provide good qualitative education. Due to economies of scale (Stigler, 1958) I expect that as school boards become larger, the relative expenditures per pupil will decrease. Bowless and Bosworth (2002) support this claim and concluded that a 10% increase in school size is associated with a 2% decrease in costs per pupil. Expenditures in this hypothesis are meant as the yearly operational expenses according to income statements of the school boards (such as depreciation, rent, etc.). Seeing some fixed costs for school boards, who will not (or exceptionally small) differ when one pupil enrolled the school, I stated the following hypothesis in the alternative form:

H1: The expenditures per pupil are lower in a larger school board

Based on H1, it follows that larger school boards have relatively lower expenditures. Due to the Dutch school system, automatically, larger school boards receive a higher amount of lump-sum. Seeing higher income (Dutch school system) and relatively lower expenditures (H1) as school board size increases, there remains money for other purposes. So larger school boards could choose to save or invest it. Seeing relatively higher expenditures for smaller school boards, it follows that the possibility to retain money is smaller, and therefore either invest or save is harder. In advance of H3, school boards could improve their education quality through investments. In this research, I distinguish two investment types. School investment is the first type, which is meant as capital expenditures for assets, such as inventory and equipment, learning methods, ICT software, laptops, iPad, etc. The second type

[11] Common examples of other income, according to income statements of school boards, are (voluntary) parental contribution, donations, rental revenues and personnel secondment.

is personnel investment, which is meant by employing personnel. This distinction is reflected in the hypotheses and results since it would not be possible to test together as investments. Seeing school goal is to improve their education quality, school board would do as much they can to achieve their education quality. Therefore, I expect that, if the choice is there (higher for larger school boards), school boards will choose to invest in their education quality and stated the following hypotheses in the alternative form:

H2a: The school investments in education quality per pupil are higher in a larger school board

H2b: The personnel investments in education quality per pupil are higher in a larger school board

3.2 School performance

A good understanding of what is meant by school performance in this research is necessary. The easiest school performance definition is linked to school outputs. These school outputs are measures that underlie a performance indicator system. Widely known are test scores, for example. However, these outcomes are primarily determined by pupil capabilities, and therefore are highly inadequate to indicate school performance. For example, a school consisting of highly intelligent pupils probably achieves higher school output, but these school output does not automatically indicate good school performances. School output provides a severely misleading portrait of changes in school performance over time and differences in performance across schools (Meyer R. H., 1994). Therefore, value-added indicators, which rely on a statistical model to identify the distinct contributions of schools to growth in student achievement at a given grade level, should be a better measure of school performance. As a result, I define school performance as schools' contribution to pupil achievements. The key idea here is to isolate statistically the contribution of schools from other sources of student achievements (Meyer, 1997). This can be seen as the degree to which school boards succeed to accomplish pupil's potential, as main goal of school performance. Later in this research, the school performance methodology is operationalized based on this theory.

In its core, every organization changes input to output to realize its goals (Thuis, 2013), so also schools. Glasman and Biniaminov (1981) reviewed the literature of input-output analyses of schools, with differentiation between student- and school inputs on the school output. According to their model of school input and output, school boards have the possibility to positively affect school output by investing more in school conditions and instructional personnel, both considered as school inputs which may be more easily

manipulated than student inputs. A positive effect of investments on school performance is also derived from a model of Rivkin et al. [12] (2005), and Andrews et al.[13] (2002). Therefore more input (=investment expenditures) should lead to higher output (=school performances). This leads to the following hypothesis, stated in the alternative form:

H3: School performance is higher in schools with larger investment in education quality

Due to economies of scales expenditures per pupil decrease when a school board increases (H1), whereby the school boards can use more money for investments in education quality (H2). Because of improved school performance by more investment expenditures (H3), it should follow, taken all these hypotheses together, that larger school boards achieve higher school performance.

In addition, research (Moseley & Owen, 2008; Huitsing & Bosman, 2011) found that smaller schools face some problems in the area of finance and staff, which affect the quality of education. Teaching methods and styles, and social interaction between children is limited by smaller schools. According to a paper of Haartsen and Wissen (2012), strong demographic declined schools are more often classified as weak or very weak by the Inspectorate of Education. These theories lead to the following hypothesis, in the alternative form:

H4: School performance is higher in schools with a larger school board

According to all theories above, educational governance will be more effective in larger school boards. The more effectiveness means that the goal of improving school performance is realized to a higher extent in larger boards than in small boards.

4. Research design

According to the most important terms, the research design will be described. These are school board size and educational governance, which are separated into school operations and school performances. In addition, the socio-economic background is an important control variable within these two important terms. It results in an appropriate data sample.

---

[12] $G_{ijgs} = P_i + T_j + S_s + \varepsilon_{ijgs}$, Test score gain in grade (G_{ijgs}) is written as an additive function of 1) pupil factors (P_i) that captures the myriad family influences including parental education and permanent income that effect the rate of learning; 2) teacher factors (T_j) that captures the average quality of teacher over time; 3) school factors (S_s) that incorporates the effects of stable school characteristics including resources, peers, curriculum, etc.; along with 4) a random error (ε_{ijgs}) that is a composite of time-varying components.

[13] $PA_t = h(A, E, N, \varepsilon)$ *or* $h(f(X), E, N, \varepsilon)$, pupil achievement ($PA_t$) is a function of 1) school activities (A) produced from purchased inputs (X), 2) pupil, family and neighborhood characteristics (E), 3) physical factors, such as the enrolment size of the school and district (N), and 4) other unobservable district or school specific effects (ε)

4.1 School board size

There is potential ambiguity in the definition of the school board size (SBS). Usually, SBS is defined by the number of pupils governed. However, school boards might govern more than one school institution at the same time. I will illustrate this with a short case. To control for this ambiguity, I create two proxies for SBS through a direct and indirect method.

SBS is the main subject of the research, and its effects the main point of interest. This variable is the indicator for the size and complexity of governance where school management (school board) has to deal with. Based on this indicator, I compare different SBS and their effects on educational governance. I expect that school boards, of different sizes and complexity, make different school operation decision which affect school performance. Therefore, the SBS would explain the differences between school boards. Because of economies of scale, larger school boards should have a different financial policy, which induces the school performance since more money remained.

School boards receive more government funding when the number of pupils is larger (from Appendix A). Seeing the determination of income is based on the number of pupils and expenditures per pupil are the dependent variable, SBS is operationalized on the same basis. SBS is therefore operationalized as the total number of pupils in a certain year. This is the most common method in the literature.

A very important aspect of this research is the focus on school boards instead of school institutions. School boards are concerned about the governance of their (multiple) school institution(s). In the Netherlands, almost half of the school boards govern one school institution (one board, one school), but there exist very large school boards with tens of school institutions. The school institution is the location where the actual education took place, with teachers and pupils physically together in a classroom. Within school institutions, teachers and pupils come together in a classroom, while school boards, managers are concerned with a good (financial) organization and governance of those core activities.

Using an example of school board ‘’Vereniging voor Chr. Onderwijs op Reformatorische Grondslag in de Hoeksche Waard’’ in 2018, Figure 1 outlines how SBS is operationalized. The sum of all pupils of all school institutions belonging to the school board is the first operationalization, as earlier explained. However, only this outcome is not fair in terms of school boards because they are indirectly responsible for those pupils. The school board in the example is not directly accountable for the 817 pupils in 2018; this is the responsibility of all five school institutions individually. But, in the end, the school board governs these school institutions and are, therefore, via school institution(s), (indirect) responsible for those pupils.

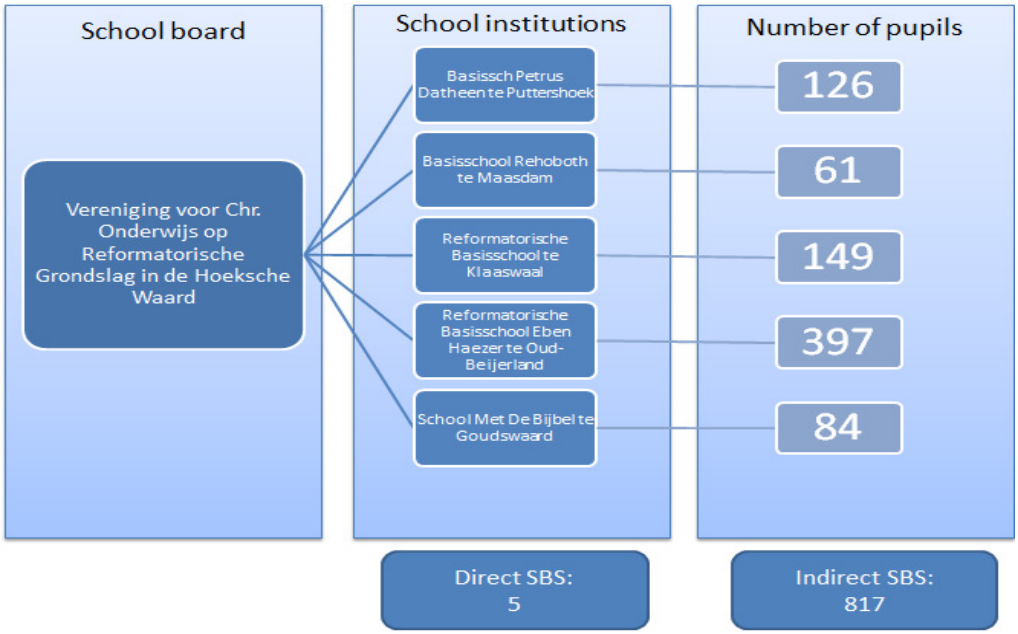

Figure 1 Operationalization of variable SBS according to the direct and indirect method, for an example school board

This implies that school boards are directly responsible for their school institutions. The number of governed school institutions by school boards differs enormously. Besides the indirect aspect with the number of pupils, the direct aspect of the number of governed school institutions is another operationalization of SBS. The example school board should control five school institutions, which require larger control management from the school board, regardless of the number of pupils the school institutions have. A relation between the total number of pupils and controlled school institutions is plausible. However, in that case, every school institution must have the same average number of pupils, but that does not correspond to reality. For example, the school board '' Stichting Katholiek Onderwijs Ginneken'' only governs one school institution (KBS Laurentius in Breda), while this KBS Laurentius teaches more than 800 pupils. Based on the number of pupils, this school board is large but the management control and responsibility face the smallest outcome possible. Therefore, SBS measured on two methods confirm a valuable distinction.

4.2 Socio-economic pupil background

As earlier explained, multiple factors determine the government funding for school boards, besides the school size. A substantial part of government funding has to do with disadvantaged pupils. These are pupils who are assumed to perform worse because of a disadvantaged economic, social, or cultural environment. To counteract this inequality of opportunity, the government allocates more money for schools with more disadvantaged pupils. A school board that teach pupils with a disadvantaged socio-economic background

become more complex, which require greater advisory needs according to Klein (1998). So, the disadvantage of pupils affects both the school operation as the school performance.

Based on an indicator, calculated by the CBS[14], the disadvantage of pupils per school institution is determined. This is called the ''schoolgewicht'' (SG, translated: schoolweight) and is recently developed commissioned by the Ministry. CBS (2017) developed and reported a new model, and found the following six surrounding factors that explain the environmental disadvantage of pupils.

1. The educational level of the father;
2. The educational level of the mother;
3. The length of stay of the mother in the Netherlands;
4. The average level of education of all mothers at a school institution;
5. The descent of the parents;
6. Whether the parents are in debt rescheduling.

This regression model explains, together with pupils' I.Q., 42% of the differences in test scores, which is relatively high for social scientific research. According to CBS's (2017) research, these six surrounding factors explain educational disadvantage better than the previous method, which only contained the educational attainment of parents[15]. Therefore, I use the schoolgewicht outcomes as the control variable. From an equivalent unit (SG=1) is calculated how much equivalent units (standard pupils) are assumed to executed for a pupil with a certain socio-economic background.

CBS calculates an expected score per school institution ($SG_{si,t}$), while the research focus is on the school board ($SG_{sb,t}$). Seeing school boards could control multiple school institutions, I have to organize the data for this research. To control for the size of a school institution (number of pupils,$NOP_{si,t}$), I organize it as the sum of all school institution weights, belonging a school board, times the number of school institution pupils. This outcome is divided by the number of pupils of the whole school board, which results in the schoolweight of a school board which I use in this research. The CBS (30 October 2020, personal communication) has assessed this method, summarized in Equation (4), as correct.

$$SG_{sb,t} = \frac{\sum SG_{si,t} * NOP_{si,t}}{\sum NOP_{si,t}} \qquad (4)$$

[14] Central Agency for Statistics (CBS) is a Dutch governmental institution that provides independent and reliable statistical information regarding social issues (CBS, n.d.).
[15] For years, the government has determined the disadvantage of pupils by the only educational attainment of the parents and categorized it in three 'weights' (0, 0.3, and 1.2).

4.3 School operations

H1 suggests a potential link between the SBS and the expenditures per pupil (EPP). EPP is a commonly used indicator in educational research. Governmental funding is the biggest part of school income, which mainly depends on the school size and advantage of pupils. Therefore, to test whether school boards relatively expend less when they become larger (indicate higher funding), SBS and SG are used as independent variables. So, SBS and average disadvantage (SG) together determine governmental funding, and indicate how much (education) work is assumed to be executed. This is based on the process/standard costing. Per standard pupil, the government provides a standard amount of money which is an indicator for the (education) work that is assumed to be executed for a pupil with a SG=1. Finally, SG is calculated as an average per school. It follows that a larger school with a certain SG, receive more government funding, and has more (education) work to be executed. So, a larger school board notices a difference in SG harder in government funding and work to be assumed than a smaller school board. Therefore, an interaction between SBS and SG is included. The following Equation (1) is used. H1 expects a significantly negativeβ_1.

$$EPP_{s,t} = \beta_0 + \beta_1 SBS_{st} + \beta_2 SG_{st} + \beta_3 SBS_{st} * SG_{st} + \varepsilon_{s,t} \qquad (1)$$

H2 suggests a potential link between SBS and investments. It is separated into school investment (SI) of H2a and personnel investments (PI) of H2b. These expenses intend to improve the school quality and are part of the total expenditures (H1). School boards make management decisions to invest in their school quality, and these hypotheses test the influence of SBS in their investment decisions. The possibility to invest only exists when income is generated, so SBS and SG are used as independent variables. Also, the interaction between SBS and SG is included, for the reasons mentioned above. This leads to the following Equations (2) and (3). H2 (H2a and H2b) expects a significant positiveβ_1.

$$SI_{s,t} = \beta_0 + \beta_1 SBS_{st} + \beta_2 SG_{st} + \beta_3 SBS_{st} * SG_{st} + \varepsilon_{s,t} \qquad (2)$$

$$PI_{s,t} = \beta_0 + \beta_1 SBS_{st} + \beta_2 SG_{st} + \beta_3 SBS_{st} * SG_{st} + \varepsilon_{s,t} \qquad (3)$$

In these Equations (1), (2), and (3) I investigate one school board multiple years which could induce correlated standard errors. Therefore, I cluster the standard errors according to the school board level.

4.3.1 Expenses per pupil variable

Each school board must disclose their annual report according to RJO[16]. Part of the annual report is the income statement, where expenses constitute the indicator of cost efficiency. Together with the income, school boards comprise financial results ('profit'). From the income statement, the expenses also contain depreciations and personnel costs, so it partially covers investments in H2. However, the income statement shows the expenses that a school board 'use' to operate the school in one year *t*, and therefore also shows investment as normalized expense to one year. The partially covering is no problem seeing the intention for testing normalized expenses in H1, and distinction in investments (H2) for initial expenses. Moreover, as additional tests, Equation (1) operates multiple times with more detailed expense levels as dependent variable. This allows me to test effects of these separated parts of the income statements, and filter investment-related parts. Also, the differences between school sizes for certain types of expenses become visible. Here, I can analyze to which economies of scales arise, and where relatively more money is spent.

Logically, a school board with 40 schools institutions faces higher expenses in total, than a school board with one school institution. Therefore, the total expenses would not fit the test, so I divide these expenses by the number of pupils of a school board. Differences become observable between school boards' financial decisions and (cost) efficiency.

4.3.2 Investment variable

The investments are subject in H2 and are separated into H2a school investment (SI) and H2b personnel investments (PI). Both investments are normalized to the number of pupils.

Firstly, investments are operationalized in school factors. The cash flow statement is the source for the school investment variable, and is normalized to the number of pupils. In this statement, I analyze if the outflow of money is mainly for operational activities, or for investments to improve school quality. From the statement, per schools and year, the cash flow of investing activities is known. This is the sum of investments in, for example, tangible assets, intangible assets, financial assets, and partnerships. So, this is the total outflow of money of a school board in a certain year, intended for investments in school quality.

Secondly, the personnel investments are operationalized as a 'pupil/teacher ratio'. This is the most commonly used parameter in educational production functions (Hanushek, 1986). Within personnel investments I recognize three function categories based on the 'COA PO 2019-2020'[17] and data from DUO. There is a difference between management[18], teaching[19],

[16] Regeling Jaarverslaggeving Onderwijs, WJZ/2007/50507, BWBR0023132, enacted January 1, 2008.
[17] Collectieve arbeidsovereenkomst 2019-2020 voor het primair onderwijs.

and supporting[20] staff. I calculate the ratios to divide the total number of pupils by the total FTE, and FTE per function. 1 October is the reference date. Generally know from Project STAR (Student/Teacher Achievement Ratio), a reduction in a ratio would improve school performance. The three functions accomplish different values.

4.4 School performance

H3 suggests a link between investments in education quality and school performance (SP). H4 suggests SBS as a factor for SP. These hypotheses contain the same dependent variable (SP) while the independent variables are linked according to H2 (H3 the investments variables, and H4 the SBS variable). Therefore, within one regression I can test H3 and H4. Moreover, the interaction between these variables can be tested. The dependent variable is SP. According to the theory, some factors influence the SP, so multiple independent variables are included. According to the three factors in Andrews et al. (2002) model, the regression is processed as explained below and results in Equation (5). H3 expects to find positive and significant coefficients β_2 and β_3. Additionally, β_4 is expected to show a positive and significant sign, which reflect the predictions of H4.

$$SP_{s,t} = \beta_0 + \beta_1 EPP_{st} + \beta_2 SI_{st} + \beta_3 PI_{st} + \beta_4 SBS_{st} + \beta_5 SBS_{st} * SI_{st} + \beta_6 SBS_{st} * PI_{st} + \beta_7 SG_{st} + \beta_8 SBS_{st} * SG_{st} + \varepsilon_{s,t} \quad (5)$$

The first factor, called in their research, is school activities produced from purchased inputs. The regression separates these school expenditures into three variables. There is a distinction between expenditures for the 'basic' expenditures for operational activities (such as rent and/or energy costs) and investment expenditures to increase school quality (such as teachers and/or teaching resources). This corresponds with the H1 and H2 variables. So, EPP, SI, and PI capture Andrews et al. (2002) school activities produced from purchased inputs.

The second factor mentioned in the research is the student, family, and, neighborhood characteristics. I assume that every pupil, on average, borne with the same intellectual capacities. But the environment where a pupil grows up influences the capacities. Pupil characteristics are therefore for the vast majority determined by their environment. The control variable SG as earlier explained entails the disadvantages of pupils and is, therefore, a strong measure for this factor in the regression.

[18] The director(s) and/or deputy director(s) of a school institution
[19] Personnel with a teaching qualification. The group of teachers, specialist teachers, and other teaching staff.
[20] The group that supports the management and teaching staff. Concrete example functions are is Appendix C.

Physical factors are called the last observable factor in Andrews et al. (2002) research. The school (board) size is called as physical factor, and is related to governance professionally, legitimization of decision, and professionalization (Heijsters et al., 2020).

As Equation (5) describes, three SBS interaction terms are included. The investment because of the expectation that larger school boards invest more, which would lead to higher school performance. Seeing the two investment variables (SI and PI), two interaction coefficients are elements of Equation (5). Also, SG and SBS are interacted again.

In this Equation (5) also standard errors will clustered.

4.4.1 School performance variable

School performance should be operationalized as the contribution of schools to a pupil's score (school output). This is very important to filter demographic differences between schools when you compare their results. A method[21], developed by Prof. dr. dr. h.c Jaap Dronkers in 'RTL scholenonderzoek'[22] (2019), is based on the 'added value' of a school institution and is therefore applicable to this research. The school performance is the difference between the expected- and actual test scores, which shows the degree to which school boards succeed to accomplish pupil's potential (school performance). Basically, the first step is to calculate the residual in Equation (6). The residual is thereafter as school performance the dependent variable in second step regressions.

$$Actual\_score_{s,t} = \alpha_1 + \beta_1 Expected\_score_{s,t} + Residual_{s,t} \quad (6)$$

This is a two-step regression procedure, and that can generate biased coefficients and standard errors that can lead to incorrect inferences (Chen et al., 2018). Following their research, I include first-step regressors in the second-step regression to control for the effect of the first-step regressors. Equation (7) presents the second regression, with $VOI_{s,t}$ for the variables of interest and $School\_Performance_{s,t}$ as Equation (6) residual.

$$School\_Performance_{s,t} = \alpha_2 + \beta_2 VOI_{s,t} + \beta_3 Expected\_score_{s,t} \quad (7)$$

4.4.1.1 Actual and expected score

Every Dutch primary school is mandatory to provide their pupils the central final test in the last primary education year (Rijksoverheid, n.d.-b). So, the central final test outcomes are a strong starting point to determine school performance across schools. But, schools are allowed to choose from five different central test institutions (see Appendix E for further insights), each with its unique results, according to its unique method. Therefore, a

[21] Various researchers reviewed and verified this method, among which educational researchers Geert Driessen, Mark Levels, Hans Luyten, and experts from the Ministry of Education, Culture, and Science (RTL Nieuws, 2019).

[22] RTL scholenonderzoek is the annual investigation regarding Dutch primary schools by news service RTL.

comparison regarding test scores between all schools is not directly possible. To reduce the comparison problem, I will only use schools that chosen for one of the three main central tests. These three main central tests cover 97% of the pupil population. However, the test scores from these central test institutions are still not comparable. Therefore, I normalize the actual test scores to one comparable score per school in year t. Appendix D presents the detailed steps to calculate the (normalized) actual school scores.

The expected school score in Equation (6) and (7) is the SG variable from section 4.2. This score is based on the same method for every school s in year t, so there are no comparison problems across schools.

4.4.1.2 Methodical issues

The school performance output is per school institution per year. Seeing the other variables in Equation (5) are per school board, there arises a matching problem. I use two methods as solutions for this problem to produce regression results. In the first method, I convert the school performance per institution, to school performance per school board. The school performance per institution per year is multiplied by the number of pupils and the sum of these outcome(s) per school board is divided by the total number of pupils per school board per year (the same method as for SG in Equation (4)). Data journalist of RTL Nieuws Jasper Bunskoek assessed this method as applicable to school boards (12 November 2020, personal communication). The second method is to remain the school institution school performance and SG results, despite the other school board variables. This is because of the disappearance of school performance effects in larger school boards. However, according to the research of Snijders and Bosker (1993), two-level research causes problems with the standard error. The standard error will become too narrow. Taking this into account, the two-level regression with school institution and school board variables is examined. As control variable, the school size (SS) of the school institution as the number of pupils is included in these regressions. SS is also interacted with SG, since both are at school institution level. Since SBS is a variable at school board level, an interaction with SG on school institution level would not be correct.

Another (very simple) solution for two-step regression that Chen et al. (2018) mentioned is to avoid using the two-step procedure. Therefore, I also use the actual test scores as a dependent school performance variable. Thus, the actual school output (school scores), without accounting for capabilities of the pupils in a one-step regression.

Lastly, there could arise some problems with the investigating of one year results. Bolhaar and Scheer (2019) of the CPB[23] advices to investigate multiple years because primary school institution scores substantially vary per year which increases the chance of accidental outliers. In CPB reports, they usually merge three year. Therefore, to reduce the chance of accidental outliers per school, I produce additional regressions with averages of three years.

Appendix F summarizes these investigating additions regarding school performance.

4.5 Data sample

Government institutions collect data for all registered schools in the Netherlands. This data contains very diverse information (income statements, test scores, etc.) on several perspectives (per school board, per school institution, etc.) and is per category, separately, open to download. Multiple excel-files with required data are the result. DUO and the Inspectorate of Education are the sources for all variables. Appendix G presents per variable the description and data source. Since this research comprises multiple facets of school boards, excel-files should be linked. I compress all data files to a large set with per year and school board variables for executing equations for the test.

From all municipalities in the Netherlands, three are deleted from the sample. Officially Bonaire, Sint-Eustatius, and Saba belong as 'special municipalities' to the Netherlands so they receive school funding from the Dutch government. But due to big cultural, language, and social differences in comparison with the other Dutch municipalities (SCP, 2015)[24], all school boards in Bonaire, Sint-Eustatius, and Saba (11 registered school boards) are ignored.

The different time series (years) in every file produces some matching problems because not every variable is correct and/or known. As a result, I have to dropout the sample until I can match the time series. The most limited dataset is the 'expected school score' (operationalization of SG, and part of school performance) which contains information about 2016/2017 to 2019/2020. This limited data is due to the new method on which the Inspectorate of Education determines "schoolgewicht'' as earlier explained. Other historical data is largely available, so the time series fully depends on the data from SG. Seeing the COVID-19 impact, final central tests were canceled in 2020, and therefore tests regarding 2020 are canceled. Eventually, three time-series remain from 2016 to 2018.

[23] CPB means ''Centraal Planbureau'' (translate: Bureau for Economic Policy Analysis) and is an independent government advisory body for scientifically economic analysis and forecasts.
[24] SCP means ''Sociaal en Cultureel Planbureau'' (translate: Social and Cultural Planning Office) and is an independent government advisory body for scientific social research

Table 2: School types which school boards could govern in this research

Education type	Educational law	School institution type
Primary education (PE)	Wet op het primair onderwijs (WPO)	Primary education
		Special primary education
	Wet op de Expertisecentra (WEC)	Special education
		Special secondary education
		Special education/special secondary education
Secondary education (SE)	Wet op het voortgezet onderwijs (WVO)	Secondary education

Further, the different data files have another understanding of a year, which influences the matching of variables. According to article 171 of the 'Wet op het primair onderwijs'[25] (WPO), a school board has to report about the previous calendar year (1 January to 31 December). So the financial variables (EPP, SI, and PI) are about a calendar year. But the other variables (SBS, SG, and SP) are about a school year, which is the period from 1 August to 31 July, according to article 1 of the WPO. Therefore, for example, variable EPP is known as 2016, while SP is known as 2016/2017. To combine these variables into one equation the school year 2016/2017 is merged with the financial year 2016. This system is for every year.

Another problem arises since a school board could govern multiple school institutions, which have their specific school type. School boards have no specific school type but govern school institutions that do have. Every school institution teaches a specific group of pupils, which belongs to a certain school type, educational law, and education type. Table 2 presents the classification of the six school types which school boards in this research could govern. Appendix H explains the pupil characteristics per school type.

Table 2 distinguishes primary education and secondary education. The scope of this research is primary school boards, but it follows that not every school board in this research governs only primary school institutions. It could be possible that a school board governs (a) primary and secondary school institution(s), for example, the *''Stichting Lucas Onderwijs''* which governed 53 primary and 26 secondary school institutions in 2018. It would not be possible to add secondary school boards into the research because of the huge differences, for example, the measures for school performance. However, school boards that govern secondary school institutions will not drop out. Multiple types of education indicate the size and complexity of a school board. The largest school boards govern multiple education types, and that sizes are the main focus of the research in comparison with small school boards. So, school boards that govern at least one primary school institution belong to the sample.

[25] Wet op het primair onderwijs (WPO), BWBR0003420, enacted July 2, 1981.

Table 3: The sample composition per year, in number of school board observations

Conditions	2016	2017	2018	Total
Number of school boards with at least one primary school institution	1026	1005	995	3026
Whereof only WEC school institutions	70	69	68	207
Whereof at least one WPO school institution	956	936	927	2819

Table 3 presents 3026 observations within the period 2016 to 2018 as result.

Within primary education, there are five school institution types with different types of pupils, which are organized according to two educational laws. Although these five school types belong to primary education, it is another kind of education, dealing with other pupil capabilities and therefore another educational approach. Seeing the disabilities, disorders, or diseases that need special care for school institutions of the 'Wet op de Expertisecentra' [26](WEC), capabilities and (test) results of pupils are not driven by environmental factors and/or school and personnel factors. Therefore data about schoolgewicht and school performance lacks and would not be relevant for WEC school institutions. So, school boards that only govern school institutions of the WEC will dropout. Table 3 presents a dropout of 207 observations. So, the 2819 observations complete the final sample and is the starting point for every test in this research on board level.

On the institution level, the starting point is 19557 observations. However, due to a lack of data (match) in some cases, I reduce the number of observations. Per equation, the reduced sample size is different but provides no new insights. For brevity, Appendix I presents the sample compositions of all equations. The sample is, despite the observation reduction, close to the population every year, and investigates the most recent three years. Therefore, this sample size fits the population and has strong external validity.

5. Empirical results and analysis

5.1 Descriptive statistics

Since some variables are used in multiple equations (with a various number of observations), the descriptive statistics of a variable are not identical. However, the descriptive statistics of a variable in multiple equations do not substantially deviate. For brevity, Table 4 presents the descriptive variable result of the equation with the highest number of observations. Appendix J presents for every equation descriptive statistics.

SBS presents the number of governed school institutions (direct) and the number of pupils (indirect). There is also a separation between primary education (PE) and secondary education (SE). Appendix J shows a separation according to educational laws. Table 4 follows that

[26] Wet op de Expertisecentra(WEC), BWBR0003549, enacted December 15, 1982.

every school board in the data sample governs a PE school institution, while a limited number of school boards govern a SE school institution. This is satisfying because the research focus is on primary education. However, the number of pupils in SE is closer to PE, than the number of governed school institutions. This is since one SE school institution teaches many more pupils than one PE school institution. Further, Table 4 presents that the standard deviations are very high (all standard deviations are higher than the mean), which means that the data is highly dispersed to the mean. Also, the differences between the minimum and maximum observation (the range) are very high, which means that there are very small and very large school boards. Further, the minimum number of school institutions is equal to the mode, which indicates that most school boards only govern one school institution. However, on average, a school board governs 8 school institutions. This is due to a smaller number of school boards that govern many larger school institutions and pupils. For example, the largest school board in the sample (‘’*Stichting BOOR*’’ in Rotterdam) governs as many school institutions as 102 of the smallest school boards in total. It becomes clear that the differences in school board size, both the number of school institutions as the number of pupils, are huge.

In all equations, SG is included. Table 4 follows those school boards with a SG higher than 29,2 in a certain year face, on average, more disadvantaged pupils, and therefore lower expected school scores. SG lower than 29,2 means fewer disadvantaged pupils, and therefore a higher expected school score. School board ‘’*Stichting Interconfessioneel Basisonderwijs* te Rotterdam eo’’ in 2016 (39,4 SG) is expected to obtain the lowest test scores and ‘’*Utrechtse Schoolvereniging*’’ in 2018 (19 SG) is expected to obtain the highest test scores.

EPP is on average 6059. This means that, on average, a certain school board expenses 6059 euro per pupil, per year. Besides the total expenses, I analyze the expenses more in detail. It follows from these descriptive statistics of detailed EPP that the biggest expense is for personnel purposes, with on average 4885 euro expenses per pupil, per year. This type of expense is relatively high for every school board, seen from the relatively high minimum EPP for personnel expenses. Further, the detailed expenses show huge differences between school boards’ expenses per pupil per year, seeing the high standard deviations relative to their mean, and the multiple modes of zero. So, on average, while the total expenses per pupil are approximately equal, the detailed place of expense differs.

SI is the investment cash flow divided by the number of pupils. A positive SI means investment, and a negative SI is disinvestment. On average a school board spends per year approximately 206 euros per pupil, intended as an investment. I analyzed the composition of investments at different levels. However, tangible asset investments are the only considerable

Table 4 Descriptive statistics all variables

Equation(s)	Variables	Mean	SD	Min	Median	Max	Mode	N
1 2 3 5	SBS - direct	7,8	9,5	1	4	102	1	2625
1 2 3 5	PE - direct	7,6	8,9	1	4	82	1	2625
1 2 3 5	SE - direct	0,2	1,4	0	0	27	0	2625
1 2 3 5	SBS - indirect	1760	2618	37	824	34882	231	2625
1 2 3 5	PE - indirect	1644	2145	37	804	20813	231	2625
1 2 3 5	SE - indirect	116	911	0	0	17322	0	2625
1 2 3 5	SG	29,2	3,5	19,0	29,8	39,4	31,0	2625
1 5	EPP	6059	1415	528	5800	25530	5255	2625
2 5	SI	206	306	7279	166	-2668	0	2625
3 5	PI	14,5	2,0	3,0	14,6	27,1	13,9	2497
3 5	[27]MSI	231,6	173,3	25,0	193,8	1180,0	1180,0	2497
3 5	TSI	18,4	2,4	5,4	18,4	35,2		2497
3 5	[20]SSI	167,9	204,0	7,6	120,1	1552,7	1552,7	2497
5	SP	0,08	0,72	-5,62	0,06	3,72	0,09	2489
5	SP -actual scores	0,23	0,84	-6,72	0,18	3,51	0,42	2489

Note. SBS is divided into primary education (PE) and secondary education (SE) and measured as number of governed school institutions (direct) and number of pupils (indirect). PI is divided into management (MSI), teaching (TSI), and supporting staff investments (SSI). ; Appendix G explains the variables.

type of investments, so there are no additional regressions for other types (as by EPP). Due to the mode of zero, high differences between minimum and maximum values and high standard deviations it becomes clear that there are many differences between school boards. Also, these results suggest that there are a big group of school boards that do not invest.

Table 4 follows that on average a school board employs one FTE per 14,5 pupils. Generally applicable; the lower the ratio means higher personnel investment[28], seeing the higher number of FTE available for a certain group of pupils. A school board invests, by a lower ratio, more in personnel for their number of pupils. So, the school board ‘’*Stichting Joodse Kindergem. Cheider*’’ with a ratio of 3,0 in 2016 has the highest PI. Further, it follows that teaching staff (TSI) share the biggest part of school boards’ personnel investments. Management (MSI) and supporting staff (SSI) investments are many lower on average and differ substantially between school boards seeing the high standard deviations and range.

Lastly, the descriptive statistics of school performance (SP) can be found in Table 4. Seeing SP is determined as residual from a first-step regression, a certain SP variable is carefully interpretable. The SP is a sort of grade for a school board for their contribution to their school output in a year. An SP of zero means that a school board reached exactly the

[27] There are school boards without management or supporting staff which results in a ratio of zero. Seeing this indicate high investments I adjust these ratio to the highest ratio of the sample (MSI=1180 and SSI=1552,7)
[28] A high investment when the ratio is low might be confusing in statistical tests because, for a positive expectation of higher investments, the coefficient should be negative. Therefore, only in statistical tests, I multiply the ratio by -1. Because of this; the higher the ratio means higher investment which might be clearer.

school output that was expected, so their contribution is equal to zero. Therefore, the higher the SP grade, the higher the school board contribution, so the better the school performance of a school board in a certain year. There exist substantial differences between the school board, seeing the relatively high standard deviation and high differences between the minimum and maximum values. These differences are very interesting for the research, considering the differences of other variables earlier discussed. The descriptive statistics of SP variants and SP-actual scores, such as the 3-year averages and school institutions level, do not provide other new insights.

5.2 Multivariate regression results

5.2.1. Expenses per pupil

H1 expects that the expense per pupil will decrease by the school board size, so H1 predicts that school board size is negatively associated with expenses per pupil. To investigate SBS in several ways, I estimate this variable within the same regression on different methods. Table 5 presents the estimation results, with SBS as total and separated into primary (PE) and secondary education (SE). Estimation results from regressing SBS according to Educational Laws are located in Appendix K for brevity. Column (1) shows that the coefficient for SBS is negative and significant, consistent with the economies of scale theory of H1. Column (2) presents further evidence for economies of scales, specific for primary school board, seeing the negative and significant coefficient for PE(2). This means that expenses per pupil decrease for a school board with a larger amount of primary school institutions. The SE (2) coefficient is positive and significant, which means that governing secondary school institutions increase the expenses per pupil. This association is consistent with the assumption that educating pupils from secondary schools are more expensive than primary school pupils. This is according to the budget of the Ministry in 2018, where the funding per secondary school pupil is 23%[29] higher than the funding per primary school pupil. The coefficients according to the indirect SBS method in Columns (3) and (4) present approximately the same results as the direct method. The results are yet stronger for primary school institutions when the special education (part of PE) is separated, as attached in Appendix K.

Among control variables, SG is positively, and significant in Columns (3) and (4) according to the indirect method, associated with expenses per pupil, consistent with the higher expected education work for school boards with more disadvantaged pupils. This

[29] On average per pupil €6900 for primary school, and €8500 for secondary school (Rijksoverheid, n.d.-c)

Table 5 Linear regression results for the relation between school board size and the expenses per pupil

	Expenses per pupil			
	1	**2**	**3**	**4**
Variables	**Direct SBS method**		**Indirect SBS method**	
SG	23,5	21,7	34,4**	29,2*
	(1,43)	*(1,27)*	*(2,07)*	*(1,7)*
SBS	-116,6**		-185,2	
	(-2,45)		*(-0,80)*	
SBS*SG	4,5***		8,4	
	(2,84)		*(1,11)*	
PE		-205,8***		-686,1***
		(-3,95)		*(-3,15)*
PE*SG		7,3***		23,2***
		(4,17)		*(3,22)*
SE		1934,3***		2154,1***
		(3,66)		*(3,07)*
SE*SG		-58,8***		-62,5***
		(-3,40)		*(-2,63)*
Constant	5230,6***	5308,7***	4942,4***	5166,0***
	(10,98)	*(10,78)*	*(10,12)*	*(10,28)*
Observations	2625	2625	2625	2625
R2	0,037	0,076	0,031	0,060
Cluster level	School board	School board	School board	School board
Cluster	915	915	915	915

Note. Table 5 reports OLS coefficient estimates and t-statistics (in parentheses and italics) from regressing expenditures per pupil on school board size and schoolgewicht; dependent variable is always EPP, and as independent variable SBS is composited on four different ways. Firstly, the direct (number of controlled school institutions) in Column 1-2 and indirect (number of total pupils of a school board) in Column 3-4. For every method, a regression ran as total SBS in Columns 1 and 3, and SBS separated into primary education (PE) and secondary education (SE) in Columns 2 and 4. All variables are defined in Appendix G; *, **, * Indicate statistical significance at the 1 percent, 5 percent, and 10 percent levels, respectively, using a two-tailed t-test.**

expectation arises from the funding system. So, the higher the SG variable, the higher the disadvantage of school boards' pupils, causes higher expenses per pupil.

Further, the interaction terms in Columns (2) and (4) are positive and significant for PE. This means that the decrease in EPP through a larger school board (negative PE) is impaired by the average disadvantages of their pupils. It follows that a school board with high averaged disadvantaged pupils, stronger increases their EPP if the school board becomes larger. The cost benefits of a larger school board even could disappear, if, ceteris paribus, the average disadvantage is high. Diseconomies of scale arise when a school boards' SG is higher than 28,2, which is slightly below the average SG of all school boards. A substantial part of school boards, so, increase their EPP, ceteris paribus, when the school board becomes larger. However, another substantial part of school boards with relatively less disadvantaged pupils (SG below 28,2) decrease EPP, ceteris paribus, when the school board becomes larger.

For example, the most advantaged school board (SG=19) in the sample will reduce their expenses per pupil per year with 67 euro, if the school board governs one extra primary school institution. But, the most disadvantaged school board (SG=39,4) raise their expenses per pupil per year with 82 euro, if the school board governs one extra primary school institution. Important to note is that these implications only hold ceteris paribus. This means that the extra school institution(s) should face the same pupil disadvantaged (school boards' SG remain).

These examples indicate that larger school boards can achieve economies of scale. However, this only holds for schools with a smaller amount of disadvantaged pupils. Schools with a larger amount of disadvantaged pupils achieve the lowest expenses per pupil in a smaller school board. Seeing the SG is an average education work per pupil, more pupils will increase the total education and organization work, which increases the relative expenses.

So, the relation between school board size and expenses per pupil is moderated by SG. The higher the SG means more complex educational governance. School boards with a low SG face simple educational governance. It follows that the expenses per pupil increases in school board size for complex school boards. But, the expenses per pupil decrease in school board size for simple school boards.

I test H1 further according to different expense levels and present the regression results of detailed EPP levels in Appendix K. Most expense levels are negatively associated with SBS, so consistent with the results of total expenses. However, three expense levels are positively associated with SBS (both direct as indirect method). The three expenses item are rental, inventory and equipment, and insurance. This means that these expenses increase if a school board becomes larger, which is not consistent with the overall result. Higher rental expenses for larger school boards are comprehensible because these expenses occur when a school board rent other buildings than their school institution building(s)[30], for example, an office. A school board with one school institution manages their organization with less bureaucracy and staff so it does not need a separate office to house their staff. A school board with 40 school institutions requires more organization with more bureaucracy and staff. A larger school board notices therefore more need for separated office(s). The higher inventory and equipment EPP in larger school boards supports H2a, as an investment in the education

[30] School boards do not rent the school institution buildings, but the municipality should range (financially) school buildings when a school needs that, and the school board should maintain the building (T. van Nes, 9 December 2020, personal communication).

Table 6 Linear regression results for the relation between school board size and the school investments per pupil

	School investments			
	1	2	3	4
Variables	**Direct method**		**Indirect method**	
SG	-3,9	-3,4	-3,7	-3,4
	(-1,11)	*(-0,95)*	*(-1,05)*	*(-0,93)*
SBS	-9,9		-24,5	
	(1,31)		*(-0,85)*	
SBS*SG	0,3		0,8	
	(1,28)		*(0,86)*	
PE		*-10,0*		*-35,1*
		(-1,19)		*(-1,04)*
PE*SG		*0,3*		*0,9*
		(1,01)		*(0,82)*
SE		*53,5*		*53,6*
		(1,06)		*(0,70)*
SE*SG		*-1,3*		*-1,0*
		(-0,76)		*(-0,37)*
Constant	324,7***	314,5***	315,9***	314,2***
	(3,00)	*(2,86)*	*(2,92)*	*(2,83)*
Observations	2625	2625	2625	2625
R2	0,002	0,007	0,002	0,007
Cluster level	School board	School board	School board	School board
Clusters	915	915	915	915

Note. Table 6 reports OLS coefficient estimates and t-statistics (in parentheses and italics) from regressing school investments per pupil on school board size and schoolgewicht; as dependent variable, the total school boards' investments are divided by the number of pupils in every Column. As independent SBS variable, Column (1) and (2) measure the SBS, direct, as the number of governed institutions, and Column (3) and (4) measure the SBS, indirect, as the total number of pupils (1=1000 pupils). Column (1) and (3) estimate the SBS as total, and Column (2) and (4) estimate the SBS separated into primary (PE) and secondary education (SE). All variables are defined in Appendix G; *, **, * Indicate statistical significance at the 1 percent, 5 percent, and 10 percent levels, respectively, using a two-tailed t-test.**

quality. Also, insurance expenses are positively associated with SBS, but it lacks of economic relevance seeing very little school boards face these expense type.

5.2.2. Investments per pupil

H2 expects that a school board invests more in education quality per pupil, as it becomes larger. Table 6 presents the estimation results for school investments per pupil (H2a). Columns (1) and (3) show that coefficients for SBS are not significant, according to both the direct as the indirect method. This means that the size of school boards by no means influences the school investments per pupil. Further, Columns (2) and (4) show that both the PE and SE coefficients are not significant, according to both the direct as the indirect method. This convinces that the size of school boards by no means influences the school investments per pupil, and means that governing primary or secondary school institutions do differ from this statement. Also, the disadvantage of school boards' pupils does not influence the school

investments. An important note is that I test school investments per pupil. Logically reasoned and practically tested, school investments as absolute number provide a high significantly negative association between school board sizes and school investments.

Table 7 presents the estimation results for personnel investments per pupil (H2b). The school board size in Table 7 is indirectly measured as the total number of pupils. Appendix L presents, for brevity, the estimation results for personnel investment per pupil, with a directly measured school board size. These results do not substantially deviate from Table 7.

Column (1) shows a significant positive association between SBS and personnel investments per pupil. This means that a larger school board does invest more in personnel per pupil, which is consistent with H2b. Also, the SG coefficient is positive and significant. This means that school boards with a higher schoolweight do invest more in personnel per pupil, which is consistent with the expectation that disadvantaged pupils need more personnel attention. But, through the negative interaction coefficient, the higher personnel investments per pupil are slightly impaired. However, every schoolweight in the sample induces higher personnel investments per pupil in larger school boards. An averaged school board (SG=29,2) with 1000 extra pupils decreases their pupil/teacher ratio by 0,218. This means a reduction of 0,218 pupils per FTE, which enhances the personal attention for a group of pupils. Per FTE the group of pupils becomes lower, so they better able to give extra personal attention. Through economies of scale, a larger school board features more resources to serve pupils with more personal attention per pupil.

However, the PE and SE coefficients in Column (5) show that there is a big difference between primary and secondary schools. In general, secondary school is another education type and requires more personnel. This claim is strongly evidenced by the positive significant SE coefficient, which means that school boards that govern large secondary schools do invest more in personnel per pupil. A positive and significant association between primary schools and personnel investments per pupil is not found. These differences implicate that the overall result in Column (1) is mainly established by school boards with large secondary schools. So, only larger school boards with secondary schools do invest more in personnel per pupil, while school boards with primary schools do not influence personnel investments per pupil.

Further, there are differences within personnel functions. Column (4) shows that SBS is highly significant and positively associated with supporting staff investments per pupil. Also, as Column (8) shows, the school boards with larger primary schools are positively associated with supporting staff investments per pupil. This means that there is high evidence that larger school boards invest more in supporting staff per pupil, regardless of primary or secondary

Table 7 Linear regression results for the relation between school board size and personnel investments per pupil

Variables	1 Total personnel investments	2 Management staff investments	3 Teaching staff investments	4 Supporting staff investments	5 Total personnel investments	6 Management staff investments	7 Teaching staff investments	8 Supporting staff investments
SG	0,19***	2,00	0,11***	7,28***	0,18***	2,05	0,09***	6,60***
	(10,97)	*(1,06)*	*(5,19)*	*(3,09)*	*(9,84)*	*(1,05)*	*(4,17)*	*(2,68)*
SBS	0,51**	-2,50	0,53*	64,70***				
	(2,08)	*(-0,17)*	*(1,91)*	*(3,68)*				
SBS*SG	-0,01	0,20	-0,01	-1,75***				
	(-1,52)	*(0,42)*	*(-1,24)*	*(-3,07)*				
PE					-0,28	21,11	-0,37	40,82*
					(-0,97)	*(1,10)*	*(-1,14)*	*(1,87)*
PE*SG					0,01	-0,43	0,02*	-0,87
					(1,38)	*(-0,67)*	*(1,75)*	*(-1,17)*
SE					4,16***	-126,73	4,44***	159,38***
					(5,57)	*(-1,53)*	*(5,60)*	*(4,02)*
SE*SG					-0,13***	3,75	-0,14***	-5,17***
					(-5,15)	*(1,38)*	*(-5,37)*	*(-3,81)*
Constant	-20,41***	-296,00***	-21,96***	-403,75***	-20,00***	-303,56***	-21,45***	-387,05***
	(-38,81)	*(-5,48)*	*(-34,89)*	*(-5,76)*	*(-36,72)*	*(-5,42)*	*(-32,96)*	*(-5,33)*
Observations	2497	2498	2497	2497	2497	2497	2497	2497
R2	0,154	0,005	0,075	0,038	0,174	0,016	0,087	0,040
Cluster level	School board	School board	School board	School board	School board	School board	School board	School board
Clusters	852	852	852	852	852	852	852	852

Note. Table 7 reports OLS coefficient estimates and t-statistics (in parentheses and italics) from regressing pupil/personnel ratios on school board size and schoolgewicht; As dependent variable, the number of pupils is divided by the total FTE of, in Column (1) and (5), total personnel, in (2) and (6) Management staff, in (3) and (7) Teaching staff, and Column (4) and (8) supporting staff. The output has been multiplied by -1. As independent variable, Columns 1-4 estimate the total school board size, and Columns 5-8 estimates the school board size, separated into primary (PE) and secondary education (SE). SBS is indirectly measured as the total number of pupils (1=1000 pupils). All variables are defined in Appendix G; *, **, * Indicate statistical significance at the 1 percent, 5 percent, and 10 percent levels, respectively, using a two-tailed t-test.**

schools. A larger school board enables resources to invest in personnel beyond the core education, who can work to improve and support the organization's processes. Supporting staff enhance therefore the professionalism and specialism in larger school boards. Also, these supporting staff results are consistent with the relatively higher rental expenses (H1) in larger school boards. Through more supporting staff there arises a need for a separate administration office in larger school boards, which they have to rent. Columns (2) and (6) show insignificant coefficients, which means that the school board size does not affect management staff investments. Columns (3) and (7) show results and implications for teacher investments per pupil which is consistent with the total personnel investments per pupil.

5.2.3. School performance

H3 expects that school performance is improved by higher investments, and H4 expects that school performance is higher in larger school boards. I estimate Equation (5) with investment and school board variables. Table 8 presents the estimation results in which the SBS is measured as the total number of pupils. For brevity, Appendix M presents the results in which the SBS is measured as total governed school institutions, because it is approximately equal (Table 8 is significantly slightly stronger) to Table 8. The results of the three-year averages are comparable to one-year, so are attached in Appendix M.

The SI coefficients are predominately positive. This means that school performances are higher in school boards that invest more in school quality per pupil, which is consistent with H3. However, the coefficients are insignificant in all regressions. This means that whether school investments affect school performance is not evidenced. The interaction coefficient between SI and SBS is also not significant. Further, the interaction coefficients are positive with an indirectly measured SBS (Table 8) while the coefficients are negative with a directly measured SBS (Appendix M). This inconsistency, together with the insignificancy, does not provide inferences for the interaction between school investments per pupil and school board size.

The PI coefficients are negative. This means that school performances are lower in school boards that relatively per-pupil invests more in personnel quality, which is against H3. However, the coefficients are insignificant in all regressions. This means that whether personnel investments affect school performance is not evidenced. As opposed, the interaction coefficient between PI and SBS is highly significant and positively associated with school performance. This implies that the larger the school board size, the more positive the effect of personnel investments per pupil on school performance. It follows that personnel investments per pupil can affect school performance positively in larger school boards. School boards with more than 1360 pupils can improve school performances through personnel investments per pupil (Column (1)). From 1360 pupils in a school board, the larger the school board, the more positive the effect of personnel investments per pupil on school performance. A larger school board teaches more pupils who individually perform at school, so more pupils who potentially can improve their performances (contribute to school performance) through personnel investments per pupil. An –extreme- example of a school board with one pupil demonstrates that higher personnel investments per pupil in small school boards will not improve the pupil (=school, in this example) performance. So, school performances are higher through personnel investments per pupil, in school boards with at least 1360 pupils.

Table 8 Linear regression results for the relation between (school/personnel) investment and school board size, and the school (board) performance/scores.

	1	2	3	4
Variables	**School board performance**	**School board scores**	**School performance**	**School scores**
SBS	5,83	5,61	4,37***	4,40***
	(0,60)	(0,58)	(2,89)	(2,91)
SBS*SG	0,02	0,03		
	(0,10)	(0,12)		
SS			-5,76	-5,69
			(-1,15)	(-1,13)
SS*SG			0,20	0,20
			(1,17)	(1,15)
EPP	-26,37	-28,54	-21,89*	-25,27*
	(-1,38)	*(-1,48)*	(-1,69)	(-1,94)
SI	46,69	41,57	-6,05	-15,35
	(0,50)	*(0,45)*	(-0,10)	(-0,26)
SBS*SI	9,05	9,21	11,44	12,73
	(0,51)	*(0,52)*	(1,08)	(1,21)
PI	-9,75	-10,45	-9,43	-9,88
	(-0,68)	*(-0,72)*	(-1,13)	(-1,18)
SBS*PI	7,18***	7,13***	4,61***	4,63***
	(2,66)	*(2,65)*	(3,77)	(3,79)
SG	2,07**	-12,25***	-0,35	-14,67***
	(2,25)	*(-13,31)*	(-0,65)	(-26,85)
Constant	-46,23	387,50***	17,22	452,20***
	(-1,02)	*(8,49)*	(0,71)	(18,68)
Observations	2489	2489	17172	17172
R2	0,021	0,292	0,004	0,243
Cluster level	School board	School board	School institution	School institution
Cluster	850	850	6127	6127

Note. Table 8 reports OLS coefficient estimates and t-statistics (in parentheses and italics) from regressing school (board) performance and scores on, among others, (school/personnel) investment and school board size; The dependent variable in Column (1) is the calculated school performance per school board as the contribution of a school board to the total school board score. The dependent variable in Column (2) is the normalized school score per school board. The dependent variable in Column (3) is the calculated school performance per school institution as the contribution of a school institution to their school score. The dependent variable in Column (4) is the normalized school score per school institution. The school board size is measured as the total number of pupils (1=1000 pupils). All variables are defined in Appendix G; *, **, * Indicate statistical significance at the 1 percent, 5 percent, and 10 percent levels, respectively, using a two-tailed t-test.**

The SBS coefficient is positive. This means that school performances are higher in larger school boards, which is consistent with H4. However, the coefficients are only significant on school institution performance. This evidences that school performances are higher in school institutions that have a larger school board. But it is not evidenced that school performances are higher in larger school boards. So, the evidence slightly disappears when all school institution performances are combined into school board performance. However, the purest

school performances occur at school institutions, and Table 8 follows that school performances are higher when a school institution is governed by a larger school board. The larger school boards can provide their school institutions with more professionalism and specialism which enhances the performances of school institutions. But the higher school performance in school institutions through a larger school board does not imply higher school board performances. Since school institution performances are combined in school boards, the effect of one school institution is weakened as a school board is larger. This may indicate weak evidence on the school board level.

Further, Columns (3) and (4) contain school institution variables. The SS coefficients are negative, which means that school performances are lower in school institutions that teach many pupils. The interaction coefficients with SG are positive, which means that the negative effect of many school institution pupils is reduced by the schoolweight. Together, it follows that a school institution with an averaged SG (=29,2) has higher school performance. However, these implications are not evidenced since the coefficients are insignificant.

The EPP coefficients are negative, which means that school board performances are higher in school boards with low expenses per pupil. This seems contradictory, despite the coefficients are mainly insignificant. However, as H1 has confirmed, EPP is influenced by the school board sizes due to economies of scale. So, take the results of H1 and EPP of Table 8 together, the expenses per pupil are lower in larger school boards (H1), and the school performances are higher in school boards with lower expenses per pupil. This implies that larger school boards are not only lower in expenses per pupil, but also more internal efficient since it achieves a compared (or even higher) level of output with a less set op resource inputs, ceteris paribus. So, larger school boards achieve higher efficiency.

As a control variable, the SG coefficients are very significant and negative in Columns (2) and (4). This means that school boards with higher schoolweight achieve lower school scores, which is not surprising seeing the schoolweight is an indicator for expected school scores. For school performance results in Columns (1) and (3) the schoolweight is ambiguous, so I cannot make inferences. Moreover, this is beyond the research scope.

Based on the same school performance equation, the personnel investments are further defined and tested into three staff functions as in Table 7 of Paragraph 5.2.2. Table 9 presents the regression results, with an indirectly measured SBS. For brevity, Appendix M presents the regression results with a directly measured SBS (corresponding with Table 9).

Table 9 Linear regression results for the relation between (school/personnel) investment and school board size, and the school (board) performance, with personnel staff separation.

		1	2
	Variables	**School board performance**	**School performance**
Personnel investments	MSI	2,16	1,44
		(1,31)	*(1,24)*
	SBS*MSI	-0,09	-0,35
		(-0,10)	*(-1,01)*
	TSI	-241,37**	-242,32***
		(-2,01)	*(-3,14)*
	SBS*TSI	80,65**	73,60***
		(2,34)	*(4,24)*
	SSI	-1,01	-0,66
		(-1,01)	*(-0,77)*
	SBS*SSI	0,41	-0,46
		(0,44)	*(-0,84)*
Auxiliary variables	SBS	11,92	9,74***
		(1,01)	*(3,71)*
	SBS*SG	-0,02	
		(-0,09)	
	SS		-5,43
			(-1,08)
	SS*SG		0,19
			(1,12)
	EPP	-13,68	-7,56
		(-0,85)	*(-0,63)*
	SI	47,85	14,32
		(0,51)	*(0,23)*
	SBS*SI	7,65	6,45
		(0,43)	*(0,59)*
	SG	2,17**	-0,30
		(2,41)	*(-0,55)*
	Constant	-83,85*	-21,49
		(-1,87)	*(-0,86)*
	Observations	2489	17172
	R2	0,028	0,005
	Cluster level	School board	School institution
	Cluster	852	6127

Note. Table 9 reports OLS coefficient estimates and t-statistics (in parentheses and italics) from regressing school (board) performance on, among others, (school/personnel) investment and school board size; The dependent variable in Column (1) is the calculated school performance per school board as the contribution of a school board to the total school board scores. The dependent variable in Column (2) is the calculated school performance per school institution as the contribution of a school institution to their school scores. As independent SBS variable, it is measured (indirectly) as the total number of pupils (1=1000 pupils). All variables are defined in Appendix G; *, **, * Indicate statistical significance at the 1 percent, 5 percent, and 10 percent levels, respectively, using a two-tailed t-test.**

The TSI coefficients are highly significant and behave in the same directions as the total personnel investments in Table 8. The MSI and TSI coefficients are mainly insignificant. So

personnel investments in teaching staff influence the school performances, while management and supporting staff investments do not influence school performances. These discordances may exist through the nature of the functions. Teaching staff is at the same location and close related to the pupils, as the source of school performance, which they can influence positively in person. Management and supporting staff are not closely related to pupils, and cannot directly influence their performance in person. Table 9, therefore, follows that personnel investment in the classroom does influence the school performance, while personnel investments at the organizational level (the administrative office, for example) do not affect.

6. Conclusions

The question of whether scale effects in educational governance arise by Dutch primary school boards is the fundamental issue in this research. Economies of scale arise in larger school boards in terms of financial policy. Larger school boards achieve lower expenses per pupil to operate their school institutions. In addition, lower expenses per pupil are associated with higher school performances, which show that lower input does not result in lower output. Larger school boards achieve therefore more efficiency. Although, these financial policy effects reduce if a school board teaches relatively more disadvantaged pupils. School boards with a larger amount of disadvantaged pupils (*Schoolgewicht* higher than 28,2) even face diseconomies of scale. So, larger school boards achieve more efficiency when schools' *Schoolgewicht* is below 28,2. Through efficiency, larger school boards' governance faces more opportunities to establish financial policy with investment in educational quality. From the expenses, it follows that inventory and equipment expenses per pupil are relatively higher in larger school boards, which would induce educational quality. However, I found that the school board size, relatively, does not influence the school investments per pupil. Also, school investments per pupil do not affect school performance. The personnel investments do provide evidence for higher personnel investments per pupil in larger school boards. Especially the supporting staff investments per pupil are strongly evidenced as higher in larger school boards, which enhances governance professionalism and specialization. Overall, the personnel investments per pupil affect the school performance positively, but mainly in larger school boards. School boards with at least 1360 pupils perceive positive effects through personnel investments per pupil on their school performances. Within personnel, the teaching staff investments per pupil induce higher school performances, while management and supporting staff investments per pupil do not affect school performances. Seeing the economies of scale and investment effects on school performance, it should follow that larger

school boards perform better. I do find moderate evidence that school institutions on an individual level benefit through a larger school board. However, I do not find evidence that school boards benefit at a broader level through a larger board. So, school board effects are not unambiguous. Although the school boards' scale affects educational governance, it does not automatically improve school performance. It follows that larger school boards achieve educational governance benefits to operate schools, yet is not sufficient to determine school performance, as ultimately purpose. Smaller school boards may obtain other scale benefits, such as involvement, shared vision, and customization that can improve school performance, which I do not test.

This research contributes to three existing bodies of knowledge in literature. First, contributions to literature that discusses Dutch school(s) (board(s)) scale. The OECD (2016) report argues big differences between school boards, which Bussemaker and Dekker recognized in a letter to Parliament. This research contributes to these outcomes by investigating scale effects as the explanatory variable for differences between school boards. Scale effects as central theme meet Scheerens et al. (2014) recommendation for better scale insight. Also, this research exceeds the literature-research outcomes to advantages and disadvantages of scale size of Heijsters et al. (2020). This research contributes to these outcomes to empirically test argued associations for Dutch primary school boards. Second, this research contributes to the economy of scale literature (Stigler, 1958), and extent into education. As a non-profit organization, education is argued to be inefficient (Fama & Jensen, 1983) but within the education field, this research evidence difference in efficiency through scale. There exists some international empirical research about economies of scale as efficiency in education, such as Barnett et al. (2002) and Bowles and Bosworth (2002). However, the report of Heijsters et al. (2020) does not find evidence in Dutch primary schools, which is found this research and therefore contributes. Third, this research contributes to corporate governance literature (Shleifer & Vishny, 1997), as a result of agency theory literature (Jensen & Meckling, 1976). Agency theory suggests that it exists in all organizations, but the coherent corporate governance literature is profit-driven. As a result, governance in the education field is slightly omitted, while school boards become more professional and businesslike with higher governance expectations. This research contributes to governance literature, to increase the extent and importance of educational governance. Within educational governance, the research establishes school board size as an important factor. Therefore, the findings contribute to literature as Honigh et al. (2018) which indicate

school board context as importantly, but not established perspective through concrete context factors.

Implications of the research findings are assigned to two key stakeholders. Fist stakeholder is the government and their public policy. The findings do not strongly conclude better school performance for a certain scale but do conclude efficiency and governance benefits for larger school boards. This could be a government implication to formalize a public policy that encourages mergers, for example, an abolition of the fusietoets. Second, school boards obtain, from the findings, new insights about the benefits of merging. This could encourage school boards to consider policy aimed at enlarging the scale, through a merger. In addition, this research shows that school boards would take into account the schoolweight as a factor that influences the benefits of a certain scale. Last, the findings could implicate the public debate about scales, the choice for the school institution by parents for their child (ren), and the choice for the school institution for teachers to work.

Especially, the research focused and found benefits for large school boards to improve governance and school performance. However, smaller school boards may meet other benefits that reduce the benefits of large school boards. This could be an explanation for the weak association between school board size and school performance. Therefore, I recommend future empirical research for the benefits of small school boards, and other school board context factors (for example the presence of a parent member, whether boards are elected, etc.) that may influence educational governance. Further, take into account that there exist other reasons to maintain the current scale in Dutch education, such as the identity of the school (board), freedom of choice (for a school through parents), denomination, and regional schools (the last school in the town). Also, take into account other reasons that encourage a larger scale, such as less risk and more certainty. These various reasons are out of the research-scope and are difficult to operationalize. But it may explain the current school board scales and the attitude of school boards (small and large), from Heijsters et al. (2020), which do not intend to adjust their scale. Lastly, school performance operationalization through school contribution to test results might be a narrow perspective, since it does not reflect the full education concept such as citizenship, well-being, and safety (Honingh et al., 2018). From a methodological point of view, capturing the full education concept is difficult. Therefore I recommend future research to find a methodological solution for this problem.

Reference list

Andrews, M., Duncombe, W., & Yinger, J. (2002). Revisiting economies of size in American education: are we any closer to a consensus? *Economics of education review, 21*(3), 245-262.

AVS. (2012). *Onderzoeksrapportage professionalisering 2012.* Utrecht: AVS (General School leaders Association).

Barnett, R. R., Glass, J. C., Snowdon, R. I., & Stringer, K. S. (2002). Size, performance and effectiveness: Cost-constrained measures of best-practice performance and secondary-school size. *Education Economics, 10*(3), 291-311.

Bolhaar, J., & Scheer, B. (2019). *Verschillen in leerresultaten basisscholen.* Den Haag: CPB.

Bowles, T. J., & Bosworth, R. (2002). Scale economies in public education: Evidence from school level data. *Journal of Education Finance, 28*(2), 285-299.

CBS. (2017). *Herziening gewichtenregeling primair onderwijs.* Den Haag: Centraal Bureau voor de Statistiek.

CBS. (n.d.). *Organisatie*. Retrieved June 12, 2020, from CBS: https://www.cbs.nl/nl-nl/over-ons/organisatie

Chen, W., Hribar, P., & Melessa, S. (2018). Incorrect inferences when using residuals as dependent variables. *Journal of Accounting Research, 56*(3), 751-796.

Coles, J. L., Daniel, N. D., & Naveen, L. (2008). Boards: Does one size fit all? *Journal of financial economics, 87*(2), 329-356.

Cotton, K. (2001). *New small learning communities: Findings from recent literature.* Washington, DC: Northwest Regional Educational Laboratory Portland, OR.

Dijkgraaf, E., Gelderblom, A., Jong, M. d., Maasland, E., & Tanis, O. (2010). *Onderzoek naar de relatie tussen financiele prikkels en schaalgrootte in het onderwijs.* Rotterdam: SEOR.

DUO. (n.d.-a). *Hoofdtaken en organogram*. Retrieved June 11, 2020, from DUO: https://duo.nl/organisatie/hoofdtaken-en-organogram.jsp

DUO. (n.d.-b). *Bekostiging basisonderwijs*. Retrieved May 20, 2020, from DUO: https://duo.nl/zakelijk/primair-onderwijs/bekostiging-en-subsidies/bekostiging-basisonderwijs/personele-bekostiging.jsp

DUO. (n.d.-c). *Bekostiging basisonderwijs*. Retrieved May 20, 2020, from DUO: https://duo.nl/zakelijk/primair-onderwijs/bekostiging-en-subsidies/bekostiging-basisonderwijs/materiele-bekostiging.jsp

DUO. (n.d.-d). *Bekostiging basisonderwijs*. Retrieved May 20, 2020, from DUO: https://duo.nl/zakelijk/primair-onderwijs/bekostiging-en-subsidies/bekostiging-basisonderwijs/groeibekostiging.jsp

DUO. (n.d.-e). *Bekostiging basisonderwijs*. Retrieved May 20, 2020, from DUO: https://duo.nl/zakelijk/primair-onderwijs/bekostiging-en-subsidies/bekostiging-basisonderwijs/prestatiebox.jsp

Fama, E. F., & Jensen, M. C. (1983). Separation of ownership and control. *The journal of law and Economics, 26*(2), 301-325.

Glasman, N. S., & Biniaminov, I. (1981). Input-output analyses of schools. *Review of Educational Research, 51*(4), 509-539.

Haartsen, T., & Wissen, L. V. (2012). Causes and consequences of regional population decline for primary schools. *Tijdschrift voor economische en sociale geografie, 103*(4), 487-496.

Hanushek, E. A. (1986). The economics of schooling: Production and efficiency in public schools. *Journal of economic literature, 24*(3), 1141-1177.

Heijsters, L., Ploeg, S. v., & Weijers, S. (2020). *Dorpsschool of leerfabriek? Onderzoek naar voor- en nadelen van verschillende vormen van schaalgrootte in het onderwijs.* Utrecht: Oberon.

Hofman, A., Steijn, B., & Hofman, R. (2013). *Educational Governance: Strategie, ontwikkeling en effecten.* Rotterdam: NWO.

Honingh, M., Ruiter, M., & Thiel, S. v. (2018). Are school boards and educational quality related? Results of an international literature review. *Educational Review, 72*(2), 157-172.

Huitsing, G., & Bosman, M. H. (2011). *Toekomstbestendig plattelandsonderwijs. Verkenning van mogelijkheden en belemmeringen voor samenwerking tussen dorpsscholen.* Groningen: Rijksuniversiteit Groningen.

Hulst, B. v., & Urlings, T. (2012). *Productiviteitstrends in het primair onderwijs.* Delft: Centrum voor Innovaties en Publieke Sector Efficiëntie Studies, Technische Universiteit Delft.

Inspectorate of Education. (2014). *De kwaliteit van schoolleiders in het basisonderwijs, speciaal onderwijs en voortgezet onderwijs.* Utrecht: Ministerie van Onderwijs, Cultuur en Wetenschap.

Inspectorate of Education. (2016). *The State of Education.* Utrecht: Ministry of Education, Culture and Science.

Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs, and ownership structure. *Journal of Financial Economics, 3*(1), 305-360.

Klein, A. (1998). Firm performance and board committee structure. *Journal of Law and Economics, 41*(1), 275-304.

Leithwood, K., & Jantzi, D. (2009). A Review of Empirical Evidence About School Size: A Policy Perspective. *Review of Educational Research, 79*(1), 464-490.

Lockheed, M. E., & Hanushek, E. A. (1994). *Concepts of Educational Efficiency and Effectiviness.* Washington, DC: World Bank.

McAfee, R. P., & McMillan, J. (1995). Organizational diseconomies of scale. *Journal of Economics & Management Strategy, 4*(3), 399-426.

Meyer, R. H. (1994). *Educational performance indicators: A critque.* Wisconsin: Institute for Research on Poverty.

Meyer, R. H. (1997). Value-added indicators of school performance. *Economics of Education Review, 16*(3), 283-301.

Midden, G. v., Nes, T. v., Janssen, T., Kleijne, J. d., & Heijltjes, H. (2015). *Volledige doorcentralisatie van onderwijshuisvesting.* Utrecht: PO-Raad.

Moseley, M. J., & Owen, S. (2008). The future of services in rural England: The drivers of change and a scenario for 2015. *Progress in Planning, 69*(3), 93-130.

Newman, M., Garrett, Z., Elboerne, D., Bradley, S., Noden, P., Taylor, J., et al. (2006). Does secondary school size make a difference?. A systematic review. *Educational, 1*(1), 41-60.

OECD. (2016). *Netherlands 2016: Foundations for the future, Reviews of National Policies for Education.* Reviews of National Policies for Education. Paris: OECD Publishing.

OECD. (n.d.). *About*. Retrieved May 27, 2020, from OECD: https://www.oecd.org/about/

Onderwijsraad. (2005). *Variëteit in schaal.* Den Haag: Onderwijsraad.

Onderwijsraad. (2008). *De bestuurlijke ontwikkeling van het Nederlandse onderwijs.* Den Haag: Onderwijsraad.

Opdenakker, M. C., & Damme, J. V. (2007). Do school context, student composition and school leadership affect school practice and outcomes in secondary education? *British educational research journal, 33*(2), 179-206.

Rijksoverheid. (n.d.-a). *Openheid over kwaliteit onderwijs*. Retrieved February 7, 2020, from Rijksoverheid: https://www.rijksoverheid.nl/onderwerpen/openheid-over-kwaliteit-onderwijs

Rijksoverheid. (n.d.-b). *Toegestane eindtoetsen basisschool*. Retrieved May 10, 2020, from Rijksoverheid: https://www.rijksoverheid.nl/onderwerpen/schooladvies-en-eindtoets-basisschool/toegestane-eindtoetsen-basisschool

Rijksoverheid. (n.d.-c). *Overheidsfinanciering onderwijs*. Retrieved December 2, 2020, from Rijksoverheid: https://www.rijksoverheid.nl/onderwerpen/financiering-onderwijs/overheidsfinanciering-onderwijs

Rivkin, S. G., Hanushek, E. A., & Kain, J. F. (2005). Teachers, schools, and academic achievement. *Econometrica, 73*(2), 417-458.

Rossmiller, R. A., & Geske, T. G. (1976). Toward more effective use of school resources. *Journal of Educational Finance, 1*(4), 484-502.

RTL Nieuws. (2019, February 20). *Scholenonderzoek*. Retrieved February 7, 2020, from Rtl nieuws: https://www.rtlnieuws.nl/nieuws/artikel/4603266/hoe-vergelijkt-rtl-nieuws-de-eindtoetsscores-van-2019

Rutte, M., van Haersma Buma, S., Pechtold, A., & Segers, G. J. (2017, October 10). Vertrouwen in de toekomst. *Regeerakkoord 2017-2021 VVD, CDA, D66 en ChristenUnie*.

Scheerens, J., & Bosker, R. J. (1997). *The foundations of educational effectiveness.* Oxford, UK: Pergamon Press.

Scheerens, J., Hendriks, M., & Luyten, H. (2014). School size effects: review and conceptual analysis. *School Size Effects Revisited, 7*(1), 7-40.

SCP. (2015). *Vijf jaar Caribisch Nederland.* Den Haag: Sociaal en Cultureel Planbureau.

Shleifer, A., & Vishny, R. W. (1997). A survey of corporate governance. *The journal of finance, 52*(5), 737-783.

Snijders, T. A., & Bosker, R. J. (1993). Standard Errors and Sample Sizes for Two-Level Research. *Journal of Educational Statistics, 18*(3), 237-259.

Stigler, G. J. (1958). The economies of scale. *The Journal of Law and Economics, 1*, 54-71.

Thuis, P. (2013). *Introductie in management.* Groningen: Noordhoff Uitgevers.

Williamson, O. E. (1983). Organization form, residual claimants, and corporate control. *The journal of Law and Economics, 26*(2), 351-366.

Rules and regulations

RJO

Regeling Jaarverslaggeving Onderwijs, WJZ/2007/50507, BWBR0023132, enacted January 1, 2008 Retrieved from https://wetten.overheid.nl/BWBR0023132/2020-11-25

Translated: Education Reporting Regulations

COA PO 2019-2020

Collectieve arbeidsovereenkomst 2019-2020 voor het primair onderwijs

Translated: Collective Labour Agreement (CLA) primary education

WPO

	Wet op het primair onderwijs, BWBR0003420, enacted July 2, 1981 Retrieved from https://wetten.overheid.nl/BWBR0003420/2021-02-01
	Translated: Primary Education Act
WEC	
	Wet op de Expertisecentra, BWBR0003549, enacted December 15, 1982 Retrieved from https://wetten.overheid.nl/BWBR0003549/2021-01-01/#TiteldeelI_Artikel1
	Translated: Expertise Centres Act
WVO	
	Wet op het voortgezet onderwijs, BWBR0002399, enacted February 14, 1963 Retrieved from https://wetten.overheid.nl/BWBR0002399/2021-01-01
	Translated: Secondary Education Act
SBK	
	Stimuleringsregeling bestuurlijke krachtenbundeling, PO/PJ-97008394, enacted April, 4, 1997, Retrieved from https://wetten.overheid.nl/BWBR0027681/2011-02-01/#Circulaire.divisie3_Circulaire.divisie_11_Artikel9
	Translated: Incentive administrative forces
Wet op het Basisonderwijs	
	Besluit overgangsmaatregelen b.o. 1985, BWBR0003807, Enacted August 1, 1985 Retrieved from https://wetten.overheid.nl/BWBR0003807/1985-08-01
	Translated: Primary Education Act

Appendix A: Composition – lump-sum

Category	Funding	Notes
Personal funding (DUO, n.d.-b)		
	Amount per pupil	-
	Additional funding for (very) small schools	-
	Supplementary funding to combat educational disadvantage	-
	Additional funding for school management	-
	Funding for personnel and labor market policies	Consist, among other things, of a basic amount, basic amount per pupil and budget for combating the workload
Equipment funding (DUO, n.d.-c)		
	Group dependent	Number of pupils groups to be accommodated
	Pupil dependent	Amount per pupil
	Supplementary	An amount per school plus the number of speakers of other languages
Growth funding (DUO, n.d.-d)		
	Staff growth funding (regular growth)	Growth is on the first of the month from August to April of a school year (granted to school board)
	Staff growth funding (special growth)	Growth is on the first of the month from May to June (granted to school board)
	Equipment growth funding	Compare the number of pupils on October 1 of the previous year, increased by 3%, with the number of pupils on March 1, the following year (individual school level)
'Prestatiebox' (performance box) (DUO, n.d.-e)		
	Amount per pupil	Intended for 1) talent development through challenging education 2) a broad approach to sustainable education improvement 3) professional schools 4) ongoing development lines

Appendix B: Total income of all primary schools

Total income of all primary schools in the Netherlands 2014-2018, divided by income source (x 1 euro).

Sector	Rijksbijdragen	Overheidsbijdragen en -subsidies overige overheden	College-, cursus-, les- en examengelden	Baten werk in opdracht van derden	Overige baten	Totaal baten
PO	48.662.333.433	1.484.800.059	-	45.279.666	2.069.234.182	52.261.647.340
% of total	93%	3%	0%	0%	4%	100%

Appendix C: Supporting staff

According to the COA PO 2019-2020, the following functions are examples for supporting staff, and their salary.

- Teaching assistants;
- Teaching support;
- Pedagogical employee;
- Concierge;
- Maintenance employee;
- Secretary;
- Administrative assistant;
- Staff employees
- Staff officers;
- Policy staff;
- Speech therapist;
- Behavioral scientist.

Appendix D: Actual score calculation

The whole process of calculating the actual scores for a certain school in a certain year. The result is used as dependent variable in Equation (6).

Calculating (normalized) actual scores		
Number	*Step*	*Explanation*
1.	Normalize expected school scores	$\frac{(X_{s,t} - \hat{X}_t)}{s_t}$ (expected score for a certain school s in year t - average expected score for all schools in year t) / standard deviation for all schools in year t
2.	Produce regression model (per central test institution, =CET, IEP, and ROUTE8)	Dependent: actual test scores per year, per school Independent: normalized expected school score per year, per school (see step 1)
3.	Interpret regression model	Recognize constant- and standard deviation coefficient
4.	Normalize actual test scores	$\frac{(X_{s,t} - RX_{i,t})}{Rs_{i,t}}$ with: $X_{s,t}$ Actual test score per year, per school $RX_{i,t}$ Constant coefficient, from regression in step 3, in year t with institution i who create the test $Rs_{i,t}$ Standard deviation, from regression in step 3, in year t with institution i who create the test

I determine, according to regressions per central test institution i in year t, the score that would be achieved when there is no expectation for a school (score for school with expected school-score of zero). Then, the result is subtracted from the actual test score, and divided by the standard deviation. This is the normalized actual score per school in year t.

Appendix E: Central final tests

The government decided that the central final test is mandatory for pupils in their last primary education year, and schools now can choose from five[31] (in the past two more) valid tests (Rijksoverheid, n.d.-b). These five central final tests are:

1. Central final test of the Board of Tests and Exams (independent administrative body of the government
2. ROUTE 8
3. IEP final test
4. Dia-final test
5. AMN final test

Previously, schools could choose for final central tests CESAN and DREMPEL.

Only final tests CEP, IEP, and ROUTE8 are used. The past five years, on average, these central tests complete together 97% of the total number of participant pupils. Too few pupils take the AMN and DIA final test for a relevant analysis, so these tests are ignored. The Table below presents the number of participant pupils per final test in a certain school year.

	Central final tests							
School year	**CET**	**IEP**	**ROUTE8**	**AMN**	**CESAN**	**DIA**	**DREMPEL**	**TOTAL**
2014/2015	154.796	4.836	2.209				8.629	170.470
2015/2016	139.653	29.885	12.661					182.199
2016/2017	116.232	42.295	16.642	527	143	411		176.250
2017/2018	100.608	46.869	21.279	1.162		2.384		172.302
2018/2019	85.594	51.808	25.932	2.683		5.512		171.529

[31] 1) Central final test of the Board of Tests and Exams (independent administrative body of the government 2) ROUTE 8 3)IEP final test 4) Dia-final test 5) AMN final test

Appendix F: School performance addition tests

Through several investigation additions, there are multiple statistical tests with little adjustments in equation and meaning. To make these additions clearer, I present a short summary of the school performance tests.

In general, I estimate regression about school performance according to four equations:

Equation A:

$$SP_{s,t} = \beta_0 + \beta_1 EPP_{st} + \beta_2 SI_{st} + \beta_3 PI_{st} + \beta_4 SBS_{st} + \beta_5 SBS_{st} * SI_{st} + \beta_6 SBS_{st} * PI_{st} + \beta_7 SG_{st} + \beta_8 SBS_{st} * SG_{st} + \beta_9 SP_{actual_{st}} + \varepsilon_{s,t}$$

Equation B:

$$SP_{actual_{st}} = \beta_0 + \beta_1 EPP_{st} + \beta_2 SI_{st} + \beta_3 PI_{st} + \beta_4 SBS_{st} + \beta_5 SBS_{st} * SI_{st} + \beta_6 SBS_{st} * PI_{st} + \beta_7 SG_{st} + \beta_8 SBS_{st} * SG_{st} + \varepsilon_{s,t}$$

Equation C:

$$SP_{si,t} = \beta_0 + \beta_1 EPP_{st} + \beta_2 SI_{st} + \beta_3 PI_{st} + \beta_4 SBS_{st} + \beta_5 SBS_{st} * SI_{st} + \beta_6 SBS_{st} * PI_{st} + \beta_7 SG_{si,t} + \beta_8 SS_{si,t} + \beta_9 SS_{si,t} * SG_{si,t} + \beta_{10} SP_{actual_{si,t}} + \varepsilon_{si,t}$$

Equation D:

$$SP_{actual_{si,t}} = \beta_0 + \beta_1 EPP_{st} + \beta_2 SI_{st} + \beta_3 PI_{st} + \beta_4 SBS_{st} + \beta_5 SBS_{st} * SI_{st} + \beta_6 SBS_{st} * PI_{st} + \beta_7 SG_{si,t} + \beta_8 SS_{si,t} + \beta_9 SS_{si,t} * SG_{si,t} + \varepsilon_{si,t}$$

It differ which equation fits with the investigating purpose. Below an overview with the test conditions:

Performance: Differences between actual and expected school (institution) scores

Scores: Actual school (institution) scores

	School board performance	**3-year average school board performance**	**School board scores**	**3-year average school board scores**	**School performance**	**3-year average school performance**	**School scores**	**3-year average school scores**
Level	School board	School board	School board	School board	School institution	School institution	School institution	School institution
Time	One-year	three-year average	One-year	three-year average	One-year	three-year average	One-year	three-year average
Measure	Performance	Performance	Scores	Scores	Performance	Performance	Scores	Scores
Equation	A	A	B	B	C	C	D	D
Observations	2489	805	2489	805	17172	5219	17172	5219

Appendix G: Variable descriptions and data sources

Variables per equation

Variable	Description	Data source	Data source link
Variables used in equation 1			
EPP	Expenses per pupil in year t by school board s, calculated though expenses divided by number of pupils	DUO	*Expenses*: https://www.duo.nl/open_onderwijsdata/publicaties/financien/xbrl.jsp *Number of pupils*: https://duo.nl/open_onderwijsdata/databestanden/po/leerlingen-po/po-totaal/leerlingen-po-6.jsp
SBS	School board size in year t by school board s. 1) direct method: number of controlled school institutions by school board s in year t 2) indirect method: total number of pupils by school board s in year t	DUO	https://duo.nl/open_onderwijsdata/databestanden/po/leerlingen-po/po-totaal/leerlingen-po-6.jsp
SG	'Schoolgewicht' as indicator for the disadvantage of pupils in year t by school board s	Inspectorate of Education	https://www.onderwijsinspectie.nl/trends-en-ontwikkelingen/onderwijsdata/schoolweging-po
Variables used in equation 2 and 3			
PI	Investments in education in year t by school board s. Personnel factors: number of pupils divided by the FTE in year t by school board s, as ratio	DUO	FTE's: https://www.duo.nl/open_onderwijsdata/databestanden/po/onderwijspersoneel/po-personeel3.jsp
SI	Investments in education in year t by school board s. School factors: investment cash flow divided by the number of pupils in year t by school board s	DUO	Cash flow statements: https://www.duo.nl/open_onderwijsdata/publicaties/financien/xbrl.jsp
SBS	idem		
SG	idem		
Variables used in equation 5			
SP	School performance in year t by school board s, calculated according to the research method based on: 1) Schoolgewicht (=expected scores) 2) (normalized) Final central tests score (=actual scores)	Inspectorate of Education DUO	*Schoolgewicht:* https://www.onderwijsinspectie.nl/trends-en-ontwikkelingen/onderwijsdata/schoolweging-po *Final central test scores*: https://www.duo.nl/open_onderwijsdata/databestanden/po/leerlingen-po/bo-sbo/bo-sbo-eindscores.jsp
EPP	idem		
PI	idem		
SI	idem		
SBS	idem		
SG	idem		

Variables school board size

Abbreviation	Variable	Description
SBS	School board size	The total SBS (direct or indirect) amount per school board per year
WPO	Wet op het primair onderwijs	The SBS (direct or indirect) of school types: BO and SBO per school board per year
WEC	Wet op de Expertisecentra	The SBS (direct or indirect) of school types: SO, SO/VSO and VSO per school board per year
WVO	Wet op het voorgezet onderwijs	The SBS (direct or indirect) of school type: VO per school board per year
PE	Primary Education	The SBS (direct or indirect) of school types BO, SBO, SO, SO/VSO, and VSO per school board per year
SE	Secondary Education	The SBS (direct or indirect) of school type: VO per school board per year
BO	Basisonderwijs (translate: primary education)	The SBS (direct or indirect) of BO per school board per year
SBO	Speciaal basisonderwijs (translate: special primary education)	The SBS (direct or indirect) of SBO per school board per year
SO	Speciaal onderwijs (translate: special educaion)	The SBS (direct or indirect) of SO per school board per year
SO/VSO	Speciaal en voortgezet speciaal onderwijs (translate: special education and special secondary education)	The SBS (direct or indirect) of SO/VSO per school board per year
VSO	Voortgezet speciaal onderwijs (translate: special secondary education)	The SBS (direct or indirect) of VSO per school board per year
VO	Voortgezet onderwijs (translate: secondary education)	The SBS (direct or indirect) of VO per school board per year
SS	School size	The total number of pupils per school institution per year

Note. ''Direct'' in parentheses can be replaced by the number of controlled school institutions, and ''indirect'' in parentheses can be replaced by the number of pupils

Variables personnel investments

Abbreviation	Variable	Description
PI	Personnel investments	The number of pupils divided by total FTE of all personnel per school board per year, as ratio
MSI	Management staff investments	The number of pupils divided by total FTE of all management staff per school board per year, as ratio
TSI	Teaching staff investments	The number of pupils divided by total FTE of all teaching staff per school board per year, as ratio
SSI	Supporting staff investments	The number of pupils divided by total FTE of all supporting staff per school board per year, as ratio

Appendix H: School types

All school types, inclusive pupil characteristics.

Education type	Educational law	School institution type	Age	Pupils
Primary education	Wet op het primair onderwijs (WPO)	Primary education	4 to 12	-
		Special primary education	4 to 12	for whom it has been established that such an orthopedagogical and orthodidactic approach is appropriate
	Wet op de Expertisecentra (WEC)	Special education	4 to 12	for whom though a disability, disorder, or disease that need special care[32]
		Special secondary education	12 to 20	for whom though a disability, disorder, or disease that need special care[33]
		Special education/special secondary education	4 to 20	combination of special education and special secondary education
Secondary education	Wet op het voortgezet onderwijs (WVO)	Secondary education	12 to 20	after primary education

[32] The exact composition for the target group of these school types can be found in article 2 of the WEC

[33] The exact composition for the target group of these school types can be found in article 2 of the WEC

Appendix I: Sample size per equation

The remaining 2,819 school board observations are the starting point for school boards' equations. However, due to a lack of data (match) in some cases, I have to reduce the number of observations per equation. There exist various reasons for the data (match) lack (DUO collected no data for a certain variable, new/closing school boards). Therefore per equation, the reduced sample size is different which results in the sample size compositions in the Table below (the sample size composition in the number of observations per equation). Regressions with the three-year averages only contain school boards and institutions that have data in 2016-2018, so if one school year lacks of data, the other two school years I have to ignore. Further, the school institution equations contain substantially more observations seeing school boards could govern multiple school institutions.

	Equation	**1**	**2**	**3**	**5**	**5**	**5**	**5**
Sample size reduction steps	Specification		**SI**	**PI**	**School board**	**3-year average School board**	**School institution**	**3-year average School institution**
All primary education types		3026	3026	3026	3026	3026	28617	28617
Primary education and special primary education		2819	2819	2819	2819	2819	19557	19557
Data lack		2625	2625	2497	2489	2489	17172	17172
3 year data						805		5219

Columns 1-4 contain observations per school board per year (2016-2018). Colum 5 contains observations per school board if all school years (2016-2018) data is available. Column 6 contains observations per school institution per year (2016-2018). Colum 7 contains observation per school institution if all school years (2016-2018) data is available; Final observations per equations at the bottom of all Columns, as lowest value.

Appendix J: Descriptive statistics

Per equation, I present the descriptive statistics of used variables in statistical tests.

Variables	Mean	SD	Min	Median	Max	Mode	N
Equation (1)							
SBStotal - direct	7,8	9,5	1	4	102	1	2625
PE - direct	7,6	8,9	1	4	82	1	2625
SE - direct	0,2	1,4	0	0	27	0	2625
WPO - direct	7,5	8,6	1	4	72	1	2625
WEC - direct	0,1	0,6	0	0	11	0	2625
WVO - direct	0,2	1,4	0	0	27	0	2625
SBStotal - indirect	1760	2618	37	824	34882	231	2625
PE - indirect	1644	2145	37	804	20813	231	2625
SE - indirect	116	911	0	0	17322	0	2625
WPO - indirect	1629	2097	37	804	20813	231	2625
WEC - indirect	15	98	0	0	2045	0	2625
WVO - indirect	116	911	0	0	17322	0	2625
SG	29,2	3,5	19,0	29,8	39,4	31,0	2625
EPP - total	6.058,7	1.415,3	528	5.800	25.530	5.255	2625
EPP - Personnel expenses	4.884,7	22,8	385	4.691	22.523	4.509	2625
EPP - Depreciation	163,6	1,2	-	156	790	152	2625
EPP - Rental expenses	28,8	1,1	-	8	759	-	2625
EPP - Insurance expenses	0,4	0,1	-	-	123	-	2625
EPP - Maintenance expenses (minor maintenance)	61,2	1,3	-	45	1.149	30	2625
EPP - Expenses for energy and water	80,2	0,6	-	78	452	76	2625
EPP - Cleaning expenses	107,0	1,1	-	116	451	122	2625
EPP - Allocation of maintenance provision	115,7	1,9	-	113	1.474	-	2625
EPP - Administration and management expenses	165,7	2,3	4	139	2.205	147	2625
EPP - Inventory and equipment	81,0	1,9	-	41	1.016	-	2625
EPP - Educational resources	166,4	2,2	-	173	1.113	-	2625
EPP - Accountant fees	13,3	0,3	-	10	218	6	2625
Equation (2)							
SBStotal - direct	7,8	9,5	1	4	102	1	2625
PE - direct	7,6	8,9	1	4	82	1	2625
SE - direct	0,2	1,4	0	0	27	0	2625
WPO - direct	7,5	8,6	1	4	72	1	2625
WEC - direct	0,1	0,6	0	0	11	0	2625
WVO - direct	0,2	1,4	0	0	27	0	2625
SBStotal - indirect	1760	2618	37	824	34882	231	2625
PE - indirect	1644	2145	37	804	20813	231	2625
SE - indirect	116	911	0	0	17322	0	2625
WPO - indirect	1629	2097	37	804	20813	231	2625
WEC - indirect	15	98	0	0	2045	0	2625
WVO - indirect	116	911	0	0	17322	0	2625
SG	29,2	3,5	19,0	29,8	39,4	31,0	2625
SI	-206	306	-7279	-166	2668	0	2625

Equation (3)							
SBStotal - direct	7,9	9,6	1	4	102	1	2497
PE - direct	7,7	9,0	1	4	82	1	2497
SE - direct	0,2	1,5	0	0	27	0	2497
WPO - direct	7,6	8,7	1	4	72	1	2497
WEC - direct	0,1	0,7	0	0	11	0	2497
WVO - direct	0,2	1,5	0	0	27	0	2497
SBStotal - indirect	1810	2655	37	877	34882	231	2497
PE - indirect	1669	2115	37	852	20813	231	2497
SE - indirect	15	100	0	0	2045	0	2497
WPO - indirect	125	939	0	0	17322	0	2497
WEC - indirect	1685	2165	37	852	20813	231	2497
WVO - indirect	125	939	0	0	17322	0	2497
SG	29,2	3,5	19,0	29,8	39,4	31,0	2497
PI	14,5	2,0	3,0	14,6	27,1	13,9	2497
MSI	231,6	173,3	25,0	193,8	1.180,0	1.180,0	2497
TSI	18,4	2,4	5,4	18,4	35,2		2497
SSI	167,9	204,0	7,6	120,1	1.552,7	1.552,7	2497
Equation (5)							
SBStotal - direct	7,9	9,6	1	4	102	1	2489
PE - direct	7,7	9,0	1	4	82	1	2489
SE - direct	0,2	1,5	0	0	27	0	2489
WPO - direct	7,6	8,7	1	4	72	1	2489
WEC - direct	0,1	0,7	0	0	11	0	2489
WVO - direct	0,2	1,5	0	0	27	0	2489
SBStotal - indirect	1809	2658	37	871	34882	231	2489
PE - indirect	1686	2168	37	852	20813	231	2489
SE - indirect	123	935	0	0	17322	0	2489
WPO - indirect	1671	2118	37	852	20813	231	2489
WEC - indirect	15	100	0	0	2045	0	2489
WVO - indirect	123	935	0	0	17322	0	2489
SG	29,2	3,5	19,0	29,8	39,4	31,0	2489
EPP	6.056	1.421	528	5.802	25.530	5.255	2489
PI	14,5	2,0	3,0	14,6	27,1	13,9	2489
MSI	231,6	173,5	25,0	193,7	1.180,0	1.180,0	2489
TSI	18,4	2,4	5,4	18,4	35,2		2489
SSI	168,1	204,2	7,6	120,1	1.552,7	1.552,7	2489
SI	-206	309	-7.279	-167	2.668	-	2489
SP	0,08	0,72	-5,62	0,06	3,72	0,09	2489
SP -actual scores	0,23	0,84	-6,72	0,18	3,51	0,42	2489
SS	229	139	12	203	1747	229	17172

Appendix K: Regression results - expenses per pupil

Total expenses per pupil

SBS is divided into three education types according to educational laws.

1. WPO: Wet op het primair onderwijs
2. WEC: Wet op de Expertisecentra
3. WVO: Wet op het voorgezet onderwijs

WPO and WEC together are PE. WVO is the same as SE.

Colum (1) measures WPO, WEC, and WVO as the number of governed school institutions.

Colum (2) measures WPO, WEC, and WVO as the number of pupils.

	Expenses per pupil	
	1	**2**
Variables	**Direct**	**Indirect**
SG	18,6	26,9
	(1,04)	*(1,49)*
WPO	-265,9***	-897,6***
	(-4,05)	*(-3,21)*
WPO*SG	9,1***	29,2***
	(4,05)	*(3,12)*
WEC	2195,7**	16907**
	(2,3)	*(2,57)*
WEC*SG	-64,6**	-488,3**
	(-2,06)	*(-2,18)*
WVO	1793,3***	2210,8**
	(2,68)	*(2,04)*
WVO*SG	-55,1**	-65,9*
	(-2,48)	*(-1,78)*
Constant	5420,3***	5262,11***
	(10,65)	*(10,01)*
Observations	2625	2625
R2	0,085	0,075
Cluster level	School board	School board
Cluster	915	916

Detailed expenses per pupil

The EPP rental expenses and inventory and equipment are discussed in the text, and therefore separately presented in this Appendix.

The regression results of the other 12 detailed EPP (inclusive insurance) then are presented in this Appendix. Standard errors are clustered on board level (915 clusters).

Linear regression results for the relation between school board size and rental and inventory and equipment expenses per pupil

	Expenses per pupil			
	1	**2**	**3**	**4**
	Direct SBS method		**Indirect SBS method**	
Variables	**Rental expenses**	**Inventory and equipment**	**Rental expenses**	**Inventory and equipment**
SG	0,57	-1,03	1,06*	-0,59
	(1,01)	*(-0,94)*	*(1,83)*	*(-0,54)*
SBS	3,73	7,19*	27,80**	32,80**
	(1,62)	*(1,82)*	*(2,17)*	*(2,32)*
SBS*SG	-0,10	-0,19	-0,80**	-0,90**
	(-1,32)	*(-1,47)*	*(-2,02)*	*(-2,04)*
Constant	6,39	99,62***	-7,70	89,76***
	(0,39)	*(3,00)*	*(-0,45)*	*(2,72)*
Observations	2625	2625	2625	2625
R2	0,017	0,021	0,024	0,017
Cluster level	School board	School board	School board	School board
Cluster	915	915	915	915

Note. Table 6 reports OLS coefficient estimates and t-statistics (in parentheses and italics) from regressing rental (Columns 1 and 3) and inventory and equipment (Columns 2 and 4) expenses per pupil on school board size and schoolgewicht; As independent variable SBS is measured direct as the number of controlled school institutions (Columns 1 and 2) and indirect as the total number of pupils (1=1000 pupils) (Columns 3 and 4). All variables are defined in Appendix G; *, **, * Indicate statistical significance at the 1 percent, 5 percent, and 10 percent levels, respectively, using a two-tailed t-test.**

Panel A: The direct method

	Expenses per pupil					
	1	**2**	**3**	**4**	**5**	**6**
Variables	**Personnel expenses**	**Depreciation**	**Rental expenses**	**Insurance expenses[34]**	**Maintenance expenses (minor maintenance)**	**Expenses for energy and water**
SG	32,16***	1,03***	0,57	-0,05*	-0,37	-0,41**
	(4,48)	(2,66)	(1,61)	(-1,92)	(-0,91)	(-2,05)
SBS	-62,03**	-1,51	3,73**	0,25**	-1,15	-2,87***
	(-2,03)	(-0,92)	(2,49)	(2,17)	(-0,66)	(-3,33)
SBS*SG	2,70***	0,05	-0,10**	-0,01**	0,07	0,11***
	(2,68)	(0,84)	(-2,02)	(-2,08)	(1,18)	(3,73)
Constant	3802,02***	134,81***	6,39	1,78**	65,25***	90,14***
	(17,98)	(11,88)	(0,62)	(2,22)	(5,44)	(15,13)
Observations	2625	2625	2625	2625	2625	2625
R^2	0,049	0,005	0,017	0,006	0,017	0,015
	7	**8**	**9**	**10**	**11**	**12**
Variables	**Cleaning expenses**	**Allocation of maintenance provision**	**Administration and management expenses**	**Inventory and equipment**	**Educational resources**	**Accountant fees**
SG	-4,20***	-2,12***	-0,61	-1,03*	3,12***	-0,12
	(-12,78)	(-3,53)	(-0,83)	(-1,67)	(4,51)	(-1,45)
SBS	-5,72***	-5,48**	-19,58***	7,19***	-7,44**	-2,14***
	(-4,09)	(-2,15)	(-6,25)	(2,73)	(-2,53)	(-6,31)
SBS*SG	0,22***	0,20**	0,60***	-0,19**	0,18*	0,06***
	(4,89)	(2,39)	(5,79)	(-2,21)	(1,83)	(4,99)
Constant	221,99***	173,64***	197,56***	99,62***	92,06***	20,36***
	(22,96)	(9,85)	(9,12)	(5,47)	(4,53)	(8,67)
Observations	2625	2625	2625	2625	2625	2625
R^2	0,083	0,008	0,027	0,021	0,040	0,109

[34] Seeing the municipal is responsible for repair in case of special circumstances, such as fire, vandalism, storm damage, etc. (Midden, Nes, Janssen, Kleijne, & Heijltjes, 2015) school boards do not make an insurance contract regarding their buildings. However, a very small portion of the school boards have taken over building responsibilities from the municipality (T. van Nes, 9 December 2020, personal communication), so so-called 'doordecentralisatie' (Translate: through decentralization, Assign responsibility for new construction, extension, construction errors and repairs in special circumstances from the municipality to the school board (Midden et al., 2015)). These school boards therefore should make insurance contracts for their building(s). Larger school boards have these constructions which is a very small group seeing the descriptive statistics.

Panel B: The indirect method

	Expenses per pupil					
	1	**2**	**3**	**4**	**5**	**6**
Variables	**Personnel expenses**	**Depreciation**	**Rental expenses**	**Insurance expenses**	**Maintenance expenses (minor maintenance)**	**Expenses for energy and water**
SG	41,03***	1,23***	1,06***	-0,05*	0,18	-0,32
	(5,79)	(3,26)	(3,08)	(-1,90)	(0,46)	(-1,61)
SBS	-0,05	0,00	0,03***	0,00**	0,01	-0,01***
	(-0,48)	(0,54)	(5,20)	(2,33)	(1,53)	(-3,54)
SBS*SG	0,00	-0,00	-0,00***	-0,00**	-0,00	0,00***
	(1,06)	(-0,57)	(-4,73)	(-2,22)	(-1,05)	(3,78)
Constant	3577,81***	127,70***	-7,70	1,74**	50,24***	88,81***
	(17,05)	(11,38)	(-0,76)	(2,19)	(4,24)	(15,04)
Observations	2625	2625	2625	2625	2625	2625
	0,042	0,004	0,024	0,006	0,015	0,009
	7	**8**	**9**	**10**	**11**	**12**
Variables	**Cleaning expenses**	**Allocation of maintenance provision**	**Administration and management expenses**	**Inventory and equipment**	**Educational resources**	**Accountant fees**
SG	-3,79***	-2,19***	-0,71	-0,59	2,80***	-0,20**
	(-11,67)	(-3,72)	(-0,98)	(-0,97)	(4,09)	(-2,51)
SBS	-0,01***	-0,03***	-0,07***	0,03***	-0,02*	-0,01***
	(-2,95)	(-3,00)	(-6,38)	(3,45)	(-1,94)	(-6,54)
SBS*SG	0,00***	0,00***	0,00***	-0,00***	0,00	0,00***
	(3,65)	(3,21)	(5,87)	(-3,03)	(1,47)	(5,40)
Constant	212,48***	177,53***	199,49***	89,76***	93,98***	21,86***
	(22,10)	(10,19)	(9,33)	(4,98)	(4,64)	(9,31)
Observations	2625	2625	2625	2625	2625	2625
R^2	0,072	0,009	0,030	0,017	0,023	0,088

Appendix L: Regression results – personnel investments

The regression results below are statistical determined with school board size measured as the number of governed school institutions (direct method).

Variables	1 **Total personnel investments**	2 **Management staff investments**	3 **Teaching staff investments**	4 **Supporting staff investments**	5 **Total personnel investments**	6 **Management staff investments**	7 **Teaching staff investments**	8 **Supporting staff investments**
SG	0,18***	1,92	0,09***	6,53***	0,17***	1,56	0,07***	6,16**
	(9,83)	*(0,96)*	*(3,86)*	*(2,75)*	*(9,25)*	*(0,76)*	*(3,29)*	*(-4,69)*
SBS	0,05	4,83	0,03	14,52***				
	(0,82)	*(1,22)*	*(0,36)*	*(3,23)*				
SBS*SG	-0,00	-0,09	0,00	-0,37**				
	(-0,07)	*(-0,70)*	*(0,39)*	*(-2,54)*				
PE					-0,10	5,37	-0,17**	9,24*
					(-1,46)	*(1,16)*	*(-2,16)*	*(-1,53)*
PE*SG					0,00**	-0,09	0,01***	-0,20
					(2,07)	*(-0,54)*	*(2,99)*	*(0,97)*
SE					3,03***	-50,30	3,46***	102,24***
					(5,03)	*(-1,03)*	*(5,33)*	*(-2,54)*
SE*SG					-0,09***	1,38	-0,11***	-3,26***
					(-4,86)	*(0,86)*	*(-5,32)*	*(2,43)*
Constant	-19,97***	-304,30***	-21,37***	-385,42***	-19,77***	-297,12***	-21,00***	-375,40***
	(-37,67)	*(-5,34)*	*(-33,11)*	*(-5,49)*	*(-36,70)*	*(-5,08)*	*(-32,96)*	*(9,76)*
Observations	2497	2498	2497	2497	2498	2499	2500	2501
R2	0,160	0,010	0,094	0,036	0,192	0,024	0,116	0,038
Cluster level	School board	School board	School board	School board	School board	School board	School board	School board
Clusters	852	852	852	852	852	852	852	852

Appendix M: Regression results – school performance

One-year regression

The regression results below are statistical determined with school board size measured as the number of governed school institutions (direct method).

	1	**2**	**3**	**4**
Variables	**School board performance**	**School board scores**	**School performance**	**School scores**
SBS	103,01	93,73	60,43	61,20
	(0,36)	*(0,33)*	*(1,39)*	*(1,41)*
SBS*SG	-0,48	-0,24		
	(-0,07)	*(-0,03)*		
SS			-6,51	-6,44
			(-1,30)	*(-1,28)*
SS*SG			0,20	0,20
			(1,18)	*(1,16)*
EPP	-24,67	-26,87	-17,86	-21,30
	(-1,30)	*(-1,40)*	*(-1,38)*	*(-1,64)*
SI	61,15	56,10	71,16	60,60
	(0,62)	*(0,57)*	*(0,95)*	*(0,82)*
SBS*SI	-54,40	-51,98	-254,53	-209,94
	(-0,09)	*(-0,09)*	*(-0,62)*	*(-0,51)*
PI	-7,54	-8,20	-6,58	-7,09
	(-0,48)	*(-0,52)*	*(0,74)*	*(-0,80)*
SBS*PI	116,44	*114,40*	64,84*	65,45*
	(1,56)	*(1,53)*	*(1,93)*	*(1,95)*
SG	2,18**	-12,14***	-0,42	-14,74***
	(2,29)	*(-12,72)*	*(-0,77)*	*(-26,89)*
Constant	-47,51	386,42***	20,09	455,03***
	(-0,99)	*(7,99)*	*(0,82)*	*(18,52)*
Observations	2489	2489	17172	17172
R2	0,020	0,292	0,003	0,243
Cluster level	School board	School board	School institution	School institution
Cluster	850	850	6127	6127

3-year average regressions

The regression results below are statistical determined with school board size measured as the number of governed school institutions (direct method) and the total number of pupils (indirect method). All variables are an average of 2016-2018.

	Direct method				**Indirect method**			
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Variables	**3-year average school board performance**	**3-year average school board scores**	**3-year average school performanc e**	**3-year average school scores**	**3-year average school board performance**	**3-year average school board scores**	**3-year average school performance**	**3-year average school scores**
SBS	294,85	293,95	72,48	72,29	10,26	10,22	4,73***	4,73***
	(0,70)	*(0,70)*	*(1,61)*	*(1,61)*	*(0,74)*	(0,74)	(2,90)	(2,90)
SBS*SG	-4,84	-4,84			-0,09	-0,09		
	(-0,49)	*(-0,49)*			*(-0,25)*	(-0,25)		
SS			-2,50	-2,45			-1,47	-1,41
			(-0,47)	*(-0,46)*			(-0,27)	(-0,26)
SS*SG			0,06	0,06			0,05	0,05
			(0,34)	*(0,33)*			(0,28)	(0,27)
EPP	-17,43	-17,35	-20,79	-20,72	-19,74	-19,66	-24,93*	-24,86*
	(-0,91)	*(-0,90)*	*(-1,39)*	*(-1,39)*	(-1,03)	*(-1,03)*	(-1,67)	(-1,67)
SI	101,29	100,50	86,16	85,54	73,82	73,08	-26,39	-27,03
	(0,94)	*(0,94)*	*(0,83)*	*(0,82)*	(0,71)	*(0,70)*	(-0,29)	(-0,29)
SBS*SI	-138,27	-131,30	-44,59	-40,80	11,10	11,33	23,40	23,54
	(-0,12)	*(-0,12)*	*(-0,08)*	*(-0,07)*	(0,30)	*(0,31)*	(1,49)	(1,50)
PI	-18,06	-18,05	-9,75	-9,81	-19,58	-19,58	-12,72	-12,80
	(-1,03)	*(-1,03)*	*(-0,97)*	*(-0,98)*	(-1,19)	*(-1,19)*	(-1,33)	(-1,34)
SBS*PI	167,57	*167,19*	78,67**	78,59**	8,33*	8,31*	5,15***	5,15***
	(1,32)	*(1,31)*	*(2,23)*	*(2,23)*	(1,85)	*(1,84)*	(3,91)	(3,91)
SG	2,88***	-11,46***	0,07	-14,26***	2,70***	-11,64***	0,18	-14,16***
	(4,05)	*(-16,13)*	*(0,14)*	*(-26,51)*	*(3,93)*	*(-16,92)*	(0,34)	(-26,33)
Constant	-86,78*	347,34***	3,51	437,3***	-82,12*	352,01***	0,11	433,89***
	(-1,84)	*(7,37)*	*(0,13)*	*(16,38)*	*(-1,83)*	*(7,83)*	(0,00)	(16,42)
Observations	805	805	5219	5219	805	805	5219	5219
R2	0,045	0,410	0,006	0,395	0,047	0,411	0,009	0,397

One-year regressions – separation personnel investments

The regression results below are statistical determined with school board size measured as the number of governed school institutions (direct method).

The personnel investments are separated into management staff (MSI), teaching staff (TSI), and supporting staff investments (SSI).

		1	2
	Variables	**School board performance**	**School performance**
Personnel investments	MSI	2,57	2,97**
		(1,57)	*(2,20)*
	SBS*MSI	-10,78	-16,64**
		(-0,75)	*(-1,99)*
	TSI	-235,13*	-216,45***
		(-1,83)	*(-2,64)*
	SBS*TSI	1744,58**	1347,16***
		(2,01)	*(3,15)*
	SSI	-0,99	-0,62
		(-0,96)	*(-0,68)*
	SBS*SSI	2,75	-9,23
		(0,17)	*(-0,86)*
Auxiliary variables	SBS	283,34	162,91**
		(0,87)	*(2,39)*
	SBS*SG	-2,18	
		(-0,31)	
	SS		-6,45
			(-1,28)
	SS*SG		0,21
			(1,20)
	EPP	-11,90	-7,90
		(-0,75)	*(-0,67)*
	SI	60,72	86,25
		(0,61)	*(1,12)*
	SBS*SI	-59,64	-339,52
		(-0,10)	*(-0,81)*
	SG	2,29**	-0,41
		(2,51)	*(-0,74)*
	Constant	-86,66*	-11,20
		(-1,89)	*(-0,44)*
	Observations	2489	17172
	R2	0,027	0,004
	Cluster level	School board	School institution
	Cluster	850	6127