

The Effect of Child-Staff Ratios on Care Choice, Availability and Parent Employment

Alyssa R. Russell

July 29, 2022

Abstract

Child-staff ratios are an important and prevalent childcare regulation that indicate the maximum number of children allowed to be cared for by each staff member. They are intended to improve the quality of care in childcare centres, but they might have unintended consequences. This study analyzes whether child-staff ratios cause a substitution away from regulated centre-based care toward less-regulated (and lower quality) home-based care. I also analyze whether ratios have an impact on childcare availability and parent employment. I use Canadian survey data and utilize variation in child-staff ratios across provinces and by child age to identify these effects. I find that stringent ratios decrease the probability that parents will use centre-based care for their child, and, interestingly, this effect is larger for high-income parents. This is likely because high income parents receive less in subsidies for childcare, causing them to move to cheaper forms of care. I also find that stringent ratios cause parents (especially mothers) to work less. Overall, this study highlights several drawbacks to an important childcare regulation that should be considered as new childcare policy is developed.

1 Introduction

Child-staff ratios indicate the maximum number of children allowed to be cared for by each qualified childcare educator. They are a common regulation in many developed nations, including Canada, the U.S., and many European countries. Implementing a maximum ratio is thought to improve the quality of care by ensuring that staff can properly and safely care for children. Additionally, lower ratios may improve child behaviour by reducing instances of teasing or bullying among children and increasing involvement in activities (Russell, 1990). However, as with many policies, there may be unintended consequences associated with child-staff ratios. Indeed, ratios place a lower-bound on the required number of staff members, which will likely raise labour costs. The increased labour costs might be passed onto consumers through higher parent fees, which may decrease enrolment, especially for low-income and minority groups (Gorry and Thomas, 2017).¹ Ratios also directly limit the number of available childcare spaces, which can make it harder for parents to access care for reasons other than price increases.

Given the potential drawbacks of child-staff ratios, this study addresses three potential concerns. The first is that lower (more stringent) ratios might force children out of the more-regulated, centre-based childcare establishments into less-regulated, home-based daycares. This seems like a plausible outcome, given that ratios directly limit the number of children allowed to be cared for by a single educator. Additionally, ratios might decrease the number of childcare centres in a given market, which would also limit the number of available spaces Hotz and Xiao (2011). Assuming that childcare centres are better quality than home daycares, this would imply that less children have access to high-quality care. As such, I analyze whether parents are more likely to choose home-based care over centre-based care as a result of child-staff ratios, and whether these effects differ across demographics.

The second concern is that ratios will reduce availability of regulated childcare as seen by increased waitlist lengths, for example. Typically, children must be placed on a waiting list before

¹It is also possible that the higher costs are passed onto educators via reduced wages, which would be concerning given that low wages are associated with higher turnover and lower care quality Blau (2007).

being confirmed a place in a childcare centre, and these waitlist times might be longer if ratios are lower. Thus, it is interesting to analyze whether stringent ratios are associated with longer waitlist times. I analyze this association, and also consider whether ratios are associated with increased parent dissatisfaction with childcare availability in the parent's community. These results provide an indication of the effect of child-staff ratios on childcare shortages, in addition to the substitution between care types discussed above.

Finally, given that ratios might decrease access to and availability of care, I analyze whether ratios have any impact on parent employment. Indeed, an important function of childcare is to increase parent participation in the labour force, especially for women. If ratios reduce the availability of care, then they may also decrease the number of parents who are employed. As such, I analyze whether ratios have an impact on parent employment status, and if so, how the effect differs by gender.

I utilize survey data from 2011, 2017 and 2020 to construct a panel dataset with variables on a child's age, their main form of care, and several family characteristics, such as education and main activity of the parent(s) and household income. I know each child's province of residence, which allows me to match each child with the relevant child-staff ratio. One issue with identifying the causal effect of child-staff ratios in Canada is that the ratios, or regulations more generally, do not change in the time period considered. This means that I lack within-province variation. That is, the ratios only vary *across* provinces, which means that any estimated effects will be susceptible to endogeneity due to underlying differences in province characteristics. However, because the ratios vary by age of the child, I am able to create some within-province variation by assigning each child a ratio based on their age and province of residence. This variation allows me to control for both province and age fixed effects. This is, in essence, a two-way fixed effects approach without variation in the treatment over time.

The existing literature on childcare regulations suggests that there may be some unintended negative consequences associated with these policies (e.g., Blau, 2007; Hotz and Xiao, 2011). This literature is somewhat limited in what it can analyze, however, due to the use of primarily

centre-level data. Centre-level data allows researchers to observe the number of staff members and their wages, revenue, business type, and other establishment characteristics. Thus, these studies are limited to analyzing supply-side effects. To my knowledge, there is no existing literature directly analyzing how consumer (parent) childcare decisions are affected by regulations. My paper provides a unique contribution by utilizing survey data that contains consumer demographics. Additionally, the existing studies are somewhat outdated, as they use data from the 1990's. It seems especially relevant to use newer data, given recent changes in childcare markets. Indeed, female participation in the labour force is increasing, which should increase demand for childcare, and many governments are expanding funding in the childcare sector.² By using data covering 2011 to 2020, I provide an updated analysis on the consequences of an important childcare regulation.

The results indicate that child-staff ratios have a small but statistically significant impact on the probability that a parent will choose to use centre-based care for their child. Higher (less stringent) ratios make it more likely that a child will use centre-based care. The reason for this could be because higher ratios reduce labour costs for centres, which might reduce parent fees. Alternatively, higher ratios might increase the number of available spaces, which would make centre-based care more accessible. Additionally, this effect is larger for high income families. Smaller ratios appear to reduce the probability that high-income families use centre-based care by more than it reduces the same probability for low-income families. This is an interesting finding, given that one might expect low-income families to be more affected by the implementation of costly regulations. However, the childcare benefits that many low-income families receive might explain this result.

The findings also indicate that imposing stringent ratios decreases parent employment, and the effect is larger for females. That is, low ratios cause female survey respondents to spend less time working relative to male respondents. This finding highlights the importance of childcare to female participation in the labour force. Imposing stringent ratios may limit availability of care,

²For example, B.C. is expanding its \$10-a-day childcare program: <https://www.10aday.ca/>

which has the unintended consequence of reducing female employment if mothers have to care for children instead.

The remainder of the paper is structured as follows. The following section describes the motivation behind regulating the childcare market and discusses the limitations of such regulations. Section 3 describes the data, section 4 the methodology, and section 5 the results. Lastly, a concluding discussion is provided in section 6.

2 Policy Motivation

Regulations are necessary in childcare markets due to several market failures. First, parents might not fully perceive the quality of care provided in centres due to information asymmetry. While parents seem to consistently overestimate quality, they do not utilize all available information when assessing quality (Mocan, 2007). Because of this, centres will have little incentive to produce high-quality care. This will result in an under-provision of high-quality childcare. Moreover, less-educated parents tend to have less-accurate perceptions of quality, meaning that low income markets might have an even lower incentive to provide high-quality care (Mocan, 2007).

The second market failure observed in childcare markets is a positive externality. It is thought that childcare improves cognitive development, such as by improving test scores in later years (Felfe *et al.*, 2015; Drange and Havnes, 2019). Such external benefits might not be considered by parents when making childcare decisions, which may result in less children ending up in high-quality care. Again, this would lead to an under-provision of high-quality childcare. Other external benefits include increased parent employment (Lefebvre and Merrigan, 2008).

These two market failures provide justification for governments to regulate childcare markets by attempting to increase the quality of care. However, it is difficult (if not impossible) to place regulations on quality itself. Instead, regulations are placed on the structural measures of quality, including child-staff ratios. However, there are concerns that the mapping between the structural measures of quality and quality itself is weak, which limits the ability of regulations to

improve quality (e.g., Scarr *et al.*, 1994; Anderson and Levine, 1999; Rigby *et al.*, 2007). This is a concern given the high costs of imposing such regulations. Given these potential limitations, the current study aims to more closely identify the negative consequences of child-staff ratios, one of the most important and common regulations. Exposing the ‘costs’ of this regulation helps to determine whether the regulation should be implemented in the first place, and if so, to what extent. The results also provide justification for implementing policy aimed at mitigating any unintended effects of these ratios.

3 Data

3.1 Regulation Data

I obtain information on each province’s child-staff ratio by age group from province websites. This information was relatively easy to find and access. However, each province defines their age groups slightly differently, which means that ages do not line up perfectly across the provinces. For example, in some provinces, children less than 12 months old will be in a different age grouping than those aged 12 to 18 months, but in some provinces, these children will be grouped together. To combat this minor issue, I record the ratios in six-month groupings, except for children younger than 12 months and older than three years—in this case, I record the ratios in 12-month groupings, because there is less variation in how the age groups are defined across the provinces. There are still two instances where the province-defined age groups do not line up with the age groups that I defined. This occurs in (1) Alberta, which uses 19 months as a cutoff point between age groups, and (2) Prince Edward Island, which uses 22 months as a cutoff. As a simple solution to match my age groupings, I round 19 months to 18 months and 22 months to 24 months. I don’t suspect that this will bias the results in any major way.

Next, because I only know each child’s age in years, I average the ratio across each age to get the child-staff ratio for each province and each age in years. This is displayed in Table 1. As seen, there is a good amount of variation across provinces and within provinces. For example, the

average ratio for 1 year old's ranges from 3 children per staff member up to 6.5 children per staff member. In several provinces, the ratio ranges from 3 children per staff member for infants to 10 children per staff member for 4 year old's. This variation is essential when identifying the causal effects of this regulation.

Table 1: Child-Staff Ratio by Province and Age Group

	0 yrs	1 yrs	2 yrs	3 yrs	4 yrs
BC	4.0	4.0	5.0	8.0	8.0
AB	3.0	5.0	6.0	8.0	10.0
SK	3.0	4.0	7.5	10.0	10.0
MB	3.0	4.0	6.0	8.0	9.0
ON	3.3	4.2	6.5	8.0	8.0
QC	5.0	6.5	8.0	8.0	10.0
NB	3.0	3.0	5.0	8.0	10.0
NS	4.0	6.0	6.5	8.0	8.0
PE	3.0	3.0	5.0	10.0	10.0
NL	3.0	3.5	5.0	8.0	8.0
Avg	3.43	4.32	6.05	8.40	9.10
S.d.	0.69	1.18	1.09	0.84	0.99

3.2 Survey Data

I combine three sources of survey data to construct a unique panel dataset with observations in 2011, 2017 and 2020. The data for 2011 and 2017 comes from the General Social Survey (GSS) Family module, while the data for 2020 comes from the Survey on Early Learning and Child Care Arrangements (SELCCA). Both surveys are conducted by Statistics Canada and ask similar questions. I next discuss the details of each survey and how I construct the dependent variables.

3.2.1 General Social Survey

The General Social Survey (GSS) Family module asks questions related to the respondent's relationship status (e.g., single, married or common-law), parents and grandparents, children and

grandchildren, as well as various socioeconomic factors. In particular, the survey asks questions related to the respondent's childcare decisions for each of their children. The survey covers people 15 years of age or older living in the 10 provinces. Because I am only interested in respondents with children that are infants, toddlers or preschool age, I subset the data to only include respondents with at least one child age five or below. I include each child as a separate observation, regardless of whether two or more children are in the same family. Thus, there are some children in the sample who are siblings. I do not suspect that this will cause any major issues, since there are relatively few instances where this occurs.³

3.2.2 Survey on Early Learning and Child Care Arrangements

The Survey on Early Learning and Child Care Arrangements (SELCCA) asks similar child-care-related questions as the GSS Family module, as well as questions relating to preferences for different types of childcare, reasons for not using childcare and challenges faced when finding suitable care. Because this survey is focused on childcare-related questions rather than families in general, the respondent pool is limited to parents with at least one child age five or below. Each respondent is asked about *one* of their children, even if they have more than one child younger than six. This differs from GSS, where parents are asked about each of their children.

3.2.3 Constructing Variables

Each year of survey data varies slightly in the phrasing of questions and in the types of questions that it asks. As such, it is not always straightforward to define each variable, particularly the variables related to main childcare type (i.e., 'Main care: Centre-based' and 'Main care: Home-based' in Table 2), which are two of the dependent variables in this study. In the 2011 GSS survey, respondents are first asked whether they have used any form of childcare in the previous 12 months

³This would cause issues if childcare decisions are correlated across siblings. For example, if one child attends a childcare centre, then the parent may want their other child to attend the same centre out of convenience. A potential solution would be to randomly select one child from each respondent and drop the others, but this would reduce the sample size and result in a loss of precision.

for a specific child (the respondent is asked about each child separately). They are only asked about their children aged 4 or below, meaning I lack childcare data for 5 year old's who are not yet in Kindergarten. Next, if the child has used some form of childcare in the previous 12 months, the respondent is asked whether this childcare is regular or irregular (whether it is at the same place every week). If the respondent states that the childcare occurs regularly, they are then asked about the type of care arrangement. Thus, I lack childcare data for children who use care irregularly.⁴ For those who answer that care occurs regularly, they are asked whether this care is (1) a licensed home daycare, (2) a daycare, (3) a preschool/nursery school, (4) a private arrangement (e.g., a relative or nanny), (5) older brothers or sisters, or (6) some other type of arrangement. If the respondent states that the main form of care is either a daycare or a preschool/nursery school (option 2 or 3), then the main form of care is considered centre-based. If they answer that the main form of care is a home daycare (option 1), then the main form of care is considered home-based.

The question process in the 2017 GSS survey follows a similar pattern as in the 2011 survey. First, respondents are asked whether they have arranged for their child to be looked after due to work or other reasons in the past 12 months.⁵ As in the 2011 survey, respondents are asked about each relevant child separately. However, in contrast to the 2011 survey, they are asked about each child age 12 or below (rather than 4 or below), meaning that I have childcare data for 5 year old's who are not yet in Kindergarten for 2017. Next, if the respondent states that they have used childcare in the previous 12 months, they are asked whether the care was regular or irregular.⁶ If the care occurred regularly, they are asked whether the main care arrangement was (1) in the child's home, (2) a home daycare, (3) a preschool/nursery school, (4) a daycare, (5) a before or after school program, or (6) some other type of arrangement. If the respondent states that the main form of care is either a daycare or a preschool/nursery school (option 3 or 4), then the main form

⁴This alone is likely not a concern, since I am interested in those who use childcare regularly. However, there may be discrepancies in what parents consider regular vs. irregular childcare. That is, what one parent considers regular childcare might be considered irregular by another parent. There is no solution to this issue, and thus is a minor limitation of this study.

⁵The wording of this question is slightly different than in the 2011 survey, which is a potential concern and a minor limitation of this study. However, it appears that the two questions intend to ask the same thing.

⁶This question is similar to that in the 2011 GSS survey and creates the same limitations.

of care is considered centre-based. If they answer that the main form of care is a home daycare (option 2), then the main form of care is considered home-based.

The construction of the childcare variables for 2020 is slightly different than for 2011 and 2017, since the data comes from a different survey. Recall that for the 2020 SELCCA survey, each respondent is only asked about *one* child age 5 or below, even if they have more than one child in this age group. First, each respondent is asked about their use of various care arrangements in the previous 3 months.⁷ These include (1) daycare centres or preschools, (2) care by a relative other than a parent, (3) family childcare homes, (4) before or after school programs, or (5) some other type of arrangement. For each of these five arrangements, the respondent answers ‘yes’ if their child has used it in the last 3 months. If the respondent answers ‘yes’ to only one of these five options, then I consider that to be their main care arrangement. If the respondent answers ‘yes’ to more than one of these options, then they are asked what their main arrangement is (i.e., the arrangement that is used most frequently). Thus, for those that use more than one arrangement, I use the information from this question to determine their main arrangement. Based on these questions, the main form of care is considered centre-based if the main arrangement is a daycare centre or preschool (option 1), or the main form of care is considered home-based if the main arrangement is a family childcare home (option 3).⁸

Other variables, including respondent and spouse education levels and main activity, are quite straightforward to construct as the questions related to these variables are very similar across surveys. For the household income variables, 2011 survey respondents are asked to provide their income, while the 2017 income data is matched to respondents from the 2016 census. As such,

⁷Note that the 2011 and 2017 GSS surveys ask about care usage in the past 12 months. This means that my data for use of care in 2020 will be biased downwards, since SELCCA only asks about the past 3 months. Controlling for year fixed effects might help remove this bias. Nonetheless, the 2020 data will be slightly inconsistent with the 2011 and 2017 data.

⁸Unlike in the 2011 and 2017 GSS surveys, there is no question asking whether the care is regular or irregular. Thus, the 2020 survey data includes care information for all children, even if the care occurs irregularly. For this reason, the 2020 data is not entirely consistent with the previous years. I suspect that this is not a major issue, since the majority of children who use centre- or home-based childcare do so full-time, as indicated by survey responses on the frequency of care.

there are missing values in 2011 for those who didn't report their income, and for those who did report, there might be measurement error.

3.2.4 Survey Summary Statistics

Summary statistics for both surveys are provided in Table 2. Variables of interest include child age and several childcare variables, respondent and spouse characteristics, and household income. Each value represents the portion of the sample that corresponds to the given variables.⁹ For example, in 2011, 67.1% of children in the sample are aged 1-3. Childcare variables include whether the child is using some form of childcare, formal or informal, and whether the primary source of care is centre-based (e.g., a childcare centre or preschool) or home-based (e.g., a home or family daycare). Care use appears to increase from 45.8% in 2011 to 68.3% in 2017, but from down to 62.8% in 2020. This drop is likely due to both the Covid-19 pandemic as well as slight differences in survey questions between the two data sources, as discussed earlier. Use of centre-based care as the main care arrangement appears to increase through the period, up from 16.4% in 2011 to 32.2% in 2020. Home-based care sees no evident pattern throughout the years. As discussed earlier, the 2020 SELCCA survey contains additional questions related to childcare. These include whether the respondent believes there are not enough childcare spots available and whether the respondent's child is on a waiting list, as displayed in Table 2. These two variables provide some indication of a childcare shortage and can be used to further analyze the market.

Both surveys (GSS and SELCCA) ask questions about the respondent's characteristics, including gender, education level and main activity. For the two years of GSS data (2011 and 2017), the proportions of male vs. female respondents are roughly half and half, with slightly more female respondents in both years. However, for 2020, the vast majority of respondents are female. This is likely because mothers tend to know more about their child's care schedules and are therefore more likely to fill out a survey related to childcare. Respondent education level and main

⁹Although many of the variables displayed in Table 2 are mutually exclusive and exhaustive binary variables, they don't always add up to 100%. This is because of missing data due to skipped survey questions.

Table 2: Summary Statistics for Survey Data

	2011	2017	2020
<i>Child characteristics and care usage (%)</i>			
Age: 0	9.1	8.6	-
Age: 1-3	67.1	54.0	57.5
Age: 4-5	23.8	37.4	40.8
Using childcare	45.8	68.3	62.8
Main care: Centre-based	16.4	23.9	32.2
Main care: Home-based	11.8	15.1	11.2
Not enough spots	-	-	36.1
On waiting list	-	-	3.6
<i>Respondent characteristics (%)</i>			
Female	55.8	53.5	91.3
Male	44.2	46.5	7.8
Education: Highschool or less	18.8	22.2	21.5
Education: Some college	45.1	35.3	35.0
Education: Bachelor's or higher	35.4	39.7	42.7
Main activity: Job	66.7	-	61.2
Main activity: Parental leave	2.0	-	6.9
Main activity: Stay at home	22.2	-	21.2
<i>Spouse/partner characteristics (%)</i>			
Education: Highschool or less	23.1	18.9	-
Education: Some college	34.9	33.1	-
Education: Bachelor's or higher	32.2	36.7	-
Main activity: Job	64.8	65.3	-
Main activity: Parental leave	2.2	5.7	-
Main activity: Stay at home	17.4	13.7	-
<i>Household income (%)</i>			
Less than \$50,000	19.8	18.8	-
\$50,000 to \$99,999	32.8	34.9	-
\$100,000 or greater	34.3	46.3	-
	N=2,574	N=2,838	N=8,759

^a each value is a percentage representing the portion of the sample that corresponds to the given variable

^b dashes indicate that the information is unavailable

activity are roughly similar across all years, although it appears that achievement of a bachelor's degree or higher is increasing throughout the period. Note that information on main activity of the respondent is not available in the 2017 GSS survey.

The GSS survey also asks questions on characteristics of the spouse, including education level and main activity, as well as household income. Education and main activity of the spouse follow similar proportions across both years. It appears that household income is slightly higher in 2017, but this could be because those who have a higher income in 2011 choose not to report.

4 Methods

An issue with estimating the causal effect of childcare regulations in Canada is that regulations have not changed in the past decade, which is the time frame I am considering. This limits the econometric tools that I am able to employ. If regulations had changed within provinces in the past decade, then a two-way fixed effects difference-in-difference model could be used to capture the effect of regulations on the outcomes of interest. This methodology utilizes within-province variation (variation in the policy over time) to help identify the coefficients. Because regulations do not change in the sample period, I do not have this within-province variation. However, a useful aspect of child-staff ratios is that they vary by age group (see Table 1). Because I have data on child age, I can assign each child a ratio depending on their age and province of residence.¹⁰ This creates some within-province variation since the treatment depends not only on the province, but also on the age of the child. Note that, by assigning each child a ratio based on age, I am assuming that childcare choices only depend on the ratio specific to the child's age group. This seems like a reasonable assumption, given that childcare centres group children by age and charge different fees depending on the child's age. Thus, the decision to enrol a toddler into daycare will likely not depend on the child-staff ratio for infants, since these two age groups operate separately.

¹⁰Ideally, I would have data on child age by month rather than year, since child-staff ratios often depend on age in months (e.g., a 17 month old child might have a different ratio than an 18 month old). Because I don't have this data, I instead calculate the average ratio for each age in years, as discussed in Section 3.1.

Another problem that arises when estimating the effect of childcare regulations—an issue that affects not only my paper, but all similar studies—is policy endogeneity (Besley and Case, 2000). That is, provinces that impose stringent childcare regulations might have other factors at play that affect childcare choices. For example, suppose provinces with low child-staff ratios also offer larger childcare benefits. If lower child-staff ratios decrease use of regulated care and childcare benefits increase use of regulated care, then failing to account for differences in childcare benefits across provinces would *decrease* the size of the effect in this case. To account for this heterogeneity, I exploit my panel data and use province, time and age fixed effects. I also control for observed household-level characteristics where possible, including respondent and spouse education levels and household income. The regressions take the following form:

$$y_{it} = \beta_0 + \beta_1 \text{Ratio}_i + x' \beta_2 + \text{Ratio}_i * x' \beta_3 + \lambda_p + \delta_t + \epsilon_{it} \quad (1)$$

where y_{it} is a binary dependent variable for child i in year t . For care choice as the outcome of interest, two dependent variables are considered: (1) y_{it} equals 1 when the child's main form of care is centre-based, and 0 otherwise, and (2) y_{it} equals 1 when the child's main form of care is home-based, and 0 otherwise. β_1 is the effect of child-staff ratios on use of the care arrangement of interest. Let β_1^c be the effect of ratios on use of centre-based care and β_1^h be the effect of ratios of use of home-based care. Then, β_1^c will be positive if more stringent ratios (smaller ratios) decrease use of centre-based care, and β_1^h will be negative if more stringent ratios increase use of home-based care. x is a set of covariates, such as parent education and household income. β_3 indicates the differential effects for children from households of different characteristics, such as different income levels. Finally, λ_p and δ_t are province and year fixed effects.

For care availability as the outcome of interest, there are again two dependent variables that are considered: (1) y_{it} equals 1 when the child is not using care because they are on a waitlist, and 0 otherwise, and (2) y_{it} equals 1 when the respondent (parent) reports that there are not enough

childcare spots in their community, and 0 otherwise. Again, β_1 is the effect of interest. If child-staff ratios reduce childcare availability, then one would expect β_1 to be negative in both cases.

Lastly, when parent employment is the outcome of interest, y_{it} equals 1 when the respondent reports that their main activity is working at a job. If ratios cause shortages of care or make care harder to access, then one might expect smaller (more stringent) ratios to decrease parent employment. If this is the case, then β_1 will be positive. Additionally, I interact gender with the child-staff ratio in order to see if the effect differs for males and females. If females are more likely to be stay-at-home parents when care is unavailable, then one would expect the effect of ratios on employment to be larger (more positive) for females than males.

In all of the regressions, I include a variable indicating if the observation is in 2020 and the child is aged 4 or 5. This is because the survey data for 2020 only indicates the age group of the child, rather than the specific age in years. Specifically, it indicates whether the child is aged 1-3 or 4-5. When controlling for age in this case, I let those with age group 1-3 have an age of 2, and those with age group 4-5 have an age of 4. Since the age variable is defined differently in 2020 than in the other years, including a variable that controls for this difference will ensure that it is not driving any of the results.

I estimate the variance-covariance matrix taking into account the unobserved heterogeneity that likely affects childcare decisions at the level of province and child age, since this is the level at which treatment occurs. That is, I cluster the error terms by province-age in each regression.

5 Results

Tables 3 to 5 display the main results for the various outcomes of interest. To save space, I only show select coefficient estimates, and do not show the coefficient estimates for all of the covariates. In addition to the main effect of interest, I display the coefficient estimates for the interaction terms so that it is clear how the effect of child-staff ratios differs by subgroup. Note that in some models, such as models (3) and (6) in Table 3, the number of observations is smaller because some

surveys do not contain household information, such as spouse characteristics or income. As such, some survey years are dropped from the regressions when adding these covariates. The following subsections discuss the results and their implications.

5.1 Effect on Main Care Arrangement

Table 3 displays the results for the effect of ratios on use of centre-based care and use of home-based care. The definition of these variables is as discussed in section 3. Models (1)-(3) show the results for the effect on centre-based care. In model (1), which doesn't include household controls or fixed effects, the coefficient estimate on the ratio variable suggests that increasing the ratio by one child (allowing one more child to be cared for by each staff member) is associated with a 3.3 percentage point increase in the probability that a child's main childcare arrangement is centre-based. This effect is insignificant, however. Adding fixed effects and control variables in models (2) and (3) adds precision to this estimate and yields a similar point estimate. These results are consistent with the idea that implementing child-staff ratios will decrease use of centre-based care, either because it becomes too costly or there are not enough spaces.

Because of the inclusion of interaction terms in model (3), note that the point estimate of 0.038 is for children aged 0-3 whose parents do not have a bachelor's degree and are lower income (less than \$100,000). The effect for children aged 4-5 is smaller by 1.7 percentage points, indicating that older children are perhaps less affected by ratios, although this heterogeneous effect is insignificant. The effect of ratios on use of centre-based care is larger when either parent has a bachelor's degree, although the difference in effects is small and insignificant. The only significant interaction term is the one for income. High income parents are 1.0 percentage point more likely to enrol their children in centre-based care when the ratio is less stringent. This might be because high income parents are more aware of quality differences between centre-based and home-based care, and are thus more likely to place their children in centre-based care when able.

Looking at the effect of ratios on home-based care, model (4) suggests that increasing the ratio by one child increases the probability of enrolment in home-based care by 3.8 percentage

Table 3: Effect of Ratios on Main Care Arrangement

Dependent Variables:	Centre-based			Home-based		
Model:	(1)	(2)	(3)	(4)	(5)	(6)
<i>Variables</i>						
Ratio	0.033 (0.033)	0.032*** (0.010)	0.038** (0.017)	0.038*** (0.013)	0.011 (0.008)	0.010 (0.011)
Age	0.047 (0.049)	0.029 (0.023)	0.006 (0.031)	-0.010 (0.023)	0.028* (0.017)	0.033 (0.022)
Age: 4 or 5	-0.468 (0.372)	-0.170 (0.133)	0.087 (0.250)	0.005 (0.141)	0.046 (0.110)	-0.142 (0.163)
2020 \times Age: 4 or 5	0.043 (0.056)	-0.117* (0.060)		-0.069*** (0.021)	-0.061** (0.028)	
Ratio \times Age: 4 or 5	0.029 (0.043)	0.011 (0.012)	-0.017 (0.027)	-0.011 (0.015)	-0.017 (0.011)	0.002 (0.017)
Ratio \times Bachelor's			0.007 (0.006)			-0.002 (0.005)
Ratio \times Spouse: Bachelor's			0.008 (0.005)			-0.001 (0.005)
Ratio \times High income			0.010** (0.005)			0.007* (0.004)
<i>Fixed-effects</i>						
Year		Yes	Yes		Yes	Yes
Province		Yes	Yes		Yes	Yes
<i>Fit statistics</i>						
Observations	14,024	14,024	4,536	14,024	14,024	4,536
R ²	0.02532	0.07643	0.10355	0.02621	0.04062	0.07890
Within R ²		0.01786	0.07446		0.01484	0.03528

Clustered (Province-Age) standard-errors in parentheses

Signif. Codes: ***: 0.01, **: 0.05, *: 0.1

points. This is surprising, since one might think that increasing the ratio for centre-based establishments would cause children to substitute away from home-based care toward centre-based care. The reason for this positive sign might be because home-based daycares, although less regulated than centre-based establishments, still face some regulations, and these regulations are likely cor-

related with the regulations on centre-based care. Thus, it appears as though more-stringent ratios in childcare centres are causing *less* children to attend home-based care, but this is likely because home daycare regulations are also stringent in these provinces. Nonetheless, the effect gets smaller and loses its significance when adding fixed effects and controls in models (5) and (6), which suggests that the relationship between ratios and home-based care is weak.

Overall, the results displayed in Table 3 suggest that ratios might have a small effect on use of centre-based care, and this effect is larger for high income families. Allowing one more child to be cared for by each staff member in childcare centres means low-income (high-income) parents are 3.8 (4.8) percentage points more likely to enrol their children in this form of care. The non-negative coefficient signs on the education and income interaction terms suggest that children with less educated, low income parents are *not* pushed out of centre-based care due to the imposition of ratios. This might be because low income families often have access to childcare benefits that help them pay for costly centre-based care. Regardless, it appears as though less well-off families still have access to high-quality regulated care, even in the presence of stringent ratios.

5.2 Effect on Availability of Care

Table 4 displays the results for the effect of ratios on whether a child is on a waitlist and whether the parent reports that there is a lack of available childcare in their community. Note that only 2020 data is used for these results, since the 2011 and 2017 GSS surveys do not ask about childcare availability. When the dependent variable is whether the child is on a waitlist, the data only includes children who are not using care; the survey does not ask if the child is on a waitlist if they are currently using another form of care, so these observations are dropped. When the dependent variable is whether there is not enough spots, observations are dropped if respondents do not indicate whether there is or is not childcare-related problems in their community.

The coefficient estimates in each model are close to zero and insignificant, and often change signs across model specifications. As such, it appears that there is little relationship between child-

Table 4: Effect of Ratios on Availability of Care

Dependent Variables:	Waitlist			Not Enough Spots		
Model:	(1)	(2)	(3)	(4)	(5)	(6)
<i>Variables</i>						
Ratio	-0.015 (0.024)	-0.003 (0.015)	0.002 (0.015)	-0.025 (0.039)	0.018 (0.016)	0.023 (0.017)
Age	-0.037 (0.076)	-0.015 (0.072)	-0.017 (0.072)	0.004 (0.211)	0.107 (0.089)	0.104 (0.089)
Ratio \times Age: 4 or 5	0.006 (0.025)	-0.003 (0.020)	-0.003 (0.020)	0.0008 (0.055)	-0.035 (0.025)	-0.034 (0.025)
Ratio \times Bachelor's			-0.011 (0.006)			-0.009* (0.004)
<i>Fixed-effects</i>						
Year		Yes	Yes		Yes	Yes
Province		Yes	Yes		Yes	Yes
<i>Fit statistics</i>						
Observations	3,102	3,102	3,079	5,770	5,770	5,734
R ²	0.01159	0.02823	0.03008	0.00572	0.06396	0.07859
Within R ²		0.01109	0.01364		0.00416	0.02023

Clustered (Province-Age) standard-errors in parentheses

Signif. Codes: ***: 0.01, **: 0.05, *: 0.1

staff ratios and availability of care, as measured by these two indicators. More data might add precision and better-identify these effects.

5.3 Effect on Parent Employment

Table 5, models (1)–(3), displays the results for the effect of child-staff ratios on parent employment.¹¹ Specifically, it shows the effect of ratios on whether the survey respondent (parent) indicates that their main activity is working at a job, in contrast to being a stay-at-home parent, for

¹¹Note that 2017 is not included in these regressions, because the survey for this year did not ask about the respondents' main activity.

example. For each of the three model specifications, the coefficient estimate for the ratio variable is positive, indicating that allowing more children to be cared for by a single staff member increases parent employment. This effect is insignificant, however. Models (2) and (3) add in an interaction term to determine if the effect differs between males and females. While the primary coefficient estimate is insignificant, the difference in effects between males and females is highly significant and indicates that females are more likely than males to report that their main activity is a job when ratios are less stringent. That is, allowing one more child to be cared for by a staff member increases female employment more than it does male employment. This suggests that child-staff ratios, or childcare availability in general, play an important role in female participation in the labour force.

Because 2020 has a higher proportion of respondents that are female, there might be some bias in these estimates. This would occur if, for example, people tend to work less in 2020 compared to previous years, which is probable given the Covid-19 pandemic. In case this is driving the results, I run the same three models with 2020 excluded. This is shown in models (4)–(6) of Table 5. Interestingly, the coefficient on the ratio variable becomes significant and slightly larger, indicating a more severe effect of child-staff ratios on female employment. The difference in effects between males and females is similar in magnitude to models (1)–(3), but slightly less significant.

6 Conclusion

Child-staff ratios are implemented with the intention of improving quality of care. They do so by ensuring that educators can closely look after all children and ensuring that all children can partake in supervised activities. However, because child-staff ratios increase labour costs for childcare centres and limit the number of available childcare spaces, there is concern that there will be some unintended negative consequences associated with these ratios. In this study, I analyze whether child-staff ratios cause parents to substitute away from centre-based care toward home-based care, whether ratios increase waitlist lengths and cause parents to express concern over lack of childcare

Table 5: Effect of Ratios on Parent Employment

Subsample:	2011 & 2020			2011 only		
Dependent Variable:	Job					
Model:	(1)	(2)	(3)	(4)	(5)	(6)
<i>Variables</i>						
Ratio	0.024 (0.017)	0.020 (0.022)	0.012 (0.008)	0.039*** (0.012)	0.054*** (0.015)	0.040* (0.021)
Age	-0.018 (0.037)	0.029 (0.041)	0.035 (0.025)	-0.034 (0.030)	-0.038 (0.029)	-0.013 (0.041)
Age: 4 or 5	0.187 (0.238)	0.029 (0.271)	0.016 (0.095)	0.510* (0.290)	0.445 (0.271)	0.236 (0.208)
Ratio × Age: 4 or 5	-0.016 (0.026)	-0.005 (0.030)	-0.003 (0.010)	-0.054 (0.034)	-0.046 (0.032)	-0.024 (0.022)
Ratio × Male		-0.033*** (0.010)	-0.036*** (0.010)		-0.032** (0.015)	-0.032** (0.014)
<i>Fixed-effects</i>						
Year			Yes			Yes
Province			Yes			Yes
<i>Fit statistics</i>						
Observations	10,078	10,032	10,032	2,354	2,354	2,354
R ²	0.00835	0.07709	0.10056	0.01106	0.28861	0.30288
Within R ²			0.08154			0.28781

Clustered (Province-Age) standard-errors in parentheses

Signif. Codes: ***: 0.01, **: 0.05, *: 0.1

in their community, and whether ratios decrease parent employment. Using Canadian survey data and variation in ratios across provinces and child age, I find that lower ratios decrease the likelihood that parents will use centre-based care. However, I do not find that these effects are stronger for disadvantaged households, such as those with less educated and lower income parents. In contrast, it appears that the effects are *smaller* (less severe) for households with lower income. This could be because low-income households often receive childcare benefits that help them pay for childcare. Because the effect of ratios on care choice is small, and because disadvantaged

households are not disproportionately affected, it seems reasonable to conclude that child-staff ratios do not have a substantial effect on care choice. However, knowing that ratios can indeed reduce use of centre-based care is useful when forming these policies. Indeed, implementing a ratio policy without offering childcare benefits to low-income households might result in these groups being disproportionately affected.

Additionally, I find that child-staff ratios decrease parent employment, as indicated by whether the parent's main activity is a job or some other activity, such as a stay-at-home parent. Notably, I find that the effect for women is greater. That is, women spend less time working when ratios are lower compared to men. This highlights the importance of access to childcare for female labour force participation. When imposing ratios, policymakers may wish to also ensure an adequate supply of childcare spaces, such as by funding the childcare sector, to mitigate the female labour supply reduction.

In conclusion, there is a need to balance the positive aspects of child-staff ratios with the unintended negative consequences. More research on the link between ratios and care quality should be done to better quantify the benefits of this regulation. Ratios are a necessary and important regulation, but all effects of the policy must be considered to ensure it is doing more good than harm.

References

- Anderson, P. M., and P. B. Levine. 1999. Child care and mothers' employment decisions.
- Besley, T., and A. Case. 2000. Unnatural experiments? estimating the incidence of endogenous policies. *The Economic Journal* 110 (467): 672–694.
- Blau, D. M. 2007. Unintended consequences of child care regulations. *Labour Economics* 14 (3): 513–538.
- Drange, N., and T. Havnes. 2019. Early childcare and cognitive development: Evidence from an assignment lottery. *Journal of Labor Economics* 37 (2): 581–620.
- Felfe, C., N. Nollenberger, and N. Rodríguez-Planas. 2015. Can't buy mommy's love? universal childcare and children's long-term cognitive development. *Journal of population economics* 28 (2): 393–422.
- Gorry, D., and D. W. Thomas. 2017. Regulation and the cost of childcare. *Applied Economics* 49 (41): 4138–4147.
- Hotz, V. J., and M. Xiao. 2011. The impact of regulations on the supply and quality of care in child care markets. *American Economic Review* 101 (5): 1775–1805.
- Lefebvre, P., and P. Merrigan. 2008. Child-care policy and the labor supply of mothers with young children: A natural experiment from Canada. *Journal of Labor Economics* 26 (3): 519–548.
- Mocan, N. 2007. Can consumers detect lemons? an empirical analysis of information asymmetry in the market for child care. *Journal of population Economics* 20 (4): 743–780.
- Rigby, E., R. M. Ryan, and J. Brooks-Gunn. 2007. Child care quality in different state policy contexts. *Journal of Policy Analysis and Management: The Journal of the Association for Public Policy Analysis and Management* 26 (4): 887–908.
- Russell, A. 1990. The effects of child-staff ratio on staff and child behavior in preschools: An experimental study. *Journal of Research in Childhood Education* 4 (2): 77–90.
- Scarr, S., M. Eisenberg, and K. Deater-Deckard. 1994. Measurement of quality in child care centers. *Early Childhood Research Quarterly* 9 (2): 131–151.