Handelshøgskolen ved UiT

Rental expenses in private kindergartens

Impact of organizational structure on rental expenses in private kindergartens

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Master´s thesis in Economics, SOK-3901, June 2024

Acknowledgments

I would like to thank Rune Ytreberg from iTromsø for sharing the data and ideas that inspired the research question of the thesis. In addition, I would like to thank Mikko Moilanen and Derek Clark for guidance, insights, and support.

Abstract

Between 2019 and 2021, several major corporate groups within the kindergarten sector sold kindergarten properties to foreign private equity firms. As a result, affected kindergartens transitioned from property ownership to tenancy roles. This thesis aims to investigate the impact of organizational structure and ownership type on rental expenses within the private kindergarten sector in Norway. The data for this analysis originates from The Norwegian Directorate for Education and Training (Utdanningsdirektoratet). The methods used in the paper include descriptive statistics and logistic regression.

The results show that nonprofit kindergartens exhibit the lowest rental expenses and have the lowest probability of significantly above-average rental expenses, when controlled for at the municipality level. On the other hand, while kindergartens from the top five largest chains did not show signs of notably high rental expenses between 2017 and 2019, their rental expenses spiked during the period of 2020 to 2021.

Keywords:

private kindergartens, rental expenses, logistic regression, organizational structure, ROC curve, agency theory

Contents

List of Tables

List of Figures

1. Introduction

1.1 Contextual background

Increasing awareness on the socio-economic consequences of the shortage of early childhood services, both for child development and for their parents who cannot participate in working life, led to the introduction of a new policy called "Barnehageforliket" (in English: The Kindergarten Agreement) in 2003 (NOU 2020:13, 2020). This policy aimed to make childcare services more accessible and available to a larger percentage of the population by equalizing childcare facilities regardless of their ownership status. Private kindergartens became eligible to receive similar subsidy payments *per* child and were subject to a maximum fee ceiling introduced nationwide. To combat the shortage of daycare centres, the government offered affordable building loans and free plots to those wishing to open new private kindergartens. As a result of the policy and its subsequent amendments, by the mid-2010s, nationwide kindergarten coverage was around 91 %, up from 63 % in 2000 (SSB, 2017).

On the negative side of an otherwise seemingly successful policy, concerns about excessive profitability in childcare business have arisen as the number of private kindergartens has increased. Over the last few years, super profits in private Norwegian kindergartens have garnered considerable media attention. As a consequence of public opinion, the government signaled its intention to de-commercialize the welfare sector in 2022 (Avkommersialiseringsutvalget, n.d.). Although making reasonable profits from state-subsidized kindergartens is a legally established right in Norway (Barnehageloven, 2005, § 21), it is evident that the extraction of super profits, engagement in tax avoidance or exploitation of regulatory loopholes to make extra profits is unacceptable in the eyes of the public. In 2020 and 2022, the Kindergarten Act underwent major changes to make regulations stricter and more resilient to circumvention (Endringslov til folkehøyskoleloven, barnehageloven og voksenopplæringsloven, 2020; Endringslov til barnehageloven, 2022).

There are two major groups of kindergartens: public and private. Private kindergartens can be characterized as either “not-for-profit” or “for-profit”. Kindergartens that operate on a not-for-profit basis are usually owned by unions, religious and student welfare organizations, foundations, parental cooperatives, *etc*. A common characteristic of this type of kindergartens is that any profits acquired are not taken out as dividends for owners but rather are used to cover operational needs within the kindergarten itself or its group. The motivation behind running non-for-profit kindergartens lies in the ‘idea’ of providing a specific social good to a particular group (e.g.,

students, union members, church members, etc.); therefore, this group is often classified as "ideell" (idea-motivated) (NOU 2020:13, 2020, pp. 21-22).

On the other hand, commercial profit-motivated kindergartens are usually organized as limited liability companies (AS) or individual entrepreneurships (ENK). The main characteristic for this type of kindergartens is that they are organized as businesses with the primary purpose of making financial profit for shareholders. As financial profit is the main motivator for this group, they are often referred to as "kommersiell" (commercially motivated).

1.2 Previous research

Over the last years, several studies commissioned by the state have been conducted on profitability and ownership structure in private kindergartens in Norway, but the results seem to be mixed. Lunder (2018) finds that kindergarten chains have higher profitability than independent kindergartens. Furthermore, the size of a chain is important, with bigger chains delivering better results. However, it does not find that higher profitability is due to economies of scales effect. It concludes that a significant part of derivation in net income variation cannot be explained by the analysis. BDO's report (2018) studied property and consolidation in the private sector from 2007 to 2016. It found that, although profitability in the market has been stable over the 10-year period and capital returns have decreased, there has been strong capital accumulation, mostly in the form of property. A major study on private parties in the welfare state conducted by the Norwegian Ministry of Trade, Industry and Fisheries (NOU 2020:13, 2020) finds that the quality in private kindergartens is at the same level or sometimes better than in public kindergartens. It concludes that state policies and government control are adequate. As part of the study, it examines the concentration of corporate groups and foreign ownership, specifically private equities. It finds that the concentration of corporate groups in the kindergarten sector is one of the highest among private welfare sectors (59 %), and corporate groups account for 79 % of the market's total operating revenue. The report finds very low concentration of foreign ownership and private equities. However, it is important to note that the analysis used data from 2018. Additionally, the report finds that net income in kindergartens averages 6.3 % before tax. Overall, the study finds that kindergartens from larger corporate groups have higher net income, followed by smaller corporate groups and independent kindergartens, but it does not conclude that there are super profits in the private sector.

1.3 Research objectives and questions

The research idea was inspired by recent significant media attention on unethical practices involving kindergarten properties, such as selling properties to foreign private equity firms (Windstad *et al.*, 2020; Wangberg, 2022) or renting from their own companies (Windstad *et al.*, 2020). For example, a newspaper article from 2022 (Wangberg, 2022) found that 797 million NOK a year was paid to new foreign owners as rent for facilities that were previously owned by the kindergartens themselves.

This thesis aims to compare rental expenses across different categories of private kindergartens. The hypothesis is that the major corporate groups of commercial kindergartens have higher rental expenses than other kindergarten types, as suggested by the above-mentioned article. This hypothesis is built on the assumption that after selling most of the properties, new owners might set rental prices above the market average to reduce the payback period and generate higher profit margins. Based on this, the research question of this study is the following:

How does the ownership structure and organizational type of private kindergartens in Norway affect their rental expenses, particularly in the context of recent property transactions involving foreign private equity firms and internal rental agreements?

Descriptive statistics and logistic regression model are chosen as a method to answer the research question.

The rest of the thesis is structured as follows: Chapter 2 provides the relevant theoretical framework for the hypothesis. Chapter 3 describes the methodology employed in the study. Chapter 4 presents the results of the analysis. Finally, Chapter 5 offers a summary of key findings, followed by a discussion.

2. Theoretical Framework

2.1 Agency agreement analogy

The relationship between subsidized kindergartens, on the one hand, and relevant state agencies and private shareholders, on the other, could be described in various ways and from different perspectives. Among others, it has similarities to the agency agreement from contract theory. An agency agreement can be defined as "a contract in which a principal expressly authorizes an agent to take certain actions on behalf of the principal. So long as the agent acts within the scope of authority granted by the agency agreement, the actions taken by the agent have the same effect as if the principal had itself taken them ..." (Bloomberg Law, n.d.). Applying this definition to the research objectives, the following analogy can be made: funding actors (public agencies and private shareholders) can be considered as principals authorizing the funded kindergartens (agents) to take certain actions on their behalf and in a manner that secure and promotes their interests. This analogy allows the agency agreement to form a theoretical framework of this study, particularly for building the hypothesis, as it is considered rather suitable for its research purposes.

This framework highlights the duty that kindergartens have to their funding bodies, such as shareholders and corporate groups, or government bodies, and emphasizes the importance of transparency and accountability in their operations. By acting as agents, kindergartens are expected to align their decisions and activities with the objectives and expectations of their principals, ensuring that funds (especially public subsidies) are utilized effectively, ethically, and for the intended purposes. Finally, this relationship framework underscores the importance of a monitoring and evaluation system to assess the performance and impact of the kindergartens, thus ensuring the trust and cooperation between the kindergartens and their funders.

2.2 The Principal – Agent Problem

The main reason for selecting the agency agreement as theoretical foundation is the principal-agent problem that arises from it. Once established, an agency creates a special relationship between its parties (namely, the principal and the agent), according to which the principal authorizes the agent to act in the name and on behalf of the former within the scope and limits of the agency. The principal-agent problem may arise in various situations and for different reasons. Typically, it occurs due to misaligned objectives and conflicts of interests between the parties involved (Popovic *et al.*, 2020). Consequently, this can result in a scenario of moral hazard,

wherein the agent is presented with both the opportunity and the incentive to exceed the bounds of their agency, or even abuse their authority, in order to advance their own interests rather than those of the principal. Such moral hazard is often triggered or exacerbated by factors such as information asymmetry, where the agent possesses more information than the principal, or ineffective management, such as a lack of monitoring and enforcement mechanisms by the principal.

A simplified mathematical notation of principal's utility maximization problem can be written as follows (1) (Rees, 1984; Bloch & Caillaud, 2017):

$$\max_{x,w}[f(x) - w] \tag{1}$$

$$\text{s.t.} \quad w - c(x) \geq v \quad \text{(Participation Constraint)}$$

$$x = arg \max_{x}[w - c(x')] \quad (Incentive\ Constraint)$$

Here, x is the agent's action variable, $f(x)$ is a benefit of the principal from the agent's action, w is a compensation given to the agent, $c(x)$ is the cost function of the agent for taking action x, v is a reservation utility of the agent. Principal's utility function is $f(x) - w$, and agent's utility function is $w - c(x')$.

2.3 Theory application

The multiple principals problem arises in situations where an agent is accountable to two or more principals (Voorn *et al.*, 2019). This scenario is often applicable in cases of joint services, such as in the public sector where government institutions outsource production of welfare services to private companies (Khalil *et al.*, 2005). In the context of the research objectives, kindergartens that secure their operation with both private and public funds must be accountable to both private shareholders and government bodies. Thus, the problems arising from the agent-principal relationship may become more complicated. As a literature overview from 2019 has shown, the existence of multiple principals often leads to inefficiencies, poorer monitoring, higher costs of monitoring, conflicts of interest, and increased lobbying (Voorn *et al.*, 2019).

The multiple principals problem can manifest in various ways, including conflicting objectives between stakeholders, reduced transparency, and monitoring inefficiencies. Private shareholders may prioritize profitability and operational efficiency, potentially at the expense of educational

quality and accessibility. On the other hand, the state which provides public subsidies expects the kindergartens to meet certain educational standards and serve in the best interest of children. However, a kindergarten with multiple principals could make decisions that favor the interests of the private shareholders over those of the state. Moreover, the conflict of interests could lead to suboptimal outcomes, such as inadequate investments in educational resources, reduced transparency in financial reporting, and compromised monitoring processes. Ultimately, this could lead to an overall lower quality of educational services provided, as the kindergarten might prioritize its financial interests over its educational mission, thereby failing to meet the standards expected by the state.

3. Methodological Framework

The Methodological Framework chapter provides an overview of the approaches used to address the research question. The first section familiarizes readers with the original data and presents descriptive statistics before any data manipulation. Following that, the second section offers a theoretical background on the regression model used for the analysis. Lastly, the third section discusses the method used to evaluates the model results and outlines a test for assessing the model's performance.

3.1 Data and Descriptive Statistics

The data for analysis was collected by The Norwegian Directorate for Education and Training (Utdanningsdirektoratet). It is a quantitative accounting and general data annually self-reported to the common register database BASIL by administrative body of private kindergartens. This dataset contains information on all open private kindergartens in Norway from 2017 to 2021. It includes a range of variables such as unique identification numbers, locations, number of children enrolled, rental data and facility sizes, financial results, organizational details, and other pertinent factors. The original data was acquired in two distinct files for each year: *(a)* an annual general report (årsmelding); and *(b)* an income statement report (resultatregnskapsrapport). To facilitate the analysis, these files were merged into one dataset file per year, retaining only select relevant variables.

Despite being sources from a reliable entity, the data is not devoid of errors, noticeable typos, and missing entries. Therefore, some data limitations need to be acknowledged before proceeding with the analysis. Notably, changes in reporting requirements were instituted in 2020, mandating a more detailed submission of information. For example, since 2020, daycare centers must report the ownership of their facilities and provide the organizational number of the company they rent from. To address discrepancies, an assumption was made for the data from 2017 to 2019, presuming that reported rental costs exceeding zero denote rented kindergarten facilities.

As a result, the lowest observed rent paid in 2017 is 26 NOK, with 148 instances in 2017 where the total rental cost equals or falls below 1 000 NOK. Given that these observations represent annual rental expenditures, they are likely reporting errors. However, no lower boundaries were

set on values, as it is unverifiable whether these observations are accurate, typos, or a result of misinterpretation during reporting.

The merged dataset comprises 17,764 unique observations spanning from 2017 to 2021. Descriptive statistics for continuous variables are presented in Table 1, while Table 2 outlines descriptive statistics for categorical variables.

Table 1. Descriptive statistics for continuous variables

Variable	Mean	St. Dev	Min	Max	NA's
Number of children	46.31	32.52	0	316	68
Facilities area (m^2)	256.90	166.56	0	3522.10	68
Foundation year	1999		1841	2021	33
Chain size	73.58	94.66	0	240	10 205
Personnel expenditure	5 685 406	3 868 859.72	0	37 783 005	2 725
Rental expenditure	443 527	805 881.14	- 357 000	9 717 893	6 562
Other rental expenditure	34 744	58 720.36	- 125 000	891 697	7 561
Tax	85 034	434 614.93	- 5 082 735	19 650 486	10 240
Income	8 808 425	6 314 297.70	0	62 443 055	2 644
Total expenditure	9 120 051	6 540 052.10	5	60 358 421	11 894
Result	315 177	966 600.07	- 14 717 864	7 638 040	11 894

Table 2. Descriptive statistics for categorical variables

Variable	Yes (1)	No (0 or 2)
Part of a chain	5 834 (32.84 %)	11 930 (67.16 %)
Owns another business	3 102 (17.46 %)	14 662 (82.54 %)
Own kindergarten's premises	2 743 (15.44 %)	15 021 (84.56 %)

For the purposes of the analysis, every kindergarten will be categorized into one of four types: big chains, small chains, nonprofit, and others. Sources such as Utdanningsdirektoratet, relevant scientific papers, reports, and news articles often highlight the five largest kindergarten chains and compare them against other groups (Utdanningsdirektoratet, 2022; NOU 2020:13, 2020; Wangberg, 2022). These five chains will be categorized as "big chains" in the following analysis.

The "nonprofit" category will follow the definition provided by Statistics Norway (SSB, 2012), which includes the following ownership types (in Norwegian): forening and lag (coded as 1 in the original dataset), stiftelse (3), samvirkeforetak (mostly parental cooperatives) (5), fylkeskommune (16), kirkelig fellesråd (18), and staten (20). Additionally, some kindergartens from other ownership categories were classified as "nonprofit" when they clearly self-identify as nonprofit organizations. The "small chains" category includes all kindergartens organized in chains that do not belong to the "big chains" or "nonprofit" categories. In the "independent" category will be organized the rest of independent commercial kindergartens.

Tables 1 and 2 in this section present descriptive statistics prior to data manipulation. In the Results chapter, some variables related to kindergarten performance and costs will be subcategorized by type, allowing more direct comparisons.

3.2 Logistic Regression and Marginal Effects

The selection between different types of regression models depends primary on the structure of the data the type of variables involved, particularly the dependent (outcome) variable. When the dependent variable is continuous, a linear regression model is often a suitable choice. However, if the dependent variable has only two outcomes (binary), a linear model is inappropriate for several reasons: it contains an error component that is not normally distributed, its variance is not constant (heteroskedasticity), and outcome predictions are not restricted to give values outside of a binary outcome (0 or 1). A binary dependent variable is best to be fitted with Logistic regression model, and a categorical dependent variable with more than two alternatives can be fitted with Multinominal logistic regression model (DeMaris, 1995). As the dependent variable in an estimated model will be binary, this study uses logistic regression.

There are two types of logistic regression models that could be used for this estimation, the logit and probit models. The main difference between the two models is that the probit model uses standard normal distribution of the cumulative distribution function (*cdf*) as its logistic function,

and the logit model uses logistic random variable of the cumulative distribution function (Hill et al., 2018). This leads to different coefficient estimations and slightly different approaches to interpret estimation results. As the overall results for both models tend to be similar, the final choice between the two models is a choice of preference (Hill et al., 2018). The probit model will be used in the estimation.

The probit model takes starting point in a standard linear regression, but the outcome variable Y^* is restricted to a binary choice:

$$\begin{cases} Y = 1 \text{ if } Y_i^* > 0 \\ Y = 0 \text{ if } Y_i^* \leq 0. \end{cases}$$

The probability P(X_i) of observing the outcome Y = 1 is calculated by standard normal *cdf,* that is denoted as a big Φ in the probit model equation (2) (Hill et al., 2018; DeMaris, 1995).

$$P(Y_i = 1|X_1, X_2, \ldots, X_{iK}) = \Phi(\beta_0 + \beta_1 x_1 + \cdots + \beta_K x_{iK}) \text{ where } \Phi(z) = P(Z \leq z) \quad (2)$$

In the model, x_i are explanatory variables (also known as predictors) and β_i are parameters (also known as coefficients), the parameters capture effect of a one-unit change in x_i on an outcome. As the probit regression model is nonlinear, the effect in parameters is not linear as well, instead they represent a change in a *z*-value score of the outcome probability. The *z*-value represents the number of standard deviations that are away from the mean in a standard normal distribution. Lastly, Z in the equation (2) represents a standard random variable.

Direct effect of one-unit change in explanatory variables on probability of the outcome can be measured through marginal effects. Marginal effect in the probit model is denoted in the equation (3) (Hill et al., 2018), where the right side of the equation is the standard normal probability density function (*pdf*) (denoted as a small ϕ) evaluated at $\beta_i x_i$ point.

$$ME_i = \frac{\partial \mathrm{P}(Y_i = 1|X_i)}{\partial X_{iK}} = \phi(\beta_0 + \beta_1 x_1 + \cdots + \beta_\mathrm{K} x_{i\mathrm{K}}) * \beta_\mathrm{K} \quad (3)$$

3.3 Predicted Probabilities and ROC Curve Test

Predicted probabilities are a fundamental concept in statistical modeling, particularly in the context of binary outcome variables, as they are crucial for understanding the relationship between independent variables and the probability of a particular event or outcome. The further analysis will illustrate predicted probabilities of the models.

Receiver Operating Characteristic (ROC) curve analysis is a method for evaluating the performance of binary classification models, including binary logistic regression models (Fawcett, 2006). ROC curves provide a visual presentation of a model's ability to discriminate between positive and negative cases.

In the present case, ROC analysis can be used to evaluate the overall predictive performance of the logistic regression model, including the specific effects of the variable and its classes on the dependent variable. The ROC analysis plots True Positive (TP) rate (also known as Sensitivity) against the False Positive (FP) rate. TP rate is calculated from correctly classified positive values of the dependent variable divided by all positive values in the dataset. FP rate is calculated from negative values incorrectly classified divided by total negative values. Another important term in understanding the ROC analysis is Specificity, which can be calculated as 1 minus FP rate.

The overall performance of a classification model can be quantified using the Area Under the ROC Curve (AUC). Higher AUC values signify better discrimination between classes of the dependent variable. AUC values range from 0.5 to 1.0, where models closer to 0.5 exhibit no discriminatory ability (equivalent to random guessing), while those nearing 1.0 demonstrate perfect discriminatory ability.

4. Results

4.1 Descriptive statistics

The Results chapter starts with presenting descriptive statistics on the manipulated data. Each observation was classified into one of the four categories of organizational structure: independent, big chains, nonprofit, and small chains. Key accounting information was calculated on a per-child basis, allowing for easier comparison of relevant statistics, regardless of kindergarten size or number of attending children. Furthermore, in line with the primary objective of the paper, the rental expenses were calculated on a per square meter basis.

Table 3. Descriptive statistics

Variable	Mean	Median	St. Dev	Min	Max
Number of children					
- Independent	36.50	30	29.97	1	316
- Big chains	75.66	74	31.49	13	299
- Nonprofit	46.20	45	24.08	3	177
- Small chains	50.98	47	37.53	1	299
Facilities area per child (m^2)					
- Independent	4.96	5	4.33	0	110
- Big chains	5.40.	4.99	1.40	2.4	18.52
- Nonprofit	5.67	5.25	1.96	0	75.46
- Small chains	4.42	4.64	3.62	0	112.90
Rental costs per child					
- Independent	11 481.26	9 600	11 619	-58.31	21 433
- Big chains	10 925.57	9 087.39	10 779.54	-3 570	58 771.71
- Nonprofit	5 627.47	3 878.31	6 619.65	-1 153.85	50 965.20
- Small chains	17 921.72	16 865	15 950.47	-6.26	220 048
Rental costs per square meter					
- Independent	1 727.50	1 542.90	1 359.97	1.40	10 036.64
- Big chains	2 586.09	2 406.47	2 078.94	0.08	8 764.81
- Nonprofit	1 222.04	986.92	1 190.66	0.28	10 003.11
- Small chains	2 836.91	2 728.43	1 927.45	0.16	12 132.20
Income per child					
- Independent	200 555.7	196. 804	42 199.85	44 432.50	783 935
- Big chains	193 989.3	193 842.8	22 892.74	16 360.29	325 122.6
- Nonprofit	195 034.9	191 893	38 009.14	39 075.45	1 026 961.2
- Small chains	202 114	197 321.6	49 666.79	0	1 262 060

Personnel costs per child					
- Independent	109 657.5	118 576.8	49 304.90	0	561 859.8
- Big chains	120 445.1	119 879.7	17 381.92	10 734.44	210 682.6
- Nonprofit	134 526.2	131 525.9	27 742.59	0	631 030.9
- Small chains	122 482.3	119 091.4	32 983.18	0	683 427.0
Total costs per child					
- Independent	183 922.6	119 193.9	68 659.16	8 858.6	1 033 710.9
- Big chains	198 815.1	196 905.2	21 110.24	14 879.54	287 495.5
- Nonprofit	202 201.2	198 259.5	35 122.55	93 758.25	934 514.1
- Small chains	209 896.5	198 259.5	67 923.58	0.2631	1 263 505
Result per child					
- Independent	27 940.44	9 846.28	56 160.28	-741 254.06	676 913
- Big chains	6 178.05	6 145.53	16 085.30	-73 711.16	63 997.08
- Nonprofit	4 491.69	4 389.72	15 480.48	-189 507.70	145 788
- Small chains	5 250.25	7 146.49	30 473.01	-209 000	185 271.50

The initial observation from the statistical results highlights that kindergartens operated by large chains tend to accommodate a significantly higher number of attending children. Therefore, per-child statistics more relevant in this context. Regarding facility sizes, data across the four organizational types are quite similar, with minimal variation, except for the maximum values which are notably lower for large chains compared to the other types.

The most compelling insights are observed from the rental cost statistics, revealing distinct deviations among organizational types. Nonprofit organizations demonstrate significantly lower median and mean rental prices, both per child and per square meter. Conversely, small chains incur notably higher rental costs compared to other types. Interestingly, while the rental costs of large chains align with those of independent kindergartens, when measured per child, they resemble those of small chains, when measured per square meter.

4.2 Model results

The following sections present five separate models, one for each year, in contrast to the merged descriptive statistics. This approach allows for the observation of trends over time, as well as of probabilities. The estimated in this thesis probit model has the following structure:

$$P(\,index = 1 \mid X\,) = \Phi(\beta_0 + \beta_1 \cdot type_1 + \beta_2 \cdot type_2 + \beta_3 \cdot type_3 + \beta_4 \cdot type_4 + \beta_5 \cdot children + \beta_6 \cdot locarea^2 + \beta_7 \cdot foundyear)$$

The model estimates the probability that the rental price is 1.5 times higher than the average price, corrected by municipal level, focusing primarily on the relationship between the type of kindergarten (referred as *type* in the model) and the rental cost index variable (*index*). Rental costs *index* variable is a binary variable with values 0 or 1. It was categorized by finding rental expenses per square meter for each kindergarten, and then comparing the calculated price to a mean price of kindergarten's municipality. Prices that exceeded 1.5 times the mean price of the related municipality were marked as 1.

The number of attending children (*children*), foundation year (*foundyear*), and size of the kindergarten's facilities (*locarea*) are included as control variables to account for their potential influence on the rental price. The variable *locarea* is quadratic, as it accounts for diminishing exponential effect of facilities' size on the price.

Table 4. Model estimation results

Predictor	Data 2017	Data 2018	Data 2019	Data 2020	Data 2021
Intercept	-19.8719**	-26.06***	-25.14***	-31.01***	-36.41***
	(7.0234)	(6.968)	(6.907)	(7.814)	(8.588)
Type (reference: independent)					
- Big chains	-0.0522	0.2582*	0.2653**	0.5230***	0.7543***
	(0.1065)	(0.1062)	(0.1007)	(0.1067)	(0.1131)
- Nonprofit	-0.5472***	-0.4342***	-0.3922***	-0.3730**	-0.5399***
	(0.0971)	(0.0999)	(0.1019)	(0.1156)	(0.1412)
- Small chains	0.0929	0.1925.	0.2725*	0.4173***	0.5029***
	(0.1066)	(0.1123)	(0.1164)	(0.1184)	(0.1189)
Children	0.0141***	0.0141***	0.0169***	0.0143***	0.0225***
	(0.0028)	(0.0029)	(0.0028)	(0.0028)	(0.0031)

Locarea	-0.0023***	-0.0022***	-0.0029***	-0.0020***	-0.0029***
	(0.0005)	(0.0006)	(0.0005)	(0.0005)	(0.0006)
Foundyear	0.0104**	0.0131***	0.0122***	0.0149***	0.0175***
	(0.0034)	(0.0035)	(0.0034)	(0.0039)	(0.0043)
AIC	1738	1613.2	1780.2	1539.6	1352.5
Pseudo R-squared	0.0744	0.0918	0.0938	0.1408	0.2423

* p-value < 0.05, ** p-value < 0.01, *** p-value < 0.001

Table 4 contains estimation results with p-values (encoded in asterisks by significance level) and standard error values (in brackets). P-value is an important parameter in understanding model's performance and goodness-of-fit. It is a probability of observing estimated result when there is no correlation between the dependent and independent variables. Overall, every of the five estimated models have a good significance level. Additionally, there is a noticeable trend of an increasing significance observed for each variable in subsequent years.

Akaike Information Criterion (AIC) identifies best fitting model by using a likelihood function. The model with the lowest AIC criteria has the best fit in comparison to the other models. Unlike Bayseian Information Criterion (BIC), another widely used methos, AIC does not penalize directly for a larger number of observations (but does so indirectly through likelihood value), making it a relatively better fit for comparing models with different number of observations (Narisetty, 2020). Among the estimated models, the last model from 2021 indicates the best fit.

In addition to the AIC value, the pseudo R-squared was also calculated. Although pseudo R-squared is computed differently from the R-squared in linear models, values closer to 1 similarly indicate a better fit. Consistent with the observed significance levels, the AIC values and pseudo R-squared indicate an increasing trend in model fit from the 2017 data to the 2021 data. Specifically, the 2017 model explains only 7.44 % of the variation in the observed values of the predicted variable, whereas the 2021 model explains 24.23 % of the variation.

4.3 Marginal effects

Marginal effects allow for direct comparison of the impact of explanatory variables on probability of the index taking value 1, thus providing clear insights into which factors most significantly affect rental price deviations. Table 5 gives an overview of the marginal effects.

Table 5. Marginal effects

Predictor	Data 2017	Data 2018	Data 2019	Data 2020	Data 2021
Intercept	-5.789**	-7.414***	-7.182***	-7.998***	-8.498***
	(2.038)	(1.959)	(1.960)	(1.990)	(1.975)
Type (reference: independent)					
- Big chains	-0.013	0.081*	0.082 *	0.154***	0.217 ***
	(0.031)	(0.036)	(0.032)	(0.034)	(0.037)
- Nonprofit	-0.159***	-0.127***	-0.112***	-0.095**	-0.122***
	(0.025)	(0.027)	(0.028)	(0.028)	(0.028)
- Small chains	0.042	0.060	0.087*	0.127**	0.144***
	(0.035)	(0.037)	(0.040)	(0.040)	(0.038)
Children	0.004***	0.004***	0.005***	0.004***	0.005***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Locarea	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.0000)
Foundyear	0.001**	0.004***	0.003***	0.004***	0.004***
	(0.0034)	(0.001)	(0.001)	(0.001)	(0.001)

* p-value < 0.05, ** p-value < 0.01, *** p-value < 0.001

The marginal effects of the variables *children*, *locarea*, and *foundyear* are all significant in p-values and show minimal variation from year to year. However, their impact is comparatively low when compared to the *type* variable. The estimated effects of the *type* variable are particularly compelling to observe. It is important to note that direct comparison between two specific values from different models may not be possible due to differing intercept values, which represent probabilities' respective starting points. Nonetheless, comparisons can be made in terms of dynamics to values within the same model.

Starting with nonprofit kindergartens, the effect estimations are significant in p-values and relatively consistent across the years, with negative values indicating a lower probability of observing higher rent compared to the reference group of independent kindergartens.

The probability of observing higher rent that triggers *index* variable to take value 1 in small chains, as opposed to independent kindergartens, is notably higher and increases substantially. However, this trend is only significant in the datasets from 2019 to 2021, while the error estimation in 2017 is as high as the calculated effect itself.

The marginal effect of big chains undergoes an interesting change from 2017 to 2021. Initially, the value is negative, suggesting a higher probability of observing higher rent in independent kindergartens than in big chains. However, the p-value is not significant, and the standard error is double the estimated effect, making it inconclusive. Interestingly, the remaining observations on big chains from 2018 to 2021 are significant and demonstrate a trend towards an increase. The probability of observing above-average rent in big chains, as opposed to the reference group, is almost three times higher in 2021 compared to 2018.

4.2 Wald Test Hypothesis Testing

In order to further assess significance of the first variable *type* in the model, Wald Test was performed with the following hypothesis tested:

$$H0: \beta_1 = \beta_2 = \beta_3 = \beta_4 = 0$$

$$H1: \ At\ least\ one\ of\ \beta_1, \beta_2, \beta_3, \beta_4 \neq 0,$$

Which can be interpreted as that at least one of the estimation coefficients of the categorical *type* variable is not equal zero, effectively being significant for the outcome of the dependent variable.

Table 6. Wald Test

	Data 2017	Data 2018	Data 2019	Data 2020	Data 2021
Chi-squared, X^2	8.0	14.1	13.3	15.8	18.0
P-value	0.0047	0.00017	0.00027	0.000072	0.000022

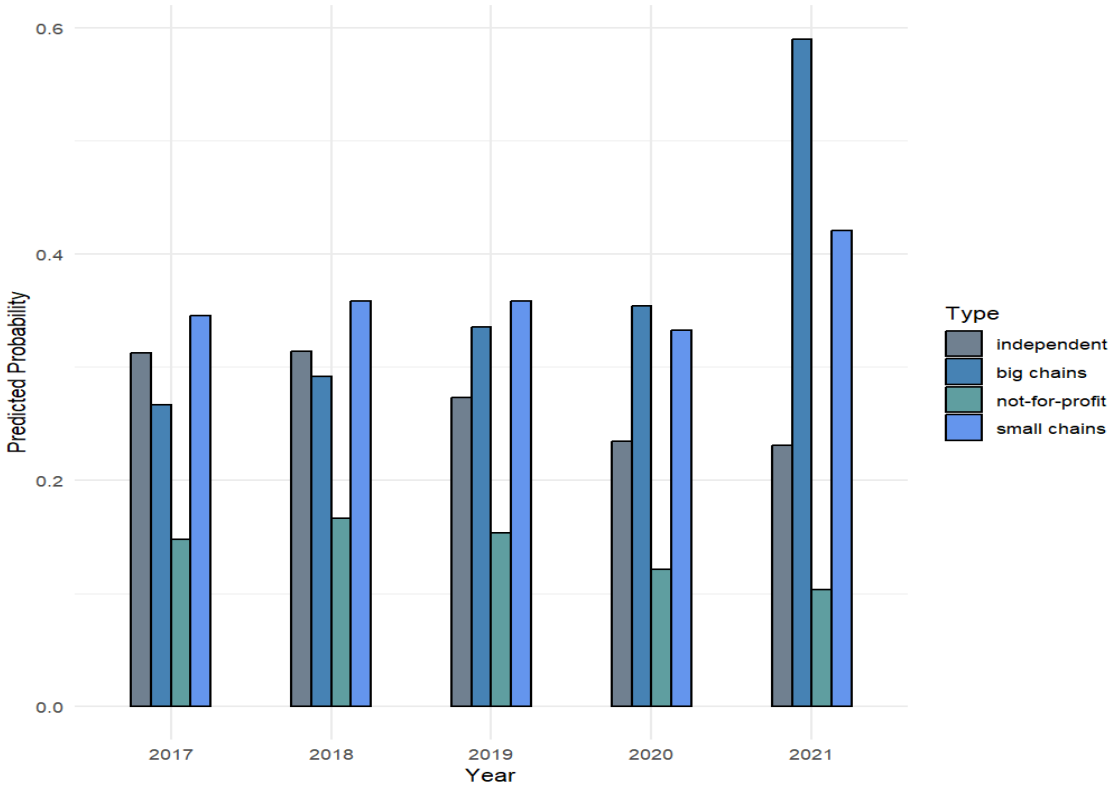
Critical value x^2 *at* 0.95 % confidence and 1 degree of freedom: 3.841459

The Null Hypothesis, suggesting no significance of the *type* variable on the outcome, can be rejected when the obtained chi-squared value exceeds the critical chi-squared value, and the p-value for the test is below the significance level of 0.05. Based on the results presented in Table 6, the Null Hypothesis can be rejected for all the tested models, indicating that the *type* variable has indeed a significant effect on the outcome.

4.3 Predicted probabilities

Figure 1 illustrates the predicted probabilities of the *index* variable having an outcome of 1, categorized by kindergarten type. For simplified comparison, the probabilities were sub-grouped by year, spanning from 2017 to 2021.

Figure 1. Predicted probabilities



From 2017 to 2019, small chains had the highest probability of having rental expenses significantly above average. However, by 2020, the top position was overtaken by the big chains. In 2017, the big five chains had a slightly lower probability of high rental expenses compared to independent and small chains, but over the years, they showed a consistent increasing trend. By the peak in 2021, their probability was almost 30 % higher than that of the second-highest type: small chains. Independent kindergartens showed a slightly decreasing trend, while nonprofit kindergartens consistently had the lowest probability of incurring above average rental expenses.

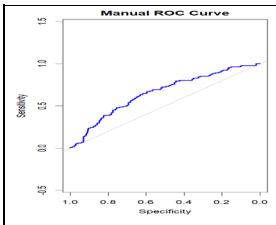
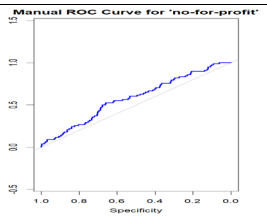
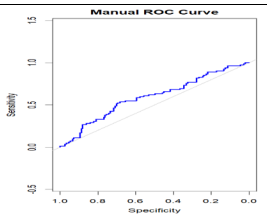
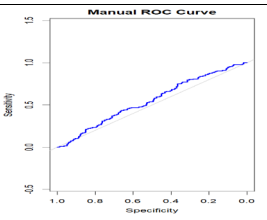
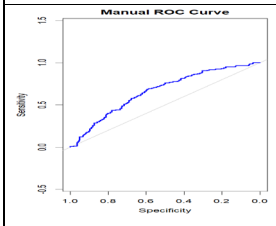
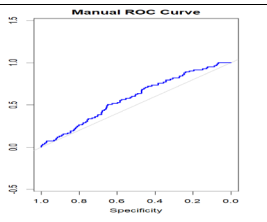
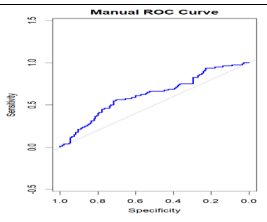
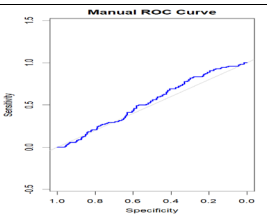
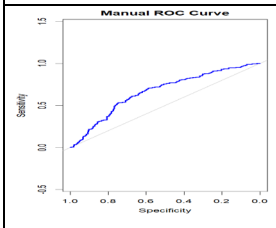
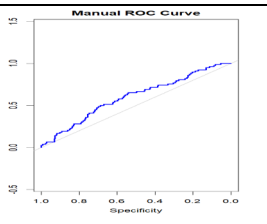
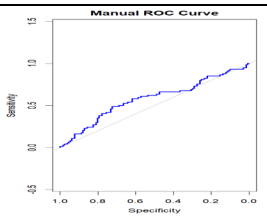
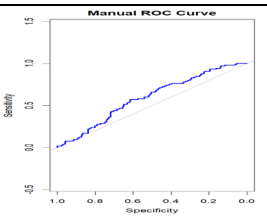
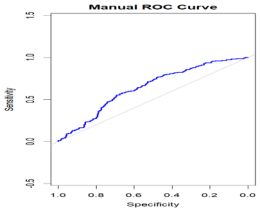
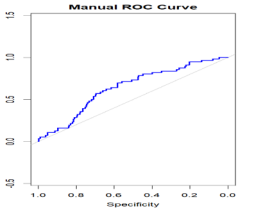
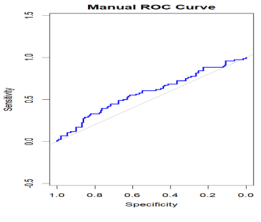
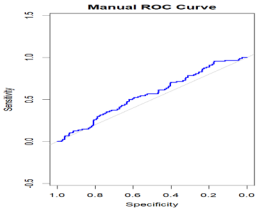
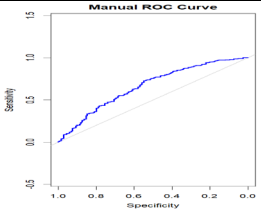
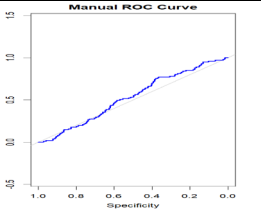
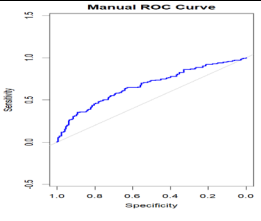
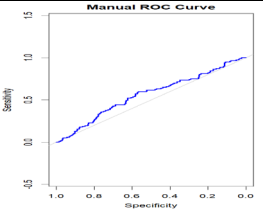
4.3 ROC Curve Analysis

To evaluate the model's ability to distinguish between true and false predictions, the analysis was supplied with the ROC curve test. This test specifically focused on the model's discriminatory ability concerning the variable *type*. The technique used is known as the One-vs-All ROC curve test, often employed in multiclass classification problems (Trevisan, 2022). Figure 2 illustrates the results for each *type* category from 2017 to 2021. The curve in the top left corner indicates a high level of correctly identified true positives and a low level of false positives. Below the graph, the AUC score for each category is provided, summarizing the model's performance for that category.

Checking both the AUC score and plotting the graphs is important for evaluating the performance of the classification models. Initially, the data was visualized using the plotting function from the "pROC" package in R. The graphs from the package indicated good discriminatory ability, particularly for nonprofits and big chains. However, after calculating the AUC score for each graph, it was found to be low and inconsistent with the plotting results. As part of the diagnostic process, the predicted probabilities were manually plotted instead of using the package solution. The new graphs demonstrated consistency with the AUC scores, providing a more accurate assessment of the model's performance.

Both the plotted graphs and AUC scores suggest limited discriminatory ability, with values closer to 0.5 and the graphs being centrally located rather than in the top left corner. Generally, model’s discrimination ability is considered good when AUC values exceed 0.7 (Fawcett, 2006). Thus, it's reasonable to conclude that the predicted probabilities from the previous section may not be considered as sufficiently reliable. Overall, the probabilities can be considered as random guessing, with only a few results reaching a level of confidence that could be seen as fairly adequate (above the 0.65 threshold).

Figure 2. One-vs-all ROC curve

Big chains 2017 – 2021	Nonprofits 2017 - 2021	Small chains 2017 - 2021	Independent 2017 - 2021
 AUC: 0.6545	 AUC: 0.5897	 AUC: 0.6545	 AUC: 0.5525
 AUC: 0.6639	 AUC: 0.5861	 AUC: 0.6259	 AUC: 0.5377
 AUC: 0.6655	 AUC: 0.5994	 AUC: 0.5800	 AUC: 0.5933
 AUC: 0.6431	 AUC: 0.6411	 AUC: 0.5838	 AUC: 0.5620
 AUC: 0.6632	 AUC: 0.5331	 AUC: 0.6710	 AUC: 0.5630

5. Discussion

The main objective of this thesis was to investigate the influence of organizational structure on rental expenditure in private kindergartens. The descriptive statistics showed that while large chain kindergartens generally accommodate a significantly higher number of children per kindergarten, there were no notable deviations in means and medians in per-child statistics across big chains, small chains, nonprofits, and independent kindergartens. Nonprofit kindergartens were observed with the lowest rental expenses, and with an average of 12 000 NOK higher in personnel expenses per child. On the other hand, small chain kindergartens appeared to have the highest rental expenses both on a per-child and per-square-meter basis. Big chain kindergartens ranked third on the per-child basis, showing similarity to independent kindergartens in this regard. However, on the per-square-meter basis, large chain kindergartens are closer to small chain kindergartens, being just slightly lower.

The findings from the models partially supported the hypothesis suggesting a correlation between kindergarten organizational structure and rental prices significantly exceeding the average. Overall, the model's significance increased in subsequent years compared to the initial observations. A comparison of the results across different years showed a significant increase in the marginal effect for large chain kindergartens from 2017 to 2021, thus increasing the probability of high rental prices. Although the predicted probabilities of the model indicated a spike in rental costs above average in 2021, further testing through ROC curve failed to confirm the reliability of the model's predictions. It is noteworthy, however, that the ROC curve test demonstrated relatively reliable outcomes specifically for the big chains.

The most significant finding of this study is the notable increase in rental expenses observed in big chain kindergartens during the period 2020 to 2021. This trend coincides with the timeline of the major corporate groups selling kindergarten properties to foreign private equities between 2019 and 2021 (Windstad, 2024). Despite the observed spike, the results could not validatefully confirm claims made in newspapers regarding double the average of rental expenses in big chains (Windstad *et al.*, 2020; Wangberg, 2022). It is crucial to acknowledge, however, that the methodological framework of this thesis and of the articles differ and cannot be used for direct comparison.

One might anticipate that the major corporate groups within kindergarten sector, alike other large companies or groups, would benefit from economies of scale. , nonetheless due to a higher number

of children per kindergarten. However, contrary to this expectation, such advantages were not observed in the results due to the higher number of children per kindergarten. This finding is consistent with earlier research (Lunder, 2018). Interestingly, an opposite trend was observed: kindergartens organized in chains, with the exception of nonprofits, exhibited a higher probability of having rental costs above average.

A plausible explanation for this phenomenon is that the owners of independent kindergartens are more cautious when selecting rental agreements, given their lower operating margins and reduced financial security in the event of failure, compared to chain-affiliated kindergartens. Nonetheless, irrespective of organizational *status*, all stakeholders should be interested in maximizing profitability and minimizing costs.

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