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Child Care Arrangements and Labor Supply

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Abstract*

This paper discusses several approaches to examining the relationship between child care and mothers' labor supply. The focus is on child care for children aged 0-3, because this is a critical period for working mothers and their children and because most European and American households with children aged 3-5 already use child care centers. The paper provides data concerning availability of, government spending on, and quantity and quality standards for child care in different countries, then compares different approaches to the determinants of child care demand and labor supply. The paper subsequently reviews and compares empirical results regarding the impact of child care costs, availability and quality. Finally, the paper discusses different impacts across different groups and provides concluding remarks.

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1. Introduction

One of the main, long-term labor market trends in most OECD countries is the increase in the proportion of working mothers resulting from greater shares of dual-earner families and higher employment rates among single-parent households. Because of parents' growing reliance on formal and informal child care to help with child-rearing, researchers and policymakers are focusing new attention on the importance of child care arrangements, mothers' labor market participation and child outcomes.

In this paper, we discuss several approaches to examining the relationship between child care and mothers' labor supply. We focus on child care for children aged 0-3, because this is a critical period for working mothers and their children and because most European and American households with children aged 3-5 already use child care centers. In Section 2, we provide data concerning availability of, government spending on, and quantity and quality standards for child care in different countries. In Section 3 we compare different approaches to the determinants of child care demand and labor supply. In Section 4 we review and compare the empirical results regarding the impact of child care costs, availability and quality. In Section 5 we discuss the different impacts across different groups, and Section 6 provides some concluding remarks.

2. Structure and Characteristics of Child Care Systems in Europe and the United States

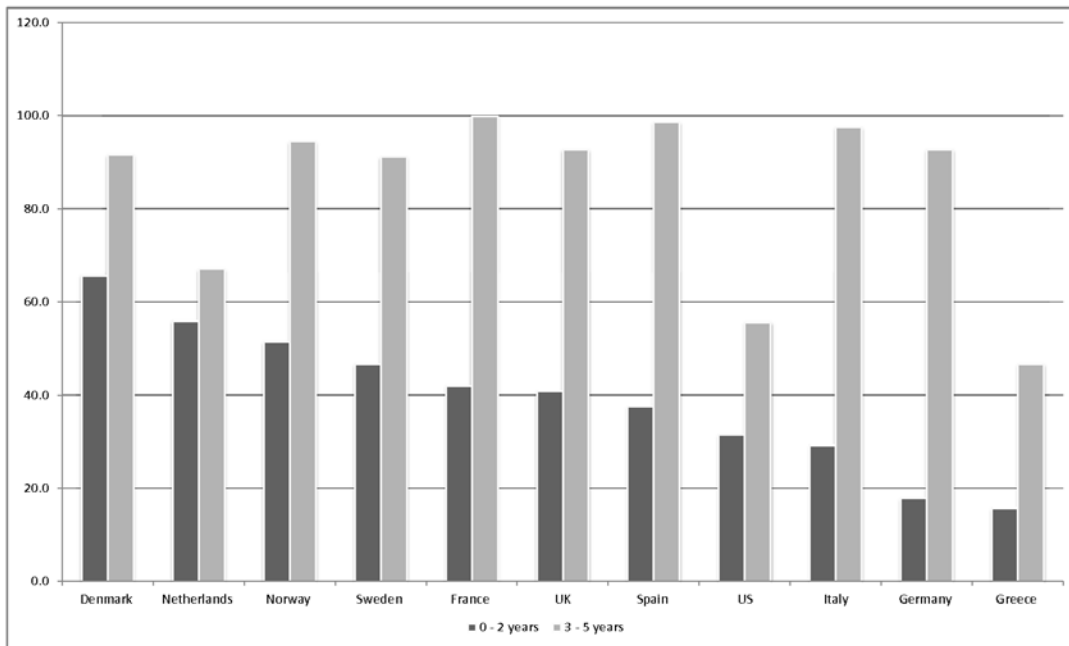
The structure and characteristics of child care systems differ significantly across countries. In the United States and the United Kingdom, the private sector accounts for the largest share of the child care market, with the government providing subsidies and tax allowances to assist poor households with child care expenses. The quality of child care centers in both countries is very heterogeneous.

Instead, most European governments are directly involved in the provision of child care services, while the supply from the private sector is very limited. However, strong differences still exist across Continental Europe. While Northern European countries such as Sweden, Denmark and Norway provide universal public child care, countries in Southern Europe are moving toward a mixed system that combines private and public forms of child care.

The availability of child care for children aged 0-2 is still very limited throughout Europe. Figure 1 shows the enrollment rates of children by age. Among the countries listed,

Denmark has the highest proportion of children <3 enrolled in child care, while Italy and Greece as well as Germany have the lowest. West and East Germany exhibit striking differences: policies to increase child care availability for children aged 0-2 are quite recent in West Germany, while East Germany's longstanding tradition of child care investment means that the service is already more widespread. In the United Kingdom, access to public child care has traditionally been limited and targeted to households in need. In France, generous subsidies are available to offset the costs of child care centers as well as care by child minders, and they are distributed according to a uniform, nationwide standard. Child care fees represent about 12 percent of the average French household's income, and the latest reforms make individual care even more advantageous for high-income families.

Figure 1. Enrollment Rates of Children under Age 6 in Formal Care or Early Education Services, 2008



Source: OECD Education database.

Note: Formal care and early education services include both public and private facilities.

The different types of child care arrangements (formal, parental and other) available across countries seem to be related to the labor market participation rates of mothers. In fact, female employment rates in some Northern countries (Denmark, Sweden) hover around 70 percent, while they barely reach 40-45 percent in Southern countries (Italy, Greece, and Spain). Other differences emerge in terms of child care costs. In most EU countries, child care for 3 to 5-year-olds is fully subsidized, but the same is not always true for those aged 0-2. Northern European countries and France provide more generous child care subsidies than countries in Central and Southern Europe. In recent years, the increasing relative cost of child care has made the service less affordable in most countries. Because many households lack access to alternative forms of child care (such as informal care provided by relatives), this could have a major impact on the labor supply. According to the comparative analyses of Bradshaw and Finch (2002), average monthly child care costs vary from €151 in Sweden to 185 in France, 187 in Italy, and 225 in Germany and the United Kingdom.¹

Although difficult to measure, another key aspect of child care provision is quality of service. While some variables can be “observed” (staff/child ratio, educational level of teachers and some environmental factors such as space, light, toys, books), others (the disposition, communication skills, enthusiasm and competence of the teachers and staff, for example) are more difficult to assess. The staff-child ratio varies widely throughout Europe. In Denmark and the United Kingdom, the staff-child ratio for children under three is 1:3; elsewhere, including in Italy and Germany, it measures between 1:6 and 1:10). Table 1 provides a country ranking of the child-staff ratio for children 0-2 and 3-6 and shows that Denmark and Finland provide the highest number of teachers per child in the 0-2 range, and Denmark and Sweden for the 3-6 range.

¹ Child care costs for a two-earner couple (average male + half average female earnings) would be expected to pay for the most prevalent form of full-time child care in their country per month, after direct and indirect subsidies but before taxes and benefits (year 2001 – £ PPP).

Table 1. Country Rankings According to the Child/Staff Ratio in Public Child Care for Infants and Pre-School-Aged Children in Selected Countries

Child/staff ratio 0-2		Child/staff ratio 3-6	
Denmark	3	Denmark	6
Finland	4	Sweden	6
France	5.8	Finland	7
Italy	6	Italy	12.5
Sweden	6	France	12.7
Germany	7.5	UK	24.3
Netherl.	7.5	Spain	25
Spain	13.7	Germany	25.5

Source: Del Boca and Wetzels (2008).

The educational level of child minders and preschool teachers also tends to vary, not only among countries, but also between public and private child care institutions, with private child minders usually having less education.

The cross-country evidence shows also that most of the countries spending more on child care are also the countries with relatively more generous parental leave policies.

Under EU law, employed women are entitled to a maternity leave period of a minimum of 14 weeks and to a parental leave period of a minimum of 3 months, but countries are free to provide additional time, transfers, and flexible timing, pension and seniority rights. While the length of maternity leave (14 - 22 weeks) and the replacement ratio (most of them over 80 percent) are quite homogenous among countries, parental leave differs substantially in terms of length and paid period (Table 2). For the Netherlands a period of 6 months applies, whereas a relatively long leave of 3 years exists in France and Germany. The wage replacement is more generous in Denmark and Sweden. Moreover, in some countries such as Sweden women are allowed to take only part of the leave and to work a reduced number of hours; or allowed to postpone the leave until the child is older, rather than immediately after childbirth (De Henau et al., 2008). Maternity leave and parental leave are likely to have a positive impact on women's employment rates since more women would enter employment if they knew they had access to leave. Estimates using European Household Panel Data show that the length of parental leave is positively related to participation, and the effect is positive until a certain period and then starts to decline (Del Boca, Pasqua and Pronzato, 2009). While official rights to maternity leave make

it easier for women to keep a formal attachment to their previous job, prolonging the leave beyond a certain point may have the opposite effect, implying career interruptions.

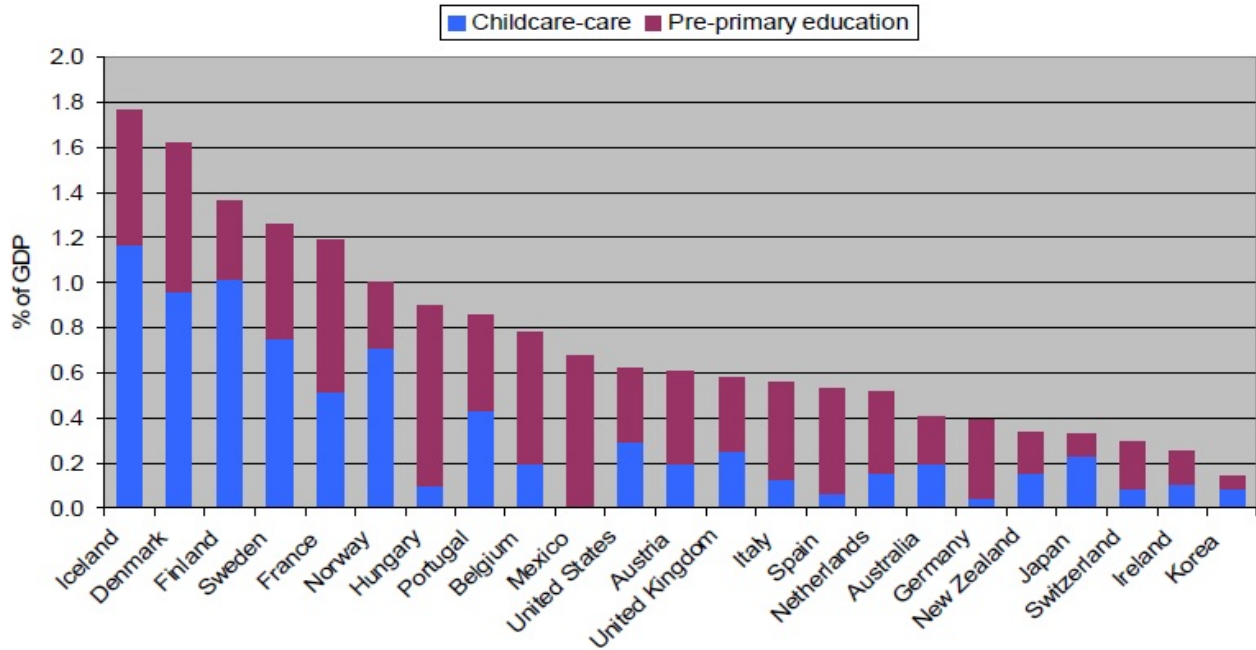
Table 2. Maternity and Parental Leave in Selected European Countries

	<i>Maternity Leave</i>		<i>Parental Leave</i>	
	<i>Duration (week)</i>	<i>% Wage</i>	<i>Duration (months)</i>	<i>% Wage</i>
Denmark	18	62	11	83
France	16	100	36	42.4
Germany	14	100	36	25.1
UK	18	43	8	15.3
Italy	22	80	11	30
Netherlands	16	100	6	14.2
Sweden	14	80	18	66

Source: De Henau et al. (2008).

Several authors have classified countries according to the generosity of their welfare state and their policies for promoting the employment of mothers of preschool children. On the basis of the availability of publicly funded child care (as well as tax relief, maternity and parental leaves), countries were classified as providing high support (Sweden, Denmark, Finland, France), medium support (West Germany, the Netherlands, Norway) or low support (Greece, Italy, Spain, the United Kingdom, the United States). A relatively strong co-variation between the supportiveness of policies and women's employment emerges except in the liberal countries (and particularly the United States and the United Kingdom), where low support was associated with high female participation (Del Boca and Wetzels, 2008; Gauthier and Hatzius, 1997).

Figure 3. Spending on Child Care and Pre-Primary Education as a Percentage of GDP



Source: OECD Family Database 2010.

In countries where governments spend less on formal child care, parents tend to rely more on grandparents for care. Data from the Survey of Health, Ageing and Retirement in Europe show that 49 percent of Western European grandfathers and 58 percent of grandmothers provide some form of care for their grandchildren (Hank and Buber, 2009) and that from 20 percent to 40 percent of them care for their grandchildren on a regular basis (once a week or more). Almost twice as many grandparents in Southern Europe provide regular child care (once a week or more) as in the Nordic countries. The difference is even greater among grandparents providing care on a daily basis: around 30 percent in Italy and Spain versus 15 percent in Germany and only 2 percent in countries like Denmark and Sweden.

The extent to which grandparents are involved in child care depends on a series of socioeconomic and cultural factors related to the characteristics of the grandparents, parents, family structure, and the public provision of schooling and child care services. Grandparents provide child care for a number of different reasons (and preconditions). When grandparents are available to provide care, low-income parents may prefer this option because of the savings and greater flexibility in timetables it brings. Parents who can afford child care are not always able to

find accessible services. Parents at all income levels may choose to leave their children in grandparents' care because of the safer and more emotionally nurturing environment they believe it provides. This is particularly true in more traditional families (for example, those with a Catholic background), which have stronger intergenerational ties. Family structure is also important, of course. In households with children in which only one parent is present, grandparents (and other relatives of the parent residing with the child) are likely to have a much more prominent role in providing child care services and assuming surrogate parent positions in the child's life.

In Southern European countries the participation rate of women is much lower than in the Northern Countries and declines with the number of children. According to recent data (OECD family data base 2009), in countries like Sweden the participation rate of mothers with one child is 80 percent, 85 percent with two children and 78 percent with three children. In Italy and Spain it is, respectively 60-65 percent with one child, 30-35 percent with two children, and 30-35 percent with three children.

Another important difference concerns employment over the life cycle. The participation rate of Swedish mothers with the youngest child less than three is 73 percent, 75 percent when the child is 3-5 and 75 percent when the child is 6-14.

The respective participation rates of Italian and Spanish mothers are much lower and decline with the age of the child: 47 per cent and 53 percent, when the youngest child is less than three; 47 percent and 54 percent when the child is 3-5; and 45 percent and 53 percent when the child is between 6-14. In the Southern European countries, not only do a large proportion of women leave the labor market during child-bearing years, but they also do not come back when children grow up. Only women employed in the public sector or in large firms as well as women living in areas where more child care services are available come back to work soon after childbearing (Bratti, Del Bono and Vuri, 2005)

The lower participation rates of Italian and Spanish women are associated with much greater domestic work responsibilities and more unequal allocation of time within families. According to time use data (2007) Harmonized European Time Use Surveys, in Sweden women dedicate 3.45 hours a day to household activities and men 2.30. In Italy and Spain the averages are 5.20 and 4.55 for women and only 1.35 and 1.37 for men. In spite of the major

transformation of the labor market in recent decades these proportions have changed very little (Del Boca and Giraldo 2013).

3. Mothers' Labor Supply and Child Care Demand

3.1 Background

Policymakers and scholars with an interest in child care have focused on three main issues. The first is the impact of child care costs on the labor market decisions of mothers of young children. The cost of those services is a critical factor in parents' decisions and can be viewed as a sort of tax on the mother's salary: the higher the cost of child care for families, the lower the value of mothers' time in the market. Child care subsidies and publicly provided child care are both important policies to support mothers' employment. The second issue is related to the availability of child care and is strongly linked with costs. Affordable and conveniently located child care is an important form of support for working mothers of young children, providing incentives to work especially for mothers in low-income households. The final issue concerns the role of child care quality.

In recent years, a growing proportion of young children of non-employed mothers spend time in external child care centers. This means that in addition to using child care to look after their children physically during working hours, mothers are relying on external child care for other reasons as well. As recent empirical evidence reports, the use of external child care centers may positively affect child development, especially for children in low-income households.

Anderson and Levine (2000) and Kalb (2009) provide reviews of the research literature related to child care and labor supply. The literature can be broadly classified according to the assumptions made regarding parental demand for child care and the aspects of child care considered. We consider mostly mothers' labor supply, since fathers' labor supply has not been found responsive to changes in costs or availability of child care.²

A first stream focuses primarily on mothers' labor supply. This stream considers child care as a way to make time for parents to engage in market work, but it does not consider child care as one option among many. In this framework, child care is considered mainly as part of the costs of working, and the demand for care is completely determined by the parental labor-supply

² Blundell et al. (2000) and Doiron and Kalb (2005) are among the few studies to look at married men. Their results suggest that men are hardly affected at all by child care costs.

decision. The advantage of this type of modeling is that it simplifies a more complicated decision-making problem. The limitation of this approach regards the exogeneity issue, since child care is a choice and child care characteristics may differ significantly across different types of child care. Child care costs are in fact likely to be endogenous, since households choose among options with different levels of quality and other attributes (usually unobserved), as well as differing costs. Most household surveys rarely include measures of quality or other attributes of the child care service.

Another approach jointly analyzes child care and mothers' labor supply decisions, addressing the issue of endogeneity. In this approach, households make their employment and child care decisions simultaneously. Blau and Robins (1988), Connelly (1992), Del Boca and Vuri (2007), among others, consider joint labor supply and child care decisions, analyzing whether the mother is employed and whether the family uses child care. In these papers, the endogeneity of child care costs is addressed by using variables capturing regional variations as instruments for price variations or by merging information from other sources.

A third stream incorporates the choices parents make among the various and widely different types of child care available. These studies allow for other explanations of child care demand, such as educational and developmental opportunities for children. The results of studies incorporating child care quality are useful to policymakers interested in creating guidelines to ensure that child care encourages and stimulates children's cognitive and non-cognitive development. Blau and Hagy (1997) is the first study to present a unified framework within which to analyze the mother's employment decision, the decision to pay for care, the type of care chosen, and the demand for attributes. They estimate a model of demand for quality-related attributes of child care: group size, staff/child ratio, and provider training. In their econometric model, which is based on the quality-quantity literature (e.g., Becker and Lewis 1973), the quality of care depends on the observed attributes of the arrangement chosen as well as unobservable variables such as the motivation and energy of the child care providers. The results indicate that parents tend to view quality and quantity of care as substitutes. A decrease in the quality-adjusted price per hour of center-based care increases demand for hours of care and decreases demand for quality attributes.

Within a structural framework, Ribar (1995) analyzes joint labor supply and child care choices and estimates a discrete-choice model of married mothers' care arrangements and labor

supply. A full-information maximum likelihood specification relies on direct utility comparisons over women's decisions to work zero, part-time, or full-time hours and to use formal or informal care. This approach provides estimates of the relevant utility parameters, and allows wages and care costs to vary across alternative work and care utilization states. Ribar considers a static framework in which a family has preferences regarding market goods C , the quality of child care Q , and the mother's hours devoted to nonmarket activities, L . These preferences are represented by a direct utility function, $U = U(C, Q, L)$ where utility is increasing in C , Q , and L . Total care quality for the children depends on the input of maternal care, paid and unpaid non-maternal care, and other goods; the quality is assumed to increase with inputs of maternal care and market goods. Ribar's econometric methodology allows women's work and child care decisions to be endogenous determinants of one another. Estimates based on this model indicate that the costs of paid care have small effects on labor supply, but stronger negative effects on paid care utilization. While Ribar's model is static, more recently Bernal (2008) and Brilli (2013) have analyzed dynamic structural models that explicitly include child outcomes, which will be discussed in the last section.

Most existing studies are limited by their failure to model the supply of child care services, and more generally, of general equilibrium effects. In other words, they do not take into account that the largest proportion of child care expenditures is paid by actors other than the household (mainly the Federal government and municipalities). Local governments intervene directly in the regulation or the provision of public child care; government intervention in child care regulation or the subsidization of the service is, in fact, justified on the grounds of both equity and efficiency (Carneiro and Heckman, 2003).

In Brilli, Del Boca and Pronzato (2013), the local government's decisions regarding the number of places in child care depend on the local budget constraint and its own preferences. Local governments may have different objectives: on the one hand, they may wish to encourage women's work (which would also increase the tax base that can be used to pay for local services, including child care); on the other, they may wish to increase children's educational outcomes, which is especially important for lower-income families. A local government may use "rationing" as a means of maximizing its objective function. For example, to increase maternal employment, local government could limit access and make maternal employment one of the criteria for acquiring a place in child care. In this view, rationing and selective access are

outcomes of a mechanism design problem. The authors provide empirical estimates of the impacts of different rationing levels of child care on both outcomes, showing that in areas where child care is more “rationed,” it has a stronger impact on mothers’ working status and on children’s educational outcomes, since it selects groups which are more likely to benefit from the services.

Besides rationing, another explanation for the limited use of formal child care may be related to family preference (values and gender roles). The traditional role of mothers in child care activities is highly valued by many families, especially in Southern European countries. According to this view, mothers are the best caregivers for young children. In families where this view prevails, parents may choose not to use public or private child care even if the mothers are employed full-time and would be eligible for it. A larger proportion of families may prefer to rely on the assistance of relatives who they know and trust. In doing so, parents can rely on arrangements that are more similar to parental care. Recent studies analyze child care choices using a new approach based on trust (both toward people and institutions) and on how much parents recognize child care as an early childhood investment for the development of the social and academic skills of children. El-Attar (2013) studies the role of trust toward other people in child care choices, assuming that child care options differ in their degree of “externalness,” ranging from mother to grandparent care, up to babysitter care and kindergarten. Considering Southern European countries, she finds that trust has a positive effect on the choice to use more external child care options.

The variability in the use of external child care across European countries depends not only on government spending but also on different levels of “cultural” resistance to the delegation of parental child care responsibilities. Data from the World Values Survey show that in Italy, Spain and Germany the proportion of men who believe that a young child suffers if his/her mother works is higher than in the rest of Europe. It is 76 percent in Italy, 58 percent in Spain, and only 20-25 percent in Northern European countries. It is also the case that many Southern European women agree with this statement (74 percent in Italy, compared to 17 percent in Sweden). Alesina and Giuliano (2010) have shown that in countries where family ties are stronger, the participation rate of married women is lower and time devoted to housework and child care is greater. The reliance on the family prevents the development of institutions including public child care, which require generalized trust and loyalty to the organization.

Strong family ties are not unique to the Southern European countries case, but are also present in many Asian and Latin American countries. Other studies have considered the impact of culture, beliefs or the degree of religiosity in explaining women's participation and fertility decisions (e.g., Algan and Cahuc, 2005; Fernández, Fogli and Olivetti, 2004; and Berman, Iannaccone and Ragusa, 2006). These findings imply that social policies affecting the cost and availability of child care are not the only factor that facilitates the use of formal child care and promotes labor market participation of mothers' trust and any policies affecting it also matter. Enhancing trust may also make social policies more effective, particularly in countries with low levels of trust such as the Southern European countries.

Another approach has examined the impact of events that exogenously separate women into different child care types and cost structures, viewed as "natural experiments," and then has compared employment patterns across the different institutional structures. Berger and Black (1992) consider differences in employment between two groups of low-income women, one of which is enrolled in a program that provides subsidized day care and the other is on a waiting list for the program. Because both groups have at least attempted to enroll in the program, one could argue that they must have similar observable and unobservable characteristics. Other studies use a quasi-experimental set-up, providing potentially exogenous variation in the eligibility to reduce child care costs. Baker, Gruber and Milligan (2008) analyze the impact of introducing universally accessible subsidized child care in Quebec in the late 1990s on the labor supply of women with children. They find a highly significant positive labor supply effect. Lefebvre and Merrigan (2008) exploit the same quasi-experiment and conclude that the policy has had a large impact on employment of women with preschool children. Gelbach (2002) and Cascio (2009) report positive effects of expanding preschool on single mothers' labor supply.

Finally, recent research have examined whether reducing child care policies is effective in increasing mothers' labor supply even in countries where it is already very high, such as Sweden or Norway. Lundin, Mork and Ockert (2008) evaluated the effect on female labor supply of a child care price reform introduced in 2002 in Sweden. Their analysis showed no effect of the reduced child care prices on labor supply, suggesting that, in a well-developed and highly subsidized child care system, further reductions seem to have a negligible impact. Havnes and Mogstad (2011) investigate the impact on maternal employment of a large expansion of child care coverage in Norway in the 1970s. They also find no effect of the increased capacity on

maternal employment and suggest that the newly subsidized child care may have crowded out informal child care arrangements. Only Hardoy and Schøne (2012), in their evaluation of the 2003 “Child Care Centre Agreement” reform in Norway, reported some positive effect on mothers’ employment decisions, but the reform did not affect the labor supply of already-employed mothers.

3.2 Empirical Approaches and Results: Child Care Costs, Availability and Quality

3.2.1 Child Care Costs

Research on the relationship between child care and labor market participation in the United States and the United Kingdom has mainly focused on the effect of child care costs on employment decisions (Heckman, 1974; Blau and Robins, 1988; Connelly, 1992; Ribar 1995; and Viitanen, 2005, among others). These studies use different approaches to estimating these impacts, taking into account the potential endogeneity of observed costs. In one of the first studies on this topic, Heckman (1974) estimates a child care price function that incorporates measures of the availability of child care. Blau and Robins (1988) include a regional average of day care expenditure as a proxy for price, but they do not control for household-specific information such as the age of the youngest child. Connelly (1992) uses predicted expenditures as an instrument for child care costs in an accompanying labor force participation equation; the cost instrument controls for regional variation and family characteristics. Ribar (1995), in his structural approach, considers expenditures per hour of care per child as a measure of child care costs.

These studies indicate that family behavior is significantly influenced by child care policies. Blau and Robins (1988) estimate child care price elasticities for married women of -0.38 with respect to labor supply and -0.34 with respect to the demand for formal child care. These estimates implied that if child care prices were zero, 87 percent of mothers would work rather than the 58.8 percent actually working now. In performing this policy experiment, Blau and Robins compute the response using the characteristics of the average woman in the sample. In contrast, Connelly (1992) evaluates the impact of such a policy on the labor market decisions of each woman in the sample. She finds a less substantial labor supply effect: if universal no-cost child care were available, the model predicts that 68.7 percent of women would be employed. These results refer to the United States, but similar findings have been obtained for the United

Kingdom (Viitanen, 2005) and for Canada (Powell, 1997). All these studies show that child care costs are a very significant determinant of the demand for these services and employment decisions, ranging from 0.38 to 0.07.

Other studies focusing on other countries find quite different results. In countries like the United States, Canada and the United Kingdom, where child care services are provided in the private sector, the focus is on the costs and quality of the services. In most European countries, the focus has shifted from the cost of child care to its availability, since most countries offer subsidized child care. In spite of relatively generous public subsidies and a reputation for high quality, only a very limited proportion of Southern European families use public child care, whereas a large proportion use informal care. Del Boca et al. (2005) attempt to explore the determinants of the use of child care among dual-worker families. Given the limitations of available data, they match two different data sets: the Bank of Italy (SHIW) and ISTAT Multiscopo. They find evidence that the availability of public child care has a strong impact on its demand and that increases in costs of public child care reduce the use of public as well as private care, indicating a shift to informal child care. Having healthy grandparents living nearby goes a long way in explaining this choice, especially in the presence of infants and toddlers. The evaluation of child care policies must take into account the importance of these factors. This is particularly the case in countries like Italy, where most families with children have only one child, and children would benefit from the socialization experiences provided by the child care system.

3.2.2 Availability

More recent studies from Europe have explicitly investigated the effect of child care costs in areas where formal child care is widely available and where it is not, limiting the price effects.

Using data from Northern European countries. Gustaffsson and Stafford (1992) investigate the responsiveness of the decision of women to work and use public child care in response to variation in child care fees, availability of places, and spouse's income in Sweden. They found that in regions where child care does not appear to be "rationed," higher fees significantly lowered the probability of mothers' market work and public child care choice; in areas where "rationing" is more severe, there is little evidence of significant price effects. When households are restricted in their choice, the true effect of price is difficult to measure.

Del Boca and Vuri (2007) analyzed the effect of child care costs on mothers' employment and child care decisions in the Italian context (where part-time jobs are not widely available), taking into account the effect of rationing in the provision of care services as well as in the labor market. Their results indicate that rationing is an important factor in interpreting price effects on employment and utilization of child care. Their results show that the supply of public child care services needs to reach at least 40 percent if they are to increase female labor market participation up to the Lisbon target of 60 percent. The European Commission's recommendation of a 33 percent increase in public child care therefore falls short.

Kornstad and Thoresen (2002) examine the case of Norway and develop a model to simulate the female labor supply effects of the Norwegian home care allowance reform, taking rationing into account. They find that mothers' labor supply will be reduced by about 9 percent through the home care allowance reform, but the predicted effect is considerably less pronounced if availability constraints are eliminated. Hank and Kreyenfeld (2000) employ a multinomial logit model to estimate how the availability of public and informal day-care arrangements affects female labor-force participation. The authors find no significant effect of regional child care provision on female labor-force participation. Wrohlich (2005) explicitly models availability restrictions in the budget constraint and assumes that rationing only occurs for subsidized child care. Her results show that policy reforms in Germany targeted at an increase in child care availability had larger effects on the maternal labor supply than reducing child care costs.

Table 3 reports the signs and the significance of the coefficients associated with child care costs on labor market participation and child care utilization. The sign and significance of the estimates are quite similar across studies.

Table 3. Studies Evaluating the Effects of Child Care Costs on Labor supply

Study	Country	Data	Labor supply
Blau and Robins (1998)	United States	Employment Opportunity Pilot Project 1980	-0.38
Connelly (1992)	United States	Wave5 of 1984 SIPP panel	-0.20
Ribar (1995)	United States	Wave5 of 1984 SIPP panel	-0.07 to -0.09
Powell (1997)	Canada	Canadian national Child care survey 1988	-0.38
Viitanen (2005)	United Kingdom	Family Resources Survey (FRS) 1997/8–2003/4	-0.14

Table 4 reports empirical results from studies analyzing European countries where the provision is mostly public, such as in Sweden, Norway, Germany and Italy. These studies show that child care costs are significant only in areas where child care is not rationed.

Table 4. Studies Evaluating the Effects of Child Care Costs and Availability on Labor Supply

Study	Country	Data	Labor supply
Kornstad and Thoresen (2002)	Norway	The Home Care Allowance Survey 1998	-0.14
Gustaffson and Stafford 1992	Sweden	Swedish Household Survey for 1984	-0.07 -1.88 nr
Wrohlich and Borck (2008)	Germany	German Socio-Economic Panel from the year 2002	-0.03 east -0.7 west
Del Boca and Vuri (2007)	Italy	Bank of Italy Survey Survey Multiscopo ISTAT survey 1998	-0.12 0.44 nr

Table 5 shows the policy implications of some comparable empirical estimates, Viitanen (2005) for the United Kingdom, Wrohlich and Borck (2008) for Germany, Connelly (1992) for the United States, and Del Boca and Vuri for Italy (2007), where subsidies are either 50 percent or 100 percent. Connelly reports substantial increases in labor force participation: 5.2 percentage points for subsidies covering 50 percent of child care costs and 9.9 percentage points for subsidies of 100 percent of costs. Viitanen (2005) reports an even larger increase in labor force

participation: 13.8 percentage for 50 percent subsidies and 25.4 percentage points for 100 percent subsidies. Running a policy simulation of a 100 percent subsidy to child care costs for East and West Germany, Wrohlich (2005) finds an increase in the participation rate of mothers with preschool children of about 3.0 percentage points in West Germany and about 1.5 percentage points in the East (starting from labor force participation of 63 percent in the East and 43 percent in West Germany).

Table 5. Labor Supply Simulations Studies

Study	Country	Baseline	50% Subsidy	100% Subsidy
Connelly (1992)	United States	58.8%	+5.2%	+9.9%
Viitanen (2005)	United Kingdom	50.7%	+13.8%	+25%
Wrohlich (2005)	Germany	43% West, 63% East	--	+3% W, +1.5% E
Del Boca and Vuri (2007)	Italy	40.8%	+15.5% nr, 2.7% r	27% nr, 5.4% r

The same simulation exercise run for the sample of women in Italy who are not rationed in the child care market, i.e., those affected by the change in child care costs, leads to an increase in the employment rate of about 27 percentage points when the area is not rationed (nr) and by only 5.4 percentage points if the area is rationed (r). This confirms that employment is barely affected by child care costs when there is rationing in the provision of child care services. The results from Del Boca and Vuri (2007) for the non-rationed areas appear to be greater than the results obtained in the studies related to Germany (Wrohlich, 2005) and the U.S. (Connelly 1992), but are in line with predictions made for the U.K. by Viitanen (2005) that if child care costs were subsidized 50 percent, 64.4 percent of married women with young children would be employed (from the baseline 50.7) and if there were universal no-cost child care available, 75.5 percent of women would be employed.

Most studies focusing on availability have not considered other related child care characteristics such as proximity of child care services. A potentially convenient location would be the place of employment of one of the parents. Among the few studies that have considered

onsite child care facilities, Lehrer, Santero and Mohan-Neill (1991) have found a positive effect of employer-sponsored child care on the number of hours worked and attachment to the employer in the U.S. labor market for nurses.

Recent studies have also analyzed child care impacts in developing countries. Recent papers examining Latin American countries (Medrano, 2009, and Encina and Martínez, 2009) have studied the effect of an expansion of child care centers on women's labor participation in Chile and report that it does not induce any change on participation for low-income women. One possible explanation could be attributed to the fact that the new child care centers were not conveniently located relative to the work place or the mother's home, or the child care hours were not compatible with mothers' hours of work. Contreras, Puentes and Bravo (2012) examine the effects of three different policies: i) day care centers close to households or places of employment for women with children under six, ii) increasing the compatibility between the hours day care centers hours' and labor hours, and iii) a combination of i) and ii), found that having a daycare center close to either their home or place of work and with hours of operation matching labor hours are positively correlated with participation. They simulate changes in both variables—proximity and compatible hours—and show that all these policies have a positive impact on labor force participation, but the women who take advantage of the benefit would come from middle-income households, with no impact on poor households. These results cannot be generalized to other countries in Latin America. In their study of data from Argentina, Berlinski and Galiani (2007) analyze the impact of an expansion of preprimary child care between 1991 and 2001 and report a positive and significant effect of the program on female labor supply (between 7 and 14 percentage points).

3.2.3 Quality

Besides cost and availability, quality is another important aspect of child care that has to be considered. Low-quality care might explain the low responsiveness of child care use and labor supply to child care policies that reduce prices or increase availability. The empirical results in the literature on child care quality are mixed and inconclusive, perhaps because of the difficulty of measuring “quality.” Hofferth and Wissoker (1992) find that changing staff-child ratio has a weak and inconsistent effect on the demand for center-based care. Parents do not seem to respond to this variable, even though it is one of the more easily observed measures of quality.

The empirical results reported by Blau and Hagy (1998) show that parents do not value highly observable child care quality indicators, although there is evidence that parents care about some unobserved features of child care. A decrease in the price per hour of care in a given mode (e.g., centers) leads to increased use of that mode of care, decreased use of other modes, increased employment of mothers, and increased likelihood of using a paid child care arrangement. One explanation might be that, although parents care about child care quality, they may be unable to find an arrangement with the preferred combination of attributes. Sonenstein (1991) found that the best predictors of a mother's satisfaction with her child care arrangement were a convenient schedule, location and reliability of the arrangement, while child care quality did not appear to be an important factor.

3.2.4 Grandparental Care

Few recent empirical studies have analyzed the effect of grandparental child care on women's work decisions. This may be because, while common in Mediterranean countries with strong family ties, grandparental child care is rarer in Northern European countries. Arpino, Pronzato and Tavares (2012) analyze the case of Italy and show that the effect of grandparental child care on mothers' labor supply is positive, statistically significant and economically relevant. They also find that the effect is heterogeneous: the benefit of grandparental child care is stronger for mothers with low educations living in Northern and Central Italy.

García-Morán and Kuehn (2012) use data from the German Socio-Economic Panel (GSOEP) and show that the presence of grandparents nearby increases the chances that mothers will work. These authors adopt a simulation approach using a general equilibrium model of residence choice, fertility decisions, and female labor force participation that accounts for the interrelationships among these processes. They simulate alternative counterfactual scenarios and find that if grandparent-provided child care were not available, fewer women would be participating in the labor market.

Using data from the U.S., Compton and Pollak (2011) also consider the important aspect of proximity. They find that close geographical proximity to mothers or mothers-in-law has a substantial positive effect on the labor force participation of women with young children. The authors argue that proximity is a good instrumental variable for child care arrangements, as the

positive effect of proximity on labor force participation does not extend to groups for which grandparent-provided child care is not a determinant of labor supply, such as men and unmarried women without children.

Finally, Aassve, Arpino and Goisis (2012), using the Gender and Generation Survey, compare the impact of receiving child care help from grandparents and show that it has a positive and significant impact on mothers' labor force participation in some countries, but not in others. Their findings suggest a complex interaction between formal and informal child care, national context, and fertility decisions.

4. Parental Labor Supply, Child Care and Child Outcomes

The interest among economists for labor supply, early child care and child outcomes has grown in the last few years, motivated by concerns about the potential negative impact of the growth in labor market participation of women with young children. Recent data show in fact that mothers' time with children has in fact declined in the last decades, while indicators of several cognitive and non-cognitive outcomes of children have worsened. Ermisch and Francesconi (2005) summarize existing studies in the economics literature evaluating the impact of maternal employment on several child outcomes, such as attainment and years of schooling, and report the results are quite mixed and that maternal employment estimates on child outcomes range from negative to insignificant to beneficial. While the loss of the mother's child care time has a negative effect on the child's well-being (e.g., socio-emotional adjustment and cognitive outcomes), it is also the case that the additional income from mother's employment has positive implications for expenditures on goods consumed by the household and the child.

There are many reasons for the diversity of the results found in the empirical literature on parental employment and child development, but perhaps the main differences are the variables and estimation methods used. First of all, maternal employment is often used as a proxy for mothers' time with children, but it cannot exactly measure the actual time spent. A more accurate measure of time investments in children can be provided by time diary surveys. Time diary surveys usually contain detailed information on the time children spend in different activities with the mother, the father and other adults, but only a few studies have used time diaries to measure time investments in children.

Among the few studies available, Bernal (2008) assumes that time not spent by the mother at work is time spent with the child and that father's contact time with the child has no impact on the child's cognitive development. Her estimates indicate that employment of the mother when the child is quite young has a substantial negative impact on the child's score on standard cognitive ability tests at the time of entry into formal schooling. Using data from the National Longitudinal Survey of Youth (NLSY) she estimates a dynamic model of the employment and child care choices of mothers to determine how these decisions affect children's cognitive outcomes. She controls for potential biases associated with the fact that women who work/use child care may be systematically different from women who do not work/do not use child care, and that the child's cognitive ability itself may affect the mother's decision to work and/or use child care. The decisions depend on these unobserved heterogeneous characteristics of both mothers and children. Bernal's main contribution is to consider the impact of work and child care choices and to test whether the mother decides to work and to use external child care after having observed the child's initial ability endowment. She finds that one year in external child care reduces the child's cognitive ability, and that the impact of mother's employment and external child care is even more detrimental, negatively affecting the child's outcome.

The substantially negative effect found in this study may depend on the assumption Bernal makes concerning the relationship between the time the mother spends with her child and the time she spends at work, since a one-to-one relationship is assumed between the mother's time outside of work and maternal child care time. This assumption implies that mothers devote all of their time off work investing in their children's development. The mother's employment is thus seen as a detriment to the child, because employed mothers spend less time at home.

Del Boca, Flinn and Wiswall (2014) use data from the Panel Study on Income Dynamics (PSID) and the Child Development Study (CDS), which allow direct observation of mothers' and fathers' time. In the first study, the child care decision is not explicitly modeled, but the impacts of mothers' and fathers' time on child outcomes are analyzed. The results show that fathers' time is actually just as productive as mothers' time, especially for older children. Within a similar framework, Brilli (2013) estimates a behavioral model where labor supply, external child care and leisure time allocation are endogenously chosen by the mother and represent the inputs for the child development production function. Brilli analyzes the impact of maternal time and external child care on the child's development, accounting for the fact that the mother not only

chooses how many hours to work and how much external child care to use, but also how much time to devote to the child instead of having more leisure. She specifies a dynamic setting in which the mother's utility maximization problem is subject to the mother's time and budget constraints, as well as to the child's cognitive ability production function. The mother cares about consumption, leisure and the child's cognitive ability, while the child's ability is specified with a value-added functional form and depends on the inputs received in the previous period. Her results show that while a reduction in maternal time with the child induces a negative effect on a child's ability, this is compensated for by the use of an equal amount of external child care. Her results seem to suggest that the previous literature using mothers' employment as an indicator of mothers' time use may have overestimated the productivity of maternal time and therefore the negative effect of maternal employment on child development.

These results confirm that the inputs that mothers use to substitute their time when working are very important. If a mother's time is substituted with high-quality child care, the impact of her absence may be less negative. Research from Europe focuses on public child care, which is more widespread than in the United States, especially in Northern European countries. Datta Gupta and Simonsen (2012) evaluate the impact of child care exposure at age on children's cognitive outcomes at age 11 in Denmark. They find that having attended high-quality preschool (instead of family day care) has a positive impact on language and problem-solving test scores, while it decreases the probability of grade retention.

In several countries, where governments spend less on formal child care, parents' time is often substituted with grandparents' care, with potential different impacts on child cognitive and non-cognitive outcomes. In their analysis of the Millennium Survey Cohort data for the United Kingdom, Del Boca, Pronzato and Piazzalunga (2014) consider children's cognitive and non-cognitive outcomes and possible links with grandparental or formal child care. Child care provided by grandparents may be negatively associated with cognitive child outcomes compared to formal care for some outputs and positively for others. For example, grandparents' care may lack the structure and content of daily activities, so that their care may not provide as much educational content as would interactions with other children and a child care professional in a structured environment. On the other hand, grandparents' care may be less likely to lead to problematic social behavior because the child already has a close relationship with the caregiver.

It was found that children looked after by their grandparents do well on vocabulary, but less well in terms of school readiness than children in formal child care.

5. Heterogeneous Effects: Family Structure, Income, Education, Ethnicity

Since mothers' employment rates and child outcomes in disadvantaged families are the most important targets of child care policies, a crucial question is whether the impacts of child care structures differ across income and schooling levels. Most of the results discussed to this point indicated that the effect of child care costs on the labor supply of women is rather limited on average, while for some subpopulations the impact is much larger and significant. Research based on data from several countries indicates that the impacts of child care costs are stronger for women at the bottom of the income distribution, and for single mothers and those with lower education levels, as any standard neoclassical model would lead one to believe. Using Australian data, Doiron and Kalb (2005) found that the elasticity of participation with respect to child care costs for married women with a preschool child is around -0.05, while for single mothers the corresponding elasticity is -0.136. Michapoulos and Robins (2000) analyze the case of the US and Canada and report a higher elasticity for single mothers. Anderson and Levine (1999) reviewed several econometric studies and concluded that the overall elasticity of labor force participation of mothers with regard to child care prices lies between -0.05 and -0.35, but women with few skills are more affected by child care subsidies than higher-skilled women. Blundell et al. (2000) analyze the impacts of child care costs across households characterized by different household employment structures and compare the effects of women married to employed and unemployed partners; they find larger elasticities for the latter (-0.066 versus -0.075). Child care subsidies aimed at lower income and less skilled groups are more effective than subsidies benefiting households with higher incomes.

In addition to the cost side of child care, the impact of availability on participation decisions also varies across education and income classes. Del Boca, Pasqua and Pronzato (2009) analyzed the impact of child care availability across different European countries (Belgium, the Netherlands, Italy, Spain, France, Denmark and the United Kingdom) and by level of education. Child care availability has a positive effect on the probability of employment for women at all levels of education, but the effect appears to be stronger for less educated women: increasing child care availability by 10 percent increases the probability of working from 53

percent to 67 percent for less educated women, and from 79 percent to 86 percent for more educated ones. In addition, the impacts of the length of parental leave and family allowances are more significant for women with lower educational attainment. The specific differences related to child care characteristics are consistent with the general results that women living in low-income households are more responsive to economic incentives (in kind and monetary incentives) than high-income women (Aaberge, Colombino and Strøm, 2005).

Heterogenous effects by income, education, gender and ethnicity emerge also when we analyze the impact of child care policies on child outcomes. Almond and Currie (2011) show that children with less educated parents or whose parents come from low socio-economic backgrounds benefit most from child care attendance. The importance of child care policies depends on the possibility of providing more opportunities to children coming from disadvantaged contexts. High-quality early childhood education and care services are crucial for the development of the child and their subsequent education, and is also widely recognized as a means of compensating for economic disadvantages. Several studies provide evidence of heterogeneous child care impacts according to the child's socio-economic status, gender and ethnicity. Analyzing the Head Start program, Currie and Thomas (1995) find that the program is associated with large and significant gains in test scores among both whites and African-Americans; however, among African-Americans these gains are rapidly lost. Head Start significantly reduces the probability that a white child will repeat a grade, but it has no effect on grade repetition among African-American children. Other studies focus on other minorities, such as Hispanic children, whose educational attainment is persistently poorer than that of non-Hispanics. Gormley et al. (2005) and Gormley (2008), assessing the impacts of a pre-kindergarten policy implemented in the U.S. state of Oklahoma, find stronger effects for black children and for children whose parents were born in Mexico: both groups, in fact, may need more support to compensate for their linguistic and social disadvantages.

Felfe and Lalive (2012) estimate the impact of having attended child care between 0 and 2 years of age in West Germany. They find that, on average, having attended child care has positive effects on both language and social skills. Their results show that children with low birth weight and with younger and less educated mothers benefit more from child care. Havnes and Mogstad (2010) evaluate the impact of a child care expansion in Norway in the 1970s on the entire household earnings distribution. They find that the child care policy has been more

effective for children in the lower and median part of the distribution, up to the 70th percentile. This result seems to suggest that child care policies have heterogeneous effects within the population: in particular, they might be stronger for children belonging to disadvantaged backgrounds (e.g., in the lower part of the earnings distribution), but they might be ineffective for children with higher socio-economic status (e.g., in the upper part of the earnings distribution). In fact, children with high socio-economic status were already receiving investments from their parents before primary school, so they did not benefit from the policy. Conversely, the policy has been effective for those who receive a low initial level of investments in human capital from their parents. Brilli, Del Boca and Pronzato (2013) show that the impacts of child care availability in Italy are greater for both mothers' labor supply and child cognitive outcomes (language skills) among immigrant households and those living in areas where child care is more rationed.

The impact of grandparents' care on mothers' labor supply appears to be heterogeneous as well; the benefit of grandparental child care is stronger for mothers with low educations living in Northern and Central Italy (Arpino, Pronzato and Tavares, 2012). A study of data from the U.K. Millenium Cohort Survey, moreover, finds that the association between grandparental care and high vocabulary scores holds only for children from more advantaged backgrounds, while the association between formal child care and school readiness is greater for disadvantaged children (Del Boca, Pronzato and Piazzalunga, 2014).

Gender differences are also important since there is a persistent gap in achievement between females and males. In fact, child care policies, having differential effects on boys and girls, may aid in mitigating the gender wage gap or other differences in life-cycle behavior between men and women. For instance, Havnes and Mogstad (2011) provide evidence that a preschool policy implemented in Norway affects the timing of fertility for women and also leads to increases in their labor market attachment. Hansen and Hawkes (2009) find that, for school readiness scores, formal care in the United Kingdom is associated with higher test scores for girls only. Felfe, Nullenberger and Rodríguez-Planas (2012) find that the effect of reform of preschool implemented in Spain during the 1990s is stronger for girls than for boys in both Reading and Math test scores. However, other studies report opposite results. Berlinski, Galiani and Gertler (2009) find that the gains from the preschool expansion program and preschool education in

Argentina are similar for boys and girls. On average, though, the results seem to confirm stronger impacts for girls.

6. Conclusions

In this paper, we discuss the most important questions raised in the analysis of the relationship between child care and mothers' labor supply. When having a child, parents face several decisions concerning child care and employment. First of all, they have to decide whether or not to rely on non-parental child care. Secondly, they have to decide how much they are willing to spend on child care and what child care characteristics (hours, location, quality) are important to them in order to coordinate work and childrearing. Analysis of the impact of child care on labor supply is complex because of the potential endogeneity of a large number of factors. The cost of child care is partly the outcome of a choice between lower and higher quality child care. When quality is unobserved, measuring the effect of price will be difficult. Similarly, when quality is observed for a particular type of child care, it is likely to be the outcome of a choice, and is thus potentially endogenous.

While in the United States and United Kingdom most research has focused on child care costs and quality, in Continental Europe more attention is devoted to child care availability and reliance on grandparents' care. The empirical results from this literature show that the impact of child care costs is quite large and significant in areas where places in child care are widely available, but is not significant where child care is rationed. Results from European studies show that not allowing for rationing can potentially affect the estimated effect of child care fees on labor supply. Child care availability appears to be more important than costs, while child care quality does not seem to have a large effect on households' decisions, given that few indicators can actually be observed. Finally, the effect of grandparental child care on mothers' labor supply is positive and statistically significant.

Child care policies (both in terms of subsidies and in terms of the number of affordable and available places) are among the most important tools for encouraging mothers' labor supply as well as for improving children's cognitive outcomes. However, the responsiveness of the women's labor supply and child care use varies significantly across groups characterized by different family structure, income, education levels and ethnicity. Most of the results seem to suggest that child care policies have heterogeneous effects on the population: in particular, they

are stronger for mothers' labor supply as well as child outcomes among more disadvantaged backgrounds.

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