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Local Availability of Subsidized Child Care and Maternal Labor Force Participation: Evidence from Australian Longitudinal Data

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Abstract:
In order to assist parents with young children to balance family and work, many governments attempt to ensure the provision of accessible non-parental childcare. This study investigates how changes in the local availability of subsidized center-based childcare are correlated with changes in the pattern of childcare utilization and maternal labor force participation. It combines the new data on the number of subsidized childcare centers in Australia with the 2002-2005 HILDA (longitudinal household survey) based on each household's residential area. The household-level fixed-effects estimates show that an additional center per 100 children per area is accompanied by a 35-50% increase in the probability of a household (with a more-educated mother) using center-based care and a 14-36% decrease in the probability of

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using home-based carers. The increased availability is also associated with a 32-62% increase in these mothers' labor force participation rate. These findings suggest that the effect of the availability of subsidized childcare on maternal economic participation is likely to be limited to relatively educated mothers.

JEL Codes: J13, J22
Key words: child care, labor force participation, longitudinal data

1 Introduction

Recently, there has been a growing concern in developed countries about the accessibility of non-parental childcare. As women's aspirations to participate in economic activities increased, so has the expectation for governments to help women to balance work and family. Also, recent reforms in welfare systems have encouraged the self-sufficiency of recipients (many of whom are low-income, single mothers), which can further increase the need for non-parental childcare. Moreover, such demand has been strongly acknowledged in many aging societies, where mothers are seen as potential workers who can contribute to social security funding. Many governments have responded to these changes by introducing public childcare subsidies, ranging from partial fee relief to the universal provision of free childcare.

A number of recent studies investigate whether these policies help mothers to participate in the workforce, and generally find that they do. Maternal labour force participation is enhanced after the introduction of a subsidized or free public preschool system (Baker, Gruber and Milligan, 2005, Cascio, 2006 and Schlosser, 2005); it also rises following the increase in the number of public preschools (Berlinski and Galiani, 2006). Increased labor supply is also found for mothers of children who are eligible for free preschool service, compared to those of children who are not yet eligible for it (Gelback, 2002). The consistency of these findings is in contrast to the more mixed findings of earlier studies, which are based mainly on cross-section data and a structural estimation approach (Blau and Currie, 2004 provides a review). However, recent studies shed relatively little light on the effect of subsidized childcare for mothers with very young children who are not yet of

preschool age, with the exception of the work of Baker, Gruber and Milligan (2005). Also, little evidence is available from countries where childcare subsidies are more generously provided to low-income households. While the recent studies indicate the effectiveness of a universal free service, in order to ensure the access to a minimum level of child care to all the parents, it might be more efficient to target a subgroup of households (OEDC, 2007, Casiao, 2006).

This study fills these gaps by first providing the evidence for mothers with children 0-2 and 0-4 years old; and second, by utilizing the data from Australia, where low-income households are entitled to a larger child care subsidy. My empirical strategy exploits the expansion of the availability of subsidized childcare across different areas between 2002 and 2005. Specifically, I investigate how changes in the number of subsidized child care centres per 100 children aged 0-4 years in the area of residence are correlated with changes in the utilization of different types of child care and maternal workforce participation. The new data on the number of subsidized child care centers are combined with the Household Income and Labour Dynamics in Australia (HILDA) Survey based on households' residential areas.

The results based on the household-level fixed-effects show that the addition of one subsidized centre is accompanied by a 35-50 percentage-point increase in the proportion of households using center-based childcare and a 14-36 percentage-point reduction in the proportion using registered nannies. These effects are concentrated among households with mothers who completed some qualification, a bachelor or higher degree. The increase in the availability of subsidized childcare is also associated with a 32-62 percentage-point increase in these mothers' workforce

participation. That is, the likelihood to be part-time workers increases among mothers with a tertiary degree, and the chance to be full-time workers rises for mothers with some qualification. These findings suggest that the effect of subsidized childcare on maternal economic participation may be limited to relatively educated mothers.

The rest of the paper is organized as follows: first, I describe childcare institutions and policies in Australia. Then, conceptual framework, the data and identification strategy are explained in Sections 3, 4 and 5. I discuss the results in Section 6 and conclude in Section 7.

2 Childcare Institutions and Policies in Australia

2.1 Childcare Institutions

The majority of Australia's pre-primary school childcare / early childhood education facilities include Long Day Care (LDC), Kindergarten/Preschool, and Family Day Care (FDC). LDC is a centre-based form of childcare service and typically looks after children who have not started school. Some of LDC staff members tend to have education or experience that is related to early childhood development. FDC is provided by registered carers at their homes or the child's home.[2] Kindergarten and preschools are administratively categorized as educational facilities as opposed to childcare facilities; however, they both provide the same service in terms of freeing up mothers' time for work or other activities.

Mandatory education starts from the age of six. Thus, 5 year-olds who turn six during an academic year start attending primary school. In addition, many younger children

[2] The Department of Family and Community Services (2005). Another type of care, Outside School Hours Care, is provided for children aged for primary school.

attend early childhood educational institutions. One year before primary school, children who turn five can attend kindergarten, which operate 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.[3] Kindergarten or preschool services are sometimes offered at childcare facilities, and some preschools offer a childcare service as well.

In this paper, I group these types of formal care into two categories, centre based care (LDC and kindergarten/preschool) and FDC. LDC and kindergarten/preschool are combined because of the overlap in services that some of these providers offer. In addition to these formal services, informal care is provided by grandparents, relatives, friends, neighbours, and unregulated nannies. These nannies are not included in the FDC category because, unlike FDCs, their quality is not regulated by the government and their clients cannot receive a more generous childcare subsidy. I investigate how the utilization of these types of care changes as the local availability of subsidized centre-based care increases.

2.2 Childcare Policies

The central childcare policy in Australia is the subsidy program that targets low-income households. Its design implicitly encourages parental labor force participation and the use of government-approved care. The majority of public expenditure for

[3] Kindergarten and preschool are have different meanings in each state. For example, the program one year before primary school is called kindergarten in New South Wales (NSW) and Australian Capital Territory (ACT), while it is called preschool in Queensland. The program two years before primary school is called preschool in NSW and ACT, and kindergarten in Queensland.

childcare comes from the Commonwealth (federal) government.[4] Its central instrument, Child Care Benefit (CCB), provides users of childcare with payments according to the number of hours during which the child(ren) use approved types of childcare.[5] One of the main features of CCB is that, though its receipt is not means-tested, the hourly subsidy rate is higher for low-income households.[6] The second feature is that the subsidy size can be larger for working parents; if both of the parents (or one parent in a single parent household) work, study, look for work, or undertake training for 15 hours or more per week, the maximum number of hours that can be claimed per child per week is increased from 24 to 50. The third feature is that the subsidy rate is higher if parents use formal (or approved) care compared to registered care. As of 2006, the hourly subsidy was A$3.37 for approved care and $0.564 for registered care. Approved care for pre-primary-school children mainly includes LDC and FDC. Some of the preschools also opt into this scheme. Registered carers include grandparents, relatives, friends and nannies who look after children while their parents are at work and are registered with the government as carers.

For CCB purposes, government approval of childcare is based on the accreditation status of childcare providers, and this in turn is determined by the National Childcare Accreditation Council (NCAC) under the national Child Care Quality Assurance (CCQA) system. Childcare providers are required to register with the NCAC and receive an accreditation status in order to receive the CCB payments that allow them

[4] For example, in the 2006/07 fiscal year, the Australian Government accounted for 78% of total government expenditure on children's services (A$3.03billion), while state and territory governments provided the rest (SCRGSP, 2008).

[5] A new program, Child Care Tax Rebate, was introduced in 2004, to cover the 30% of the childcare expenditure that is left after receiving the CCB payment with the limit of A$4000. However, the CCTR payment was initially deferred until 2006. It is possible to test whether this policy change is creating some of the results by conducting the same exercise for the sample for 2002-03.

[6] The rate also depends on the age and number of children (http://myaccount.centrelink.gov.au/wps/portal/pay_2_child_care_information?initURL=true).

to offer reduced fees. As a result, providers generally participate in the CCQA system. To be accredited, providers must satisfy a set of standards specified by the NCAC, which are related to staff relationships with children and peers, partnerships with families, learning environments, safety, nutrition and health, and management practices. Nearly all participating providers receive the CCB payments because most (on average 95% between 2002 and 2005) are accredited. In fact, centers receive funding even when they have not finished the assessment process, or indeed even if they fail to be accredited a few times. Only after the incidence of repetitive non-compliance, serious child protection problems, or consistently problematic practice, do providers face the potential to have the payment terminated.[7]

This paper mainly focuses on the number of registered childcare providers in the area of residence as one indicator for the local availability of subsidized childcare. Though this indicator does not distinguish accredited and non-accredited providers, it is unlikely to matter because accreditation status seldom changes the availability of the CCB fee reduction. It is not known whether any non-accredited providers have had their CCB payments terminated.[8] These registered providers are mainly LDCs, but also include preschools and kindergartens that opt into the CCQA system. The area of residence is defined as a geographic area called Statistical Local Area (SLA), which includes on average six post code areas.[9]

3 Conceptual framework

[7] See Appendix for the details of the CCQA system.
[8] The analysis based on the number of accredited providers, which could be interpreted as the availability of both subsidized and quality-controlled care, is currently being conducted.
[9] The number of carers registered for FDC is not available. The number of FDC coordination offices (which provides information on carers to families) hardly changed during the analysis period of 2002-2005.

A number of studies have pointed out that the capacity constraint of childcare can affect the level of utilization and maternal labor supply. Gustafsson and Stafford (1992) for example show that, under the settings where the quality of public childcare is kept homogeneous through regulations, not only the cost of childcare but also the rationing or availability of childcare could play a role in affecting parents' decision-making.[10] Though Australia's childcare is largely provided by the private sector, the quality of all the providers is controlled by the national-level assessment system. Also, the concern has been growing not only about the cost of childcare, but also about the local availability (Yamauchi, 2007). Particularly, it is possible that perceived difficulty in accessing childcare is partly driven by the households' preference for center-based care due to the reasons discussed below. If this results in excess demand for that care in a local market, then relaxing the availability constraint is likely to increase the usage of that type of care.

While households can have different preferences for types of childcare, a number of factors point to the possibility that center-based care is preferred. First, compared to FDC or informal care, childcare centers are more geared towards school preparation, not only for care. Second, households may perceive less uncertainty in the quality of service provided by established centers than individual FDC carers or unregulated nannies. This is particularly true for large chain providers which offer service based on a set of rules applied to all the centers wherever the location. Third, the centers may be more convenient for parents who do not live with other adults (a common situation) and who wish to participate in the workforce, as they usually operate during standard work hours. Making equivalent care arrangements for every working day

[10] Kreyenfeld and Hank (2000) also argue that, in Germany where hardly no private providers operate, the availability of care may be more important for mothers' labor supply decision, though they find no significant relationship between the two.

with informal carers such as relatives and friends might incur psychological or social costs. These factors can create a large demand for center-based care, and it may in the short-run exceed the existing capacity of local providers. Some households may still be able to meet their needs by travelling and using care offered in neighboring areas. However, others may find this too costly.

Alternatively, the preference of parents to have a child looked after at a nearby place (for example, it is more convenient to do so in cases where the child becomes ill or injured) can also create a similar excess demand in some local areas. That is, such a preference may prevent parents from considering childcare offered in other areas, yet the local demand may not be always matched by enough supply.

In areas under these constraints, the addition of a center-based provider will relax the limit, or reduce the average cost of using center-based care by removing the fixed transportation cost. This is likely to increase the use of center-based care and/or the switch to that care from other types of care. If the center-based care enables parents to allocate extra time to employment, maternal labor force participation can be also affected. I test these hypotheses by exploiting the recent changes in the availability of subsidized center-based care across different areas.

4 Data

I combine the longitudinal household survey, Household Income and Labour Dynamics in Australia (HILDA), with the data on the availability of subsidized, center-based care providers based on the are (SLA) of residence of each household with children aged 0-4 years. The HILDA is a nationally representative household

survey that started in 2001. This paper uses only 2002-2005 panels because the questionnaire on childcare usage significantly changed in 2002. From each wave, households with at least one child aged 0-4 years are extracted, and merged across waves. The availability data is created by the author based on the information on the location and accreditation status histories of childcare providers, which is collected from the NCAC's website. I converted this provider-level information into the year*SLA level information by counting the number of providers for each SLA in each year. The total number of providers is then divided by the number of children aged 0-4 years – most of whom have not started the mandatory education.[11] The SLA-level unemployment rate is also combined to control for the local economic condition.[12]

There is a qualification in the use of the availability measure. The number of childcare providers is not a perfect measure of supply because different providers accommodate different numbers of children. Existing providers can also increase their number of places, contributing to an uncaptured increase in availability. To the extent that the number of childcare places is common across providers, however, the number of providers gives a rough proxy for the supply of subsidized, center-based childcare.

The summary statistics for the analysis period (2002-2005) show that, first, the pattern of childcare utilization differs by the age of the youngest child (Table 1). Since children who will turn six during an academic year start mandatory education and those who will turn four can attend preschool, the use of kindergartens/preschools

[11] The numbers of children for each SLA are extracted from the 2001 and 2006 census (Time Series Profile of the Australian Bureau of Statistics Datapack). The numbers for between years are interpolated. See Appendix 2 for detailed data issues.
[12] The unemployment rate is extracted from Small Area Labour Markets data.

(and therefore center-based care) increases significantly for a household where the youngest child is three or four years old. Second, the educational system also affects maternal labor force participation behaviors. On average, 12% of mothers with 0-2 year-olds are engaged in full-time employment and another 34% of them are part-time workers. However, mothers without such very young children have a higher chance of being either full-time worker (18%) or working part-time (40%). Based on these differences, the rest of the analysis is separately applied to the sample of households where the youngest is 0-2 and 0-4 years old. There are too few households to conduct a separate analysis for households where the youngest child is 3-4 years old.

Over the analysis period, the number of registered center-based providers increased from 0.32 to 0.37 per 100 children aged 0-4 years per SLA. Among these providers, the share of either accredited or newly registered providers has been generally stable around 95-96% with the slight decrease in 2003 to 93% (Figure 1). The increase in the local availability of center-based care took place together with the increase in the usage of such care from 25% to 29% among households where the youngest child is 0-2 years old (Figure 2). This is in contrast to the decrease in the use of this type of care among households without 0-2 year-olds (Figure 3). Mothers with these very young children also exhibit larger changes in the labor force participation rate (Figure 4). Their probability of being a full-time worker increased by 3 percentage points from 11% to 14%. A more substantial 7-percentage-point increase is found in the probability of being a part-time worker, rising from 30% to 37%. In contrast, mothers without very young children show less pronounced changes over time (Figure 5). The rate of participation for full-time workers increased by the same percentage points as for mothers with very young children, from 18% to 21%, but the rate for part-time

workers rose only 3 percentage points, from 41% to 44%. I further investigate whether these increases are associated with the changes in the local availability of center-based childcare providers using the following empirical models.

5 Identification Strategy

In order to take into account observed and unobserved heterogeneity across households, I estimate the following household-level fixed effects model:

$$Y_{ijt} = a + b*N_{jt} + d_1*U_{jt} + d_2*X_{ijt} + d_3*S_{ijt} + T_t + u_i + e_{ijt} \ (t = 2002\text{-}2005) \qquad (1)$$

The outcome variable, Y_{ijt}, is measured for a household i living in SLA j in year t. This includes the dummy variable indicating whether the mother is a full- or part-time worker and her number of work hours. The outcomes for childcare utilization are the dummy variables representing the household's use of center-based care, FDC, and informal care. These outcomes are assumed to be a function of the number of center-based providers operating in the SLA where the household lives, N_{jt}. Thus, the parameter of interest, b, shows how responsive households are in terms of the outcomes when the local availability of subsidized, center-based care increases.

The estimated coefficient is net of the household-level fixed effects, u_i, which could include time-invariant components in mothers' work preferences as well as the preferences for different types of childcare. The results also control for year dummy variables, T_t, which capture possible effects of improvements in overall childcare quality and general changes in attitudes of mothers towards non-parental childcare. The changes in the local economic condition are controlled by the SLA-level

unemployment rate, U_{jt}. In addition, the estimates take into account the amount of childcare duty that varies across households by including a set of household-level demographic characteristics, X_{ijt}.[13] This includes the number of adult members other than the parents by age and gender, and the number of children of varying age. Whether the mother has a resident partner is captured by S_{ijt}. Lastly, the error term is allowed to be correlated within SLA across years.

I further extend the basic model to investigate the heterogeneity in the relationship between the availability of subsidized childcare and maternal labor force participation as well as childcare utilization. In particular, I include the interaction terms between the availability measure and the following two characteristics of the mother: educational attainment and marital status.

$$Y_{ijt}= a + b_1*[N_{jt}*C_{ij}] + b_2*[N_{jt}*Q_{ij}] + b_3*[N_{jt}*Q_{ij}*S_{ijt}] + b_4*[N_{jt}*H_{ij}] + b_5*[N_{jt}*H_{ij}*S_{ijt}] + d_1*U_{jt} + d_2*X_{ijt} + d_3* [Q_{ij}*S_{ijt}] + d_3* [H_{ij}*S_{ijt}] + T_t + u_i + e_{ijt} \ (t = 2002\text{-}2005) \qquad (2)$$

Mothers' highest educational attainment is indicated by dummy variables for those who completed a bachelor or higher degree (C_{ij} =1), some qualifications (Q_{ij} =1), and high school (H_{ij} =1). In addition, for mothers who did not attain a bachelor's degree or above, those with and without a resident partner are distinguished by S_{ijt}.[14] In this specification, the parameters of interest, b_1, …, b_5, signify how responsive mothers in each of the groups (college graduates, coupled mothers with some qualifications,

[13] The age of the mother is not included because it creates a collinearity with the year dummies after the fixed effects transformation.

[14] Among college graduates, there are too few single mothers to allow the inclusion of the interaction term, $N_{jt}*C_{ij}*S_{ijt.}$ A small number of high school graduates attained some qualifications during the analysis period; however, the number of changes is not enough to include the educational dummies as time-varient variables.

single mothers with some qualifications, coupled high school graduates, single high school graduates) are to changes in the local availability of subsidized, center-based childcare.

The following two factors suggest that single mothers are more likely to be sensitive to changes in the local availability of subsidized childcare. First, single mothers are more likely to be in need for non-parental care during their work and other activities, holding other factors constant, simply because they do not have an alternative parent who could look after children. Second, conditional on educational attainment, single mothers tend to have lower household income. Since the CCB more generously benefits low-income households, single mothers may perceive additional subsidized childcare as a less expensive method of non-parental care. Contrastingly, the heterogeneity by educational attainment is ambiguous. On one hand, to the extent that educational attainment is correlated with household income, less-educated mothers may adjust their behaviors more sensitively to changes in the availability of subsidized childcare. However, on the other hand, more-educated mothers may find it easier to obtain a job once their childcare duty is relieved by non-parental childcare. Expecting this, less-educated mothers may not switch to the combination of working and using non-parental care. These heterogeneity issues are discussed below, following the results on the overall effects.

6 Results

6.1 The Overall Effects of Local Availability of Childcare

The results of estimating Eq.(1) show that an increase in the availability of center-based care is associated with an increase in the use of center-based care and a

decrease in the use of FDC. It is also correlated with the increase in the likelihood that the mother is engaged in part-time work among households where the youngest is 0-2 years old. Panel A of Table 2 indicates the results for households where the youngest child is 0-4 years old,[15] which suggests that an additional center-based provider per 100 children aged 0-4 years in the area of residence is associated with a 12% increase in the probability that a household uses center-based care and a 9% decrease in the probability that it uses FDC (Columns 2 and 4). The results are consistent even when the outcome is limited to the use of childcare during which parents work (Columns 1 and 3). On the other hand, the probability of using informal care does not show a significant change associated with the change in the local availability of center-based care (Column 5 and 6). These results for childcare utilization indicate the shift from FDC to center-based care; however, this is not accompanied by a change in maternal labor supply (Columns 7-9). These results may seem to indicate that the increased availability of childcare does not induce mothers to work. That is, capacity constraint is not the central obstacle preventing them from participating in the labor market.

However, the results in Panel B for households where the youngest child is 0-2 years old indicate a different story. Among these households, mothers tend to start part-time work as more center-based care becomes available around their residential areas. An additional center is correlated with an 18% rise in the probability for these mothers to be part-time workers. In terms of the pattern of childcare utilization, these households demonstrate a similar switch from FDC to center-based care. The likelihood that they use FDC declines by 6 percentage points while the likelihood that they use center-based care increases by 14 percentage points. The difference is that households with

[15] See Appendix Table for the full results.

very small children are even more likely to shift from FDC to center-based care for work-related purposes. This discrepancy in the results suggests that, when it comes to determining maternal labor supply, local factors (such as the availability of childcare) are more important for households where the youngest is very small. This is reasonable because many children aged 3-4 years attend preschools or kindergarten. These school systems shorten the time for which mothers seeking employment need to arrange some non-parental childcare. In contrast, mothers with very young children have to arrange non-parental care for the entire time in which the parents are at work. Thus, the benefit of having locally available subsidized childcare is likely to be larger for these mothers.

6.2 The Heterogeneity in the Effects of Local Availability of Childcare

In addition to the difference by the age of the youngest child, the households' responses to changes in the availability of center-based childcare vary also by the mother's educational attainment and marital status. In particular, increases in both the labor supply and the use of center-based care are found for single mothers who completed some qualifications (regardless of the age of the youngest child) and college graduates (including single and coupled mothers) from households where the youngest child is 0-2 years old.

The first group to demonstrate an employment effect is that of single mothers with some qualifications. Results based on the extended model indicate that, as another center-based provider becomes available per 100 children, they become 73% more likely to be employed (Column 2, Table 3). This change is mainly driven by the increase in the probability that they are engaged in full-time work (Column 4). The

results for childcare utilization outcomes demonstrate that these moderately educated, single mothers become 50% more likely to use center-based care and 25 % less likely to use FDC, though the negative effect is statistically insignificant (Columns 4 and 8, Table 4). The increase in the use of center-based care more than offset the decrease in the use of FDC when the outcome is limited to the usage during the time in which parents work (Columns 2 and 6). As a result, these mothers become more likely to use some kind of non-parental childcare (center-based, FDC, or informal) for work-related purpose (results not shown). These results indicate that the increased availability of center-based care is accompanied by some of these mothers substituting FDC with center-based care, and others newly starting to utilize center-based care. Both of these changes are likely to have helped the mothers to increase their labor supply. Similar patterns of change are found when only mothers with some qualification from households where the youngest child is 0-2 years old are examined. In this situation, there is an increase in the probability of engaging in full-time work and shifting from the use of FDC to the use of center-based care. The use of informal care is also increased, mainly reflecting the increased use of grandparents, relatives, and friends who look after the child at their home (who generally do not receive compensation), rather than the use of paid sitters and friends who take care of the child at the child's home (who generally receive compensation). One interpretation for these results is that, in the cases where the youngest child is very small, the full-time work of single mothers with some qualification can be realized due not only to the increased availability of center-based care, but also to the informal support complementing the center-based care.

The second group of mothers who increase labor supply following the increased childcare availability is those who completed a bachelor degree or above and whose youngest child is aged 0-2 years. They become 33% more likely to be employed, as an additional center-based provider becomes available. This is mainly due to the increase in the probability of being part-time workers (Table 3). These mothers indicate a large increase in the use center-based care (34%) and a somewhat smaller decrease in the use of FDC (23%) (Table 5). When I combine these mothers with mothers who have the same level of educational attainment and the youngest child aged 3-4 years, a similar, though weaker, shift from center-based care to FDC is observed. Reflecting this weaker shift, this sample of mothers does not indicate a significant employment effect (Table 4). These results suggest that the local availability of center-based childcare encourages highly educated mothers to return to work in the early stages of their child-rearing. This is the time when these mothers are gradually returning to the workforce. That is, while many of these mothers (80%) become employed by the time when their youngest child is 2 years old, when their youngest child is 1-2 years old, more than half of employed mothers work part-time. As the youngest child becomes older, the composition of part-time workers declines. Therefore, the effect on part-time employment for mothers with very young children suggests that childcare availability in the beginning of the transition period is particularly critical in facilitating highly educated mothers' return to work.

The third group of mothers, coupled individuals with some qualifications, shows a limited labor supply effect on the intensive margin by switching from part-time work to full-time work, without changing the total participation rate. However, this effect appears to be contained to mothers with the youngest aged 3-4 years old. That is, the

results for households where the youngest child is 0-4 years old indicate that these mothers become 30% less likely to be part-time workers and 23% more likely to be full-time workers (Table 3). They are also 30% more likely to start using center-based care, without decreasing the probability to use FDC (Table 4). As a result, they become 32% more likely to use some kind of non-parental care for work-related purposes. On the other hand, the results for mothers with the youngest child aged 0-2 years show that the decline in the chance of being a part-time worker overwhelms the increase in the likelihood to be a full-time worker, resulting in the lower labor force participation rate.

While the results so far generally point to some changes in mothers' labor supply and childcare utilization as a response to the increased availability of subsudized center-based childcare, the results for high school graduates suggest less pronounced responses. For example, their labor supply outcomes generally indicate insignificant changes, except for the 10% decrease in the probability for coupled high school graduates to be full-time employees (Table 3). Also, once marital status is controlled, these less-educated mothers do not indicate an increase in the use of center-based care. Instead, single, less-educated mothers become less likely to use center-based care, and more likely to use informal care (Tables 4 and 5). Since the decline in the use of center-based care is not found for the group of mothers with the youngest child aged 0-2 years, the effect is likely to be concentrated among those with 3-4 year-olds. When LDC and kindergarten/preschool are separated, the results show that it is the use of kindergarten or preschool that is reduced. Note that not all the kindergartens and preschools are included in the CCQA system. Hence, the declined usage might

possibly reflect unobserved changes in the availability, affordability or quality of these services, which are not captured in the number of registered providers.

Finally, the results for these different groups of mothers demonstrate a complicated pattern of concentration. That is, the positive effect of the availability of childcare providers on maternal labor supply is found among college graduates (only when their youngest child is 0-2 years old) and single mothers with a qualification (regardless of the age of the youngest child). Though high school graduates are more likely to have low income, and thus be eligible for a more generous childcare subsidy, the results suggest that it does not induce them to work, even when the local availability is expanded. There are several possible explanations for these findings. First, the fact that the less-educated mothers do not show any employment effect might indicate the difficulty these mothers have in obtaining a job. Alternatively, the high marginal tax rate that they face when starting a paid job might be a more important disincentive for them to look for work. Second, one possible explanation for the concentrated positive employment effect among the relatively educated mothers is that the capacity constraint in childcare is a barrier to a subgroup of mothers who do not have other obstacles - namely, mothers who have the skill sets that are demanded in the labor market and/or who do not face a disincentive to participate in the workforce. Third, among mothers with a qualification, single mothers are, as expected, more sensitive than coupled mothers to changes in local childcare availability, perhaps due to their stronger needs to work and to obtain non-parental care. Fourth, among the most educated, only mothers who are in the early stages of child-rearing respond to the local availability of childcare. This implies that their employment decision is less dependent on the availability of non-parental care once the youngest child turns three.

This is likely to be a reflection of the fact that they tend to have higher wage rates and work preference, and thus, being out of the labor force for a long time is unlikely to be the optimal for them. The concentrated effect suggests that the local availability of childcare facilitates their even earlier return to work.

7 Conclusion

The growing concern about the increasing need for non-parental care has led many researchers to investigate how the local childcare market structures affect households' childcare utilization and maternal labor supply. Exploiting the variation in the number of childcare providers across areas and over time, this paper has shown that an additional subsidized childcare center per 100 children in the area of residence is accompanied by an increase in maternal labor supply as well as the substitution of home-based carers by center-based care. These effects are however highly heterogeneous. On one hand, mothers with a bachelor or higher degree whose youngest child is aged 0-2 years become more likely to work part-time; single mothers with some qualifications become more likely to be a full-time worker regardless of the age of the youngest child. On the other hand, mothers who completed only high school exhibit few significant responses. These findings suggest that the effect of the availability of subsidized, center-based childcare on maternal economic participation may be limited to relatively educated mothers.

I plan to extend the analysis further to test whether part of the correlations are due to the fact that childcare providers choose to operate in areas where the number of work-oriented mothers is growing. Particularly, I use several kinds of commercial property values (proxies for the rental cost for providers) as instrumental variables for the

number of childcare providers. The identification assumption is that, controlling for the household-level fixed effects, year effects, and residential property value, commercial property values do not affect mothers' labour supply or demand for childcare.

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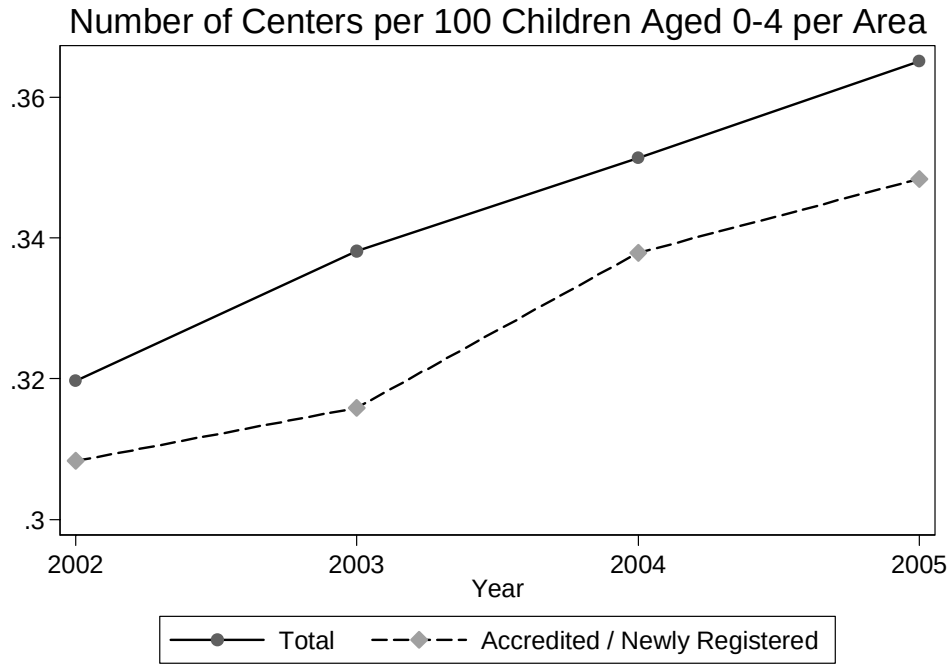
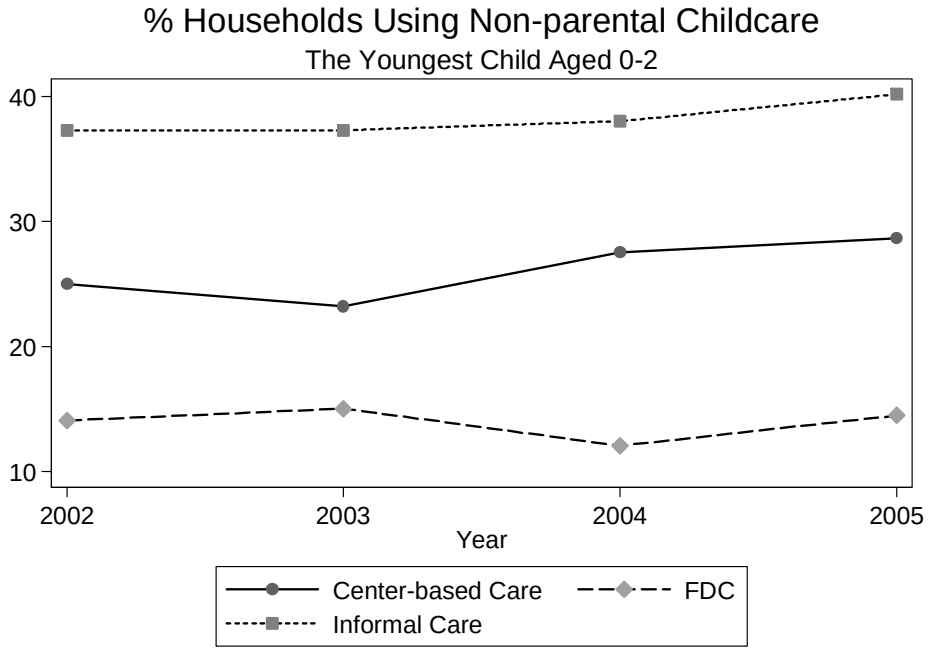
Figure 1: Changes in the Local Availability of Center-based Childcare Providers in Australia: 2002-05



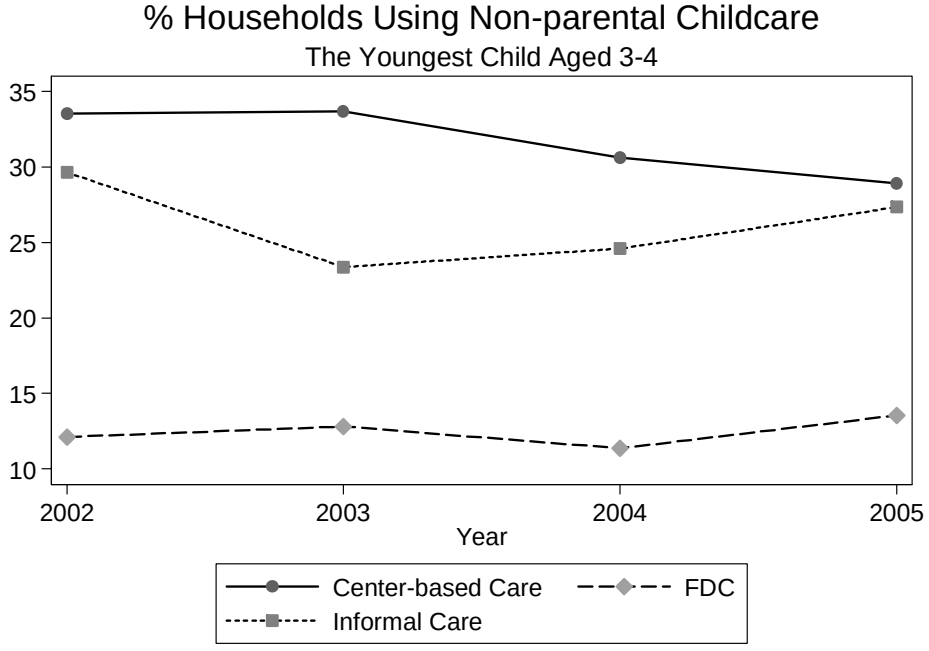
Sources: The National Childcare Accreditation Council (NCAC) data and the 2001 and 2006 Australian Census.
Notes: Centers include Long Day Care, kindergarten, and preschools that are registered with the NCAC. Both newly registered providers and providers that received accreditation after assessment are given the governmental financial assistance designated for fee relief, Child Care Benefit (CCB). Providers that failed receiving accreditation a few times are provided with the assistance except for seriously problematic cases. The area refers to Statistical Local Area (SLA), which contains on average six post code areas. The number of children per SLA is interpolated based on the two census datasets.

Figure 2: Changes in the Usage of Different Types of Childcare among Australian Households Where the Youngest Child is 0-2 Years Old: 2002-05



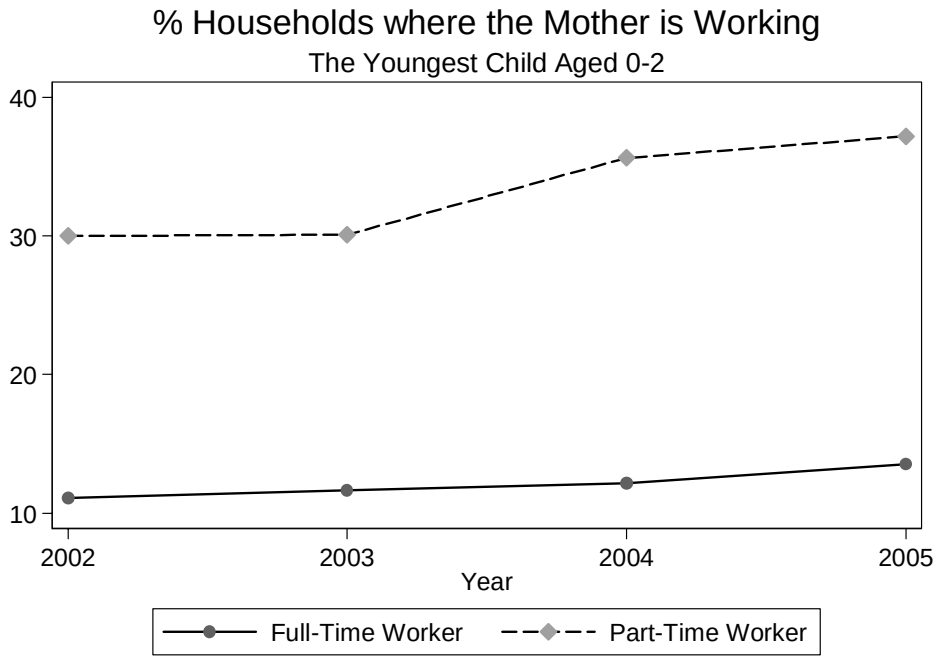
Sources: The 2002-05 Household Income and Labour Dynamics in Australia (HILDA) Survey
Notes: See the notes for Fig.1 for the definition of center-based care. FDC is Family Day Care, provided by registered sitters. Informal care is provided by grandparents, relatives, friends, and unregistered sitters.

Figure 3: Changes in the Usage of Different Types of Childcare among Australian Households Where the Youngest Child is 3-4 Years Old: 2002-05



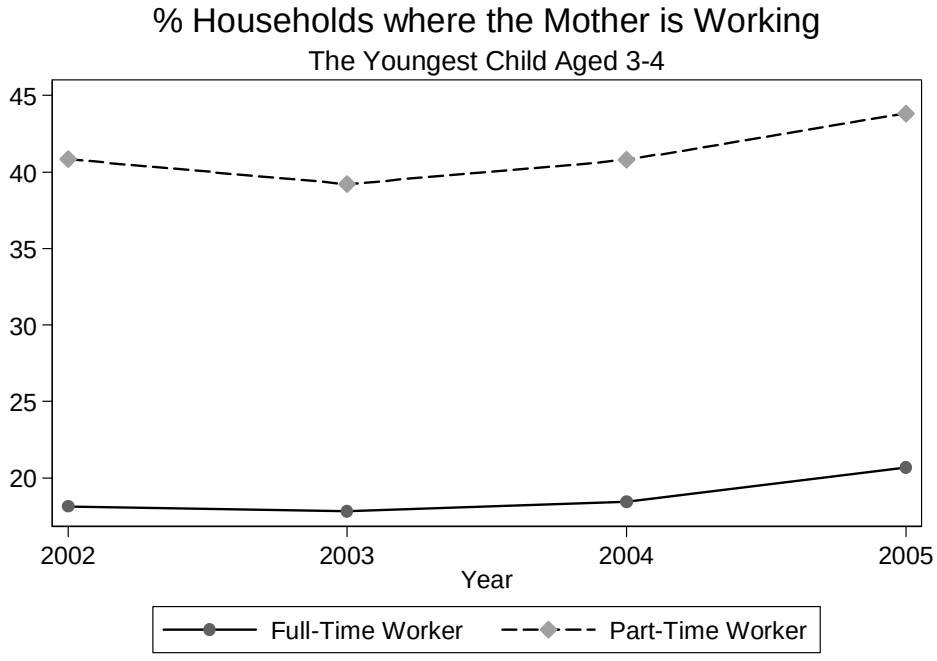
Sources: The 2002-05 HILDA Survey
Notes: See the notes for Figures 1 and 2 for the definitions of the three types of care.

Figure 4: Changes in the Labor Force Participation by Australian Mothers from Households Where the Youngest Child is 0-2 Years Old: 2002-05



Sources: The 2002-05 HILDA Survey
Notes: Mothers are defined to work full-time if they generally work 35 or more hours per week. They are defined to work part time if they work fewer than 35 hours per week. The employment status of mothers who work irregular hours is defined based on the actual number of hours worked in the week prior to the survey.

Figure 5: Changes in the Labor Force Participation by Australian Mothers from Households Where the Youngest Child is 3-4 Years Old: 2002-05



Sources: The 2002-05 HILDA Survey
Notes: See the notes for Fig.4 for the definitions of full- and part-time work.

Appendix 1: Child Care Quality Assurance (CCQA) system

Once registered, a provider must submit a self-evaluation report called Self-Study Report (SSR) within one and half years. The assessment process then involves a further survey filled in by the director, staff, and families prior to the visit by Validators who assess the provider (Validation Survey), followed by a report by Validators (Validation Report), and the provider's comments on the validation visit. These materials are then assessed by Moderators. A computer program is used to calculate a composite Quality Profile of the provider based on ratings from the SSR, VS, VR, and the Moderators evaluation. This profile indicates whether their practice is Unsatisfactory, Satisfactory, Good Quality, or High Quality. The NCAC accredits a provider if it achieves a rating of Satisfactory or higher on all the assessed areas (NCAC (2006a), (2006b), (2006c)).

Providers can fail the accreditation process under one of the following three circumstances: (1) they are not compliant with the CCQA system, (2) not accredited by the system, or (3) have had their accreditation withdrawn. In the first case, providers receive Non-Compliant status because they do not undertake the necessary actions required by the assessment process. This includes paying registration fees, submitting their Self-Study Reports, and allowing a Validator to conduct a validation visit / spot check. The second case occurs when providers have not met the standard required under the CCQA system. The third case takes place when they have serious problems related to licensing or child protection, as confirmed by relevant authorities. Providers could also receive this status when other issues are reported to the NCAC as a written complaint but do not adequately respond to the NCAC within eight weeks of the initial correspondence.

Providers do not immediately close down after failing to receive Accreditation status; however, Non-compliant status, Accreditation Withdrawn status and a repeated or particularly problematic Non-Accredited status are reported to the Department of Families, Housing, Community Services and Indigenous Affairs (FaHCSIA), which can impose sanctions in the form of suspension / cancellation of the provider's approval for CCB purposes. Alternatively, the other form of sanction, additional conditions for approval, can be applied. Once approval is suspended, providers no longer receive the CCB payments for fee relief; therefore, this sanction effectively increases the cost of childcare for families using the providers. Providers that receive Non-Accredited status can regain Accreditation status once they improve their practices and meet the required standards. Providers that are non-compliant or have their accreditation withdrawn can move to Compliant status after they address the issues that contributed to the decision to the initial status, and further have Accreditation status reinstated once they go through the assessment process and meet the standards (NCAC (2006a), (2006b), (2006c)).

Appendix 2: Data

The numbers for SLAs defined as of 2006 are converted into the number for SLAs defined as of 2001 based on the ABS's concordance file. The provider information, which is available for each postcode, as of 2006, is also converted into the information for each SLA as of 2001. The data on the unemployment rate is extracted from the dataset called Small Area Labour Markets, which is administered by the Department of Employment and Work Relation