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## **Comparison of cost and performance in the private and public primary and lower secondary schools in Denmark**

**Med dansk sammenfatning:  
Udgifter og resultater i frie grundskoler og folkeskoler**

CEPOS arbejdspapir nr. 13



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# **Comparison of cost and performance in the private and public primary and lower secondary schools in Denmark**

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## **Forord**

Inden for de sidste par år har Folketinget ved flere lejligheder gennemført tiltag, som har gjort det vanskeligere at drive frie grundskoler i Danmark. Det er bemærkelsesværdigt at dette er sket uden at der har foreligget og været inddraget noget solidt grundlag i form af undersøgelser af de frie grundskolers præstationer og omkostninger. Det forhold har tilskyndet til udarbejdelsen af analysen i det nærværende papir.

Selve arbejds papiret er engelsksproget. Baggrunden er, at det indgår i den almindelige internationale forskningsudveksling. Det er således blevet antaget til præsentation på den årlige samling i det europæiske forskernet for forskere, som beskæftiger sig med økonomisk teori om politiske og bureaukratiske systemer, European Public Choice Society. Arbejds papiret indledes imidlertid med en dansk sammenfatning. Det statistiske analysearbejde i forbindelse med papiret er udført af stud.polit. Jeppe Madsen.

Juni 2011

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## Sammenfatning

I arbejdsrapporten om resultater og ressourcer i offentlige skoler og frie grundskoler analyseres forskellen i kvaliteten i undervisningen mellem de to skoleformer. Kvalitet opgøres i denne forbindelse som skolernes opnåede undervisningseffekter. Undervisningseffekten er et mål for, hvor meget den enkelte skoles karaktergennemsnit i de centrale kernefag ved folkeskolens afgangsprøve afviger fra det forventede niveau, når man i en statistisk regressionsanalyse tager højde elevernes sociale, økonomiske og etniske baggrund. Undervisningseffekten er således et mål for, hvor meget skolens undervisning hæver eller sænker elevernes præstationer over eller under det forventede niveau.

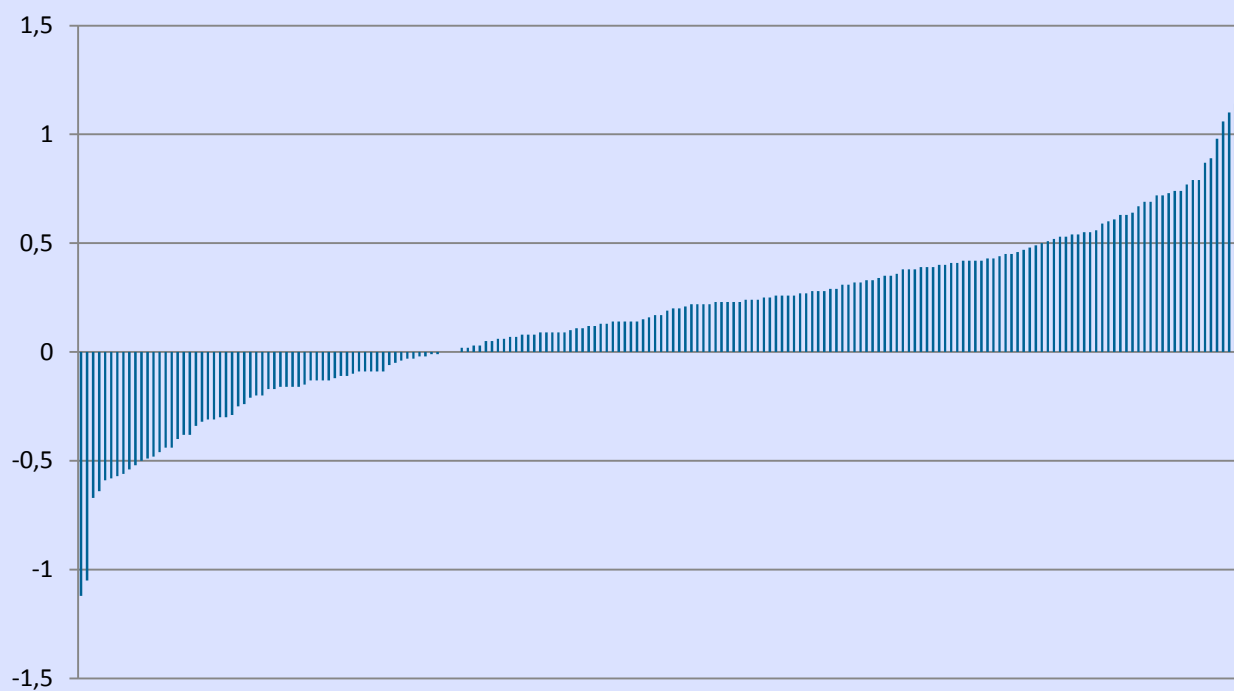
Analysen viser, at de frie grundskoler generelt set leverer bedre resultater end de offentlige skoler. Der er naturligvis en betydelig spredning i undervisningseffekten for både de frie grundskoler og de offentlige skoler, men det er en langt større andel af de frie grundskoler, der opnår et resultat for deres elever, som ligger over det man skulle forvente, når man betragter elevernes sociale, økonomiske og etniske baggrund, jf. figur 1 og 2.

Det kan således med en høj grad af statistisk sikkerhed påvises, at de frie grundskoler leverer bedre undervisningsresultater end de offentlige skoler.

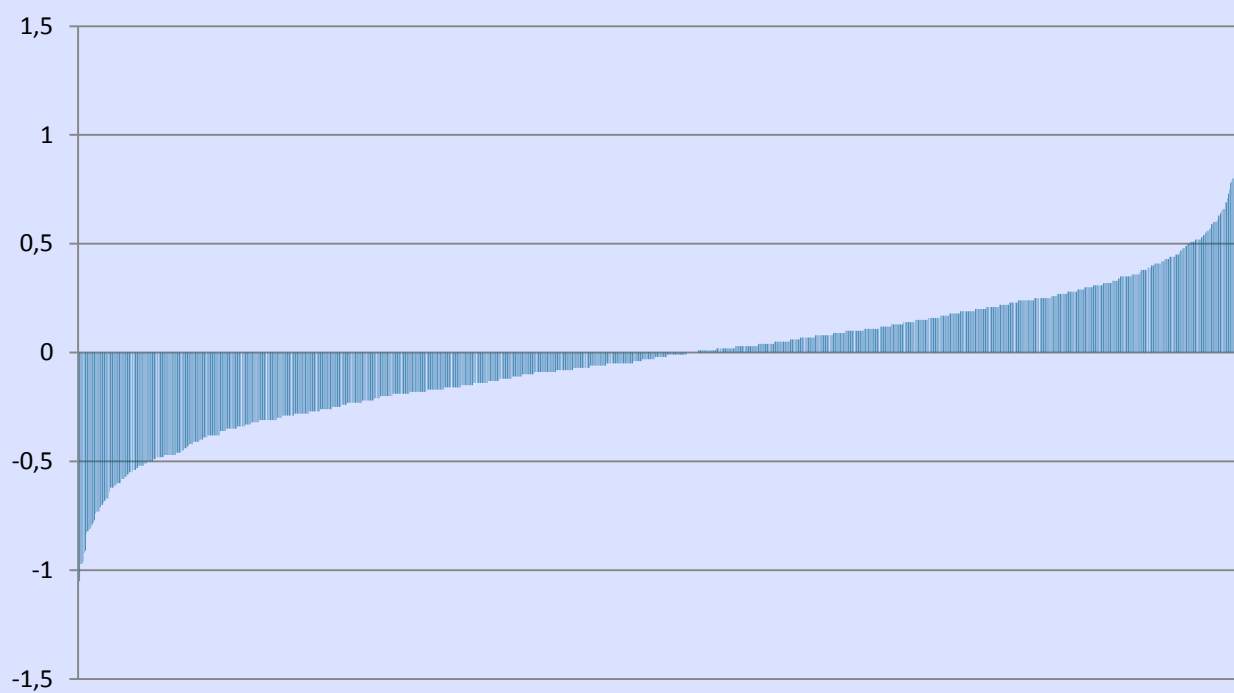
De bedre resultater i de frie grundskoler kan ses i lyset af, at de frie grundskoler har lavere omkostninger pr. elev end de offentlige skoler. Der gennemføres i arbejdsrapporten en mere indgående analyse af omkostningsstrukturen i henholdsvis offentlige skoler og frie grundskoler med henblik på at komme nærmere på en forklaring af, hvorfor de frie grundskoler gennemsnitligt set er bedre og billigere end de offentlige skoler:

I de offentlige skoler er elevernes sammensætning i forhold til social, økonomisk og etnisk baggrund den afgørende forklaring på de enkelte skolers gennemsnitlige omkostninger pr. elev. Derimod påvirker elevernes baggrund ikke omkostningerne pr. elev i de frie grundskoler. Dette kan i øvrigt ses i sammenhæng med, at der ikke kan påvises en mere væsentlig statistisk sammenhæng mellem elevsammensætningen og skolernes ejerskab.

Figur 1: Afvigelse fra forventet karaktergennemsnit i frie grundskoler – arrangeret stigende



Figur 2: Afvigelse fra forventet karaktergennemsnit i offentlige folkeskoler – arrangeret stigende



I de frie grundskoler er det udelukkende den gennemsnitlige skolestørrelse, som kan forklare forskelle i omkostningerne pr. elev mellem skolerne, hvor omkostningerne pr. elev falder, når antallet af elever stiger. Skolestørrelse forklarer derimod ikke forskellene i udgifter mellem de offentlige skoler. Det tyder således på, at de frie grundskoler indhøster stordriftsfordele, men det skal i den forbindelse understreges, at de frie grundskoler gennemsnitligt set er mindre end de offentlige skoler og at der eventuelt kun er fordele ved en øget skolestørrelse op til et vist niveau. En stor del af de offentlige skoler kan således være så store, at der ikke er yderligere stordriftsfordele, som kan indhøstes.

De frie grundskoler i Danmark kan ikke siges at operere på et marked i traditionel forstand – eksempelvis kommer deres væsentligste indtægter fra offentlige tilskud, der følger elverne, og skolerne må ikke give afkast til investorer. De frie grundskoler er dog underlagt en større grad af konkurrence end de offentlige skoler, da dårlige resultater for de frie grundskolers elever kan medføre elevflugt, hvilket vil underminere skolens økonomi, så den kan blive tvunget til at lukke. Et tilsvarende scenarie er utænkeligt for en offentlig skole.

Konkurrenceelementet i form af en trussel om lukning ved dårlige resultater er måske den væsentligste forklaring på, at de frie grundskoler opnår bedre resultater. Når det kommer til konkurrence har de frie grundskoler en række muligheder i forhold til de offentlige skoler hvad angår frihedsgrader med hensyn til tilrettelæggelsen af undervisningen.

De reaktionsmønstre, som synes at ligge bag de fundne resultater, tegner en grundlæggende forskel i rationaler i de to måder at organisere skoler på. Når en fri grundskole får elever med særlige udfordringer, så bliver skolen presset til at løse problemerne, da det ellers kan betyde, at de øvrige elever i sidste ende forlader skolen og at det bliver vanskeligere at rekruttere nye elever. Et sådant rationale ser ikke ud til at gælde i de offentlige skoler, hvor en stor andel af elever med særlige problemer i relation til etnicitet, sociale forhold mv. vil være et argument for, at skolen skal have tildelt flere ressourcer, lige som en sådan elevsammensætning for skolen kan tjene som forklaring, såfremt den leverer dårligere resultater.



## **Abstract**

The paper analyzes the quality and cost of the education in the public and private primary and lower secondary schools in Denmark. It is shown that the private schools have at significantly higher quality (higher grades when adjusted for differences in socioeconomic background among the pupils), and significantly lower costs. We search for explanations of this result, and we find that, even though the Danish school system is designed to make public and private schools compete mutually, only the private schools behave as if they were operating on a competitive market.

Jel: H42, H52

Keywords: Private and public production of education, incentives to reduce cost, market mechanism, market failure policy failure.

**Paper presented at the 2011 meeting in European Public Choice Society, University of Rennes, May 2011**

## **Danish primary and lower secondary schools - grants, incentives and competition between schools**

Danish parents have in principle the freedom to choose the school that they want their children to attend.

If they send the child to a public school it is free of cost because the public schools are fully financed by taxes. The Danish municipalities are responsible for running the public schools, and they have to offer education to any child that is between 6 and 16 years old and whose parents are living in the municipality. In principle the parents are free to choose any public school in their own or another municipality, but in practice the schools can refuse new pupils if they do not have capacity for them, and if it will be overly expensive to increase the capacity of the school (building new classrooms, hiring new teachers etc.). In the legislation there exists no clear definition of the conditions which justify that a school refuses to admit a child, but the municipalities make as an example their own local rules for the maximum number of children in a class.

The Danish municipalities receive general grants from the central government, and a proportion of the grants is calculated from an indicator based on the number of children between 6 and 16 multiplied by the average expenditure pr. pupil in all Danish public schools last year (corrected for inflation and possible politically decided increases in the grants to the primary and lower secondary schools). The municipalities can choose to spend more or less than the average cost per pupil; that is a question of priorities and the economy of the municipality (the income-level of the citizens, tax-rate etc.). The Danish municipalities have in principle the right to tax their own citizens, but since 2001 a liberal-conservative government has enforced a so-called tax-freeze on the municipalities, which in practice makes it very difficult for the municipalities to change their tax-rates.

When a child moves from one public school to another public school the money follows the child, so that the receiving school also receives a higher budget. There is a variation among municipalities according to how the school budget is calculated, but the main rule is that the average cost of a pupil in the municipality follows the child like a kind of voucher, when children move from one public school to another. The rationale is to give parents as much freedom of choice as possible and to increase the competition among public schools to provide the best education.

A similar system is used when children move from a public school to a private school. The public school loses grants equal to the average cost of a pupil in the municipality. The private school receives 75 pct. of the average cost per pupil in public schools. The municipality only pays 85 pct. of the public contribution to the private school – the rest is financed by national taxes. A basic argument why the private schools are compensated only 75 percent of the average cost in public schools is, that it is assumed that private schools can practice cream-skimming with the

consequence that children with learning disabilities, bad behavior, non-academic family background etc., making them more difficult and more costly to teach, will be overrepresented in the public schools.

The private schools are allowed to charge a supplementary tuition fee, but such fee only covers a limited part of the cost of the educational activities in the private schools (Approximately 4 percent on average).

About 15 pct. of Danish children attend a private school. Private schools in Denmark are not allowed to earn profit to private school owners but are self-governing independent institutions regulated by the Ministry of Education. They are based on a more than hundred years old tradition and they are offered freedom to organize education within wide boundaries.

It is almost impossible that a public school would close because of pupils moving to other schools. The main reason is that the municipalities have a legal obligation to provide education for all children between the ages of 6 and 16. With only 15 pct. of children attending private schools the capacity of the private schools would in the short run set a natural maximum for the number of children leaving the public schools. Public schools have been closed, but this has been caused by demographic changes in certain parts of Denmark, which reduces the number of children living in the local area to a point where it's too expensive or even impossible to run an averagely functioning school.

All schools can gain higher grants by attracting more pupils, but only the private schools experience the threat of exit.

In this paper we analyze the cost and performance of public and private schools in Denmark. Our hypothesis is that the private schools will come up with lower costs per pupil and with a higher quality of education than the public schools. We base this hypothesis on the facts that users of private schools are confronted directly with the full marginal costs of running the school and that the private schools operate on more market-like conditions than the public schools, because the private schools, unlike the public schools, can be forced to close down if their performance is too poor.

## Quality of the education in primary and lower secondary schools

To test our hypothesis we construct an indicator for the quality of the education following Christensen (2009). We are doing so by isolating the effect of performance of the school in a regression where the average marks at the final exam for the single pupil after the obligatory 10 years of basic education is explained by a series of variables representing circumstances that could have an effect on the learning abilities of the child and which cannot be changed by the performance of the school. This procedure has been made on an individual level by combining the Danish peoples-registration-number-systems data files together with other central government data files covering income, education, children etc. All the variables used in the analysis of school performance are listed in the appendix. The part of the average mark of the child that cannot be explained by social background, genetic inheritance etc. (the residuals) can be interpreted as a measure of school performance or, in other words, the ability to raise/lower the results of the child above/below the expected average level for children with the same social background. The results for the individual pupils can be aggregated to school or municipal level.

In this paper we use this measure of school-performance to investigate if there is any difference between the performance of public and private schools. In a logistic regression model we try to explain the performance by a dummy variable for private or public school. The results are shown in table 1.

Figure 1: Logistic regression private/public school* (dummy) explained by school-performance			
	coefficient	z-value	P> z
School-performance	-1,80	-6,97	0,000
Constant	1,78	20,72	0,000

The dummy is 1 for a public school and 0 for a private school. The dataset is presented in figure A1 and A2 in the appendix.

The logistic regression shows that the private schools perform significantly better than the public schools. In the following parts of the paper we will try to explain why the private schools perform better than the public schools.

Every person having an address in Denmark are registered in the Danish peoples-registration-number-systems, but if a person have been living abroad for many years the Danish public databases do not contain information about income, education etc. If we can't get information about all the variables listed in the appendix for at least one of the parents then the pupil is excluded from the analysis. Schools with useful parent-data for less than 14 pupils taking the final exam are excluded from the analyses. This means that all small schools and the few Danish international schools are excluded from the analysis. Furthermore the continuation schools are excluded from the analysis because a lot of these schools focus on education to a certain kind of pupils – par example pupils with learning disabilities, pupils with a special talent for music etc. which would create a selection bias in the dataset. Finally a lot of Danish schools do not have any pupils taking the final exam because they only take care of the first seven years of the obligatory

10 years of basic education. Totally this means that the data set used in the analysis consists of 1.214 Danish schools - 192 private schools (35 percent of the 489 private schools in Denmark) and 1022 public schools (67 percent of the 1519 public schools in Denmark).

## **Cost of production in the Danish primary and lower secondary schools**

Christoffersen and Larsen (2010a) find that private schools are on average variable costs at least 12 percent cheaper per pupil than public schools, so the first impression of our search is that the private schools are better as well as cheaper. To investigate this further, we analyze the cost pr. pupil in public and private schools. Unfortunately, the private and the public schools use different accounting principles according to cost of capital, so it is impossible to calculate comparable measures for the average total cost. Instead we use expenditure on wages pr. pupil, which is very close to the average variable cost, since wages are by far the biggest item of expenditure in both the public and the private schools. It is possible to get accounting data for the individual private school in Denmark, but that is not the case for the public schools in the municipalities. Accounting data for the public schools exist only on the municipal level, and in the following analysis of the cost in public and private schools we also aggregate data for the individual private schools to the municipal level. The dataset consists of the 171 out of the 192 private schools in the performance-analysis that have been delivering accounting-data to the central database used by The Danish Ministry of Education for supervision of the private schools (39 percent of the 489 private schools in Denmark) and the 69 municipalities where we have data about cost in both the private and the public schools (70 percent of the 98 municipalities in Denmark). The data for wage per pupil in private and public schools are presented in figure A3 and A4 in the appendix.

We formulate three basic hypotheses about what decides the cost of educating children between 6 and 16 years old. The hypotheses are shown in figure 2.

**Figure 2. Explaining the cost per pupil in the Danish primary and lower secondary schools in 2007: Three hypotheses**

Hypotheses and variables	Variable explanation
<b>Explained variable: Wages per pupil</b>	Cost of wages in public and private schools aggregated to municipality-level (data from Statistics Denmark).
<b>Hypothesis 1: weak socio economic structures</b>	
H:1: Socioeconomic index	The expected average marks calculated in the regression used to find the school-performance can be used as a socioeconomic index (the higher the value is, the stronger are the socioeconomic structures)
<b>Hypothesis 2: Scale</b>	
H:2: Average school size	Average number of pupils per school (Data from the Ministry of Education)
<b>Hypothesis 3: Competition</b>	
H:3: Private or public school	Data from the Ministry of Education

*The socioeconomic structures:*

**H:1** The expected average marks calculated in the regression used to find the school-performance can be used as a socioeconomic index (the higher the value is, the stronger are the socioeconomic structures). The hypothesis states that it is – all other things being equal - less costly to educate children from higher social classes, because they have been raised to behave in a manner that is better suited for traditional teaching in classrooms and they do not have other problems that the school must deal with (social and economic problems at home).

*Scale:*

**H:2** sets focus on average school size in the municipality. The hypothesis states that there is expected to be economies of scale in running primary and lower secondary schools.

*Competition:*

**H:3** The Danish school-system is designed to make all schools – private or public – compete with each other to attract children. The grants follow the child, and therefore the schools can benefit from a higher number of pupils, but there is not a perfect market-competition working. The grants

are in principle following the child, but the grant size is decided by the central or local government and does not work like a real price mechanism that determines the market price per child. Our hypothesis is that the private schools are operating on more market-like conditions because they, as opposed to the public schools, can be forced to close down, if they fail to attract enough children.

The results of the regression are shown in figure 3.

Figure 3: Regressions for wage per pupil explained by all variables in figure 2			
	Coefficient	t-value	P> t
Socioeconomic index	-269,79	-1,74	0,084
Average school size	-12,24	-3,33	0,001
Dummy (1=public, 0=private)	10.929,81	10,4	0,000

The model is a simple linear model explaining the wage per pupil by all variables from Figure 2.

The regression rejects the hypothesis that wages per pupil depend upon weak socioeconomic structures, but it is very close to being accepted on a 5 percent significant level. The regression confirms two hypotheses: wages per pupil are shown to be correlated with average school size and private/public school. According to the results of the regression there seems to be economies of scale in primary and lower secondary schools, and public schools spend more money on wages per pupil than private schools.

Figure 4: Correlation between explanatory variables in the regression in figure 3			
	Socioeconomic index	Average school size	Dummy (1=public, 0=private)
Socioeconomic index	1,000		
Average school size	0,380	1,000	
Dummy (1=public, 0=private)	0,265	0,660	1,000

There is a considerable correlation between average school size and school ownership. On average the public schools are bigger than the private schools. On the other hand there is only a weak correlation between school ownership and socioeconomic index, and the sign of the correlation shows that the private schools seem to have pupils with weaker social background than the public schools.



Even though public and private schools compete to attract pupils they do not compete on equal conditions. Private schools only receive 75 pct. of the cost per pupil in the public schools, and they have to cover the rest of their costs by tuition fees.

The public schools receive their budget as determined by the municipal council. Normally the allocation of funding will be based on a resource allocation model operating with a standard tariff for each pupil calculated as the average cost and with supplementary budget allocation to children with learning disabilities, social problems etc. The supplementary budget allocation is eventually decided after negotiation where the schools have to explain why the children in their school have more severe learning disabilities and social problems. The private schools do not have a similar possibility of getting special grants to pupils with social problems etc.

Since private and public schools operate under different conditions, they will be analyzed separately in the following section.

## Comparing cost at private and public schools

When analysing wage costs separately in public and in private schools the two hypotheses, H1 and H2 in figure 2, will form our model. The model then represents the conditions that, from a production-perspective, should decide the cost in both private and public schools when we look at them separately.

The results from the regression on data from the private schools are shown in figure 5 and 6.

Figure 5: Regressions for wage per pupil in private schools			
	Coefficient	t-value	P> t
Socio economic index	-487,29	-0,40	0,691
Average school size	-24,32	-3,37	0,001

The model is a simple linear model explaining the wage per pupil by socioeconomic index and average school size.

The regression rejects the hypothesis that wages per pupil depends upon weak socioeconomic structures. The regression confirms that there seems to be economies of scale in private primary and lower secondary schools. There is no severe correlation between the two explanatory variables.

Figure 6: Correlation between explanatory variables in the regression in figure 5		
	Socioeconomic index	Average school size
Socioeconomic index	1,000	
Average school size	0,236	1,000

The results from the regression on data from the public schools are shown in figure 7 and 8.

Figure 7: Regressions for wage per pupil in public schools			
	Coefficient	t-value	P> t
Socioeconomic index	-4429,41	-3,95	0,000
Average school size	-2,59	-0,67	0,504

The model is also a simple linear model explaining the wage per pupil by socioeconomic index and average school size. The regression rejects the hypothesis that wages per pupil depend upon average school size. The regression confirms that the public schools where the pupils have a weak

social background have higher cost. There is no correlation between the two explanatory variables.

Figure 8: Correlation between explanatory variables in the regression in figure 7		
	Socioeconomic index	Average school size
Socioeconomic index	1,000	
Average school size	0,096	1,000

The private schools lower cost by exploiting economies of scale, which does not seem to be the case for the public schools. An explanation could be that the private schools on average are smaller than the public schools, so that some public schools could be beyond the part of the cost function with economies of scale. It is however not possible to verify this explanation. As there is an overlap in school sizes between public and private schools it is however possible to conclude, that even with some public schools on the part of the cost function without economies of scale, the public schools do not generally behave like firms in a competitive market (minimizing costs), because they do not (at least all of them) adjust the school size to the level with the lowest average cost.

Public schools having pupils with weak social backgrounds have higher cost, as expected, since the municipalities generally give additional grants to these schools. The same pattern is not found for the private schools. As the children in private schools are found in figure 3 and 4 not having significantly stronger social backgrounds than children in public schools, that is probably not the explanation. The private schools can scarcely get higher grants if they have a lot of children with weak social backgrounds, and it is probably impossible to make the parents pay a higher tuition fee, because some of the children have a weak social background. On the other hand some parents might even make their children leave the school, and the school can be forced to close down if it becomes a well know fact, that a lot of the pupils in the school have severe social problems.

## Comparing economic performance among private and public schools

The regressions in chapters 3 and 4 with the narrow production and technologically orientated explanatory variables only explain a small part of the variation in wage per pupil. We only get an R-square-value around 0.14. In a production theoretical view the residuals from the regressions in chapters 3 and 4 could be seen as a measure of efficiency. Therefore it could be interesting to test whether the variation from the predicted value (the residual) is determined by other factors. We have two basic hypotheses operationalized by seven variables about what these factors could be.

**Figure 9. Explaining the spending on wages in Danish primary and lower secondary schools in 2007: Three hypotheses**

Hypotheses and variables	Variable explanation
<b>Explained variable: Excess spending on wages (deviation from the predicted value)</b>	Residuals from the regressions. A positive figure indicates excess spending on wages.
<b>Hypothesis 1: Income and substitutes</b>	
H:1.1: Tax base per inhabitant	Key figures from the Ministry of Interior.
H:1.2: Local income tax level	Local income tax rate (Ministry of Interior).
H:1.3: Service level	Relation between total costs in budget 2007 for all municipal services and the total needs as measured by the Ministry of Interior as basis for allocation of block grants.
<b>Hypothesis 2: Preferences</b>	
H:2.1: Political party of the mayor	Dummy for belonging to the liberal or conservative party
H:2.2: Fragmentation in the municipal board	Herfindahl index (calculated with data from the Ministry of Interior)
H:2.3: Share of the voters employed in the public sector	Proportion of over 18-years age being public servants (data from the Danish Statistical Office)
H: 2.4 Share of inhabitants with a college degree	Proportion of over 18-years age having a college degree (data from the Danish Statistical Office)

*Income and substitutes: H:1.1, H:1.2 and H:1.3*

**H:1.1** The hypothesis states that a large tax base (high income) in the local area implies a higher willingness to pay for the education of children.

**H:1.2** The hypothesis states that a high tax level will reduce the household's disposable income and thereby make it harder for the private schools to get the parents to pay a higher price for sending their children to a private school.

**H: 1.3:** The hypothesis states that a high general level of public services (including the schools) will make the competition harder for the private schools, and they will have to lower their price.

*Preferences: H:2.1, H:2.2, H:2.3 and H:2.4*

**H:2.1** The hypothesis states that the voters in right-wing municipalities might have a stronger preference for private schools.

**H:2.2** The hypothesis states that a fragmented municipality indicates a non-homogenous group of voters (parents) that might choose a private school that gives a better fit for their preferences according to the education of their children (ideology, pedagogical principles etc.)

**H:2.3** The hypothesis states that public employees might have a strong preference against private schools because they generally are against privatization. This hypothesis refers to the idea of a welfare coalition blocking for efficiency in the welfare sector as formulated in Christoffersen and Paldam (2003).

**H:2.4** The hypothesis states that people with higher education might choose private schools because they might have a higher willingness to pay for the education of their children.

The model is a simple linear model explaining the degree of variation from the expected wages per pupil in private schools by all variables from figure 9. First, all variables are included in the estimates in the first column. Then the stepwise Hendry Mizon procedure of deletion of the most insignificant variables is pursued until only significant variables remain in the estimates in the second column.

Figure 10: Regression for the residual (deviation from the expected) from the analysis in figure 5 (private schools)

	Full model			Reduced model		
	Coefficient	t-value	P> t	Coefficient	t-value	P> t
Fragmentation in the municipal board	-3.602,42	-0,28	0,78	-	-	-
Share of inhabitants with a college degree	15.090,14	1,03	0,31	18.917,97	2,39	0,02
Local income tax level	-685,01	-0,70	0,49	-	-	-
Tax base per inhabitant	-0,01	-0,16	0,88	-	-	-
Political party of the mayor	-2.294,46	-1,53	0,13	-	-	-
Share of the voters employed in the public sector	-37.775,37	-2,57	0,01	-31.059,26	-2,27	0,03
Service level	26.914,92	1,30	0,20	-	-	-

The regression confirms the hypothesis that private schools have higher cost (charge a higher prize) in municipalities with a bigger share of inhabitants with a college degree. The regression however first of all confirms the hypothesis that private schools must lower their cost (charge a lower price) in municipalities with a bigger share of inhabitants employed in the public sector. The correlation between the explanatory variables in figure 10 and 13 is shown in figure 12. There are no severe correlation problems for the variables in the reduced models.

**Figure 12: Correlation between explanatory variable in the regressions in figure 11 and 13**

	Fragmentation in the municipal board	Share of inhabitants with a college degree	Local income tax level	Tax base per inhabitant	Political party of the mayor	Share of the voters employed in the public sector	Service level
Fragmentation in the municipal board	1,000						
Share of inhabitants with a college degree	-0,168	1,000					
Local income tax level	-0,038	-0,483	1,000				
Tax base per inhabitant	-0,106	0,810	-0,548	1,000			
Political party of the mayor	-0,006	0,028	-0,099	0,149	1,000		
Share of the voters employed in the public sector	-0,046	0,129	-0,273	0,142	-0,161	1,000	
Service level	-0,106	0,310	0,044	0,393	-0,027	0,062	1,000

We also run the regression with the data (residuals) from the public schools. It shows that the only variable that can explain the variation from the expected cost per pupil in public schools is the general service level in the municipality. The service level in the municipality depends on the tax base, but the block grants in Denmark are used to redistribute the taxes between the rich and poor municipalities. Furthermore the last 9 years the Danish liberal-conservative government has enforced a tax-freeze on the municipalities, which makes it very difficult for the municipalities to raise their taxes. On the other hand the municipalities avoid tax-cuts because they are afraid that it will not be possible to raise the taxes again if necessary. In practice this means, that the municipal taxes are stuck on the level of taxes they had 9 years ago, and the municipalities just use all the money that they can get their hands on and they all argue that they need more money, because it can only be taken for other municipalities or the central government as shown in Christoffersen and Larsen (2010b).. The public schools with higher wages per pupil than expected are the schools in municipalities characterized by relatively high taxes or by a strong economy

based on a relatively large tax basis compared to the local needs as expressed by demographic and socioeconomic structures.

Figure 12: Regression for the residual (deviation from the expected) from the analysis in figure 7 (public schools)

	Full model			Reduced model		
	Coefficient	t-value	P> t	Coefficient	t-value	P> t
Fragmentation in the municipal board	7.448,75	0,87	0,387	-	-	-
Share of inhabitants with a college degree	5.826,56	0,60	0,549	-	-	-
Local income tax level	130,87	0,20	0,845	-	-	-
Tax base per inhabitant	-0,04	-1,14	0,256	-	-	-
Political party of the mayor	846,71	0,91	0,364	-	-	-
Share of the voters employed in the public sector	7.145,98	0,79	0,431	-	-	-
Service level	36.857,00	3,36	0,001	31.088,21	3,34	0,001



## Concluding remarks

In Denmark public and private primary and lower secondary schools compete to attract pupils.

The private schools receive less money per pupil from the central government than the public schools. The parents have to pay a tuition fee, but they do not receive a corresponding deduction in their tax payment. The private schools can be forced to close down if they do not get enough pupils; this is an unrealistic scenario for a public school.

The public schools have a clear economic advantage in the competition with the private schools. Thus for surviving the private schools have to be more efficient than the public schools, and we show that this is the case since the private schools deliver a higher quality in education and have lower costs. This result appears at the same time as is found, that it cannot be confirmed that pupils in private schools generally have a stronger social background than pupils in public schools.

The private schools in Denmark do not operate under perfect competition: They are run by altruistic foundations, which do not behave like profit-maximizing firms, the main part of their cost are covered by the government, they do not operate under a perfect competitive price mechanism etc. The main competitive element that the private schools experience is the possibility of exit from the market, which apparently makes them a lot more efficient than public schools. This indicates that it may be possible to benefit from introducing a single competitive element, when trying to create a semi-market for a semi-public good.

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## **Appendix – variables reflecting pupils socioeconomic background used in the regression analysis that measure school-performance**

### **Marks**

Danish - oral \*

Male - danish - neatness

Male - danish - spelling

Male - danish - written

Male - maths - oral

Male - maths - written

Female - danish - neatness

Female - danish - spelling

Female - danish - written

Female - maths - oral

Female - maths - written

### **Explanatory variables**

#### **Gender**

Female \*

Male

#### **Father Identified**

Father observed

Father not observed

#### **Mother Identified**

Mother observed

Mother not observed

#### **Equivalent disposable income decile**

Decile 1

Decile 2

Decile 3

Decile 4

Decile 5

Decile 6

Decile 7

Decile 8

Decile 9

Decile 10 (highest)

#### **Age at test time**

14 years 9 months or less

14 years 10 months

14 years 11 months

15 years 0 months

15 years 1 month

15 years 2 months  
15 years 3 months  
15 years 4 months  
15 years 5 months  
15 years 6 months  
15 years 7 months  
15 years 8 months  
15 years 9 months  
15 years 10 months  
15 years 11 months  
16 years 0 months, or more

**Number of brothers in the household**

1  
2  
3 or more

**Number of sisters in the household**

0  
1  
2  
3 or more

**Test-taker lives with**

Mother+ father  
Mother re-married  
Lone mother  
Father re-married  
Lone father  
Other arrangements

**Mother place of birth**

Denmark \*  
The west  
Rest-of-world

**Father place of birth**

Denmark \*  
The west  
Rest-of-world

**Mother age when child born**

Teenage  
20-24  
25-29  
30-34  
35-39  
40 plus

**Father age when child born**

Teenage

20-24  
25-29  
30-34  
35-39  
40 plus

**Mother labour market status**

Self-employed  
Wage earner  
Unemployed  
Education  
Activation program  
Welfare  
Other out-of-labour-force

**Father labour market status**

Self-employed  
Wage earner  
Unemployed  
Education  
Activation program  
Welfare  
Other out-of-labour-force

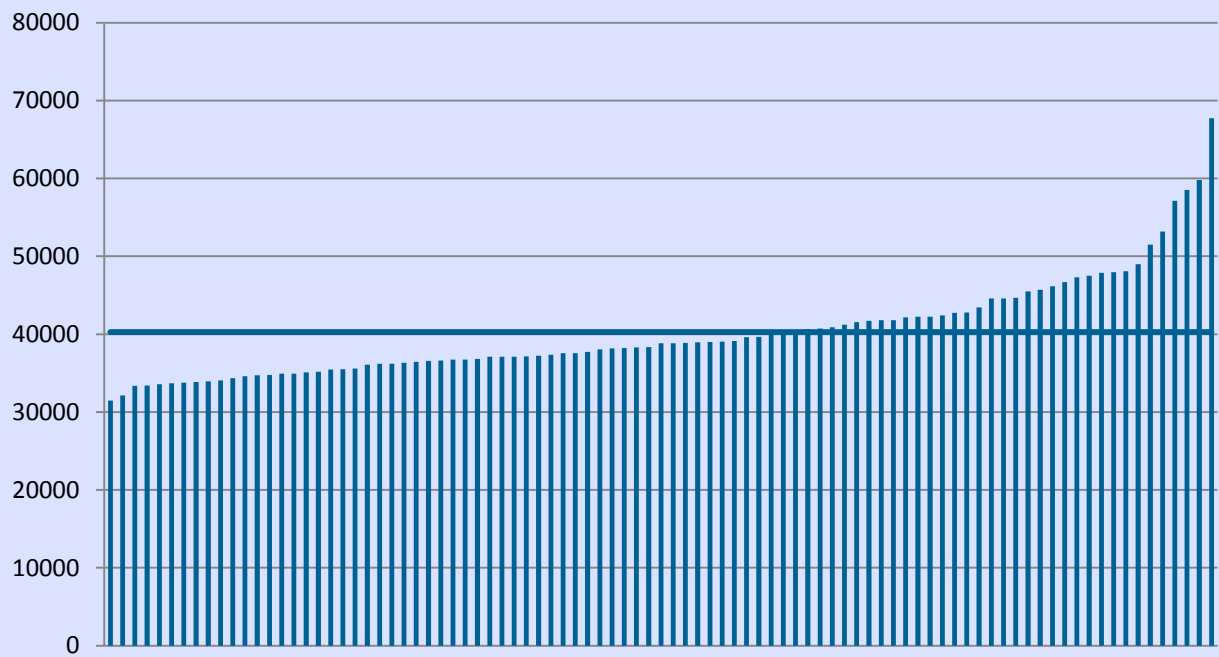
**Mother education**

Missing education information  
Grundskole  
Erhvervsfaglig  
Gymnasium or KVVU \*  
Short tertiary  
Long tertiary

**Father education**

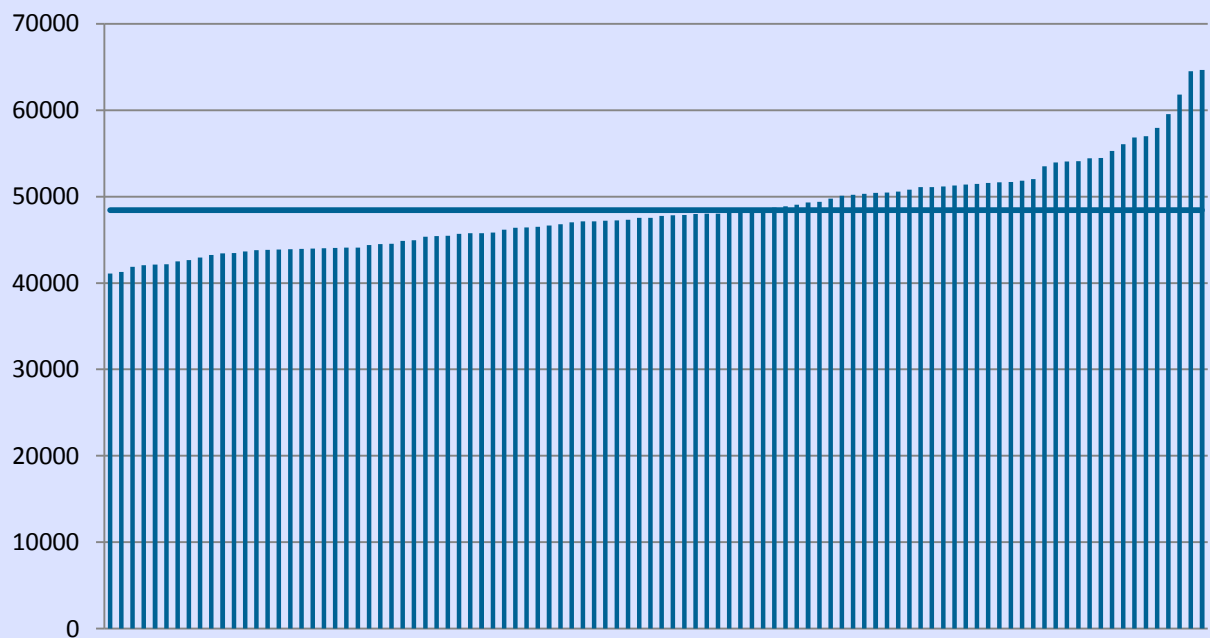
Missing education information  
Grundskole  
Erhvervsfaglig  
Gymnasium or KVVU \*  
Short tertiary  
Long tertiary

Figure A1: Wage pr. pupil in private schools arranged in ascending order



Note: The blue line indicates the mean

Figure A2: Wage pr. pupil in public schools arranged in ascending order



Note: The blue line indicates the mean

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