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The Effect of Child Care Center Openings on Child Care Arrangements and Maternal Labor Supply

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Abstract:

This study investigates how new child care center openings are associated with child care arrangements and maternal labor supply. The results show that center openings are accompanied with a substitution toward center-based care, away from home-based care, particularly among households with 0 and 1 year-olds. However, maternal labor supply is not responsive to changes in center care availability. These results imply that, unlike the introduction of subsidized childcare, increasing center availability only is likely to have a limited impact on maternal labor supply.

JEL Codes: J13, J22

Key words: child care, labor supply, center

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1. Introduction

Recently, there has been growing concern regarding the limited accessibility of non-parental child care as a possible constraint to maternal labor supply and early childhood education (OECD, 2006). This issue has become increasingly important as the expectation grows for governments to help women balance their work and family commitments. Such an expectation is particularly strong in aging societies where mothers are seen as potential contributors to social security funding. In addition, growing interest in early childhood education is likely to amplify demand for high-quality child care. Such demand, in turn, is likely to make concerns about availability more serious for center-based care, which tends to be provided by more highly qualified staff than home-based care.

This paper examines how the opening of new child care centers is correlated with child care arrangements and maternal labor supply. Specifically, I utilize the rapid increase in the number of center-based child care places offered in Australia in the early 2000s. The number of places grew by more than 35,000 between 2001 and 2004, contributing to a 18% increase. Exploiting the variations in the numbers of child care places offered across communities over a period of time, I examine the association between changes in the number of places per child of the same age in a community and changes in the behavior of households with children in the community.

Results show that center openings are accompanied with substitution toward center-based care, away from home-based care, particularly among very small children. An additional center-based child care place per child aged 0 is associated with a 8-hour (73% of the average in 2002-04) increase in the number of weekly center care hours,

as well as a 4-hour (36%) reduction in the number of weekly home-based care hours. Similar, and somewhat stronger, results are found for households where the youngest child is aged 1 or 2, but not for households where the youngest is aged 3 or 4. However, changes in maternal labor supply are found to be not correlated with changes in center care availability. This is in contrast with previous studies which find a positive impact of child care subsidies on maternal labor supply. In the light of these previous studies, the finding in this paper suggests an increase the availability of child care facility, which does not accompany a reduction in fees, is likely to have a limited impact on maternal labor supply. These results have important implications for public efforts to ensure accessibility of child care.² While an increase in child care centers is likely to broaden child care options, it is unlikely that increased availability of child care places per se would increase mothers' contribution to the social security funding.³

Previous studies on childcare utilization and maternal labor supply have focused on the impact of newly introduced subsidies or construction of subsidized preschools. The recent study by Baker, Gruber and Milligan (2008) examines the effect of the subsidized child care system for 0-4-year-olds, introduced in the Canadian province of Quebec. The study indicates that, following the introduction of subsidized child care, compared to the rest of the country, Quebec exhibited an increase in overall usage of child care among married mothers by 15 percentage points, one-third of which was

² For example, some governments let the market provide services with a minimum standard set by regulation, and encourage providers to operate in areas with limited supply by offering start-up assistance. Other governments directly provide free or low-cost childcare, managing the geographic allocation of care facilities (OECD, 2002, 2003, 2004, 2005, and 2007).

³ Consideration of childcare policy formulation necessitates knowledge of the impact on parents' behavior and children's well-being, and it could be that the benefit from the effect of childcare availability on children's outcomes is overwhelming. Since the data used in this study do not provide information on the latter, this paper focuses on parental, particularly maternal, labor supply and childcare utilization.

due to a shift away from non-subsidized care toward subsidized care. While this substitution effect is similar to the substitution toward center-based care induced by center openings, the study also identifies an increase in married mothers' labor force participation by 8 percentage points.

A similar substitution effect is found for the U.S., but the evidence on the labor supply effect is more mixed. Utilizing the staggered introduction across the US states of preschool for 5-year-olds into the public school system, Cascio (2006) shows that the initiative increased utilization of public subsidized schools by 11-24 percentage points. About half of this increase was due to overcrowding of private, unsubsidized preschools. While take-up was observed widely, no labor supply effect was found for married mothers in her study. On the other hand, using the 1980 US census, Gelback (2002) finds a positive effect on labor supply for married mothers of 5-year-olds eligible for free preschool service, compared to mothers of 5-year-olds who were not yet eligible for it.⁴

Evidence of the positive effect on maternal labor supply has also been observed in other countries that introduced public preschool for somewhat younger children. Schlosser (2005) examines Israel's recent attempt to provide new preschools for Arab 3-4-year-olds between 1999 and 2003, which increased their attendance by 60 percentage points. She shows that labor force participation of Arab mothers in towns designated for provision of new preschools increased by 7-12 percentage points, compared to towns in the control group.

⁴ Both Cascio (2006) and Gelbach (2002) find that single mothers who do not have children younger than five show an increase in labor force participation. Blau and Tekin (2007) reported the positive effect of subsidy receipt on labor supply of single mothers with 0-12-year-olds.

In addition, Berlinski and Galiani (2006) find that, in Argentina, regions with an additional increase in the number of public preschool places per child exhibited an increase of 89 percentage points in the probability of attendance among 3-5-year-olds, and a 7-14 percentage point increase in the probability of mothers participating in the labor force. These two studies do not investigate substitution between different types of preschool. The high attendance effect may suggest there were few unsubsidized alternatives.⁵

The present research departs from the abovementioned previous studies in that it focuses on the effect of increased center availability in a setting where no change has been introduced to the subsidy system. While there is a significant body of evidence regarding the impact of a subsidized child care system, the effect of facility availability *per se* has not been fully investigated. However, it has been shown the availability of educational facilities can affect attendance (e.g., Card (1995), Currie and Moretti (2003) and Duflo (2001)). The differences between my results and the results based on the previous studies also facilitate our understanding of the mechanism through which the subsidized child care/preschool system works. Since a public child care/preschool system usually provides households with not only increased availability but also reduced fees, the absence of the positive effect of center openings on overall child care usage or maternal labor supply found in this study suggests the fee-reduction component embedded in the subsidized child care system is

⁵ Earlier studies also investigated the effect of childcare cost on utilization and maternal labor supply, chiefly based on a cross-sectional, structural-estimation approach. Most likely reflecting the lack of an exogenous variation in the cost of childcare, they provided more mixed evidence. Studies using a relatively exogenous variation suggest the small but positive effect on utilization and mothers' labor supply. These studies are reviewed by, for example, Anderson and Levine (2000), Blau (2003), Blau and Currie (2004), and Baker et al. (2005). Existing evidence for Australia is also based on cross-section analysis, and the price elasticity is estimated to be positive, but smaller than the range reported in other countries (Doiron and Kalb, 2005, Kalb and Lee, 2008, Rammohan and Whelan, 2005, 2007).

likely to be the key factor in the positive effect on these outcomes. On the other hand, the substitution toward center-based care induced by the increased availability of that care is akin to the substitution away from unsubsidized preschool/child care (Baker et al, 2008, Cascio, 2006).⁶

The present research contributes to the international comparison of different child care regimes. While there is growing interest in subsidized child care centers and preschools, critics argue that such a scheme necessitates a substantial tax burden and organised local government service. Countries that are unlikely to meet these requirements may find it more suitable to pursue a mixture of market child care provision and public provision of more targeted subsidies and quality assurance (OECD, 2007). Since the beginning of the 1990s Australia has pursued this combination of state and market approach, during which time the supply of child care has expanded mainly due to growth in the private sector (OECD, 2002; Press and Haynes, 2000). This paper provides evidence of the effect of this market-driven supply of child care.⁷

The remainder of this paper is presented as follows: in Sections 2 and 3, I describe the data used in this study and child care institutions in Australia. In Sections 4 and 5, the conceptual framework and identification strategy are discussed. Sections 6 presents the results and conclusions are drawn in Section 7.

⁶ Based on the regional variation in the quality-adjusted fee level, Blau and Hagy (1998) also find substitution away from more expensive types of care.

⁷ Blau (1993, 2001) investigated the supply of childcare focusing on labor supplied by childcare workers. The relationship between community characteristics and center entry has not been studied. Another set of studies focuses on the rationing of supply in settings where childcare is mainly publicly provided (Gustafsson and Stafford, 1992 and Del Boca and Del Vuri, 2007). These studies, however, examine whether price responsiveness differs in rationed areas and areas with enough supply of public childcare, without directly testing the impact of availability. Based on the cross-section data from Germany, where hardly any private providers operate, Kreyenfeld and Hank (2000) find no relationship between the availability of care and mothers' labor supply.

2. Data

This study utilized the 2002-2004 Household Income and Labor Dynamics in Australia (HILDA) Survey, which constitutes nationally representative longitudinal household data collected since 2001. The 2002-2004 panels are used in this paper because the questionnaire on child care usage significantly changed in 2002, and the Australian child care policy framework changed after 2004.⁸ Mothers of at least one child aged 0-4 years⁹ are extracted from each wave. When pooled together, they comprise three cohorts of mothers with young children.

This household (mother)-level data is merged with the information on community-level information based on the area of each household's residence. A community is defined by Statistical Local Area (SLA), which contains one or more Census Collection Districts.¹⁰ The summary statistics of household- and community-level variables are depicted in Table 1 (See Appendix 1 for details).

3. Child care Institutions in Australia

3.1 Types of Child care

The major, formal pre primary-school facilities can be categorised into two groups: center-based care and home-based care. Center-based care includes Long Day Care (LDC) and Kindergarten/Preschool. LDC is a center-based form of child care service

⁸ A new program, the Child Care Tax Rebate, was introduced in 2005, which is likely to reduce out-of-pocket childcare expenditure for middle- and high-income households. In order to focus on the effect of center openings, I study the period in which the policy framework remains unchanged.

⁹ Mandatory education starts from the age of six. Five-year-olds who turn six during an academic year therefore begin attending primary school.

¹⁰ As of 2001, there were 1353 SLAs, which contained 37,209 Census District (CD)s in Australia. An urban CD had about 220 dwellings, while the number for rural CD depended on population density (Australian Bureau of Statistics, 2001).

and typically looks after children who have not yet started school. Staff members are more likely to have qualifications in early childhood education or child care, compared to home-based caregivers.¹¹ While kindergartens and preschools are administratively categorised as educational as opposed to child care facilities,¹² they both provide the same service in terms of freeing up mothers' time for work or other activities. Further, kindergarten or preschool services are sometimes offered at child care facilities, and some preschools offer a child care service as well. Home-based care (the second type of formal child care) includes Family Day Care (FDC), which is provided by registered carers at their homes or the child's home.¹³ In addition to these two types of formal service, informal care is provided by grandparents, relatives, friends, neighbours, and unregulated nannies.

Between 2002 and 2004, an average of 57% of households used some type of non-parental care for at least one hour per week. Center-based care was used by 31% of households, while home-based and informal care was used by 15% and 37% of households, respectively (Table 1).¹⁴ The proportion of households using some form of non-parental care exceeds the proportion of households in which mothers work (47%), suggesting that some households use non-parental care for purposes unrelated to maternal work. The average user of non-parental child care uses it for 18 hours per

¹¹ For example, 61% of 52,865 Long Day Care staff hold a qualification, while 31% of 10,669 Family Day Care carers hold one (Department of Education, Employment and Workplace Relations, 2006).

¹² One year before primary school, children who turn five can attend kindergarten, which operates five days a week. Two years before primary education, children who turn four can go to preschool, which provides about 10-12 hours of preparatory classes over two or three days a week. These pre-primary-school services have different names in each state. For example, the program one year before primary school is termed kindergarten in New South Wales (NSW) and the Australian Capital Territory (ACT), while it is termed preschool in Queensland. The program two years before primary school is called preschool in NSW and ACT, and kindergarten in Queensland.

¹³ The description of LDC and FDC is based on the Department of Family and Community Services (2005).

¹⁴ Usage of different types of care is not mutually exclusive; one household can use multiple types of care for at least one hour each.

week. The figure is similar for formal care users; 17 hours among center-based care users and 18 hours among home-based care users. The average informal care users spend 8 hours per week with informal care providers. In the analysis, I use the weekly number of care hours by assigning 0 to non-users.

3.2 Measure of center-based child care availability

The availability of center-based child care is measured by the estimated number of places available at center-based providers per child in each age group. First, the information on the number of center-based providers was collected from the website of the National Childcare Accreditation Council for each year and community. In order to derive the number of childcare places by age, the number of providers was multiplied by the state-level, per-provider average number of children aged 0, 1, 2, 3, or 4, who are taken care of at center-based providers. These averages are based on the 2002 and 2004 Child Care Census. They indicate a typical number of children of each age who are looked after at one provider. The resulting figure for each age group was then divided by the number of children of the same age group living in the area, which was interpolated from the 2001 and 2006 Census.¹⁵ It was lastly divided by 100. On average, there were 0.24 places per child aged 0-4 (Table 1). In the analysis, I assign the number relevant to the youngest child in a household. For example, if the youngest child is aged 0, the number of center-based childcare places for 0 year-olds per child aged 0 is assigned to the household. The average number per child is 0.06 (0

¹⁵ See Appendix 1 for details. Since the number of childcare places per center does not vary within state and year, the measure used in this paper under- (over-)estimates the number of places per child in an area with an above- (below-) average number of children per center. However, to the extent that this non-classical measurement error is time-invariant, it is differenced out in the fixed effects estimation. This is true if a new center in a certain area is a similar size to existing centers in the area. This is likely the case, as population size, an indicator for demand size, did not change drastically within three years of the analysis period. The measure also does not capture a change in the maximum number of children existing centers accommodate. However, conversations with some center managers suggest the scope for this adjustment could be small because of limitations of space and staff to match the increased number of children.

year-olds), 0.22 (1 year-olds), 0.37 (2 year-olds), 0.44 (3 year-olds), and 0.35 (4 year-olds).

Some of these places were provided by private (for-profit) centers, while others were provided by community-based (not-for-profit) centers.¹⁶ Although the data source does not allow the disaggregation of centers based on management structure, the variation during this period was dominated by the increase in supply from the private sector. Between 2001 and 2004, the growth rate of the total number of center-based child care places was 24% for the private sector, and 7% for community-based providers.¹⁷

3.3 Child care Policy Framework

As this paper focuses on center openings and their impact on household behavior, it is important to note the child care policy environment did not change during the analysis period. The major child care policy at the federal level, which accounts for a large proportion of public expenditure on children's services, did not change between 2002 and 2004.¹⁸ The policy consisted of a price subsidy, quality assurance, and direct support for providers, the details of which are provided in Appendix 2. The only change during the period was the repeal of the state regulation on licensing in two of the seven states/territories.¹⁹ In order to control for the possible effect of this change

¹⁶ Community-based providers are owned by not-for-profit entities such as local governments, community/religious organisations, charities and non-profit organisations (Australian Institute of Health and Welfare (AIHW), 2007; the Department of Family and Community Services, 2004).

¹⁷ The share of childcare places provided by the private sector rose from 68 percent (of the total of 193,809 in 2001) to 72 percent (of the total of 229,603 in 2004) (AIHW, 2005).

¹⁸ For example, in the 2006/07 fiscal year, the Australian Government accounted for 78 percent of total government expenditure on children's services (A\$3.03billion) (Steering Committee for the Review of Government Service Provision, 2008).

¹⁹ The states of Queensland and New South Wales introduced new childcare regulations in 2003 and 2004, respectively. These state governments set regulations regarding the approval of premises, construction plans, applicants, and staff. For example, requirements are set based on the number of

as well as other common state-level changes, the regression analysis incorporates heterogeneous year effects.²⁰ The source of variation explored in this paper is not those arising from changes in the policy framework, but changes in center availability across communities over time.

4. Conceptual framework

The availability of child care can affect household decision-making about child care usage and labor supply in various ways. Households located close to centers are more likely to take advantage of newly available services because, first, they can reduce the effective hourly price that parents need to pay by decreasing transportation costs.²¹

Second, an additional child care center in the neighbourhood can increase the marginal benefit of using center-based care as perceived by parents. For example, a nearby service may be utilized by neighbouring households, who can provide information about the quality of care offered at the center, reducing parents' uncertainty. At the same time, information relating to the possible benefits of using center-based care, such as providing social interaction with peers and learning opportunities, may become more widely shared among the local community.

Proximity to centers can also provide parents with the security that they can collect their children in the event of an emergency. Third, the increased availability of child care can facilitate greater competition among providers, which may result in a reduction in the average fee level and an improvement in the average quality.

children in care, the size of rooms, the number of staff and their qualifications, and health/safety (Department of Family and Community Services, 2005).

²⁰ The state-specific year effect is included for the state of Victoria in addition to the two states that introduced new childcare regulations. The remaining four states and territories have too few observations to include their own year effects.

²¹ For the formal model of maternal employment and childcare usage decisions, see Blau (2003).

These factors are likely to induce parents to utilize center-based care. This demand increase could be accompanied by a decrease in demand for other types of care. If overall usage of non-parental child care increases, it can increase maternal time that can be devoted for work. This paper does not aim to disentangle the various pathways through which child care availability may affect household decision making; rather, it provides evidence of the overall impact of new center openings.

5. Empirical Strategy

To identify the correlation between center openings and changes in the outcomes, I use the following community fixed effects model for cohorts of mothers with at least one 0-4 year-olds:

$$Y_{ijst} = a + bN_{ijt} + d_1X_{ijt} + d_2COM_{jt} + S_s * T_t + u_j + e_{ijst} \quad (t = 2002-2004) \quad (1)$$

The outcome variable, Y_{ijst} , includes indicators of maternal labor supply and child care usage for a household i , living in community j in state s , in year t . The outcome is assumed to depend on the number of center-based child care places per child of the same age as the household's youngest child, living in the community in which the household lives, N_{ijt} , controlling for community (SLA)-level unobserved effects, u_j , state-specific year effects, $S_s * T_t$, and time-variant household- and community-level characteristics, X_{ijt} and COM_{jt} (See Table 1). The parameter of interest, b , indicates how the behavior of a cohort of mothers with 0-4-year-olds differs compared to the previous cohort of mothers, particularly in communities where a new center-based care place becomes available per child in the area, netting out these controls. This difference-in-differences specification is comparable to recent studies (Baker et al.,

(2008), Cascio (2006) and Schlosser (2005)), and is similar in particular to the specification used by Berlinski and Galiani (2006).

To the extent that unobserved household preferences or unobserved determinants of centers' entry, which are correlated with both the center availability and the outcome, are time-invariant, the parameter b shows the causal effect of the availability of center-based care. However, if such unobserved factors are time-variant, then the estimates based on Eq.(1) may provide a biased estimate. I first discuss the results based on this baseline model, and then describe an instrumental variable method as an extension of the analysis.

The unit of observation is a mother / household. This facilitates the comparison of the results for maternal labor supply and child care utilization. For households with more than one child aged 0-4 (32% of the sample), usage is defined as using a certain type of care for at least one of their children for one hour; the number of child care hours is defined as the total time the children spend at a certain type of child care in a usual week, divided by the number of children.

6. Results

For comparison, I start with estimating Eq.(1) with a simple OLS model. Table 2 shows the estimated coefficient b in Eq.(1) without fixed effects. They indicate that areas which have an additional center-based care place for a certain age group are 11 percentage points (35% of the average likelihood of 31 percent) more likely to have households where the youngest child belongs to that age group to use center-based care (Column 2). The weekly number of center care hours per child is also higher by

one and half hours – 29% of the average of 5.2 hours (Column 6). This positive association between center care availability and center care usage is not accompanied by a different pattern of use of other types of care (Column 3, 4, 7, and 8). Also, mothers in these areas do not exhibit a particularly different level of labor force participation (Column 9-11). To the extent that firms enter areas with high expected demand for center care, the positive correlation between center care availability and center care usage could reflect reverse causality.

I partially address this issue by controlling for community fixed effects. The results indicated in Table 3 show that areas which *gain over time* an additional center care place for a certain age group are 13 percentage points (42% of the average) more likely to have households where the youngest child belongs to that age group to use center care (Column 2). Though the standard error becomes larger compared to the OLS estimate, the association between changes in center care availability and changes in center care usage remains significant at 10% level. Also, the results for the number of weekly care hours indicate a substitution away from home-based care into center-based care in areas with increasing availability of center care (Column 6 and 7). On the other hand, the results for maternal labor supply continue to exhibit insignificant correlation with center care availability.

Examining the relationship by the age of the youngest child reveals that households with babies take advantage of newly available center care places. Table 4 depict the results of estimating a modified version of Eq.(1), which includes additional four interaction terms between the center care availability and dummies for households where the youngest child is 1, 2, 3, and 4 years old. The estimates suggest that an

additional place for children aged 0 (1) is associated with a 47 (165) percentage-point increase in the probability for households where the youngest child is aged 0 (1) of using center-based care (Column 2). Though the estimate for 1 year-olds seems too large, it is not distinguishable from 100 percentage point due to its large standard error. Thus, the results imply that a newly available place is fully taken up by 1 year-olds. On the other hand, the estimates for households where the youngest is 3 or 4 years old suggest little change in the pattern of childcare usage. A possible explanation for this is that the majority of households that use center care start using it when a child is small (for example, aged less than 3), and continue to use it until the child enters the school system. In this case, households where the youngest child is aged 3 or 4 are likely to have already sorted into care arrangement of their choice, with no need to respond to a newly available center place.

The substitution from home-based to center-based care is also found strongly among households with children aged 0 and 1. When the availability of center care increases, households where the youngest child is aged 0 not only increase the probability of using center care, but also decrease the probability of using home-based care by 15 percentage points. The results for the weekly number of care hours indicate households with infants decrease the weekly home-based care time by 4 hours (36% of the age-specific average-12 hours) and increase center-based care time by 8 hours (73% of the average-11 hours). Thus, roughly half of the increase in center care use is a substitution from home-based care. In contrast, the results for maternal labor supply exhibit no significant change for very small children. Though households where the youngest child is 4 year-olds indicate a significant deviation from the benchmark coefficient for infants, the estimate for these households is not different from zero.

Thus, no association is found for any age group between center care availability and maternal labor supply.

7. Conclusion

This study has investigated the impact of the local availability of child care centers on child care utilization and maternal labor supply. In particular, it has exploited the across-community variation in center openings, controlling for community fixed effects. The major findings are that, first, center openings are associated with a shift toward center-based care away from home-based care. This substitution is particularly strong among infants and 1 year-olds. A possible explanation is that this is a critical age range in which parents decide whether a child attends center care or not. A second major finding is that, unlike previous studies on subsidized child care, no change in maternal labor supply is found. These findings imply that an increase in the availability of child care centers, with no substantial fee reduction, is not effective in enhancing maternal labor supply.

The results thus far however have not taken into account the fact that care providers might choose communities to operate based on their time-variant characteristics, such as the size of child population. If the availability of center care increases because care provider perfectly expect where demand grows, then the results based on fixed effects model still face a possible upward bias for center care usage. This concern is unlikely to alter the finding that center care availability does not affect maternal labor supply. For if care providers also base their location choice on the expected labor force

participation rate among mothers, the estimates would be an upper bound for the effect of center care availability on maternal labor supply, which was insignificant.

One way to investigate the degree to which the results based on the fixed effects model are biased is to use exogenous components in the availability variable – surprise births. That is, the number of children in a community can deviate from the level expected by care providers. Since it takes 1.5-2 years to start a new center, it is unlikely that care providers can accommodate an unanticipated increase in the size of new cohort, and therefore its demand for center care, particularly while they are very small. I construct the variable indicating a deviation from a trend in the number of births in each community, and use it as an exogenous factor affecting center care availability. The results will be hopefully presented at the workshop.

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Table 1: Summary Statistics

	Obs.	Mean	SD
<i>Household-level Variables</i>			
<u>Outcome variables: childcare usage</u>			
1{Household uses the following type of non-parental care for at least one hour}			
some non-parental	2751	0.57	0.50
center-based	2751	0.31	0.46
home-based	2751	0.15	0.35
informal	2751	0.37	0.48
Average weekly number of childcare hours per child, including non-users as zero			
some non-parental	2751	10.66	14.27
center-based	2751	5.15	10.54
home-based	2751	2.64	8.32
informal	2751	2.87	7.09
<u>Outcome variables: maternal labor supply</u>			
1{Mother works (> 0 hour per week)}	3860	0.47	0.50
1{Mother works (> 20 hour per week)}	3860	0.13	0.34
Average weekly number of work hours (assuming zero hour for non-working mothers)	3860	11.54	15.49
<u>Household Characteristics</u>			
Number of children aged 0	3860	0.30	0.47
Number of children aged 1	3860	0.24	0.44
Number of children aged 2	3860	0.26	0.45
Number of children aged 3	3860	0.26	0.45
Number of children aged 4	3860	0.27	0.46
Number of children aged 5-14	3860	0.75	0.98
Number of female members aged 15+	3860	0.07	0.30
Number of male members aged 15+	3860	0.08	0.30
Number of members with long-term health problems	3860	0.42	0.81
<u>Mother's characteristics</u>			
Mother's age	3860	32.31	5.79
1{Mother completed high school (Year 12)}	3860	0.24	0.43
1{Mother completed high school (Year 12) and holds a qualification}	3860	0.23	0.42
1{Mother completed a Bachelor's degree or higher}	3860	0.20	0.40
1{Mother does not have a resident partner}	3860	0.16	0.37
1{Mother has long-term health problems}	3860	0.11	0.31
<u>Community (SLA)-level Variables</u>			
1{an SLA has data on unemployment rate}	1458	0.94	0.23
1{an SLA has data on unemployment rate} * unemployment rate (%)	1458	6.00	3.34
Age-specific number of center-based childcare places per child	1458	0.24	0.27

Sources: The 2002-2004 Household, Income and Labor Dynamics in Australia (HILDA) Survey, the National Childcare Accreditation Council data, the 2001 and 2006 Census, and the Small Area Labor Markets data.

Notes:

- A household is regarded as using a certain type of care if it chooses that type of care as an answer to one of the following two questions: (1) while you (and your partner) are working, who looks after the child? (2) in a usual week, what types of care do you use for these children when you (or your partner) are not working? The options for the answers include, for example, 'me or my partner,' 'the child's brother or sister,' 'private or community long day care center,' and 'family day care.'
- Center-based care includes private or community long day care, long day care center at workplace, kindergarten and preschools.
- Home-based care includes family day care - care provided by registered, regulated carers at a carer's home.
- Informal care includes care provided by siblings, relatives, friends/neighbours, and paid sitters. Paid sitters are not included in formal care because it is unclear whether they are approved carers.
- Average weekly number of childcare hours per child is the total number of hours used by all the pre school-aged children divided by the number of the children. Thirty-two percent of the sample have more than one child aged 0-4.
- Work includes paid work, self-employment work, and unpaid work for family members. Work hours include any paid or unpaid overtime, and if a person has more than one job, they include the hours worked in all jobs.
- Educated mothers completed high school and hold a qualification or completed a bachelor degree or higher.
- Long-term health problems are self-reported.
- For mothers who change the highest educational attainment during the analysis period, their educational attainment is defined to be the highest level attained by the time they appeared for the first time in the HILDA survey.
- See Appendix 1 for the definition of the SLA-level variables.
- The unit of observations is household*year for the outcome and household-level explanatory variables, while it is the SLA*year level for the SLA-level variables.

Table 2 Correlation between center care availability and the patterns of child care utilization and maternal labor supply in Australia: 2002-2004 OLS model

	1 {Parents use the following type of childcare}				Weekly number of childcare hours per child				Maternal labor supply		
	Some non-parental care	Center-based care	Home-based care	Informal care	Some non-parental care	Center-based care	Home-based care	Informal care	1 {Mother works}	1 {full-time}	hours of work
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Age-specific center care availability	-0.011 [0.045]	0.11 [0.043]***	0.014 [0.043]	-0.035 [0.041]	0.523 [1.194]	1.475 [1.012]	-0.184 [0.931]	-0.769 [0.440]*	0.003 [0.035]	-0.002 [0.031]	0.327 [1.328]
Observations	2751	2751	2751	2751	2751	2751	2751	2751	3860	3860	3860
SLAs	496	496	496	496	496	496	496	496	509	509	509
F-stat	9.23	12.04	3.22	5.45	14.05	11.74	3.68	3.66	21.61	6.12	17.23

Sources: See the sources listed in Table 1.

Notes:

- The coefficient of the age-specific number of center-based childcare places per child, or b in Eq.(1), is shown.
- Standard errors are shown in square brackets. * significant at 10%; ** significant at 5%; *** significant at 1%.
- All the regressions control for maternal characteristics such as three dummy variables indicating maternal educational attainment levels, a dummy variable indicating mothers with long-term health conditions, and a dummy variable indicating single mothers.
- The controls also include household demographic characteristics such as the numbers of children aged 0, 1, 2, 3, 4, and 5-14 and the numbers of male and female members aged 15 or above, and the number of members with long-term health problems.
- The community (SLA) level characteristics are additionally included. They are a dummy variable indicating areas with data on the unemployment rate and the interaction between this dummy variable and the unemployment rate
- The following three largest states are allowed to take different intercepts and year effects: New South Wales, Victoria, and Queensland. The rest of four states and territories have too small a sample size to define their own intercepts and year effects.
- The sample used for regressions of childcare utilization variables is smaller because only 2002-2004 data are used. The 2001 data are excluded because questions on childcare utilization were changed between 2001 and 2002.

Table 3 Correlation between changes in center care availability and changes in the patterns of child care utilization and maternal labor supply in Australia: 2002-2004
Statistical Local Area (SLA) fixed effects model

	1{Parents use the following type of childcare}				Weekly number of childcare hours per child				Maternal labor supply		
	Some non-parental care	Center-based care	Home-based care	Informal care	Some non-parental care	Center-based care	Home-based care	Informal care	1{Mother works}	1{full-time}	hours of work
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Age-specific center care availability	-0.03 [0.072]	0.13 [0.075]*	-0.035 [0.058]	-0.031 [0.077]	1.092 [1.844]	2.4 [1.449]*	-2.007 [1.283]	0.7 [0.926]	-0.08 [0.056]	-0.017 [0.052]	-1.132 [1.998]
Observations	2751	2751	2751	2751	2751	2751	2751	2751	3860	3860	3860
SLAs	496	496	496	496	496	496	496	496	509	509	509
F-stat	8.67	7.78	3.07	4.27	11.01	6.94	3.51	3.71	17.19	4.74	14.84

Sources: See the sources listed for Table 1.

Notes:

- See the Notes for Table 2.
- Among the covariates listed in the Notes for Table 2, the dummies for three largest states are dropped.

Table 4 Heterogeneity in the correlation between changes in center care availability and changes in the patterns of child care utilization and maternal labor supply in Australia: 2002-2004
Statistical Local Area (SLA) fixed effects model

	1 {Parents use the following type of childcare}				Weekly number of childcare hours per child				Maternal labor supply		
	Some non-parental care	Center-based care	Home-based care	Informal care	Some non-parental care	Center-based care	Home-based care	Informal care	1 {Mother works}	1 {full-time}	hours of work
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Age-specific center care availability	0.037	0.473	-0.151	0.015	5.761	8.155	-4.346	1.952	-0.067	-0.086	-3.491
	[0.100]	[0.129]***	[0.091]*	[0.105]	[3.156]*	[2.510]***	[2.217]*	[1.619]	[0.094]	[0.068]	[3.222]
Age-specific center care availability * 1 {the youngest child is aged 1}	-0.174	1.178	-0.679	-0.072	10.731	16.844	-13.9	7.788	0.487	0.049	4.964
	[0.540]	[0.582]**	[0.466]	[0.594]	[17.353]	[10.964]	[13.614]	[8.098]	[0.483]	[0.459]	[17.688]
Age-specific center care availability * 1 {the youngest child is aged 2}	-0.075	0.084	-0.145	0.032	-2.732	-0.027	-4.133	1.429	-0.085	-0.086	-1.556
	[0.109]	[0.185]	[0.126]	[0.130]	[3.540]	[3.802]	[3.372]	[1.984]	[0.127]	[0.090]	[5.065]
Age-specific center care availability * 1 {the youngest child is aged 3}	-0.13	-0.21	-0.02	-0.048	-5.739	-4.755	-0.765	-0.218	0.028	0.051	1.842
	[0.073]*	[0.090]**	[0.085]	[0.089]	[2.019]***	[1.657]***	[1.797]	[0.936]	[0.069]	[0.051]	[1.886]
Age-specific center care availability * 1 {the youngest child is aged 4}	-0.089	-0.263	0.07	-0.063	-3.603	-4.51	1.435	-0.528	0.044	0.103	4.169
	[0.061]	[0.074]***	[0.066]	[0.076]	[1.732]**	[1.436]***	[1.524]	[0.815]	[0.061]	[0.045]**	[1.862]**
Observations	2751	2751	2751	2751	2751	2751	2751	2751	3860	3860	3860
SLAs	496	496	496	496	496	496	496	496	509	509	509
F-stat	7.55	7.48	2.86	3.71	9.74	6.45	3.25	3.24	14.94	4.4	13.01

Sources: See the sources listed in Table 1.

Notes:

- See the Notes for Table 3.

Appendix 1: Sources and definitions of Community (Statistical Local Area (SLA))-level data

- **The age-specific number of center-based childcare places per child**

The information on the location (postcode) and accreditation history of center-based care providers was collected using an automated procedure in May 2006 from the website of the National Childcare Accreditation Council (NCAC). NCAC is responsible for the registration of childcare providers and quality assessment under the federal quality-assurance system. The original information was converted into the year*SLA-level data based on the concordance file that converts the 2006 postcode into the 2001 SLA (The Australian Bureau of Statistics).

To obtain the number of child care places, the number of providers was multiplied by the state-level average number of children looked after in one center-based provider. This information was obtained and interpolated from the 2002, 2004, and 2006 Child Care Census.²² That is, the total number of children taken care of at all the care providers is computed for each state and age group (0, 1, 2, 3, 4 year-olds). Each of these numbers was divided by the number of providers in each state.

The number of childcare places was then divided by the number of children residing in each SLA by age group. The number of children living in each SLA was interpolated based on the 2001 and 2006 Census (Time Series Profile of the Australian Bureau of Statistics Datapack).

- **The unemployment rate**

The data for each area and year were extracted from the Small Area Labor Markets (the Department of Employment and Work Relation). Since the data are not available for some SLAs which experienced boundary changes in the December quarter of 2002, a dummy variable is defined for area*year observations where the unemployment rate is available. While this dummy variable takes into account a possible difference in the pattern of childcare utilization and maternal labor supply, the interaction term between the dummy variable and the unemployment rate shows the correlation between the outcomes and the unemployment rate among areas with the data.

Appendix 2: The federal childcare policy in Australia: 2002-2004

This section summarises the major federal childcare policy that was in place in the analysis period. It consisted of a price subsidy, quality assurance, and direct support for providers.

The price subsidy (Child Care Benefit), the largest expenditure item, provided a means-tested hourly benefit to a household using childcare, according to the number of hours used by the child(ren). Thus, a poorer household was able to use the same service at a lower fee, though the childcare expenditure typically occupied a larger proportion of household disposable income (Toohey, 2005). Parents were able to claim this payment for up to 24 hours of care per child without working, and working parents were eligible for up to 50 hours of child care.²³ A more generous subsidy rate was applied to the usage of government-approved care providers, which satisfied the national quality standards set under the Child Care Quality Assurance (CCQA) system.²⁴ Approved care included LDC, FDC, and preschools/kindergarten that opted into the system. Providers of center-based care examined in this paper were all participating and generally approved under this system.²⁵

A small proportion of childcare expenditure was spent on support for providers operating in areas deemed as scarce of supply. These programs provided certain incentives to households and providers. These incentives were in place for the entire analysis period.

²² The Department of Families, Housing, Community Services and Indigenous Affairs (FaHCSIA) collected the 2002 and 2004 data, and the Department of Education, Employment and Workplace Relations conducted the 2006 Census.

²³ This also applies to parents who are studying, looking for work, or undertaking training for 15 hours or more per week.

²⁴ To be approved or accredited, providers must satisfy a set of standards related to staff relationships with children and peers, partnerships with families, learning environments, safety, nutrition and health, and management practices (National Childcare Accreditation Council, 2006). Parents using informal care (such as grandparents, relatives, friends and unregulated nannies) can register their providers and receive a lower rate of subsidy. As of 2006, the hourly subsidy was \$3.37 for approved care and \$0.564 for registered care.

²⁵ Due to the link to the subsidy program, a majority of childcare providers, including LDC and some preschools, was likely to participate in the scheme. Between 2002–2004, most (95%, based on the data collected by the author) participating providers were accredited.