Rev Econ Household (2015) 13:837–870
DOI 10.1007/s11150-013-9222-9

Child-care costs and mothers' employment rates: an empirical analysis for Austria

Helmut Mahringer · Christine Zulehner

Received: 13 September 2012 / Accepted: 12 September 2013 / Published online: 25 September 2013

Abstract The availability of affordable formal child care is an important determinant of the labour force participation of parents, particularly of mothers, which is increasingly discussed. This paper examines the impact of child-care costs on the employment rates of mothers with children younger than 12 years. Using data from the 1995 and 2002 Austrian Microcensus, combined with administrative wage data from Austrian tax records, we estimate the impact of net wages and child-care costs on mothers' employment probabilities. In line with theoretical considerations and most of the empirical literature, we find a negative elasticity of mothers' employment rates to child-care costs as well as positive elasticity with regard to net wages. The point estimates for the impact of net wages and child-care costs are of similar absolute size. Additionally, the empirical results indicate that higher family income reduces the employment probability of mothers.

Keywords Child-care · Labour supply · Bivariate sample selection · Matched survey and administrative data

JEL Classification C25 · J13 · J22

Electronic supplementary material The online version of this article (doi:10.1007/s11150-013-9222-9) contains supplementary material, which is available to authorized users.

H. Mahringer (✉) · C. Zulehner
Austrian Institute of Economic Research (WIFO), Vienna, Austria
e-mail: helmut.mahringer@wifo.ac.at

C. Zulehner
Johannes Kepler University Linz, Linz, Austria
e-mail: christine.zulehner@jku.at

1 Introduction

As in most European Countries, female labour force participation in Austria has increased over the last few decades. However, the employment rates of mothers are still low: recently, around 50 percent of prime age mothers with children below the age of 6 were employed.

Major policy strategies emphasise the importance of a further increase in female employment rates (see, for instance, the EU 2020 strategy, European Commission 2010). Improving the reconciliation between work and family life is widely accepted as an important factor in enhancing the labour market participation of women, and the availability of affordable child-care facilities is seen as an important aspect of these reconciliation strategies. The OECD points out that "… childcare supports are a key factor in the determination of maternal employment behaviour during the early years. The increase in female labour force participation since the 1960s went hand-in-hand with the development of work/family life balance policies of which access to affordable childcare of good quality is an important element" (OECD 2011).

International comparison reveals huge country-specific differences in child-care utilisation and employment rates among mothers, which appear to be most striking among mothers with children under the age of 3. For this group of mothers, the correlation coefficient between the employment shares and enrolment rates of children in formal child care is significant, reaching 0.81 for OECD countries[1] in 2008. In an OECD working paper, Jaumotte (2003) provides empirical evidence on the determinants of female labour force participation in OECD countries and concludes that subsidies for formal child care increase female labour supply and are, from that point of view, superior to transfers for nursing children. In Austria, low employment rates for mothers with children under the age of 3 coincide with low participation rates of children in formal child care. At the same time, the increase in mothers' employment rates between 1995 and 2012 goes hand in hand with higher enrolment in formal child care.[2]

Austria has applied family policies that concentrate on universally available monetary transfers for all families regardless of their income or employment situation. Expenditures for family benefits amount to 3 percent of the GDP, which is in the midfield of OECD countries. Most of the Austrian government expenditures for families are generally available monetary transfers (78 percent) and tax reliefs (7 percent), while only 11 percent are spent on in-kind transfers (Festl et al. 2010). A similar structure can be found in the UK, Luxembourg or Ireland, while other OECD countries spend a higher share of their family expenditures on in-kind transfers (such as the Nordic countries, France and the Netherlands) or on tax reliefs (such as Germany and France). The low employment rate of mothers in Austria has

[1] The data source is the OECD family database for 2008, including Slovenia, Sweden, Denmark, Netherlands, Portugal, Cyprus, Belgium, Luxembourg, Canada, Lithuania, Austria, France, Germany, Romania, United Kingdom, Spain, Ireland, Greece, Italy, Finland, Poland, Latvia, Estonia, Bulgaria, Malta, Japan, Slovakia, Czech Republic and Hungary. Employment rates are corrected for mothers who are on parental leave and not actually working.

[2] See chapter 3 for more details.

given rise to a discussion on ways to increase employment incentives through reforms of family policy. In particular, measures to reduce child-care costs and increase subsidised child-care slots have been discussed and to some extent implemented. In this context, the federal structure of Austria, which delegates relevant competencies to institutions at various government levels, has created a diverse set of regulations regarding the supply and cost of formal child care. This complexity may present an obstacle for policy reform; however, it offers an interesting source of variation in the net costs of child care for families.

The aim of this paper is to provide empirical evidence on the impact of reduced child-care costs on the employment behaviour of mothers with dependent children.[3] Our basic idea is to make use of the differences in child-care costs across regions to estimate the impact of variations in child-care costs on mothers' employment probabilities. These differences in child-care costs are largely undocumented and therefore not traceable in detail. Additionally, available data covering information on households, employment behaviour and child-care activities rely on small sample surveys, which do not allow the investigation of regional and local differences with a sufficient number of observations. Therefore, we apply structural employment participation models to estimate the impact of wages and child-care costs on the employment probability of mothers and exploit the regional variation in child-care costs within this structural approach. Within this type of model we have to solve the problem of unobservable wages and child-care costs for mothers out of employment and with children not in formal child care, respectively. Therefore, potential wages and costs have to be predicted. Problems of selection bias and high sensitivity of estimates with respect to the modification of specifications (see, for instance, Kimmel 1998), typically have to be considered in the application of such models. We tackle potential problems associated with this method by using highly informative data, which reduce the problem of unobserved heterogeneity and contain important determinants of wages and child-care costs (in particular regional and local variables, which explain much of the variation in child care costs), by applying selection correction models and carrying out extensive sensitivity analysis.

We make use of two unique data sets in Austria that combine information on labour force participation, household and family characteristics, personal and family incomes, as well as the utilisation of formal child care: the Austrian Microcensus 1995 and the Microcensus 2002, amended with administrative income information from Austrian tax records.

In line with results for the US, Canada, and some European countries, and in keeping with theoretical considerations, we find significantly negative employment elasticity with regard to child-care costs (point estimates of -0.13 for 2002 and -0.11 for 1995). The influence of child-care costs is similar—in absolute size—to the influence of changes in net wages. The wage elasticity of mothers turns out to be considerable (1.21 for 2002 and 1.96 based only on survey information on wages for 1995), but child-care costs only partly explain the difference in employment rates between mothers and women without dependent children. Additionally, the empirical

[3] We restrict our analysis to mothers because we rarely find fathers who hold the main responsibility for bringing up their children.

results indicate that a higher family income (excluding any income earned by the mother) reduces the employment probabilities of mothers. These results support strategies to shift government spending from general monetary transfers that increase unearned household incomes to in-kind transfers such as the provision of subsidised child care with the aim of improving the employment participation of mothers.

We consider our contribution to be innovative for two reasons. First, the diversity of local and regional regulations provides us with great variation in child-care costs, which—as we will argue—are to a substantial extent not influenced by individual households. Second, we are able to combine highly reliable administrative data on wages and incomes with detailed survey data on households and their members for the 2002 sample, and to compare estimates with survey data collected in 1995. Both of these measures should contribute to the reliability of the results.

In the following chapter we review relevant literature on the impact of child-care costs on the employment probabilities of mothers. Chapter 3 offers details on the family and child-care policies currently in place in Austria, as well as on the labour market situation of mothers. Chapter 4 presents the datasets, variable construction and further descriptive evidence, while chapter 5 discusses the econometric strategy. In chapter 6 we present the estimation results within the context of comparable work for other countries.

2 Review of relevant literature

Most empirical studies investigating the impact of child-care costs on mothers' employment decisions find that increasing child-care costs have a negative effect on mothers' employment probabilities. However, the estimates of this effect vary considerably across countries, sub-populations and institutional conditions. One of the earliest studies by Heckman (1974) found a significantly negative effect of the cost of child care on female labour supply, using an indirect measure of child-care costs. Since then, a number of studies have analysed the impact of child-care costs on mothers' employment rates based on different research methodologies, data sets and sample restrictions. The size and significance of the estimated effects are diverse: Estimated elasticities range from close to 0 to slightly below -1, but in most cases they lie between -0.1 and -0.4.

To identify the effect of child-care costs on mothers' employment decisions most of the methodological approaches use variation in child-care costs across individuals (e.g. Connelly 1992; Powell 1997; or Jenkins and Symons 2001), while others exploit regional differences (e.g. Blau and Robins 1988) or other sources of exogenous variation in regression discontinuity designs (e.g. Fitzpatrick 2010; Gelbach 2002) and experimental situations (e.g. Viitanen 2011).

The strand of the literature that uses variation in child-care costs across individuals mostly relies on structural employment participation models. Using survey data on individual child-care and employment behaviour, most studies—including ours—apply control function methods to account for unobservable heterogeneity in a sample selection framework (see Heckman 1979). To estimate the employment participation equation with child-care costs and wages as explanatory variables, auxiliary

equations for the wage rate and the child-care costs (per hour worked) have to be specified to obtain estimates of potential wage rates and child-care costs for those mothers who are not employed or who are not using child-care services. These first-stage equations have to be corrected for a potential sample selection bias, as the estimated equations only rely on information on employed mothers or mothers utilising formal child care. Such sample selection correction terms are—depending on the characteristics of the underlying selection problem—calculated from univariate or bivariate probit models of employment probabilities and probabilities of formal child-care use. Examples using similar types of methodological approaches are Connelly (1992), Ribar (1992), Kimmel (1995, 1998), Powell (1997), Anderson and Levine (1999) or Jenkins and Symons (2001).

In one of the earlier studies, Connelly (1992) estimates an elasticity of labour force participation due to a change in the average cost of child-care cost to be −0.2 for married US mothers of pre-schoolers using a two-stage, tobit-model and correcting for sample selection bias. Powell (1997) uses a similar specification to estimate the impact of child-care costs on the labour supply of married mothers in Canada. She applies selection-corrected estimates for child-care costs per hour of work and for wages estimated by OLS. Her estimate of the labour supply elasticity of married mothers is −0.38. Similar results are found, for instance, by Anderson and Levine (1999) who estimate the child-care cost elasticity of employment participation to be −0.30 for married and −0.47 for unmarried mothers, and by Kimmel (1995) who finds a value of −0.35 for single mothers in poverty. Kimmel (1998) examines the sensitivity of estimates with regard to differences in the set of explanatory variables. Estimates of the child-care costs elasticity of employment vary between −0.92 for married mothers and −0.2 for single mothers. Additionally, she attributes much of the variance of findings to econometric specification. Anderson and Levine (1999) point out that the elasticities are larger for less skilled mothers and for mothers living in poor or near-poor families. Jenkins and Symons (2001) find a rather low elasticity of −0.09 for single mothers and conclude that there are several other factors that encourage mothers' labour force participation.

Connelly and Kimmel (2003) extend the analytical framework to the question of whether a reduction in child-care costs could reduce welfare recipiency amongst single mothers. They find that a reduction in child-care costs increases the probability of employment (elasticity –1.0) and reduces welfare recipiency significantly. Herbst (2010) explores net prices, net wages, child-care subsidies and the Earned Income Tax Credit in a unified empirical framework. The elasticity of employment with respect to child-care costs estimated for single mothers is −0.05. Larger effects on labour supply are identified for mothers with higher child-care costs. Van Gameren and Ooms (2009) model the decisions on labour force participation, use of formal child care and hours of child care simultaneously depending on economic variables as well as attitudes towards work and formal child care. Their results regarding child-care costs suggest that there is no impact on the employment decision of married mothers in the Netherlands.

Another strand of the literature considers excess demand for publicly subsidised child care. It explicitly deals with the fact that in certain countries child-care facilities are financed directly by the public, with the parents' contribution covering

only a small share of total costs. Queuing for subsidised child care may be a problem if the publicly financed supply for child care falls short of demand. Viitanen and Chevalier (2003) model access restrictions to child care for the UK. Using a partial observability model, they find evidence for excess demand. Similarly, Wrohlich (2008) studies the excess demand for subsidised child care in Germany. She finds evidence of queuing, particularly for child-care slots for children under three years of age.

Kornstad and Thoresen (2005) and Wrohlich (2011) model demand for child care and the labour supply decisions of mothers simultaneously. Both studies find evidence of queuing for subsidised child care and a negative impact of child-care costs on the labour supply of mothers. Haan and Wrohlich (2011) additionally incorporate the fertility decision into a structural model of mothers' employment decisions and account for inter-temporal feedback effects between fertility and employment outcomes based on data from the German Socio-Economic Panel. Among other results, they find that an increase in the availability of subsidised child care for working mothers also increases labour market participation, but they find no significant effect on fertility.

In contrast to research strategies based on structural models and micro simulations, some recent papers in this field have moved increasingly toward methods that exploit natural experiments as a source of exogenous variation in childcare costs. Gelbach (2002) compares employment for mothers with children just above and below the age of eligibility for public school, the idea being that public school removes the need for the mother to provide care and thus provides a form of free child care. Among single mothers whose youngest child is five, he finds that public school enrolment significantly increases labour supply, increases earnings and reduces the amount of public assistance received. It also has a positive effect on labour supply for married mothers. Fitzpatrick (2010) uses a similar regression discontinuity estimation of the introduction of universal prekindergarten programmes in Georgia and Oklahoma. In spite of an increase in enrolment, her results show no statistically significant effect on the labour supply of mothers. Havnes and Mogstad (2011) investigate the effects of an expansion of subsidised child care in Norway on the employment rates of married mothers. In spite of the coincidence of high maternal employment rates and high child-care coverage compared to other countries, they find hardly any causal effect when applying a difference-in-difference design. In two random assignment studies in Cook County, Illinois, and Washington State, Michalopoulos et al. (2010) and Michalopoulos (2010) find no impact of changes in child-care subsidies on employment or earning for moderate-income families. In both studies they admit that, because most study participants were steadily employed, there was little room for the programme to have an effect. Additionally, they find lower job-related problems and higher satisfaction with the child care situation among programme participants compared to the control group in the Illinois study.

Baker et al. (2008) analyse the introduction of highly subsidised and universally accessible child care in Quebec. Estimating difference-in-difference effects compared to the rest of Canada based on panel data, they find a strong and

significant increase in married mothers' labour supply, as well as evidence for negative effects on indicators of family wellbeing.

Viitanen (2011) finds that the introduction of a voucher for privately provided child care increased the utilisation of formal child care as well as the employment rates of mothers in regions with excess demand for publicly provided child-care slots. She applied a propensity-score matching approach to compare outcomes between treated and non-treated areas. Schoene (2004) examines the introduction of cash-for-care compensation for families not using public child-care places in Norway. Applying a difference-in-difference approach, he finds a negative effect on the employment participation of mothers due to the increase of child-care costs relative to maternal care.

3 The formal child care system and employment participation of mothers in Austria

Austrian governments spend a comparably high share of public funds on family policy. Unlike the Nordic welfare state model,[4] most of these expenditures are spent on monetary transfers. Only 11 percent are spent on in-kind transfers such as public child care provision (Festl et al. 2010). Families receive a family allowance consisting of a transfer and a tax credit[5] for each child, as well as a transfer during parental leave. For children born before July 2000, parents on parental leave received a transfer for up to 18 months, and after this date the maximal benefit duration became 30 months.[6]

The formal Austrian child-care system is characterised by high enrolment rates during the traditional kindergarten age (3–5 years) and low enrolment rates for younger children (0–2 years) as well as for school age children (6–11 years). In contrast to many other countries, primary schools classes last only until noon, requiring working parents to enrol their children in child care in the afternoon. Figure 1 shows how enrolment rates have developed over the last two decades. The proportion of children in child-care facilities is currently around 20 percent for children between 0 and 2 years, 90 percent for children between 3 and 5 years, and slightly below 20 percent for children between 6 and 9 years (Statistik Austria 2012).

The most common form of child care for children aged up to 5 is provided at care centres and kindergartens, although many of them do not provide places for children under the age of 2 or 3 and some have limited opening hours. After-school child care is provided through day care facilities in schools or in independent institutions.

[4] See Datta Gupta et al. (2008) for a discussion of Nordic countries' family-friendly policies and their impact on employment, wages and children.

[5] The family allowance is currently 112.7 euros per month for a 3-year-old child, 130 euro for a 10-year-old child and the tax credit amounts to an additional 58.4 euros per month. Moreover, there is a general tax exemption for each child of 220 euros per year and additional tax exemptions for certain expenses on children.

[6] Transfers during parental leave currently amount to 436 euros and the benefit duration can be extended by an additional 6 months if both parents share the parental leave period.

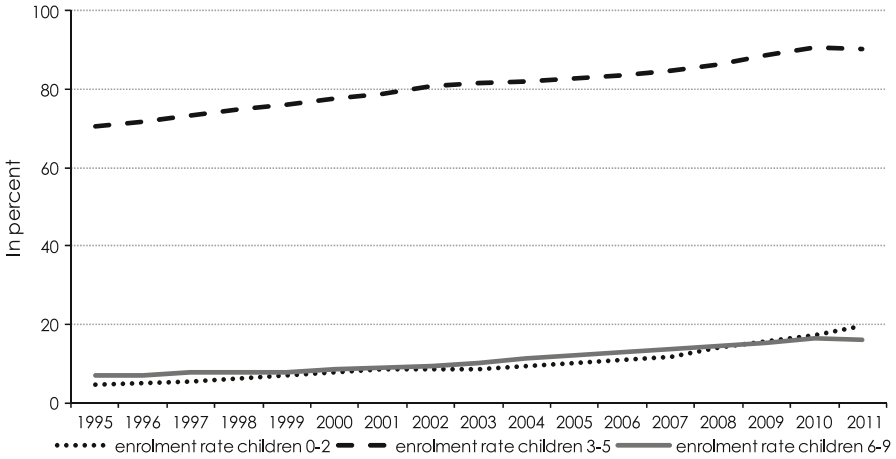

Fig. 1 Age-group-specific enrolment rates in formal child care in Austria 1995–2011. *Source*: Child Care Centre Statistic, Statistik Austria 2012, own calculations

In 2012 about 65 percent of the child-care places were provided in kindergartens, 7 percent were provided in early child care centres for children aged 0–2 and 17 percent were supplied in after-school day care. Kindergarten is by far the most common type of formal child care for children under the age of compulsory school entry. "Day-mothers" and self-organised children groups occupy only minimal shares in the child-care market (see Baierl and Kaindl 2011; Statistik Austria 2012). Most kindergartens and crèches (about 70 percent) are provided by the more than 2,300 municipalities in Austria, while around 13 percent are provided by private associations and churches.

For children of school age (6 years and above), afternoon child care is either provided within the school (36 percent) or in after-school child-care facilities (nearly 60 percent including age-mixed groups). More than 55 percent of the after-school child-care centres are again provided by municipalities, with 23 percent provided by private associations and 15 percent by churches. After-school child care is not only used for children in primary schools up to the age of 9 (43 percent of the slots), but also for children above the age of 10 (57 percent of the slots, see Baierl and Kaindl 2011).

According to Austrian constitutional law, the provinces[7] and municipalities hold the main responsibility for formal child care. Consequently, we find a vast diversity of regulations regarding the supply and particularly the costs of formal child care. The mix of public and private child-care centres, as well as the costs families have to pay for child-care slots, differ considerably between provinces and municipalities. Moreover, several changes in regulation have taken place over the years. The only distinctive regulation at the federal level was the introduction of an obligatory

[7] Austria as a federal country consists of nine provinces with their own provincial parliaments.

free-of-charge last year of kindergarten (until noon) for children aged 5 in 2009.[8] However, since enrolment rates among 5-year-olds were already above 94 percent in 2008, the potential for a further increase in this age group was limited and only increased to 96.5 percent in the following year.

As Baierl and Kaindl (2011) point out in their thorough compilation of child care regulations in Austria, the heterogeneity, unobservability and lack of transparency of the support schemes makes it practically impossible to draw a detailed comparison of child-care fees between regions and municipalities. Private child-care centres can decide on the fees they charge, but parents might still be eligible for partial refunds through subsidies (again depending on the certification of child-care institutions, regional regulations and household characteristics). Additionally, the Public Employment Service offers a child-care allowance of up to 80 percent of child-care costs to some parents (mostly mothers) who need child care in order to start a new job. In addition to this heterogeneity in child-care cost schemes, public child-care slots were and are still scarce in many Austrian regions, for full day care, for children below the age of 3, and for after-school care (see Dörfler 2004; Statistik Austria 2004). Hence, a variety of support schemes as well as the coexistence of public child care and private institutions characterise the institutional child-care situation in Austria. As we will argue in the following empirical analysis, we make use of this source of heterogeneity in child-care prices to estimate its influence on the employment rates of mothers.

Mothers' employment rates have been on the rise in the last decades, in the same way that female employment rates have risen, accompanied by a significant increase in part-time shares.[9] This development has taken place in a labour market situation that is quite favourable compared to many other OECD countries. In Austria, unemployment rates according to EUROSTAT amounted to 4.2 percent in the year 2012 as well as in 2002 (EU: 9.7 percent in 2011, US: 8.1 percent in 2011[10]).

Figure 2 shows a positive trend in total employment rates for mothers with children under 6, which is the starting age of compulsory school attendance in Austria. This trend is broken after the year 2002 by the repercussions of the parental leave benefit reform, which led to an extension of average career breaks, as well as to an incentive for part-time work during the receipt of the parental leave allowance.[11] Longer career breaks slowed the development of employment rates (solid line), and incentives for part-time work reduced the full-time rate (dashed line) during the adjustment period.[12] The development of employment rates among

[8] For example, the City of Vienna charged fees according to family income for child-care slots in municipal kindergartens and provided a subsidy for child care in certified private child-care institutions (irrespective of location, i.e. including facilities outside the city) before free kindergarten was introduced in 2009. In the province of Lower Austria, kindergarten was free of charge until noon for residents, but only in local public child-care institutions.

[9] Large educational expansion, particularly among women, is one obvious reason for increasing employment rates.

[10] Source: OECD.

[11] Recipients are allowed to earn up to 16.200 euros per year without a reduction of the allowance.

[12] In the year 2004 the sample basis of the Austrian Microcensus changed, which may cause breaks in the time series.

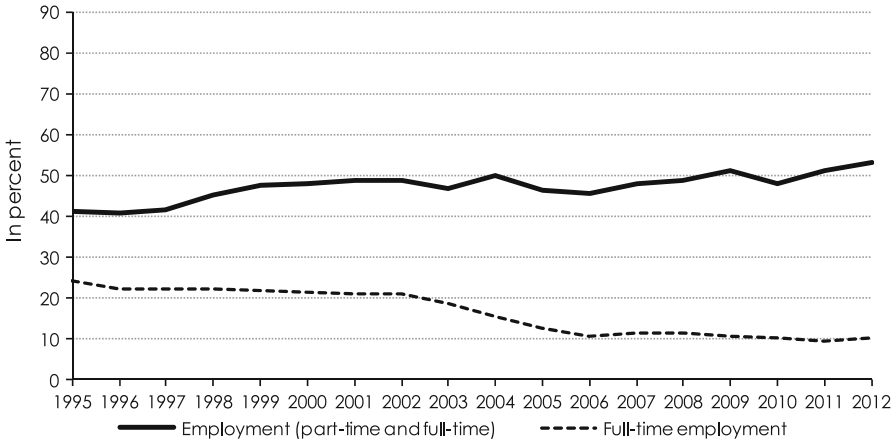

Fig. 2 Employment rates of mothers (25–44 years) with children under 6 years in Austria from 1995 to 2011. *Source*: Microcensus 1995–2012, Statistics Austria 2012, own calculations

mothers with children aged between 6 and 11 is less influenced by institutional change and therefore smoother (see Fig. 3). Nevertheless, the same longer-run trends towards higher employment rates and higher part time shares occur.

4 Data source and descriptive evidence on the utilisation of formal child care by families and employment behaviour of mothers

4.1 Data source

In order to observe the utilisation and costs of formal child care together with labour market status, wages and other characteristics of families and their members for Austria, the choice of datasets is limited. The only survey that comprises all this information is the Microcensus 3/1995 with its extra modules on child care and income. The Microcensus 3/2002 contains a similar information set on Austrian households including child care data but lacking income information. In cooperation with Statistics Austria these survey data were merged with income-information from the tax register at the individual level. As a result, we obtain a matched survey and administrative dataset which overcomes the problem of frequent non-response as well as lower reliability of income information in surveys.

In the Austrian Microcensus, a one-percent sample of Austrian households is covered and questionnaires are completed in face-to-face interviews every three months. The questionnaire comprises the standard program of the Labour Force Survey (LFS) with comprehensive information on employment participation and family characteristics. In September 2002 and 1995 an additional part of the questionnaire dealt with child care and housework (see Statistik Austria 2004; Kytir and Schrittwieser 2003; Hammer 1997), which—in connection with the regularly available information on family characteristics, labour market status and hours worked—provides a unique database with which to study the effects of child-care

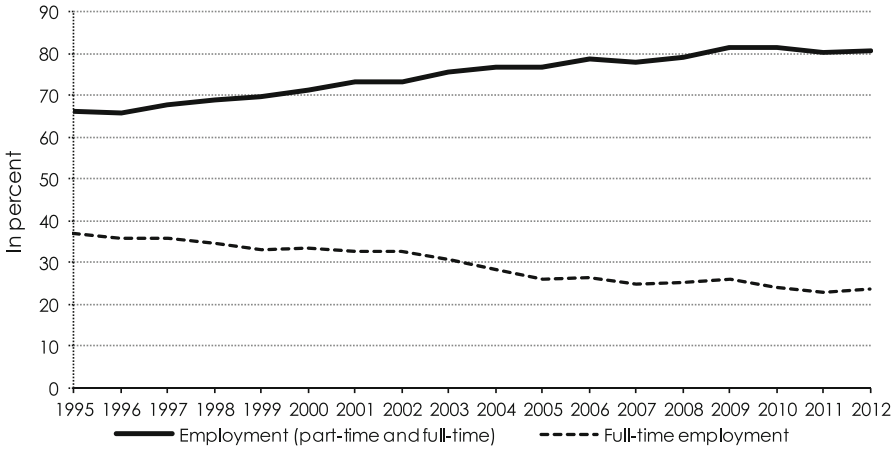

Fig. 3 Employment rates of mothers (25–44 years) with children between 6 and 11 years in Austria 1995–2011. *Source*: Microcensus 1995–2012, Statistics Austria 2012, own calculations

costs on the employment decisions of mothers in Austria. The samples include information on about 60,000 persons in 22,000 households in the sample. In these households there are about 5,400 and 5,000 families with children under the age of 12 in the respective samples for the years 1995 and 2002. We restrict our sample to mothers employed for wage or salary and non-working mothers because we do not observe wages for the self-employed. Additionally, we include only mothers between the ages of 24 and 45, to exclude young mothers in training and older mothers to obtain more homogeneity among mothers. Finally, our 1995 sample contains information on 4,198 mothers and their families. The 2002 sample comprises 3,678 mothers. Most mothers (87 percent in 1995 and 83 percent in 2002) live together with the father of the children or a male partner.[13]

4.2 Descriptive evidence

Motherhood is accompanied by a low employment rate of women. Women without children below the age of 15 have employment rates that are up to 10 percentage points lower than those of men. In our Microcensus sample from September 2002, women aged between 25 and 44 without children under 15 have an employment rate of about 81.5 percent, while men of the same age have an employment rate of 91 percent.[14]

The employment rate of mothers in our restricted sample with children below the age of 12 was 44 percent in 1995 and rose to 52 percent in 2002. Mothers' employment rates are strongly related to the age and number of their children. Only 23 percent of mothers with children below the age of 3 were employed in 1995, and 26 percent in 2002. Furthermore, women with more children are less likely to work: 54 percent of mothers with one child below 12 years were employed in 1995 and 62

[13] Survey weights are used for all calculations presented.

[14] Employment rates for the 1995 sample are similar: 93 percent for men and 80.5 percent for women without children under the age of 15.

percent were employed in 2002, while only 39 percent of mothers with two children under the age of 12 worked in 1995, rising somewhat to 50 percent in 2002. 26 percent of mothers with three children younger than 12 worked in 1995 and the figure was 31 percent in 2002 (see Table 1). Mothers' and fathers' employment decisions seem to be essentially unrelated, since only 1–2 percent of the fathers in our samples worked part-time.

Employed mothers use formal child care more often than those not employed. In particular, mothers whose children are younger than 3 rarely use formal care if they are not working (fewer than 3 percent), while the comparable share among working mothers is 20 percent.

The information on child-care costs in the extra modules of the 1995 and 2002 Microcensus is based on parents' reports. We observe hours in formal child care and child-care expenses net of subsidies to the child-care institutions or paid to the families, which is exactly the kind of information we need to study the impact of child-care costs on mothers' employment decisions. Average hourly costs of child care per child are slightly below 1 euro. On average there are 1.2 children per family in formal care, which results in average hourly child care expenses of about 1.2 euros per family and sums up to 124 euros per month for a family using formal child care in the year 2002. The corresponding amounts for 1995 reveal a similar picture on a slightly lower nominal price-level (see Table 1).[15] For employed mothers, child-care costs are somewhat higher on average because they use more child care per day and pay higher hourly fees. The child-care costs per hour of the mother's paid work are lower than hourly child-care costs, because in most cases working hours exceed the hours of formal child care.[16] Altogether, the presented evidence on child-care expenses by families confirms the fact that parents' monetary contributions to formal child care are on average too low to cover the costs of providing the service.[17]

In 2002 child-care costs for families differed greatly between the nine Austrian provinces. In Vienna, average monthly child-care costs were nearly 80 percent higher than the national average, while in Tyrol they were 53 percent lower (see Table 2 column (1)). These differences cannot substantially be explained by differences in child-care hours (column (5)) or the incidence of free child-care slots. High standard deviations confirm high heterogeneity, also within provinces (column (3)). Furthermore, the regional structure of enrolment rates (column (6)) would not suggest higher enrolment in regions with lower child-care costs.

Regional differences seem to be much greater than those found among family types. Single mothers had no higher costs for formal child care than average

[15] The Microcensus 1995 was carried out before the official currency of Austria changed to the euro in 2002. Therefore, we report the monetary variables in Austrian schillings in the year 1995. The fixed exchange rate between Austrian schillings and euros is 13.7603.

[16] Looking at reported child-care costs in more detail, we see that in many cases a payment for lunch is included, which leads to higher child-care expenditures compared to the reported expenditures where payment for lunch is not included. Consequently, child-care costs per hour in cases with no costs for food are reported at around 0.7 euro in 2002 and 6 Austrian schillings (0.44 euros) in 1995 for an average family. If costs for lunch are included, these costs increase to 1.3 euros or 14 Austrian schillings (1 euro).

[17] In municipal care facilities, about 14 percent of the costs are covered by parents' contributions (see Ohmacht and Thenner 1999).

Table 1 Overview of variables: 25 to 44-year-old mothers with children under the age of 12

	Sample means (in percent)	
	1995	2002
Employment rate	43.5	51.6
Employment rate with children between 0 and 2 years	23.1	25.6
Employment rate with one child under 12	53.9	61.7
Employment rate with two children under 12	38.6	49.9
Employment rate with three or more children under 12	26.4	30.6
Child-care situation within the family		
Children in formal care	37.2	41.0
Children in formal care (if the mother is employed)	43.8	45.5
Father lives with the family	87.2	82.6
Number and age of children		
One child younger than 12 years	42.5	43.9
Two children younger than 12 years	44.6	43.8
Three or more children younger than 12 years	12.9	12.6
Mothers with children between 0 and 2 years	33.8	30.1
Mothers with children between 3 and 6 years	44.8	45.2
Mothers with children between 7 and 11 years	42.0	40.1
Marital status		
Unmarried	10.7	15.2
Married	82.1	76.1
Divorced or widowed	7.1	8.7
Age of the mother		
25 to 29 years	29.7	19.3
30 to 34 years	35.7	34.3
35 to 39 years	24.4	31.1
40 to 44 years	10.2	15.3
Child-care costs if formal child care is used	In Austrian schillings	In euros
Monthly child-care expenses of families (rounded to 100 Austrian Schillings, or to 10 euros)	1,149.3	124.1
Child-care expenses per hour of child care per family	11.5	1.21
Child-care expenses per hour of child care per child	9.8	0.96
Child-care costs, if the mother is employed and formal child care is used	In Austrian schillings	In euros
Monthly child-care expenses of families (rounded to 100 Austrian Schillings, or to 10 euros)	1,410.70	140.2
Child-care expenses per hour of child care per family	13.8	1.21
Child-care expenses per hour of child care per child	11.8	1.01
Net wages of employed mothers	In Austrian schillings	In euros
Net wage per hour worked	96.4	9.39
Child-care duration	In hours	
Hours of child care per day	5.6	5.3

Table 1 continued

	Sample means (in percent)	
	1995	2002
Child-care duration, if the mother is employed and formal child care is used	In hours	
Hours of child care per day	5.7	5.6
Working time in paid dependent employment	In hours	
Average usual working time per week	32.2	30.3

Source: Statistics Austria, Microcensus 3/2002 combined with Austrian tax records 2002 and Microcensus 3/1995, own calculations. *Note*: N(1995) = 4,198, N(2002) = 3,678; calculations apply sample weights. Austrian Schillings (ATS) were converted to euros in 2002 (1 euro = 13.7603 ATS)

families, but the rather small group of non-national Austrian families paid about 25 euros more than Austrian families, on average, which corresponds to a concentration of this group in Vienna. After-school care for children at or above the age of 6 was on average more expensive for families than care for younger children, which again reveals the importance of afternoon care in countries without all-day school systems like Austria.

The numbers for the year 1995 are similar to those for 2002 with the exception that child care costs for single mothers were somewhat higher than those for average families (see Table A1 in the online appendix).

Working mothers earned average net wages of 9.4 euros per hour in 2002 and of 96 Austrian schillings (7 euros) in 1995. The average working time was 30 h in 2002 and 33 h in 1995. Wages were considerably lower for single mothers and particularly for non-national Austrians (see Table 3, column (1)). While both groups worked longer hours, employment rates (columns (4) and (5)) were higher for single mothers and lower for non-nationals than in the Austrian average. Furthermore, as will also turn out in the wage regressions, the number of children tended to reduce wage rates. Results for the year 1995 show similar structures compared to the 2002 sample (see Table A2 in the online appendix).

In most families in our sample, the father or a male partner of the mother lived together with the family (87 percent in 1995 and 83 percent in 2002). About 10 percent of the mothers received daily help from other relatives (not the father, brothers or sisters) in caring for children.

Most mothers were married, while fewer than 20 percent reported being unmarried, divorced, or widowed in 1995. This share increased to 24 percent of mothers in 2002. 44 percent of families had only one child under the age of 12, the same share had two children under the age of 12, and 12 percent of families had 3 or more children. This distribution did not change much between 1995 and 2002.

4.3 Construction of wage and child-care cost variables

In the 2002 dataset income information is extracted from the Austrian tax records and merged to the individual records of the Microcensus. For 1995, information on

Table 2 Costs, hours and enrolment rates in formal child care for regions and family types, 2002

	Mean	Median	Standard deviation	Reported fees of 0 euro for formal child care (in percent)	Average child-care hours per day (in hours)	Enrolment rate (in percent)
	… of child-care costs per family (in euros)					
	(1)	(2)	(3)	(4)	(5)	(6)
Vienna	221.7	200.0	143.8	2.0	6.4	53.8
Burgenland	73.8	50.0	63.8	2.0	5.7	39.8
Lower Austria	91.9	55.0	101.1	12.4	4.7	43.8
Upper Austria	94.9	72.0	92.3	2.7	4.9	40.0
Salzburg	86.9	66.0	65.1	1.0	5.1	41.0
Tyrol	58.1	40.0	54.4	2.6	4.8	29.6
Vorarlberg	87.1	40.0	131.0	4.3	5.1	36.3
Styria	108.6	80.0	96.4	5.1	4.9	33.0
Carinthia	112.5	90.0	126.5	9.9	5.2	35.5
Austria	124.1	80.0	123.2	5.1	5.3	41.0
Single mothers	123.5	100.0	111.3	4.0	5.7	40.8
Non-national	147.3	100.0	143.6	2.1	5.6	47.5
Youngest child <6	114.0	70.0	122.2	5.1	5.2	54.4
Youngest child >5	153.9	130.0	121.4	5.3	5.6	23.7
Help from friends or relatives nearly daily	125.2	80.0	123.5	5.8	5.3	42.0
Family income below median	128.7	90.0	128.0	6.2	5.5	40.1
Family income above median	119.8	77.0	118.4	4.1	5.1	41.9
One child	124.3	100.0	108.7	4.7	5.6	33.5
More than one child	124.1	72.0	130.6	5.4	5.1	46.8
Employed	140.2	100.0	124.4	4.0	5.6	45.5
Not employed	102.5	60.0	118.3	6.7	4.8	36.1

Source: Statistics Austria, Microcensus 3/2002 combined with Austrian tax records 2002, own calculations. *Note*: Figures relate to the sample of mothers aged between 25 and 44 with children under the age of 12

monthly net income per person is contained in the additional survey module of the Austrian Microcensus. Family allowance payments to the family are coded separately.[18] The administrative data collection from Austrian tax records used in the 2002 sample is a highly reliable data source providing information on individual wages, wage-related taxes and child care allowances for all family members, while

[18] Since answering the income module was not obligatory, about 30 percent of the working mothers did not respond to the income question in the 1995 Microcensus.

Table 3 Wage rates, working hours and employment rates for family types, 2002

	Mean wage per hour … of working mothers (in euros)	Median wage per hour	Standard deviation	Working time (in hours)	Employment rate (in percent)
	(1)	(2)	(3)	(4)	(5)
Working mothers	9.4	8.5	4.8	30.3	51.6
Single mothers	8.9	8.2	3.2	32.2	69.2
Non-national	7.8	6.9	3.5	34.5	43.1
One child	9.7	8.7	5.7	30.8	61.8
More than one child	9.1	8.2	3.6	29.7	43.8
Youngest child <6	9.5	8.6	6.0	30.0	40.0
Youngest child ≥6	9.3	8.5	3.7	30.5	66.5

Source: Statistics Austria, Microcensus 3/2002 combined with Austrian tax records 2002, own calculations. *Note*: Figures relate to the sample of mothers aged between 25 and 44 with children under the age of 12

the reliability of reported data on wages and income in surveys from the 1995 sample is often questioned.[19]

We use the income information and the information on the number of hours usually worked per week to calculate a net wage per hour worked. The income information for all family members (including the Austrian family allowance) is used to calculate the overall family income and the family income without the wage of the mother, which would be the unearned part of the family income from the perspective of the mother, if we assume that the mother's employment decision is taken based on that of other family members.

Data on child-care costs and utilisation contain the number of hours a child is usually in formal care, and the monthly costs of this child care for the family. We observe the child-care costs of private child-care arrangements (e.g., private kindergarten and after-school care) as well as publicly provided or subsidised child care for all children under 12 in a family. Child-care costs are measured net of subsidies received either by the child-care institution or by parents. These net costs are exactly what we intend to observe for the investigation of mothers' reaction to these expenditures. We use these data together with information on working time to calculate child-care costs per hour worked for each mother (CCH_i):

- We first compare the daily working time H_i and the time children spend in child-care facilities CT_i to find out if the hours in child care exceed the daily average working time by more than one hour $H_i + 1$. Since there is no information on the time spent on commuting and/or taking the children to and from the caregiver we account for the time involved by allowing for this additional 1 h.[20] If these

[19] Comparing results from otherwise similar data sets also provides evidence about the quality of the income information from survey data in the Austrian Microcensus.

[20] This calculation assumes that child care hours take place during working hours. This assumption would be violated if we observed a large share of mothers working in the evening or during the night. We do not observe this in the Microcensus 1995 and 2002. However, the labour force survey covers a

child-care hours exceed the working time by more than one hour per day, we consider only the share of hours in formal child-care within the working time.[21] This share is 1 if child-care time is equal to or less than daily working time plus 1.

- We calculate the costs of child care per day CC_i and multiply this by the ratio of child-care hours to working time discussed above.
- Then we divide this value by the daily working time and receive a measure for the child-care cost per hour worked,

$$CCH_i = \min\left(\frac{H_i + 1}{CT_i}, 1\right) \cdot \frac{CC_i}{H_i}$$

Additionally, we construct a number of explanatory variables characterising

- the family: the number and age of children; the number of adult family members; whether the father of the children (or a male partner of the mother) lives with the family; the family's total net income; the family's total net income without the labour income of the mother, whether formal child care is used; expenditures on child care and whether the cost of lunch is included in these expenditures; the participation of family members in child-care activities; the participation of other relatives or friends in caring for the family's children, information on the place of residence (province and type of region).
- the mother: age; education level; employment participation; actual or last occupational status; marital status; foreign or Austrian citizenship; the degree of responsibility for child care; the wage earned; hours usually worked; whether the mother or some other member of the family responded to income questions; whether income questions were answered.
- the "head of the family" (in the Microcensus data the father is usually coded as the head of the family; mothers are only the head of the family if no father or male partner of the mother is living with the family): age; education level; employment status; occupation; response to income questions.

5 Econometric strategy

Following standard theoretical models, the employment decisions of mothers depend on both the cost and quality of child care (see e.g. Connelly 1992; Powell 1997). Mothers choose the utility-maximising values for working time, leisure, and maternal child care, constrained by budget and time constraints. To increase the

Footnote 20 continued
question on night work since 2004. In 2004 there were 5 percent of mothers with children under the age of 12, who worked at night. But even these 5 percent doing night work did not exclusively work during the night. Therefore, we consider our assumption to be largely plausible.

[21] In about 20 percent of the cases, child-care hours exceeded working time by more than one hour. This could indicate that commuting may take even longer than one hour per day or that mothers pursue other activities while children are in formal child-care.

incentive for mothers to work, it would be appropriate to either improve child-care quality or reduce the price of non-maternal child care P (all other things being equal). In such a simple model, a reduction in the price of child care (net of subsidies) by one euro should have the same effect on employment participation as a one-euro increase in net wages.

In our datasets underlying the following empirical analysis, we observe child-care costs and hours of child care as well as wages and working hours. As in other datasets frequently used in the international literature, we lack information on child-care quality (such as, for instance, the number of children per teacher). Since quality regulations for child-care centres are similar between Austrian regions (see Baierl and Kaindl 2011), heterogeneity in quality can be expected to be limited.

An advantage of our dataset is that child-care costs are measured net of subsidies received either by the child-care institution or the parents. This is important, because—as pointed out above—public support for child care in Austria is very heterogeneous with respect to regions and municipalities, and in practice lacks transparency. Subsidised child-care institutions may coexist with privately financed institutions, and at the same time families might receive (additional) financial support for their child-care arrangements. These institutional settings are unobserved in the data. In spite of this, the influence of child-care costs on employment behaviour should still be observable; the heterogeneity of support schemes should even add variation to observed child-care costs, compared to a situation with a more homogeneous support scheme.

The employment decision of the ith mother could be modelled in terms of mothers' working hours H_i, which depends on wage rate W_i, the price of child care P_i, family income without the working income of the mother Y_i and other observable determinants Z_i of the ith mother and her family, as well as on potentially unobserved determinants ε_i.

$$H_i = f(W_i, P_i, Y_i, Z_i, \varepsilon_i), \tag{1}$$

As in many other studies (see e.g. Connelly 1992; Jenkins and Symons 2001), we model the discrete choice between employment and non-employment, rather than that of working hours. One reason for this is that it may be more troublesome, especially for mothers, to organise (re-)entry to the labour market, compared to extending or reducing their working time. Another reason is that there is a concentration of working hours of mothers with young children at around 20 h a week (28 percent of the cases in our sample work 18–25 h) and full-time employment (55 percent work 36 or more hours). Therefore, the employment decision could also be modelled as a choice between part-time work, full-time work and non-employment (see Powell 1998; Michalopoulos and Robins 2000, 2002). We restrict our analysis to the binary employment decision, since it facilitates a comparison with the results in the literature. To examine the validity of our results we additionally estimate ordinal regression models, which distinguish between the employment-outcomes for part-time and full-time work.

Thus, for the binary employment decision, Eq. (1) has to be reformulated as an employment participation equation in which E_i^* is the utility-maximising choice between employment and non-employment:

$$E_i^* = \begin{cases} 1 & \text{if } H_i > 0 \\ 0 & \text{otherwise} \end{cases} \tag{2}$$

Since we are interested in the impact of child-care costs on the employment rates of mothers, and since theoretical arguments suggest that changes in child-care costs should exert an impact on the employment decision similar to that of wages, we estimate the probability of employment as a function of child-care costs per hour of work, the wage rate and other covariates such as family net income without the labour income of the mother and variables summarising the characteristics of mothers and their families. Because the employment decision is modelled on the basis of an individualistic utility maximisation problem, wages and income levels have to be captured net of taxes and social security contributions, and subsidies to the families or child-care institutions should not be counted as a part of expenditures on child care. These are the factors that the individual mother considers when deciding upon her employment activities. In a probit model the probability of employment E, conditional on the realised values of the exogenous variables, can be written as a cumulative distribution function F:

$$\Pr(E_i = 1 | X = X_i) = F(\beta_0 + \beta_1 W_i + \beta_2 P_i + \beta_3 Y_i + \beta_4' Z_i), \tag{3}$$

where X summarises the independent variables W, P, Y and Z. However, before we can estimate the coefficients of Eq. (3), we have to solve the problem of unobservable wages and child-care costs: we observe wages only if a person is employed and child-care costs only if formal child care is used. We do not observe the wage that would be earned if a mother decided to work or the price for child care that would be paid if child-care institutions were used. Therefore, we estimate expected wages and child-care costs for the entire sample of mothers.

5.1 Estimation of wage and child-care costs

To estimate potential wages for the whole sample we use the wage information of working mothers to estimate a wage equation and predict expected wages for all mothers;

$$\ln W_i = \alpha' D_i + v_{W,i}, \tag{4}$$

where (4) represents a Mincer-type wage equation with vector D_i of observed characteristics of mothers and $v_{w,i}$ is the unobserved variation.

Since working mothers may differ from non-working mothers, not just with respect to their employment position and other observable variables, we cannot assume that selection into the non-working mothers sub-sample is random. Therefore, we need to correct for potential sample selection biases in the wage Eq. (4). Unfortunately, we have an additional problem of non-response in our 1995 sample of mothers: about 30 percent of the working mothers did not respond to the income question in Microcensus 3/1995. Therefore, we face the selection problem described in Eq. (5) in our 2002 data set and a double selection problem described in Eqs. (5) and (5a) when estimating a wage equation in the 1995 data:

$$E_i = \begin{cases} 1 & \text{if employed} \\ 0 & \text{else} \end{cases} \tag{5}$$

$$R_i = \begin{cases} 1 & \text{if income questions were answered} \\ 0 & \text{else} \end{cases} \tag{5a}$$

To analyse the effect of child-care costs in a way comparable to that of the wage rate we have to consider expenditures on child care during working hours. As our data contain information on daily working time and hours of utilisation of formal child care, we calculate child-care costs per hour of work (see the section on construction of wage and child-care cost variables in chapter 4). The variables needed to calculate the child-care cost variable are only observable if a mother works and uses formal child care. To estimate expected child-care costs for the whole sample of mothers, two types of approaches seem to be reasonable. First, expected child-care costs could be calculated according to existing regulations and support schemes for child care if they are generally valid.[22] Second, we could predict potential child-care costs out of sample in the same way we did for wages. If there were comprehensible rules that determined fees for certain types of families, then the first solution would probably be superior. As described in chapter 3 and presented in the descriptive evidence (see Table 2), a variety of support schemes as well as the coexistence of public child care and private institutions characterise the institutional child-care situation in Austria. Given the heterogeneity, unobservability and lack of transparency of the support schemes that parents and child-care institutions face, we are unable to construct appropriate rules to define expected child-care costs. We argue instead that these regional and local differences in families' (potential) costs for formal child care constitute a source of exogenous variation. However, the lack of transparency of regulations as well as the small sample size in regional sub-samples impede the direct utilisation of this variation for our investigation. Therefore, we decide to estimate child-care costs that individuals face based on regional and local characteristics and household variables, which can be expected to be the main determinants of child-care costs, and predict them out of the sample.

$$P_i = \gamma' M_i + v_{P,i}, \tag{6}$$

where P_i denotes the child-care costs, M_i is a vector of observed regional and household characteristics and the unobserved variation is denoted as $v_{P,i}$. Given the huge regional and local variation (see Table 2), we use a large set of regional variables in the child-care cost equation. We are able to distinguish the nine provinces and 35 districts, as well as a typology of regions, which is particularly important with regard to urbanity. We believe that this approach is an appropriate and feasible way to exploit regional and local variation in child-care costs. As we will find in the estimation, this regional and local information improves both the explanatory power and consistency of results with respect to theoretical considerations and the existing literature.

Again, we face a double selection problem. We observe child-care costs per working hour only if mothers work and use formal child care;

[22] A calculation of potential child-care costs is, for instance, carried out in Wrohlich (2011) for Germany.

$$E_i = \begin{cases} 1 & \text{if employed} \\ 0 & \text{else} \end{cases}$$
$$K_i = \begin{cases} 1 & \text{if using formal child-care} \\ 0 & \text{else} \end{cases} \quad (7)$$

Various studies in the economic literature on child-care costs have used a correction for this double selection problem (see Jenkins and Symons (2001) or Powell (1997)), which is discussed in detail by Tunali (1986).[23] Correction terms for the sample selection are included as explanatory variables in the auxiliary wage and child-care cost estimations. To estimate the wage equation for 2002 we use a Heckman selection correction procedure to take possible selectivity into account (Heckman 1979).

Using the estimated parameters from Eqs. (4) and (6) we generate predicted values for the wage per hour (W_i) and the price of child care per hour worked (P_i) for the whole sample of mothers. We use these predictions as explanatory variables in our initial employment decision probit (3).

5.2 Identification of the selection models

As just argued, the identification of the sample selection models for the wage equation and the child-care cost equation is an important issue.

In the correction (bivariate probit) model for potential selection bias in the wage equation, we include variables identifying the propensity to participate in paid employment that influence the participation decision but have no impact on the wage rate. These are

- household income without the earned income of the mother, measured in six dummy variables,
- the age of the children, measured as the presence of children under the age of 2 and the presence of children aged 3–5,
- and the support the mother receives in caring for children in her household, including the four dummy variables (1) for additional adults caring for children in the household, (2) help from friends and relatives every day and (3) every week, respectively, and (4) the presence of the father of the children or a male partner of the mother.

The identifying variables in the second bivariate probit part that models the propensity to answer the questions about wages in the 1995 dataset are:

- whether the mother or another person in the household answered the family-specific questions,
- and marital status.[24]

[23] See appendix B in Mahringer and Zulehner (2012) for more details on the application of the two-step estimation with a double selection problem for the estimation of wage and child-care cost equations.

[24] Fersterer and Winter-Ebmer (2003) apply a similar double selection model for datasets also based on the Austrian Microcensus. Differences in the identification strategy are discussed in Mahringer and Zulehner (2012) p. 18f.

Additionally, a broad set of variables is used to explain employment participation as well as wages. Among these are educational levels, age, actual or previous occupational status and nationality.

We again use a bivariate probit model to address selection in the child-care cost equation. We model both the propensity to participate in paid employment and the propensity to use formal child care. To identify these propensities we use the following variables to identify the selection into the utilisation of formal child care during employment:

- measures of the support the mother receives in caring for children in her household, as above,
- marital status,[25] and
- actual (if employed) or last (if not employed) occupational status.

Furthermore, a large set of regional and local dummy variables, along with those of education level, family income, number and age structure of children, are used to explain child-care costs as well as the employment decision and the decision to utilise formal child care.

6 Estimation and results

Following the estimation strategy outlined above, we estimate the impact of child-care costs on the employment rate of mothers. The estimation of the employment participation Eq. (3) uses predicted wages and child-care costs for the whole sample. As pointed out above, we need to run two auxiliary regressions: one for a wage-equation and another for a child-care costs equation. In both cases we have to take (double) selection problems into account. These selection problems consist of employment participation and, for the year 1995, the response to the income section of the questionnaire in the wages equation and of employment participation and utilisation of formal child care in the child-care cost equation.

We estimate separate models for mothers aged 25–44 with children under the age of 12, married mothers and Austrian mothers. Due to the small sample, it is not possible to estimate separate models for single mothers (around 13 percent of all mothers) and non-national Austrian mothers (7 and 10 percent of mothers in the respective years). Additionally, we do a number of sensitivity checks: we change sample restrictions and specifications and apply an ordinal probit estimate to distinguish between part-time and full-time employment.

6.1 Results of the wage model with sample selection

In the first step of the sample selection model for wages we estimate a probit model for employment participation for 2002, as well as a bivariate probit model for

[25] Marital status has no significant influence on the employment participation probit for the year 2002.

employment participation and the response to income questions for 1995 (see Tables A3 column 1 and A4 columns 1 and 2 in the online appendix).[26]

We use the selection correction terms calculated from the (bivariate) probit auxiliary regressions to estimate a wage equation by OLS, correcting for sample selection (see Tables A3 column 2 and A4 columns 3 in the online appendix). We see that the coefficients for the effect of mothers' education have the expected signs and are significant (for 2002 only the estimates for university degrees and technical and vocational colleges); in most cases, a higher educational level means higher coefficients in the wage equation (and most are significant). Coefficients for occupational status (civil servants, white collar workers and qualified blue collar workers) are significantly positive compared to the baseline of blue collar workers. We also estimate that mothers with foreign citizenship earn less than Austrian mothers.

Only for the 2002 sample, we estimate that the wage rates of young mothers are significantly lower than those of the older mothers. Having more children has a negative influence on mothers' wages (in both 1995 and 2002). The selection correction terms for employment participation and non-responses are insignificant for the 1995 sample. Predicted values from the wage equation are used as estimates of potential wages for the whole sample of mothers with children under the age of 12.

6.2 Results of the child-care cost model with sample selection

The child-care cost model is estimated with the same type of selection structure as the wage model presented above. In a first step, a bivariate probit model is once again estimated, using employment participation and the utilisation of formal child care as dependent variables (see Table A3 columns 3 and 4 and Table A4 columns 4 and 5 in the online appendix).

Child-care costs per hour of paid employment are only observed if mothers are employed and formal child care is used. These two conditions apply to some 758 of the 3,678 mothers in the dataset for the year 2002 and slightly more for the year 1995. We use the selection correction terms calculated from the bivariate probit, the number and age structure of children, the education levels and the set of local and provincial level data as explanatory variables in estimating an OLS regression model. In addition to those explanatory variables, we use a dummy variable to single out payments for lunch as a component of child-care costs (see Table A3 column 5 and A4 column 6 in the online appendix). To receive comparable child-care cost estimates we drop this cost component for the prediction of the child-care costs for the whole sample.

To capture the heterogeneity of child-care fees, we use dummy variables for the nine provinces, regional characteristics (particularly dummies for urban regions) and 35 district dummies for the municipality in which the family lives. Educational variables may be interpreted as a proxy for different tastes regarding child-care quality, which may be somehow related to the price of child care. Mothers with education levels above compulsory school spend more on formal child care (although some of the differences are insignificant).

[26] We present estimates for the estimation using the full sample of mothers aged 25–44 with children under the age of 12. Estimations for other samples and specifications are available on request.

Having more children raises the cost of child care, particularly in the case of children between 3 and 5 years of age which have a significantly positive influence on child-care costs. Regional variables contribute to the explanatory power of the regression model. Omitting district dummies, for example, results in a reduction of the R^2 from 0.30 to 0.23 in the estimation for the year 2002.

The selection correction term for employment participation is significant and positive in the 2002 results, indicating that, after controlling for other observables, employed mothers have higher child-care costs than mothers who are not employed. The selection correction terms for the utilisation of formal child care and for the employment participation in the estimate for 1995 are insignificant.

The estimated child-care cost equation is used to predict potential expenditures for formal child care for the whole sample of mothers with children under the age of 12.

6.3 Estimating the employment probability of mothers

In a probit model we explain the employment participation of mothers by predicted (potential) child-care costs and (potential) wages. We also use family income (less mothers' earnings), variables on the child-care situation within the family, age and number of children, marital status, citizenship and regional information as additional explanatory variables.

6.3.1 The impact of wages and child-care costs on the employment rates of mothers

The results of the estimations suggest that (potential) wages have a significantly positive impact and child-care costs have a significantly negative impact on the employment probability of mothers in both 1995 and 2002. This holds for the sample of all mothers aged 25–44 with children under the age of 12 (see Table 5 columns (1) and (4)), as well as for the samples restricted to married mothers (columns (2) and (5)), where only the coefficient for child-care costs is close to significant on the 10-percent level, and for Austrian mothers (columns (2) and (5)). For the year 2002, the magnitude of the estimated effect of child-care costs and wages is similar.

Table 4 summarises the marginal effects of the probit estimates of (potential) child-care costs and (potential) wages, as well as the elasticities of employment rates with respect to these variables. Marginal effects measure the impact of a one-euro change of wages or child-care costs, respectively, on the employment rate at sample means of the explanatory variables. At the point estimates of -0.08 (see column (1) of Table 4), a one-euro reduction in child-care costs would therefore cause an increase in employment rates of 8 percentage points. A child-care cost elasticity of employment rates of -0.13 suggests that a reduction of child care costs by one percent increases employment participation by 0.13 percent.

The estimated marginal effects of child-care costs are of similar size for the years 1995 and 2002. However, only for the sub-sample of Austrian mothers the effect is slightly higher, while differences are clearly insignificant. Compared to the full sample, married mothers have marginally lower point estimates with respect to both child-care costs and wages. This would suggest that single mothers respond more to changes in financial incentives. However, differences between married mothers and

average mothers are insignificant and far too small to justify this interpretation. The difference between average mothers and Austrian mothers does not suggest a clear structure of differences in employment behaviour.

The marginal effects of changes in net-wages and child-care costs are very close in absolute values. This suggests that, in accordance with theoretical considerations, mothers account for a one-euro change in net wages and child-care costs (net of subsidies) in a similar way when making their employment decisions. This is consistent with theoretical considerations discussed above.

Both marginal effects and elasticities with regard to wages are higher for the year 1995 than for 2002. Given the differences in the data sources on wages (tax records in 2002 and survey information in 1995), this is not surprising. The consistency of wage and child-care cost effects, as well as the higher reliability of administrative data in general, can be put in favour of a higher credibility for the 2002 estimates. However, we cannot rule out changes in employment elasticities between these years.

The marginal effect of wages on employment probabilities for the full sample of mothers shows that an increase in the average predicted wage by one euro per hour would increase the employment probability of the average mother by 11 percentage points in 1995 and 7 percentage points in 2002. These values imply a wage elasticity of the employment rate of mothers of 1.97 in 1995 and 1.21 in 2002. This is in the upper range of estimates provided in the empirical literature, particularly with regard to the 1995 estimate. In her study for married mothers in Canada, Powell (1997) reports a wage elasticity of 0.85. Kimmel (1995) estimates a wage elasticity of close to 2 for low-income single mothers and Connelly and Kimmel (2003) find one of 1.20 for single mothers. Anderson and Levine report an average wage elasticity of 0.59, which goes up to 0.90 for lower-educated sub-samples. Jenkins and Symons (2001) find an elasticity of 0.25 for their lone mothers' sample. Wrohlich (2004) reports a change of employment probability from a 1 percent change in wages of 0.13 percentage points for West-Germany compared to 0.85 percentage points in our estimate. The low employment rate of mothers and high female labour supply elasticity in Austria (see e.g. Novotny 1999) are possible explanations for this rather high estimate.

According to the estimates presented in Table 5, the elasticity of the employment rate with respect to child-care costs is −0.11 in 1995 and −0.07 in 2002. This is within the range of the results presented for other countries (see the discussion of the literature above). Using this result we simulate free access to child-care facilities in the estimated probit model. Predicted changes in employment rates show that the employment rates of mothers would increase by nearly 4.4 percentage points in the 1995 sample and by 6.4 percentage points in the 2002 sample.

6.3.2 The effects of other covariates

Additional covariates in the estimation of the employment rate of mothers shall account for factors that directly influence the employment decision, but are not sufficiently accounted for via their interrelation with wages or child care costs.

Family income less mother's income (i.e., the extra potential income available if the mother works) has a negative impact on the employment probability of mothers.

Table 4 Estimated impact of child-care costs and net wages on mothers' employment rates: marginal effects and elasticities for mothers aged 25–44 with children under the age of 12 years

	2002			1995		
	Full sample (1)	Married (2)	Austrian (3)	Full sample (4)	Married (5)	Austrian (6)
Marginal effect of an increase in (predicted) child-care cost per hour of paid employment	−0.0803**	−0.0739**	−0.0679*	−0.0744**	−0.0538	−0.1228***
	(0.0378)	(0.0349)	(0.0384)	(0.0379)	(0.0342)	(0.0381)
Marginal effect of an increase of (predicted) wage per hour of paid employment	0.0724***	0.0670***	0.0785***	0.1106***	0.1064***	0.1107***
	(0.0082)	(0.0083)	(0.0384)	(0.0098)	(0.0100)	(0.0096)
Child-care cost elasticity of employment rates	−0.1262**	−0.1242**	−0.1000*	−0.1067**	−0.0838	−0.1705***
	(0.0594)	(0.0587)	(0.0565)	(0.0545)	(0.0534)	(0.0530)
Wage elasticity of employment rates	1.2091***	1.1992***	1.2956**	1.9666***	2.0140***	2.0033***
	(0.1385)	(0.1491)	(0.1498)	(0.1824)	(0.2004)	(0.1823)

Source: Statistics Austria, Microcensus 3/2002 combined with Austrian tax records 2002 and Microcensus 3/1995, own calculations. *Note*: Standard errors in parentheses. *** 1 percent significance level, ** 5 percent significance level, * 10 percent significance level. The marginal effects for 1995 are adapted for the change in Austrian currency (the euro was introduced instead of the Austrian schilling) and for the increase in the wage index (Tariflohnindex) between September 1995 and September 2002

Income categories above the reference category show negative coefficients and vice versa, and most coefficients are significant (see Table 5).[27] This result suggests that policies increasing the unearned income component of families (e.g. through family transfers or tax relief for the partner) have to take into account that they may reduce the incentives for mothers to be employed.

The probability that a mother is employed decreases with the number of children she has, and the effect is strongest when the children are younger than 3. Mothers receiving at-home child-care-support from family, friends or other relatives have higher employment probabilities. The frequency of support from other relatives or friends further increases the employment rate of mothers. The presence of other adults in the household taking part in the child care also increases the employment rates of women. If this is the father of the children, it has a negative effect in the estimate for 2002 (see Table 5).[28] In general, the significant influence of support in

[27] In the sample for the year 2002 we do not observe income from the self-employment of other family members. Therefore, the group with the lowest family income may content families with income from self-employment. Consequently, the coefficient estimated for this group reflects its heterogeneous composition and is not significantly different from the reference group (see Table A5).

[28] As Del Boca et al. (2005) point out for Italy, the presence of a grandmother who lives nearby and is in good health may substitute costly formal child care. This could also be considered a reduction of child-care costs and hence lead to an increase in the expected employment rate of mothers.

Table 5 Probit models—probability of participation in paid employment by mothers aged 25–44 with children under the age of 12 years

	2002			1995		
	Full sample (1)	Married (2)	Austrian (3)	Full sample (4)	Married (5)	Austrian (6)
Predicted child-care cost per hour of paid employment	−0.2013**	−0.1855**	−0.1708*	−0.1917**	−0.1411	−0.3151***
	(0.0947)	(0.0876)	(0.0965)	(0.0976)	(0.0894)	(0.0976)
Predicted wage per hour of paid employment	0.1816***	0.168***	0.1975***	0.2845***	0.2787***	0.2845***
	(0.0206)	(0.0207)	(0.0226)	(0.0247)	(0.0270)	(0.0247)
Large City	0.3093***	0.3701***	0.3089***	0.1344*	0.1591*	0.2120**
	(0.0808)	(0.0868)	(0.0870)	(0.0889)	(0.0940)	(0.0893)
Tyrol	−0.1413*	−0.1853**	−0.1657**	−0.5245***	−0.5517***	−0.5426***
	(0.0773)	(0.0836)	(0.0764)	(0.0786)	(0.0843)	(0.0797)
Vorarlberg	−0.4436***	−0.4785***	−0.4734***	−0.6300***	−0.5445***	−0.6959***
	(0.0905)	(0.0981)	(0.0908)	(0.0881)	(0.0900)	(0.0936)
Family income without earned income of the mother less than 727 euros	−0.0092	0.0165	0.0375	0.6330***	0.4223***	0.6972***
	(0.0733)	(0.0762)	(0.0769)	(0.1014)	(0.1055)	(0.1025)
… 727 to 1.453 euros	0.1743**	0.1786**	0.1938**	0.2307***	0.2988***	0.1577**
	(0.0775)	(0.0774)	(0.0812)	(0.0698)	(0.0702)	(0.0701)
… 2.180 to 2.907 euros	−0.1282	−0.1236	−0.1019	−0.2487***	−0.2739***	−0.2510***
	(0.0929)	(0.0921)	(0.0941)	(0.0807)	(0.0809)	(0.0827)
… 2.907 to 3.634 euros	−0.448***	−0.4456***	−0.441***	−0.4657***	−0.4828***	−0.5173***
	(0.1431)	(0.1428)	(0.1474)	(0.1402)	(0.1391)	(0.1440)
… 3.634 to 4.360 euros	−0.3629*	−0.3496*	−0.3928*	−0.7477***	−0.7787***	−0.8309***
	(0.2025)	(0.2021)	(0.2065)	(0.2071)	(0.2059)	(0.2079)
… 4.360 euros or more	−0.8979***	−0.9186***	−0.8404***	−0.0242	−0.0819	0.0388
	(0.3362)	(0.3293)	(0.3476)	(0.3288)	(0.3285)	(0.3407)

Table 5 continued

	2002			1995		
	Full sample (1)	Married (2)	Austrian (3)	Full sample (4)	Married (5)	Austrian (6)
Number of children under 12 years	−0.2321***	−0.2269***	−0.1983***	−0.1182	−0.1014	−0.1799**
	(0.0583)	(0.0606)	(0.0612)	(0.0736)	(0.0769)	(0.0741)
Number of children under 3 years	−0.9484***	−0.9288***	−0.9496***	−0.8407***	−0.8514***	−0.7917***
	(0.0854)	(0.0884)	(0.0889)	(0.0918)	(0.0956)	(0.0971)
Additional adult caring for children in the household	0.1651***	0.179***	0.1445***	0.4192***	0.4264***	0.3890***
	(0.0618)	(0.0620)	(0.0661)	(0.0588)	(0.0587)	(0.0606)
Help from other relatives or friends nearly every day	0.411***	0.3746***	0.4154***	0.4611***	0.5682***	0.4819***
	(0.0829)	(0.0919)	(0.0860)	(0.0870)	(0.0977)	(0.0900)
Help from other relatives or friends nearly every week	0.2341***	0.2083***	0.2378***	0.2319***	0.2432***	0.1757**
	(0.0686)	(0.0744)	(0.0698)	(0.0691)	(0.0727)	(0.0721)
Father lives with the family	−0.3883***		−0.329***	0.0892		0.2573*
	(0.1186)		(0.1223)	(0.1356)		(0.1314)
Foreign citizenship	0.0319	−0.017		0.4727***	0.4209***	
	(0.0949)	(0.0970)		(0.1206)	(0.1220)	
Intercept	−0.5921***	−0.8813***	−0.7792***	−2.1892***	−2.0637***	−2.2313***
	(0.2232)	(0.2076)	(0.2406)	(0.2587)	(0.2335)	(0.2472)
Number of observations	3,678	3,193	3,324	4,198	3,670	3,912
Pseudo R^2	0.173	0.154	0.164	0.202	0.184	0.213
Log-pseudolikelihood	−2106.74	−1870.969	−1921.159	−3.12E+05	−2.75E+05	−2.72E+05

Source: Statistics Austria, Microcensus 3/2002 combined with Austrian tax records 2002 and Microcensus 3/1995, own calculations. *Note*: Probit coefficients are presented, standard errors in parentheses. *** 1 percent significance level, ** 5 percent significance level, * 10 percent significance level. The coefficients for 1995 are adapted for the change in Austrian currency (the euro was introduced instead of the Austrian schilling) and for the increase in the wage index (Tariflohnindex) between September 1995 and September 2002. Reference category: marital status: married or widowed; family income without earned income of the mother: 1.453–2.180 euros

child care within the private network of mothers indicates that when mothers do not hold the sole responsibility for child care in the family, the probability of employment is higher.

The coefficient for mothers with foreign citizenship is significantly positive in the 1995 estimates but insignificant for 2002.

Families living in larger cities show significantly higher employment probabilities of mothers than in the rest of the Austrian provinces, with the opposite holding for Vorarlberg and Tyrol, the western part of Austria.

As a quality measure of the estimation we calculate the number of cases in which our model correctly predicts the employment participation of mothers. Both in the 2002 and 1995 estimations the predictions match the actual employment status for around 70 percent of mothers (see Tables 5 and 6 in the online appendix).

6.4 Sensitivity of the estimates

One potential problem of structural employment participation models with sample selection is its sensitivity towards modifications of the specification. Additionally, the estimates might change with different sample restrictions. Therefore, we run a number of sensitivity checks with different specifications of the auxiliary wage and child-care cost models with a sample selection, an additional sample restriction and an estimation of an ordinal regression model to see if the distinction between part-time and full-time employment yields similar results to the binary definition of the employment decision.

As a first sensitivity check we present results for the estimation of the structural employment equation without other covariates other than (potential) wages and child-care costs. Compared to the specification presented above (see Table 6, column (1)) this estimation yields (in absolute values) higher coefficients for child care costs and lower ones for wages, but the estimates remain significant and show the expected signs (see column (2)). We consider the specification with further covariates to be the superior one, since additional right-side variables control for differences in the employment behaviour not sufficiently captured by wages and child-care costs.[29]

Using the observations without applying the Microcensus household weights leads to higher estimates (in absolute values) of the coefficient of child-care costs in 2002 and higher ones in 1995 (see column (3)). Since regional factors are important for both the weighting and the estimation of child-care costs this sensitivity is not surprising.

Skipping district dummies from the estimation of child-care costs leads to higher negative coefficients for child-care costs in the 1995 estimation; for 2002 this modification has no large effects (see column (4)).

If we estimate the child care costs and wage models without correction terms for sample selection, this has little impact on estimates for 1995. As we have pointed out before, all selection correction terms were insignificant in the wage and child-care costs equation. The estimates for the year 2002 show higher coefficients (in absolute values) for child-care costs, which are plausible, because the selection term

[29] Pseudo R^2 as well as the shares of correct predictions are considerably higher in the specification with additional covariates. Results are available on request.

Table 6 Results of alternative specifications and sample restrictions

	Main specification (from Table 5 (1) and (4)) (1)	Estimate without further covariates (2)	Unweighted estimate (3)	Estimate without district dummies in child-care cost model (4)	Estimate without correction for unobserved heterogeneity (5)	Age of youngest child <10 (6)
Year 2002						
Predicted child-care cost per hour of paid employment	−0.2013**	−0.3975***	−0.1417*	−0.2019**	−0.2755*	−0.1774*
	(0.0947)	(0.0630)	(0.0927)	(0.0988)	(0.1464)	(0.0970)
Predicted wage per hour of paid employment	0.1816***	0.1325***	0.1979***	0.1833***	0.1824***	0.1609***
	(0.0206)	(0.0172)	(0.0182)	(0.0209)	(0.0208)	(0.0206)
Year 1995						
Predicted child-care cost per hour of paid employment	−0.1917**	−0.3210***	−0.2822***	−0.3386**	−0.1740*	−0.1740*
	(0.0976)	(0.0670)	(0.0858)	(0.1199)	(0.0988)	(0.0999)
Predicted wage per hour of paid employment	0.2845***	0.2187***	0.2716***	0.2845***	0.2857***	0.2634***
	(0.0247)	(0.0200)	(0.0200)	(0.0247)	(0.0247)	(0.0270)

Source: Statistics Austria, Microcensus 3/2002 combined with Austrian tax records 2002 and Microcensus 3/1995, own calculations. *Note*: Standard errors in parentheses. *** 1 percent significance level, ** 5 percent significance level, * 10 percent significance level. The coefficients for 1995 are adapted for the change in Austrian currency (the euro was introduced instead of the Austrian schilling) and for the increase of the wage index (Tariflohnindex) between September 1995 and September 2002

for employment participation in the child-care cost equation was significant (see column (5)). If we further restrict the sample to mothers with children of only up to 9 years (which is the age children attend their last year of primary school in Austria) estimated coefficients for both wages and child-care costs are slightly lower (in absolute values), but remain significant at least at the 10-percent level.

Altogether, these sensitivity checks do not change the qualitative results of the estimations presented above.

As a further sensitivity check we estimate an ordinal probit model with three outcomes: non-employment, part-time employment (less than 36 h per week) and full-time employment.

$$E_i^* = \begin{cases} 2 & \text{if} \quad H_i \geq 36 \\ 1 & \text{if} \quad H_i > 0 < 36 \\ 0 & \text{otherwise} \end{cases} \tag{2a}$$

In Tables A7 and A8 in the online appendix we present the estimated coefficients as well as marginal effects for each of the three outputs for 2002 and 1995, respectively.[30] As in the binary structural probit equation, the coefficients of (potential) wages are positive and significant in the estimations for 2002 and 1995. As expected, the coefficients of child-care costs have a negative sign and are also significant, at least at the 10-percent level (see Table A7 and A8 columns (1)). The absolute sizes of coefficients for wages (0.136) and child-care costs (0.156) are similar in the model for 2002. In the estimation for 1995, the coefficient of child-care costs has a higher absolute value than that for wages. However, the results from the ordered probit model largely correspond to those from the binary model.

The marginal effects from the model (see columns (2)–(4)) show that the positive effect of wages on employment rates is stronger for full-time than for part-time work. The same holds for the partial effects for the child-care cost. The size of the marginal effects on the probability of mothers working full-time is (in absolute values) larger than for part-time work.

7 Conclusion

Theoretical considerations and the empirical evidence for other countries suggest that a reduction of child-care costs increases the employment rate of mothers. The results presented in this paper are based on regression models with sample selection correction and a dataset merging survey data from the Austrian Microcensus with administrative wage data from Austrian tax records (2002) and a survey dataset for the year 1995. The estimation makes use of the large variation in child-care costs in Austria due to the vast variety of regional and local regulations regarding fees for formal child care.

The results suggest that the elasticity of the employment participation of mothers with children below the age of 12 is high with respect to wages, as well as with respect to child-care costs. The estimated effects are significant and follow the

[30] Levels of significance indicated for the coefficients also hold for the marginal effects.

expected direction. Although the point estimates of an increase in net wages by one monetary unit are lower than those of a reduction of child-care costs by the same amount, these effects are not statistically different. These results suggest that the net wages (net of taxes and social contributions as well as child-care costs) are perceived as an important determinant in the employment decision of mothers.

The estimates of the elasticity of employment with respect to child-care costs are in the range of similar studies for the USA, Canada and some European countries. With regard to child-care costs we find an elasticity of the employment rate of −0.13 for 2002 and −0.11 for 1995. The influence of child-care costs is similar—in absolute size—to the influence of changes in net wages. In relative terms, calculated as wage elasticity of employment rates, this i is 1.21 for 2002 and 1.96 based on only survey information on wages for 1995. The relatively high employment elasticity with respect to wages reflects the often-stated high female labour supply elasticity in Austria.

Given the low employment rate of mothers (51.6 percent of mothers with children under the age of 12 did not work in 2002, compared to 43.5 percent in 1995) and the high share of universal monetary transfers for families in Austria, policies aimed at reducing the costs of formal child-care can be expected to increase mothers' employment participation if the limited availability of child-care slots does not restrict the additional consumption of formal child care. In regions where public or publicly subsidised child-care facilities are rarely available, an increase in availability can be perceived as equivalent to a direct reduction in child-care costs.

The empirical results also indicate that mothers with higher family income (without the labour income of the mother) are less likely to work. This confirms the conclusion that policies to support the availability of affordable child care are more effective than direct transfers to families when it comes to increasing female labour market participation. Our simulations suggest that free child care would—calculated at point estimates for 2002—result in an increase in mothers' employment rates of 6.4 percent.

The unobservability of child-care quality presents a limitation in this analysis. Although there are regulations for minimum standards of formal child care, regional-level quality may vary considerably. Since these standards are below those of countries with higher participation of children in day care, like Denmark, this aspect may be important in the decision about labour market participation. Theoretical considerations suggest that an increase in the quality of formal child care affects mothers' employment decisions similarly to a reduction in costs. Therefore, raising the quality of child-care institutions (e.g. by reducing the number of children per kindergarten teacher) without changing the fees should also result in an increase in mothers' employment rates.

Acknowledgments We gratefully acknowledge financial support from the Jubiläumsfonds of Österreichische Nationalbank (grant 12975). We thank the participants of the MOTU seminar in March 2012 and would particularly like to thank Alex Olssen, Robert M. Hutchens, David Maré and Isabelle Sin, as well as two anonymous referees, for valuable comments. We are grateful for the support received from Statistik Austria through the provision of a "safe-center" working environment, the data expertise and output-checks carried out by Eliane Schwerer and Nicole Gumprecht. We thank Silvia Haas, Stefan Fuchs and Astrid Nolte for editorial support.

References

Anderson, P. M., & Levine, P. B. (March 1999). *Child-care and mothers' employment decisions*. National Bureau of Economic Research, Working Paper 7058.

Baierl, A., & Kaindl, M. (2011). *Kinderbetreuung in Österreich, Rechtliche Bestimmung und die reale Betreuungssituation*. Österreichisches Institut für Familienforschung, Working Paper Nr. 77.

Baker, M., Gruber, J., & Milligan, K. (2008). Universal child care, maternal labor supply, and family well-being. *Journal of Political Economy, 116*(4), 709–745.

Blau, D. M., & Robins, P. K. (1988). Child-care cost and family labor supply. *Review of Economics and Statistics, 70*(3), 374–381.

Connelly, R. (1992). The effect of child-care cost on married women's labor force participation. *Review of Economics and Statistics, 74*(1), 83–90.

Connelly, R., & Kimmel, J. (2003). The effect of child-care costs on the labor force participation and welfare recipiency of single mothers. *Southern Economic Journal, 69*(3), 498–519.

Datta Gupta, N., Smith, N., & Verner, M. (2008). PERSPECTIVE ARTICLE: The impact of Nordic countries' family friendly policies on employment, wages, and children. *Review of Economics of the Household, 6*, 65–89.

Del Boca, D., Locatelli, M., & Vuri, D. (2005). Child-care choice by working mothers: The case of Italy. *Review of Economics of the Household, 3*, 453–477.

Dörfler, S. (2004). *Außerfamiliäre Kinderbetreuung in Österreich—Status Quo und Bedarf*. Österreichisches Institut für Familienforschung, Working Paper Nr. 43.

European Commission (2010) Europe 2020, A Strategy for smart, sustainable and inclusive growth, Communication from the Commission COM(2010) 2020 final, Brussels, 3.3.2010.

Fersterer, J., & Winter-Ebmer, R. (2003). Are Austrian returns to education falling over time? *Labour Economics, 10*(1), 31–53.

Festl, E., Lutz, H., & Schratzenstaller, M. (2010). *Mögliche Ansätze zur Unterstützung von Familien*, WIFO-Monografien, 3/2010.

Fitzpatrick, M. D. (2010). Preschooler enrolled and mothers at work? The effect of universal prekindergarten. *Journal of Labor Economics, 28*(1), 51–85.

Gelbach, J. B. (2002). Public schooling for young children and maternal labor supply. *American Economic Review, 92*(1), 302–322.

Haan, P., & Wrohlich, K. (2011). Can child-care policy encourage employment and fertility? Evidence from a structural model. *Labour Economics, 18*(4), 498–512.

Hammer, G. (1997). *Kinderbetreuung – Ausgewählte Hauptergebnisse des Mikrozensus September 1995*, Statistische Nachrichten 3/1997.

Havnes, T., & Mogstad, M. (2011). Money for nothing? Universal child care and maternal employment. *Journal of Public Economics, 95*, 1455–1465.

Heckman, J. J. (1974). Effects of child-care programs on women's work effort. *Journal of Political Economy, 82*(Supplement), 153–161.

Heckman, J. J. (1979). Sample selection bias as a specification error. *Econometrica, 41*(1), 153–161.

Herbst, C. M. (2010). The labor supply effects of child care costs and wages in the presence of subsidies and the earned income tax credit. *Review of Economics of the Household, 8*, 199–230.

Jaumotte, F. (2003). *Female labour force participation: past trends and main determinants in OECD countries*. Economics Department Working Paper No. 376, OECD, December 2003.

Jenkins, S. P., & Symons, E. J. (2001). Child-care cost and lone mothers' employment rates: UK Evidence. *The Manchester School, 69*(2), 121–147.

Kimmel, J. (1995). The effectiveness of child-care subsidies in encouraging the welfare-to-work transition of low-income single mothers. *Economic Review, Papers and Proceedings, 85*(2), 271–275.

Kimmel, J. (1998). Child-care costs as a barrier to employment for single and married mothers. *The Review of Economics and Statistics, 80*(2), 287–299.

Kornstad, T., & Thoresen, T. O. (2005). A discrete choice model for labor supply and child-care. *Journal of Population Economics, 20*, 781–803.

Kytir, J., & Schrittwieser, K. (2003). Haushaltsführung, Kinderbetreuung, Pflege, Ergebnisse des Mikozensus September 2002, Statistik Austria.

Mahringer, H., & Zulehner, C. (2012). *Child-care costs and mothers' employment rates. An empirical analysis for Austria*. WIFO working papers 429/2012, 6/2012.

Michalopoulos, C. (2010). *Effects of reducing child care subsidy copayments in Washington state, OPRE 2011-2*. Washington, DC: Office of Planning, Research and Evaluation, Administration for Children and Families, U.S. Department of Health and Human Services.

Michalopoulos, C., Lundquist, E., & Castells, N. (2010). *The effects of child care subsidies for moderate-income families in cook County, Illinois, OPRE 2011-3*. Washington, DC: Office of Planning, Research and Evaluation, Administration for Children and Families.

Michalopoulos, C., & Robins, P. K. (2000). Employment and child-care choices in Canada and the United States. *Canadian Journal of Economics, 33*(2), 435–470.

Michalopoulos, C., & Robins, P. K. (2002). Employment and child-care choices of single-parent families in Canada and the United States. *Journal of Population Economics*, *15*(3), 465–493.

Novotny, E. (1999). *The role of macroeconomic policy in overcoming slow economic growth—International comparisons and policy perspectives*. Vienna University of Economics & B.A., Working Paper in Growth and Employment in Europe: Sustainability and Competitiveness, No. 1, February 1999.

OECD. (2011). *Doing better for families*. Oxford: OECD Publishing.

Ohmacht, S., & Thenner, M. (1999). Kinderbetreuung: Geld versus Dienstleistung, Europäisches Zentrum für Wohlfahrtspolitik und Sozialforschung, 1999.

Powell, L. M. (1997). The impact of child-care cost and the labor supply of married women. *Canadian Journal of Economics, 30*(3), 577–594.

Powell, L. M. (1998). Part-time versus full-time work and child-care cost: Evidence for married mothers. *Applied Economics, 30*, 503–511.

Ribar, D. C. (1992). Child-care and labor supply of married women, reduced form evidence. *The Journal of Human Resources, 27*(1), 134–165.

Schoene, P. (2004). Labour supply effects of a cash-for-care subsidy. *Journal of Population Economics, 17*(4), 703–727.

Statistik Austria (2004). Standard-Dokumentation Metainformationen (Definitionen, Erläuterungen, Methoden, Qualität) zu Mikrozensus-Sonderprogramm „Haushaltsführung, Kinderbetreuung, Pflege“, September 2002, Statistik Austria, 2004.

Statistik Austria (2012) Kindertagesheimstatistik 2001/2012, Vienna, 2012.

Tunali, I. (1986). A general structure for models of double selection and an application to a joint migration/earning process with remigration. *Research in Labor Economics, 8*(Part B), 235–282.

Van Gameren, E., & Ooms, I. (2009). Childcare and labor force participation in the Netherlands: the importance of attitudes and opinions. *Review of Economics of the Household, 7*, 3395–3421.

Viitanen, T. (2011). Child-care voucher and labour market behaviour: experimental evidence from Finland. *Applied Economics, 43*(23), 3203–3212.

Viitanen, T., & Chevalier, A. (2003). *The supply of childcare in Britain: Do mothers queue for childcare*? Royal Economic Society Annual Conference 2003 211, Royal Economic Society.

Wrohlich, K. (2004). *Child-care Costs and mothers' labor supply: An empirical analysis for Germany*. DIW Berlin Discussion Paper 412, Berlin.

Wrohlich, K. (2008). The excess demand for subsidized child care in Germany. *Applied Economics, Taylor and Francis Journals, 40*(10), 1217–1228.

Wrohlich, K. (2011). *Labor supply and child care choices in a rationed child care market*. Discussion Papers of DIW Berlin 1169, DIW Berlin, German Institute for Economic Research.