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Competition for a better future? Effects of competition on child care quality

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Abstract

Little is known about how competition affects child care centers' quality. This paper examines the impact of competition on the quality of Dutch child care centers. The results show that high density of child care centers in an area improves scores in quality assessment measures. The positive relationship persists when either the density of primary schools or births in the area are used to instrument the density of child care centers. The effects of competition are exclusive to child care centers that operate in a private market. Despite concerns about the parents' ability to distinguish between low and high quality child care, market competition in the Dutch child care sector appears to improve quality.

Keywords: child care, ECEC, pedagogic quality, competition

JEL classification: J13, H42, L19

1. Introduction

Across OECD countries, privatization of welfare state functions has been a common theme over the last few decades. Multiple private providers are expected to respond in an efficient way to differentiated consumers preferences. Relevant examples in this respect are the energy markets and health insurance. In line with this overall trend, the Dutch child care sector was completely reorganized by introduction of the 2005 Child Care Act. As a result of the change towards a demand driven financing system, publicly provided child care in the Netherlands disappeared. Instead only private providers are now operating and competing in the child care market (Noailly and Visser, 2009). Yet, child care is not a purely public private good. Multiple studies indicate that high quality child care has positive long-term development effects (Heckman, 2006; Chetty et al., 2011). In addition, the efficiency claim of markets is based on well informed parents. If parents are unable to distinguish between high and low quality child care, a private market may instead lead to competition on prices and a race to the bottom.

For a better understanding of the role a private market can play in providing child care, we analyze the impact competition has on child care quality. We use a scale introduced by development psychologists to measure what is called process quality. Process quality measures are designed to gauge the experience a child has in the classroom by observing and grading child-caregiver interactions. Any effects competition may have on process quality is likely to directly influence child development as it tries to measure the quality of child care that children experience.

The main data source used in the analysis is Pre-Cool, a survey of child care centers in the Netherlands. The Pre-Cool survey provides data on process quality of the participating child care centers. Process quality data is collected by trained observers who visited each center to observe classrooms. The Pre-Cool also includes a survey of the center managers' which includes questions on structural characteristics such as the centers' age and size. Using data provided by Statistics Netherlands, we proxy the level of competition a center faces by the number of daycare centers around it. To overcome any potential endogeneity problems, an instrumental variable strategy is used. The competition variable is instrumented using the density of primary schools within the same area. The density of births in the neighborhood is introduced as a secondary instrument to test the robustness of the results.

Our results show that competition has a significantly positive but modest effect on child care quality in daycare centers. These results are consistent across different instruments and do not change when price is taken into account. Some center characteristics also have significant effects on quality. Older and smaller centers have higher process quality scores while the percentage of non-native teachers has a negative effect.

In line with the results of Blau (2000), classroom variables such as staff to child ratios have insignificant effects on process quality.

The main contribution of our study is the analysis of the impact of competition on child care quality within a regulated market. Perhaps partly because of the difficulty of collecting reliable quality indicators, there are no previous studies on the effect of competition on child care quality. In contrast, the impact of competition on the quality of education in primary and secondary schools has been a major focus of attention. The extensive literature investigating the link between school quality and competition finds positive effects both at the micro and cross-country levels, although the size of the effects tend to be modest (Belfield and Levin, 2002; Sandstrom and Bergstrom, 2005; West and Woessmann, 2010).

The remainder of the paper is structured as follows. In the following section, the institutional characteristics of the Dutch child care sector are discussed. Section 3 provides a theoretical basis to interpret the role of competition within the Dutch child care sector. Sector 4 details the econometric issues encountered and describes the IV method applied. Section 5 summarizes and describes the data available. Section 6 presents the results. Section 7 concludes.

2. Child Care in the Netherlands

Prior to 2005, the Dutch child care sector consisted of locally subsidized, employer financed and privately finances centers, each with their own financing structure (OECD, 2002). The Child Care Act of 2005 privatized the entire daycare market and all parents now receive a subsidy from the government for their expenditure on formal daycare up to a set hourly price. By introducing a nationally organized demand driven financing system, the 2005 Child Care Act ensured that all parents have access to same subsidies and consequently pay similar net prices that differ only by their income and by the different gross prices charged by centers. The underlying assumption in the shift towards private providers is that price-quality ratio will improve if providers efficiently respond to parental preferences. Nevertheless, the potential for a drop in quality as a result of competition is recognized. Therefore regulations are set up through negotiations between child care providers and parental organizations. Regulations are placed on structural quality indicators such as staff to child ratios and caregiver qualifications. Monitoring for compliance with the regulations are handled by the municipalities.

The price cap, which was 6.36 in 2012, on the subsidies effectively places a soft cap on the prices in the market and limits variation. Since the portion of the hourly price above 6.36 euros is paid in full by the parents, any increase above the government cap leads to a very large net rise in what parents pay.

The financing system is essentially similar to the voucher system that is often suggested for primary and secondary schools (Friedman, 1997), with the clear difference being that parents only receive subsidies if they choose to use a daycare center while schools are mandatory. Supply and availability has increased rapidly since 2005. Further increases in subsidies in 2007, despite the cutback in 2009, has led to the 2012 situation where nearly 60% of children under 4 in the Netherlands receive formal child care (Bettendorf et al., 2012).

The rise in child care use following the Child Care Act has been accompanied by a steep decline in observed quality of Dutch child care according to developmental psychologists working with the Dutch Consortium of Child Care Research (NCKO) (Vermeer et al., 2008). Using process quality instruments that measure child-caregiver interaction, NCKO researchers find that quality in Dutch child care centers has dropped from 5 to 3 on a scale from 1 to 7 between 1995 and 2008. The results are interpreted as a decline from above average quality to below average. Lower process quality is observed despite continued regulations on structural characteristics of child care such as staff to child ratio and staff qualifications. The question remains about whether the drop in quality can be attributed to the introduction of market forces.

3. Theoretical Framework

Most parents use child care that is nearby. As a result, the market for child care is not uniform across a country and is instead composed of many smaller local markets each serving an area within a small radius (Blau, 2000; Cleveland and Krashinsky, 2009). The geographical limitations of the child care market inevitably introduces differing degrees of competition for centers in different areas. The fundamental question in this paper is thus not whether imperfect competition exists in child care but whether competition has an impact on process quality.

The economic reasoning about the potential impact of competition on efficiency or productivity is that firms are forced to become more efficient to survive against their competitors. With regards to efficiency, competition can then be seen as unambiguously positive. In case of child care quality, the existence of any effects from competition is more ambiguous. The main issue is about the observation and processing of information about quality by the consumers, in this case the parents. Parents may be unable to distinguish between high and low quality child care, especially in terms of process quality. Using data from the United States, Mocan (2007) finds that parents in the child care market are weakly rational and do not use all the available information in making their decisions. This leads to a market with both information asymmetry and adverse selection. Even if parents had information about process quality levels, they may remain

insensitive to process quality and focus on other aspects of child care (Plantenga, 2012). Without parents explicitly opting for higher quality, competition is not likely to have any impact. In the Dutch market, the impact of competition is further limited because of the regulations on structural quality indicators such as staff to child ratios and teacher qualifications.

Even though structural characteristics may be regulated, an alternative mechanism through which competition can have an effect can be found in the literature on managerial slack (Nalebuff and Stiglitz, 1983; Schmidt, 1997). Partially based on an earlier study by Leibenstein (1966), the managerial slack hypothesis predicts that imperfectly monitored managers and staff who are employed in an uncompetitive market can slack, ensuring that the firm survives but not providing the effort that they would have had they been employed in a more competitive market. This hypothesis does not exclusively refer to the manager's effort. Caregivers may also have lower effort in markets where the managers have no incentive to monitor or replace employees with poor performance levels.

The managerial slack hypothesis in the Dutch daycare market with its limited price variation and structural regulation can be shown formally in a model with two players, the firm and the manager. Assuming that there is free entry into the market m for center j, profits Π can be set to equal 0 in the equilibrium. We make a strong simplification and assume that costs for the firms are exogenously given and equal for all firms in the Dutch setting because of the structural quality regulations and the larger labor market which results in a common wage rate. To break even given the government set price p, the center needs to attract sufficient number of children by offering quality Q^*. Since for each market, the competition level ε_m and the demand characteristics D_m are different, the equilibrium quality level is given by the function $Q^*(D_m, \varepsilon_m)$, which is increasing in both D_m and ε_m. Centers in areas where parents are less interested or informed about process quality will have a lower quality requirement for survival. Quality itself is produced through two inputs $Q = s^* + e$, the structural factors s^* and managerial effort e. To ensure an interior solution at the equilibrium Q^*, we assume $Q^* > s^*$. Managerial effort is determined by the manager's utility function. Although there is no monitoring, the manager gets w only if the company survives by having profits equal to or greater than 0. Since $\Pi > 0$ does not change the manager's wage, the manager has no incentive to increase his effort beyond $\Pi = 0$.

$$U^m = w - e \text{ if } \Pi \geq 0 \text{ or } U^m = 0 \text{ if } \Pi < 0 \tag{1}$$

Assuming that the function $Q^*(D_m, \varepsilon_m)$ is additively separable and linear for ε_m, managerial effort e^* needed to reach the break even point can be easily determined.

$$Q^*(D_m) + \varepsilon_m = s^* + e^* \tag{2}$$

$$e^* = Q^*(D_m) + \varepsilon_m - s^* \tag{3}$$

The presented formalization is simple but clarifies the two main issues in the child care market. First, equation (3) shows that effort and quality rises with competition. Any surplus from a local monopoly is absorbed by the manager since the firm cannot monitor effort and adjust wages accordingly. At high levels of competition where $e^* < w$, the manager has no incentive to put in any effort and would prefer the 0 pay-off rather than a negative pay-off. Hypothetically, high levels of competition can even have a negative effect on quality. Second, the demand characteristics matter. In markets where parents do not demand higher process quality, there is less incentive to put in the effort required to supply it. Of course, many complications are left out of the model. While price variation is low, it does exist in the Dutch child care market. Similarly, centers can opt to have structural quality above that required by regulation or manage lower costs while complying with the regulations. Although our main hypothesis is that competition and process quality are positively related, the impact of competition on process quality remains a fundamentally empirical question.

4. Empirical Methodology

The method of estimation for the effect of competition on quality in class i of center j located in market m would ideally be a linear OLS regression such as equation 4, where x_{ijm} are class specific, z_{jm} are center specific and M_m are market or area level characteristics and v_{ijm} is the error term. Considering that observations from the same center are likely to have correlated unobservable characteristics, standard errors clustered at the center level need to be estimated for equation 4. The main interest is on variable ε_m, which is assumed to capture the effect of competition. Previous studies on competition and quality or firm performance have used variables such as market power, market share or concentration (Nickell, 1996). In the case of service sectors such as health care or schooling, competition a firm faces is usually measured by the number of firms operating nearby. In health care, Bloom et al. (2010) analyze the impact of competition on hospital quality using the density of hospitals in the area. Agasisti (2011) finds positive effects from competition on schooling outcomes to be driven the number of schools in the area. We follow the same line of reasoning as the literature on schooling and health care and measure competition in child care by em-

ploying the average number of daycare centers within three kilometers in the area to measure competition ε_m.

$$Q_{ijm} = \beta_0 + \beta_1 x_{ijm} + \beta_2 z_{jm} + \beta_3 M_m + \beta_4 \varepsilon_m + u_{ijm} \tag{4}$$

The main econometric concern is a possible endogeneity problem with regard to the competition variable. In terms of the theoretical framework presented, the potential endogeneity arises from a plausible correlation between the demand characteristics D_m not only with quality as assumed, but also with competition ε_m. While we later control for average income and the degree of urbanization in the area, not all demand characteristics can be included in the regression analysis. Dual income families in urban areas may have a strong preference to use daycare regardless of quality, leading to a downward bias in the OLS estimate of β_4. Additionally, more centers may be started in areas where care quality is low to in order to take over low quality centers' pupils, which would also lead to a negative relationship between the number of centers in an area and quality. Either way, there is an argument to be made for potential endogeneity issues in the ordinary least square (OLS) estimates which would place a downward bias on the estimated coefficients.

A reasonable instrument needs to be both valid, thus correlated with the independent variable, and exogenous from the error term. Competition has previously been instrumented using a proxy for the level of demand in the electricity sector (Fabrizio et al., 2007). To instrument the density of primary and secondary schools, a similarly demand side instrument is popular, namely the proportion of Catholics in the local area who historically tend to prefer private schools (Cohen-Zada, 2009). In the case of Dutch child care, number of children in the neighborhood would be the obvious choice as the demand side instrument. However, child density in the area needs to be included as an independent variable since positive shocks in the number of children can cause waiting lists in daycare centers which would hamper competition until supply can adjust. Instead, we use the density of primary schools in the area as an instrument. The density of primary schools acts as a lag of the potential demand in the area, allowing us to circumvent short-term shocks in fertility. More crucially, primary school attendance is mandatory unlike child care and omitted demand characteristics which may have an impact on quality can not have an impact on the number of primary schools needed in an area. Furthermore, as of 2009, primary schools are directed to help parents find out-of-school care. The legislation implies that there are economies of scale to having daycare centers and primary schools at the same location, which is already a common occurrence in the Netherlands. Thus, we expect that primary school density would both be related to the number of child care centers in an area

and exogenous from error term in equation (4). The first and second stages of the resulting estimation can be written as in equations (5) and (6). In all 2SLS estimates, standard errors clustered at the center level are specified.

$$\varepsilon_m = \gamma_0 + \gamma_1 x_{ijm} + \gamma_2 z_{jm} + \gamma_3 S_m + \gamma_4 M_m + v_{ijm} \tag{5}$$

$$Q_{ijm} = \beta_0 + \beta_1 x_{ijm} + \beta_2 z_{jm} + \beta_3 M_m + \beta_4 \hat{\varepsilon}_m + u_{ijm} \tag{6}$$

The relevance of competition in the child care sector with regard to quality can be estimated using equations 4 and 6. However, to identify the complete impact of competition on quality, we need to take into account the small variation in prices in the Dutch child care sector. Although price variation is limited in the Netherlands due to the government cap on subsidies, there is some variation which remains uncontrolled for in equation 6. Competition may drive down prices first and only then improve quality. For example, even disregarding small differences in prices might lead to an underestimation of the casual impact of competition on the overall quality-price level. Theoretically, price itself may be affected by the level of competition and including it as a control variable in equation 6 would lead to what Angrist and Pischke (2008) refer to as the 'bad control' problem. In the intuitively plausible case of a negative effect on prices from competition and positive effect from prices on quality, there would be an overestimation of the effects on quality if price is added as a control variable. Rather than including price as an independent variable, we make price a part of the dependent variable by estimating equation 7, where quality is divided by price. Equation 7 thus estimates the effect of competition on the quality-price ratio that the center offers rather than the effect of competition on the quality level itself.

$$\frac{Q_{ijm}}{P_{ijm}} = \beta_0 + \beta_1 x_{ijm} + \beta_2 z_{jm} + \beta_3 M_m + \beta_4 \hat{\varepsilon}_m + u_{ijm} \tag{7}$$

5. Data

Throughout this study, we make use of two data sources. Data on child care centers' quality and characteristics are obtained from the first wave (2010-2011) of the Pre-Cool survey that is being conducted in the Netherlands. Information at the neighborhood or municipality level for income, population, child care center and school density are retrieved from the Dutch Statistics (CBS). These two data sources are supplemented by information obtained from the child care centers' official websites and municipalities' inspection

Table 1: Average Process Quality in Pre-Cool Daycare Centers, 2010-2011

Process Quality Measures	Mean	Std. Dev.	Min.	Max
Emotional Support	5.01	0.6	2.8	6.2
Instructional Support	3.12	0.73	1.9	5.2

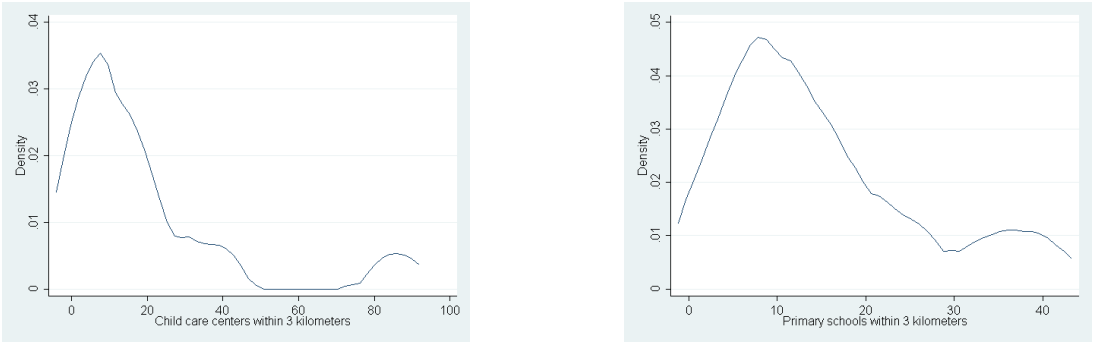
reports on the centers.

Unlike schooling where quality related variables such as graduation rates or grades are easily observable, child care quality is intrinsically more difficult to judge. The Pre-Cool survey includes observations by trained personnel who rate the process quality in a classroom according to the Classroom Assessment Scoring System (CLASS) used by development psychologists (Mashburn et al., 2008; Howes et al., 2008). Similar process quality instruments have been utilized by economists as well (Blau, 1997). A classroom is graded based on its performances in factors belonging to two large domains: emotional support and instructional support. The emotional support domain is constructed using four dimensions that classroom observers give grades on: positive climate, teacher sensitivity, behavior guidance and regard for child perspectives. The instructional support domain is made up of three dimensions: facilitation of learning and development, quality of feedback and language modeling. All dimensions within the domains are graded on a scale from 1 to 7, with 1 as the lowest and 7 the highest. [1]

There are 320 process quality observations from 68 daycare centers in the Pre-Cool sample. Multiple observations are made per center, allowing observers to rate both different groups and activities. Due to missing data issues, we make use of 245 observations from 34 daycare centers in the regressions. Table 1 presents the averages and standard deviations of quality measurements in all daycare centers within the sample, showing the state of child care quality in the Netherlands as a whole. Overall, process quality is above the average level of 4 for emotional support. On the other hand, the instructional support scores are below average, around 3. Compared to previous studies using CLASS, child care quality in Dutch centers appears to be slightly below Finnish and above or equal to that in American centers. Howes et al. (2008) find an average emotional support score of 5.29 and instructional support score of 2.20 in the United States while the average of the scores reported by Pakarinen et al. (2010) in Finland are 5.19 for emotional support and 3.97 for instructional support.

Directly taking the average of the various dimensions of instructional and emotional support domains

[1] More details on Pre-Cool observations and dimension scores can be found in Slot and Leseman (2012). Constructed variables and basic results of the Pre-Cool survey are to be made publicly available through the Dutch Data Archiving and Network Services (DANS). More information on DANS can be found at http://www.dans.knaw.nl/en, details of the Pre-Cool project is available in Dutch at http://www.pre-cool.nl/.



(a) Daycare Centers

(b) Primary Schools

Figure 1: Kernel Density Figures for the Number of Schools and Centers in the Neighborhood

ignores potential consistency problems between the measures and diminishes the variation between centers' quality levels. We make use of factor analysis to generate scores for emotional support and instructional support domains. In addition to the two domain variables, we construct an overall quality measure using all quality dimensions. The constructed summary variables from principal component analysis show a correlation well above 60% with all but one of the dimensions listed under both emotional support and instructional support. The exact factor loadings are presented in Appendix B. After normalization, the constructed summary variables have a mean of 0 and a standard deviation of 1.

Dutch Statistics provides data on the number of daycare centers within three kilometers of any neighborhood and the most commonly found 4 digit postcode in that neighborhood.[2] The number of centers variable is matched to the centers from the Pre-Cool survey using the centers' own postcodes and the most commonly found postcode in the neighborhood. In some cases, this meant that the average of the number of centers within 3 kilometers had to be used since there were multiple neighborhoods with the same 4 digit postcode as the center. The same method was followed for the primary school density in the area, which was measured using the Dutch Statistics variable that provides the average number of primary schools within three kilometers in a neighborhood. The kernel density figures showing the distribution of these two variables are shown in figure 1.

The regression analysis in section 5 includes a number of additional control variables. Number of children and adults in the classroom, and 14 dummies for possible activities that the children were doing during the observation period are included as classroom controls. The number of children and staff in the classroom are not values provided by the center but by the observers who were filling out the CLASS

[2] As a robustness check, we tried the number of centers within one kilometer as the competition variable. There were no significant changes in the results.

scales. Even though staff to child ratios are regulated in the Netherlands, there were still some variations in the number of adults present when the observations for process quality were made. Omitting activity controls can give a biased picture since they turn out to have a significant effect on all the domains. Clearly, whether children were eating or playing affects the CLASS scores in both instructional and emotional support domains.

At the center level, controls for center type, number of groups in the center, proportion of non-Dutch caregivers, whether a special educational program (VVE) is implemented, center age in years and the holding company' size are added. All center level variables are based on a survey filled by the center's managers. Center type is defined by a binary variable, with 1 indicating a nonprofit firm and 0 a for-profit firm. Some missing cases were completed using information from the centers' websites. The variable for the proportion of non-Dutch teachers is linear from 0 to 10. A value of 5 would mean that the manager thinks half the caregivers are from a minority background, at 10, the corresponding proportion is 100%. The VVE curriculum is designed and used as an educational program to improve language and academic abilities of the children similar to the Head Start program implemented in the USA. The VVE variable was checked and for some centers completed using the inspection reports published online by the municipalities. However, the municipality reports may not correctly reflect whether all the children in a center receive care based on the VVE curriculum since some centers have both VVE and non-VVE groups. Center age and holding company' size are both linear discrete variables and increase categorically. The holding company's size is measured by the number child care centers owned by it. The full list of categories can be found under the tables table 2. Two other center level controls were added but are excluded in the final analysis: proportion of minority children and total staff FTE. Adding these two controls leads to more missing observations without significantly changing the results.

Price information for 2012 and 2013 was collected from the official websites of the daycare centers. Price offers change depending on the daily, weekly and yearly use that the parents agree to. The prices on full-time child care were retrieved, with any existing offers for different number of days per week averaged. To harmonize data from different years, prices are assumed to have risen at the same rate as the subsidy cap which rose from €6.36 to €6.46 between 2012 and 2013. Most prices are in fact very close to the subsidy cap, with the average price in the resulting sample at €6.58 euros.

At the area level three further controls are added: average income of the population, the number of children per kilometer square and whether the municipality is defined as urban by Dutch Statistics. To control for income, average income per person in the neighborhood in which the child care center's 4 digit

postcode is most common is used. The child density variable defined as the number of children per kilometer square is extracted at the municipality level due to lack of data from 2011 at the neighborhood level. The control for urban areas is similarly at the municipality level. The municipality areas are larger than the neighborhood data used for the density of schools and daycare centers. Nevertheless, there are over 400 municipalities in the Netherlands, suggesting that any effects from these variables may be captured at the municipality level. Summary statistics for the main variables used in section 5 are presented in table 2.

Table 2: Summary Statistics of Dutch Daycare Centers

	Mean	Std. Dev.	Min	Max
Groups Controls				
# of children	9.59	2.78	2	15
# of adults	1.95	0.71	1	4
Center Controls				
# of groups	4.31	1.88	1	9
Days open	3.76	1.44	1	7
Firm size	3.3	1.14	1	4
Firm age	4.3	0.93	2	5
Non-Dutch Teachers	2.17	2.01	1	8
VVE	0.67	0.47	0	1
Hours open	10.43	1.02	1	9
Nonprofit foundation	0.43	0.5	0	1
Prices	6.58	0.29	5.41	6.89
Area Controls				
Income (x1000 euros)	20.33	4.71	13.4	65.5
Child density per km (x100)	1.17	0.98	0.06	2.91
Urban	0.21	0.4	0	1

Center age categories: <1 year, 1-2 years, 3-4 years, 5-10 years, >10 years.
Firm size categories (# of centers): 1, 2-5, 6-10, >10.

6. Main Results

Table 3 presents the OLS estimates of equation 4 for the two process quality domains and the overall quality score defined in the Classroom Assessment Scoring System (CLASS). Competition is measured by the average number of centers within 3 kilometers. The variable is in log form for easier interpretation and a better fit according to R-squared values in both OLS and 2SLS estimates, which indicates that the relationship between competition and quality is concave. The OLS estimates indicate that for both emotional support and instructional support, the relationship between competition and quality is positive and significant but not very large. A doubling in the child care density within 3 kilometers is correlated with higher quality of about a quarter of a standard deviation in these two domains. Given that the average

number of centers within 3 kilometers in our sample is 16.3, the increase from an extra center opened in the area is fairly small. The corresponding increase is slightly larger in the overall quality measure. The positive relationship between competition and quality is consistent for all three measures.

As discussed in section 3, we also estimate the impact of competition by instrumenting the number of daycare centers within 3 kilometers. The instruments are the average number of primary schools within 3 kilometers in the neighborhood and its square. As with daycare centers, higher numbers indicate a higher primary school density. The square term is included since the relationship between the density of child care centers and primary schools seems to be concave. Sargan tests indicate no overidentification problems. The F-test on the instruments in the first stage equation indicates an F-statistic of 24.79. According to the Monte Carlo simulations of Stock and Yogo (2002) our instruments are not weak. The first stage estimates are presented in Appendix A. We estimated all models using both Limited Information Maximum Likelihood (LIML) and 2SLS to ensure consistency and the LIML results seem to be the almost the same as 2SLS estimates.

The results of the 2SLS estimates can be seen on the right side of table 3. The child care center density variable is once again significantly positive in instructional support as well as the overall quality measure. The coefficient is about the same as the OLS estimates in all 2SLS. The most significant difference is in the emotional support domain where the 2SLS coefficient for the competition variable is insignificant. Whether there is any bias due to a correlation with omitted demand characteristics or companies tending to open new centers around lower quality centers is unclear. The results for the Dutch child care sector appears to be parallel to the findings in the literature on schooling and competition. Belfield and Levin (2002) report from the survey of American studies that while the impact of competition on school quality was significantly positive, they were also rather modest. The same conclusion may be appropriate for the Dutch child care sector, where a doubling of the number of centers within 3 kilometers improves overall quality by slightly more than a quarter of a standard deviation.

In both OLS and 2SLS estimates, the controls for the number of children and the number of adults at the classroom level are insignificant. A further F-test on the number of children and adults confirms that the staff to child ratio has insignificant effects. Some of the activity controls are significant. As would be expected, observations during free play or clearing up and transition phases tend to have lower scores compared to those during activities such as pretend play which involve group organization. At the center level, some of the control variables have significant effects both in OLS and 2SLS estimates. Center age has a positive effect while the number of groups in a center, number of hours a center is open for and the

proportion of teachers from minority backgrounds have a negative effect on process quality measures. The significant effects from the center age variable suggests that experience and establishment plays a role in providing higher quality care. Larger centers that are open for longer hours tend to be worse in terms of quality however, suggesting some trade-offs between a center's flexibility and quality.

While some center characteristics have significant effects, non-profit status is insignificant throughout which is in line with previous results in service sectors (Koning et al., 2007), but is contrary to the finding that non-profit centers provide better quality child care at least in markets with sufficient demand (Cleveland and Krashinsky, 2009). The contrary findings may be explained by our inclusion of the center age variable. Non-profit status is positively correlated with center age, which has a significant positive effect. The application of the VVE educational curriculum is also insignificant, which may be surprising since it is designed with the explicit goal of improving educational quality in early child care. The VVE variable only indicates whether there are any groups in a center that use the VVE curriculum rather than whether or not the observed group uses VVE. The resulting measurement error might account for the insignificant results we find.

The structure of the error term is critical in getting interpretable results when multiple observations from a single center are included in the dataset. Fitting the same linear regression without clustered errors and ignoring the fact that multiple observations of the same center are included in the data can lead to a different picture. Especially classroom variables, number of children and adults, have smaller standard errors if clustered standard errors are not used. The number of classroom controls that are used in this study is relatively limited. However, the finding that their significance drops once center effects are controlled for is consistent with the findings of Blau (2000) who concludes that structural factors do not have a very strong effect on process quality once center and area fixed effects are included in the analysis.

Child density, income and degree of urbanization at the municipality level have some discernable effects, though none of them have a significant effect in all estimations. Emotional support is especially higher in areas with more children and urban areas. It is difficult to speculate about the reason for the positive effects beyond to note that urban areas tend to have larger labor markets, which might improve the match quality between staff and centers. Income is surprisingly insignificant, which is likely due to the variable being based on the municipality level rather than the neighborhood level. We may be unable to capture income effects if within municipality variation of income is too large and the actual effects to center quality stem from the centers' immediate surroundings.

Table 3: Determinants of child care quality

	OLS			2SLS		
	Instructional Support	**Emotional Support**	**Overall Quality**	**Instructional Support**	**Emotional Support**	**Overall Quality**
Group Characteristics						
# of children	-0.014	-0.018	-0.02	-0.015	-0.017	-0.021
	(0.024)	(0.03)	(0.029)	(0.022)	(0.029)	(0.028)
# of adults	0.089	-0.005	0.049	0.089	-0.005	0.049
	(0.096)	(0.098)	(0.104)	(0.091)	(0.092)	(0.098)
Activity controls	Yes	Yes	Yes	Yes	Yes	Yes
Center Characteristics						
# of groups	-0.195***	-0.183***	-0.224***	-0.201***	-0.181***	-0.226***
	(0.044)	(0.05)	(0.05)	(0.045)	(0.054)	(0.052)
Days open	0.04	-0.015	0.016	0.038	-0.014	0.016
	(0.055)	(0.06)	(0.061)	(0.051)	(0.058)	(0.057)
Firm size	0.095	0.216	0.178	0.094	0.217*	0.177
	(0.11)	(0.128)	(0.134)	(0.103)	(0.119)	(0.125)
Center age	0.211**	0.253***	0.271***	0.207***	0.254***	0.270***
	(0.079)	(0.08)	(0.085)	(0.072)	(0.074)	(0.077)
Non-Dutch teachers	-0.134**	-0.197***	-0.192***	-0.144**	-0.194***	-0.195***
	(0.061)	(0.058)	(0.066)	(0.061)	(0.07)	(0.071)
VVE programme	-0.107	-0.225	-0.19	-0.129	-0.217	-0.198
	(0.213)	(0.229)	(0.244)	(0.201)	(0.228)	(0.229)
Hours open	-0.219***	-0.187***	-0.242***	-0.221***	-0.187***	-0.243***
	(0.069)	(0.068)	(0.076)	(0.065)	(0.063)	(0.071)
Non-profit foundation	0.149	0.021	0.096	0.169	0.013	0.104
	(0.215)	(0.247)	(0.257)	(0.195)	(0.216)	(0.225)
Area Characteristics						
# of centers (3km)	0.250***	0.220**	0.280***	0.284***	0.208	0.293**
	(0.088)	(0.09)	(0.098)	(0.104)	(0.133)	(0.122)
Income	-0.036*	0.024	-0.009	-0.039*	0.025	-0.01
	(0.022)	(0.024)	(0.025)	(0.021)	(0.025)	(0.024)
Child density	0.038	0.365**	0.227	0.05	0.360**	0.232
	(0.159)	(0.143)	(0.167)	(0.147)	(0.144)	(0.157)
Urban area	0.344	0.825*	0.682	0.408	0.801*	0.706*
	(0.381)	(0.415)	(0.452)	(0.351)	(0.427)	(0.425)
# of centers	34	34	34	34	34	34
Observations	253	253	253	253	253	253
Sargan test (p-value)	-	-	-	0.19	0.65	0.33
F-test instruments	-	-	-	24.79	24.79	24.79

Activity categories: literacy, circle, pretend play, creative, educational, fine motor, gross motor, science, music/dance, clearing-up/transition, eating/drinking, construction play, free play, outdoor play, rest. Center age categories: <1 year, 1-2 years, 3-4 years, 5-10 years, >10 years. Firm size categories (# of centers): 1, 2-5, 6-10, >10.

6.1. Number of Births an Alternative Instrument

The results so far suggest that the OLS and 2SLS estimates are not significantly different when the number of schools in the area is used as an instrument for the number of daycare centers. There is however the possibility that our initial instrument, the number of schools, may not be exogenous from quality in child care centers or its relevance to the number of daycare centers may be spurious. As an alternative instrument and robustness check, we use the number of births in the neighborhood obtained from Dutch Statistics. The assumption is that neighborhoods with more births will also have more daycare centers due to higher demand. Clearly, larger neighborhoods may have more total births while having a lower child density. As such, the total number of births are divided by the surface area of the neighborhoods to obtain a birth density variable which is used in log form. Fertility shocks and their impact on waiting lists would normally make the birth density a suspect instrument. To avoid a potential endogeneity problem, data for the number of births are lagged two years and are from 2009 as opposed to the number of daycare centers data which are from 2011. The number of daycare centers would presumably adjust to increases or decreases in fertility rates within two years. Further lags in the number of births variable is not possible due to large number of missing cases.

Table 4 shows the results for 2SLS estimates using birth density as an instrument for the number of daycare centers. On the right side of the table, estimates using both the number of schools and birth density as instruments are shown. There do not seem to be any overidentification problems according to the Sargan test and the F-test on the instruments are all larger than 10. The effects of competition seen in table 4 do not qualitatively differ from the initial findings presented in table 4. The competition variable is significantly positively related to child care quality in all estimates. However, the estimates using birth density as an instrument for competition show considerably larger effects from competition than those using only the number of schools or the OLS estimates. Taken together, the results indicate that the positive impact from competition on child care quality is quite robust to alternative instruments, while the predicted downward bias in OLS estimates is less obvious.

6.2. Competition and Quality-Price Ratio

From a perspective of child development and externalities from child development, quality of child care may be the most crucial aspect. However, parents' utility presumably depends on both prices and quality of available child care. While the impact of competition on quality is perhaps socially more relevant, the price-quality ratio would be a better measure of how competition affects the consumer surplus in the child care

Table 4: Alternative instruments for estimating the impact of competition

Instrument:	Birth Density			Birth Density + # of Schools		
	Instructional Support	**Emotional Support**	**Overall Quality**	**Instructional Support**	**Emotional Support**	**Overall Quality**
Group Characteristics						
# of children	-0.023	-0.022	-0.028	-0.018	-0.019	-0.023
	(0.026)	(0.029)	(0.03)	(0.023)	(0.028)	(0.028)
# of adults	0.09	-0.005	0.05	0.089	-0.005	0.049
	(0.099)	(0.095)	(0.106)	(0.093)	(0.093)	(0.1)
Activity controls	Yes	Yes	Yes	Yes	Yes	Yes
Center Characteristics						
# of groups	-0.259***	-0.214***	-0.281***	-0.222***	-0.193***	-0.246***
	(0.079)	(0.067)	(0.082)	(0.052)	(0.055)	(0.058)
Days open	0.021	-0.024	0	0.032	-0.017	0.01
	(0.049)	(0.054)	(0.053)	(0.049)	(0.056)	(0.055)
Firm size	0.08	0.209*	0.164	0.089	0.214*	0.172
	(0.11)	(0.12)	(0.13)	(0.104)	(0.119)	(0.125)
Center age	0.166*	0.231***	0.232**	0.192**	0.246***	0.256***
	(0.098)	(0.084)	(0.099)	(0.077)	(0.076)	(0.081)
Non-Dutch teachers	-0.238**	-0.249***	-0.284**	-0.179**	-0.214***	-0.228***
	(0.11)	(0.087)	(0.112)	(0.071)	(0.07)	(0.077)
VVE programme	-0.339	-0.339	-0.396	-0.206	-0.261	-0.271
	(0.214)	(0.24)	(0.248)	(0.187)	(0.223)	(0.219)
Hours open	-0.243***	-0.199***	-0.264***	-0.229***	-0.191***	-0.251***
	(0.066)	(0.065)	(0.073)	(0.063)	(0.063)	(0.07)
Non-profit foundation	0.363*	0.127	0.287	0.24	0.054	0.171
	(0.22)	(0.213)	(0.232)	(0.185)	(0.208)	(0.212)
Area Controls						
# of centers (3km)	0.612**	0.399*	0.602**	0.404***	0.277**	0.406***
	(0.277)	(0.218)	(0.286)	(0.126)	(0.135)	(0.14)
Income	-0.062**	0.011	-0.032	-0.047**	0.02	-0.018
	(0.03)	(0.024)	(0.03)	(0.022)	(0.024)	(0.024)
Child density	0.172	0.431***	0.346*	0.095	0.386***	0.273*
	(0.197)	(0.166)	(0.202)	(0.156)	(0.147)	(0.165)
Urban area	1.025	1.161**	1.288*	0.634	0.932**	0.919**
	(0.637)	(0.589)	(0.7)	(0.389)	(0.449)	(0.465)
# of centers	34	34	34	34	34	34
Observations	253	253	253	253	253	253
Sargan test (p-value)	-	-	-	0.16	0.5	0.26
F-test instruments	14.34	14.34	14.34	30.96	30.96	30.96

Activity categories: literacy, circle, pretend play, creative, educational, fine motor, gross motor, music/dance, clearing-up/transition, eating/drinking, free play. Center age categories: <1 year, 1-2 years, 3-4 years, 5-10 years, >10 years. Firm size categories (# of centers): 1, 2-5, 6-10, >10.

market. For example, if the average price falls in an area while quality is raised, the rise in the consumer surplus may be larger than that implied by the results in table 3. To that end, the dependent variable is reconstructed as the quality measure divided by price in euros as shown in equation 7. The price data are either from or adjusted to 2012. Since price information was collected after the Pre-Cool survey of 2011, there is a time lag between the remainder of the variables used in the analysis and the prices. One center had disappeared since the process quality observations were made and no price information could be found. The results for the remaining 33 centers for the determinants of the overall child care quality-price ratio are presented in table 5.

The effects on the quality-price ratio is in line with those for the quality levels. For all estimation procedures and instruments, there is a significant positive effect from competition on the quality-price ratio. To detect whether the introduction of prices changes the main results found in table 3, the coefficients can be multiplied by the average price in the sample. In case of the 2SLS estimate using the number of schools and its square as the instruments, the coefficient is calculated to be 0.265 for the level of quality, which is almost the same as the coefficient of 0.28 found in the corresponding estimate without prices. The introduction of prices to the analysis thus does not significantly change the estimated effect on the quality measures. The difference is also small for the estimate that uses both birth density and the number of schools as instruments. The coefficient for the quality level is given as 0.406 while the effect on quality can be calculated to be 0.426. At least in the Dutch case, competition does not appear to result in a race to the bottom in terms of prices and the impact of competition is limited to the quality aspect.

6.3. (Lack of) Competition in the Playgroup Sample

While the results so far suggest a positive effect from the number of daycare centers in the area on child care quality in daycare centers, this does not necessarily lead to the conclusion that competition improves quality. Competition would presumably drive centers to copy each other's best practices, leading to higher quality. However, centers can benefit from spillover effects regardless of actual competition. Alternatively, other supply side explanations such as a larger caregiver labor market in the area might account for the positive relationship between daycare center density and quality.

To understand whether competition is truly driving the results, we make use of the differences between the financing and demand characteristics of playgroups and daycare centers in the Netherlands. While daycare centers operate within a market with demand side considerations and have to attract parents, playgroups targeted towards 2 year olds are financed directly by municipalities. In addition, since daycare

Table 5: Determinants of child care quality-price ratio

	OLS	2SLS		
Instruments		**# of schools**	**Birth density**	**# of schools + birth density**
Group Characteristics				
# of children	-0.002	-0.002	-0.003	-0.002
	(0.005)	(0.004)	(0.004)	(0.004)
# of adults	0.006	0.006	0.003	0.005
	(0.015)	(0.015)	(0.017)	(0.015)
Activity controls	Yes	Yes	Yes	Yes
Center Characteristics				
# of groups	-0.034***	-0.034***	-0.043***	-0.037***
	(0.008)	(0.008)	(0.013)	(0.009)
Days open	0.001	0.001	0.001	0.001
	(0.01)	(0.009)	(0.009)	(0.009)
Firm size	(0.027	0.027	0.023	0.025
	(0.021)	(0.019)	(0.02)	(0.019)
Center age	0.040***	0.040***	0.036***	0.039***
	(0.013)	(0.012)	(0.014)	(0.012)
Non-Dutch teachers	-0.028**	-0.028**	-0.046**	-0.035**
	(0.011)	(0.012)	(0.021)	(0.014)
VVE programme	-0.032	-0.032	-0.053	-0.041
	(0.037)	(0.035)	(0.034)	(0.033)
Hours open	-0.038***	-0.038***	-0.041***	-0.039***
	(0.012)	(0.011)	(0.012)	(0.011)
Non-profit foundation	0.013	0.013	0.038	0.023
	(0.04)	(0.035)	(0.036)	(0.033)
Area Characteristics				
# of centers (3km)	0.040**	0.040*	0.101*	0.065**
	(0.018)	(0.024)	(0.056)	(0.03)
Income	-0.001	-0.001	-0.004	-0.002
	(0.004)	(0.004)	(0.004)	(0.004)
Child density	0.032	0.032	0.054	0.041
	(-0.026)	(0.025)	(0.035)	(0.027)
Urban area	0.102	0.102	0.227*	0.152*
	(0.074)	(0.074)	(0.137)	(0.088)
# of centers	33	33	33	33
Observations	235	235	235	235
Sargan test (p-value)	-	0.35	-	0.27
F-test instruments	-	21.04	11.68	20.75

Activity categories: literacy, circle, pretend play, creative, educational, fine motor, gross motor, music/dance, clearing-up/transition, eating/drinking, free play. Center age categories: <1 year, 1-2 years, 3-4 years, 5-10 years, >10 years. Firm size categories (# of centers): 1, 2-5, 6-10, >10.

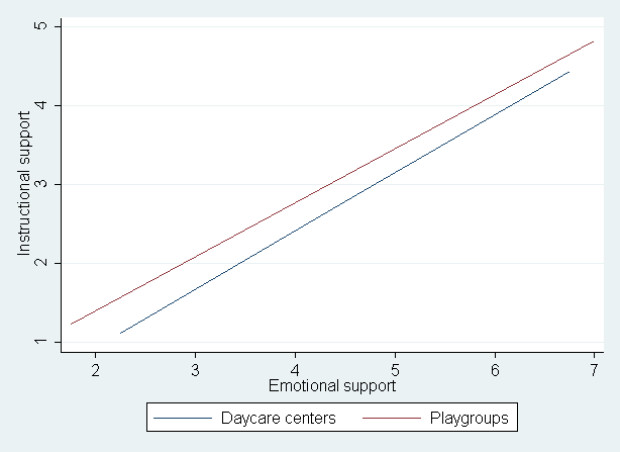


Figure 2: Quality in daycare centers and playgroups

subsidies are only available for working parents, playgroups are used by single earner families while daycare centers are used by dual income families. Unlike public and private schools which compete for the same students (Dee, 1998), the resulting degree of substitutability between daycare centers and playgroups is bound to be limited. Limited substitutability implies that daycare centers and playgroups do not operate within the same market even if they are in the same neighborhood and that there is little to no competition between the two center types. Despite limited substitutability on the demand side, the inputs used in daycare centers and playgroups are perfectly substitutable. Many daycare centers apply the VVE educational curriculum that most playgroups use and the required minimum staff qualifications do not differ. Both child care types are judged on the same quality metric in the Pre-Cool survey. Although playgroups score slightly higher than daycare centers on instructional support, the average scores for instructional and emotional support are similar as shown in figure 2. Alternative supply side explanations for the effects of center density besides competition, such as spillover effects or a wider labor market would be expected to have effects in playgroups as well since they essentially provide the same service in a different shape and employ from the same labor pool.

We test whether the effect of center density on quality is driven by competition by fitting the same regressions shown by equations 4 and 6 to a sample of 36 playgroups. For the 2SLS estimates the number of schools and its square are the instruments and the choice of instrument does not influence the results. Table 6 shows no significant effects in OLS or 2SLS estimates on overall quality of playgroups from the competition variable. The non-significance of the effects of center density on playgroups should not give the impression that daycare centers have a higher overall level of quality because of competition. In fact,

table 2 already showed that the average quality levels are remarkably similar. Interestingly, the number of adults and children in the classroom which had no effects on daycare quality appear to have significant effects in playgroups. The significant effects may be due to the slightly larger variation in staff to child ratios among the playgroup sample. In addition, the lack of market competition may be prioritizing the importance of structural characteristics and the investments made within the classroom in explaining the variation in quality among playgroups.

7. Conclusions

This paper analyzed the relationship between competition and child care quality in the Dutch child care sector using process quality measures and an instrumental variables strategy. Results indicate that there is evidence of positive effects from competition on child care quality, both in emotional support and instructional support domains of the CLASS scale. Despite worries of information asymmetry problems limiting parents' ability to demand and choose higher quality care, competition appears to improve the scores of Dutch child care centers in process quality measurements. These results fit in with the empirical literature on competition and firm performance in schooling and other sectors and supports the fundamental hypothesis that competition can improve quality and performance.

The finding suggests that the drop in quality observed the Dutch Consortium of Child Care Research (NCKO) after the Child Care Act of 2005 is more likely to be related to the enormous growth in the supply of child care rather than competition between private centers. In fact, latest findings by the NCKO suggest that the quality level has stabled and has risen since 2008 (NCKO, 2013). Dutch centers appear to compete on quality rather than in price, implying that there is little evidence for a race to the bottom. In our analysis, including or excluding price information in the analysis had no effect on the estimated impact of competition on quality.

It is important to note that our analysis is on the effect of competition on quality within a market with structural and price regulations. These two preconditions, if necessary, already place child care provision into a strictly controlled and regulated market compared to most other goods and services. Further studies on the impact of competition in contexts with varying structural regulations and price levels may be needed to see whether competition has a positive effect on under different governance systems.

Table 6: Determinants of quality in playgroups

	OLS			2SLS		
	Instructional Support	**Emotional Support**	**Overall Quality**	**Instructional Support**	**Emotional Support**	**Overall Quality**
Group Characteristics						
# of children	-0.023	-0.052***	-0.047*	-0.022	-0.052***	-0.046**
	(0.024)	(0.018)	(0.024)	(0.023)	(0.017)	(0.022)
# of adults	0.291***	0.373***	0.400***	0.283***	0.372***	0.396***
	(0.077)	(0.087)	(0.086)	(0.072)	(0.081)	(0.08)
Activity controls	Yes	Yes	Yes	Yes	Yes	Yes
Center Characteristics						
# of groups	0.026	0.026	0.025	0.025	0.026	0.023
	(0.046)	(0.034)	(0.046)	(0.044)	(0.032)	(0.043)
Days open	0.183	0.271**	0.280**	0.181	0.270***	0.278**
	(0.12)	(0.104)	(0.12)	(0.113)	(0.099)	(0.116)
Firm size	-0.02	0.09	0.04	-0.029	0.088	0.034
	(0.145)	(0.093)	(0.141)	(0.144)	(0.087)	(0.138)
Center age	-0.298*	-0.228	-0.312**	-0.339**	-0.237*	-0.347***
	(-0.166)	(-0.14)	(-0.137)	(-0.149)	(-0.137)	(-0.122)
Non-Dutch teachers	0.137**	0	0.089	0.147**	0.002	0.097
	(0.059)	(0.052)	(0.062)	(0.057)	(0.049)	-0.059)
VVE programme	0.13	0.123	0.143	0.13	0.123	0.143
	(0.18)	(0.18)	(0.176)	(0.161)	(0.168)	(0.158)
Hours open	-0.036	0.023	-0.004	-0.04	0.023	-0.007
	(0.075)	(0.059)	(0.075)	(0.074)	(0.056)	(0.073)
Non-profit foundation	-0.063	-0.192	-0.139	-0.102	-0.201	-0.175
	(0.2)	(0.258)	(0.242)	(0.186)	(0.251)	(0.228)
Area Characteristics						
# of centers (3km)	0.06	0.139	0.105	-0.023	0.12	0.033
	(0.104)	(0.083)	(0.102)	(0.116)	(0.113)	(0.115)
Income	0.018***	-0.001	0.011**	0.016***	-0.001	0.010*
	(-0.006)	(-0.006)	(-0.005)	(-0.006)	(-0.006)	(0.005)
Child density	-0.204*	-0.296**	-0.299***	-0.134	-0.280**	-0.239*
	(0.114)	(0.117)	(0.1)	(0.127)	(0.138)	(0.122)
Urban area	0.127	0.766***	0.467	-0.009	0.735***	0.351
	(0.465)	(0.22)	(0.401)	(0.402)	(0.24)	(0.355)
# of centers	36	36	36	36	36	36
Observations	235	235	235	235	235	235
Sargan test (p-value)	-	-	-	0.73	0.17	0.43
F-test instruments	-	-	-	8.53	8.53	8.53

Activity categories: literacy, circle, pretend play, creative, educational, fine motor, gross motor, music/dance, clearing-up/transition, eating/drinking, free play. Center age categories: <1 year, 1-2 years, 3-4 years, 5-10 years, >10 years. Firm size categories (# of centers): 1, 2-5, 6-10, >10.

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Appendix A

Table .1: First Stage Estimates

		Daycare		Playgroup
# of children	0.046*	0.038*	0.045**	0.034
	(0.022)	(0.022)	(0.021)	(0.026)
# of adults	-0.089	-0.006	-0.065	-0.213
	(0.072)	(0.101)	(0.068)	(0.182)
Activity controls	Yes	Yes	Yes	Yes
# of groups	0.087*	0.136**	0.092**	0.141**
	(0.046)	(0.061)	(0.042)	(0.064)
Days open	-0.015	-0.034	-0.037	0.039
	(0.062)	(0.048)	(0.048)	(0.184)
Firm size	0.059	-0.017	0.018	-0.474**
	(0.083)	(0.083)	(0.075)	(0.204)
Center age	0.151	0.039	0.094	-0.372
	(0.105)	(0.107)	(0.104)	(0.221)
Non-Dutch teachers	0.092	0.171**	0.1	0.172**
	(0.08)	(0.064)	(0.06)	(0.072)
VVE programme	0.197	0.470**	0.235	-0.322
	(0.202)	(0.203)	(0.193)	(0.344)
Hours open	0.142**	-0.005	0.084	-0.398**
	(0.052)	(0.055)	(0.052)	(0.149)
Non-profit foundation	-0.452**	-0.559**	-0.462**	0.296
	(0.221)	(0.235)	(0.21)	(0.372)
Income	0.085***	0.051*	0.070***	0.002
	(0.026)	(0.03)	(0.025)	(0.01)
Child density	-0.265*	-0.502***	-0.361***	-0.637
	(0.139)	(0.127)	(0.121)	(0.43)
Urban area	-0.700**	-0.979**	-0.568*	-0.762
	(0.285)	(0.415)	(0.289)	(0.514)
# of schools (3km)	0.185***		0.139***	0.234***
	(0.04)		(0.04)	(0.066)
# of schools (3km)sq	-0.003***		-0.002**	-0.002*
	(0.001)		(0.001)	(0.001)
Birth density		0.602***	0.297*	
		(0.159)	(0.149)	
Observations	253	253	253	238
# of centers	34	34	34	36

Appendix B

Table .2: Factor loadings for daycare quality measures

	Emotional Support	**Instructional Support**	**Overall Quality**
Emotional Support			
Positive climate	0.745		0.727
Teacher sensitivity	0.771		0.721
Regard for child perspectives	0.258		0.271
Behavior guidance	0.635		0.619
Instructional Support			
Facilitation of learning and development		0.72	0.718
Quality of feedback		0.753	0.709
Language modelling		0.788	0.764