With strings attached: Grandparent-provided child care and female labor market outcomes

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Abstract

Grandparents are regular providers of free child care. Similar to other forms of child care, availability of grandparent-provided child care affects fertility and labor force participation of women positively. However, grandparent-provided child care requires residing close to parents or in-laws. While living close can provide access to free child care, it may also imply costly spatial restrictions. We find that mothers residing close to parents or in-laws have lower wages and that the probability of having to commute increases if relatives provide child care. We build a model of residence choice, fertility, and female labor force participation that can account for the relationships between grandparent-provided child care, fertility, and female labor market outcomes. We simulate our model to analyze how women's decisions on residence, fertility, and labor force participation would change if the availability of grandparent-provided child care or family policies were altered. We find that if child care subsidies were raised to the Swedish level, fertility and mothers' labor force participation would increase, while mobility would remain unchanged. The absence of grandparents, on the other hand, would increase mobility, while it would have only limited negative effects on aggregate fertility and labor force participation.

JEL classification: J13, J61, H42, R23
Keywords: grandparent-provided child care, fertility, labor force participation, spatial restrictions, regional labor markets

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1 Introduction

Grandparents are an important source of child care. According to data from the 2^{nd} wave of the Survey of Health, Ageing and Retirement in Europe (SHARE), between 18% (Denmark) and 49% (Italy) of grandparents take care of their grandchildren age six or younger on a daily or weekly basis. More than 30% of grandparents in the Netherlands, Belgium, and Switzerland provide weekly care, whereas in Italy, Greece, and Poland almost 30% look after their grandchildren each day (see Figure A-1 of the Appendix A).[1] The availability of child care and especially cheap or even costless child care has important effects on fertility and mothers' labor force participation. This is important, because while female labor force participation has increased tremendously over the past decades, mothers are still participating significantly less than other women.[2]

There exists an extensive empirical literature that studies the relationship between female labor force participation and child care. Many papers propose a joint analysis of the effects of child care costs on fertility and labor force participation. For Italy, Del Boca [2002] shows that both the availability of child care and the possibility of part time work increase labor force participation and fertility. Blau and Robins [1989] establish a similar pattern for the US. Within the context of already high female labor force participation rates in Sweden, Mörck et al [2009] is one of the few papers that focuses exclusively on the positive effect of lower child care costs on fertility. In a literature summary, Del Boca and Vuri [2007] point out that most studies find that high child care costs deter female labor supply, while availability of child care is found to have positive effects on mothers' labor force participation. These findings suggest that the main barrier that mothers face at the time of working is to obtain affordable child care.[3]

Free grandparent-provided child care seems to be the perfect solution for working mothers. However, in order to enjoy grandparent-provided child care on a regular basis, residence choices of adult children and elderly parents have to coincide. Data from the 2^{nd} wave of SHARE show that the frequency of grandparent-provided child care is clearly related to the geographical distance between parents and their adult children. Figure 1.1 displays the

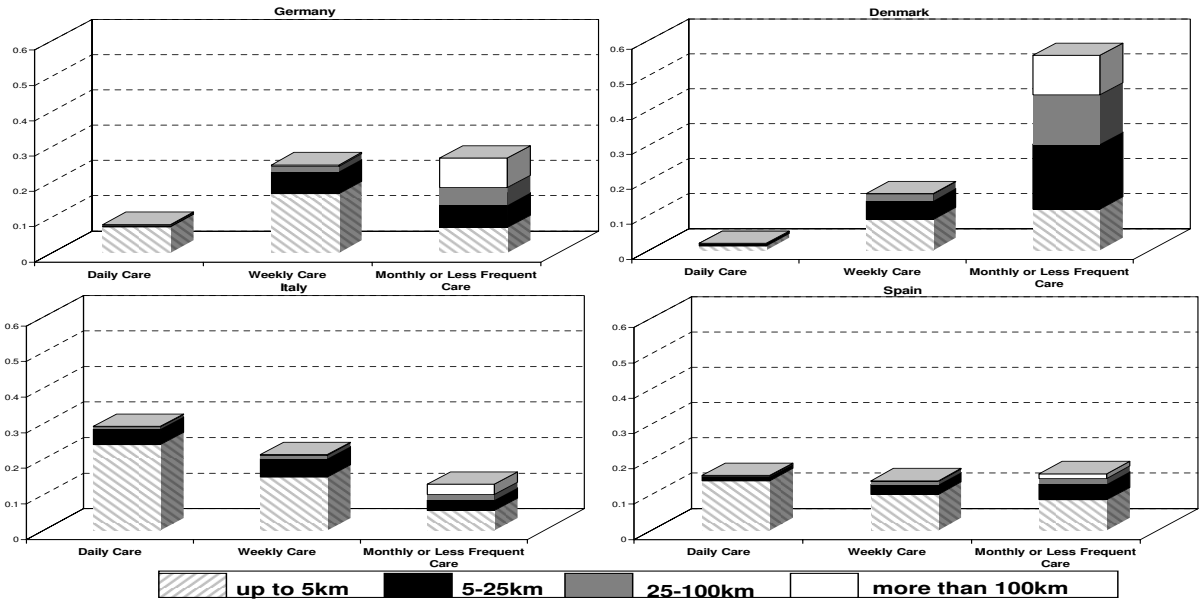
[1] In the US, 22.7% of children under 5 years are regularly cared for by their grandparents (Overturf Johnson [2005]).

[2] Considering OECD countries, the average difference in labor force participation rates for women and mothers (of children age 3 or younger) is around 10 (20) percentage points. Scandinavian countries are an exception where labor force participation rates of mothers are equal to or even higher compared to those of women in general, OECD [2008].

[3] For instance, for a US family living below the poverty line, child care costs amount to 30% of income (US Census Bureau [2011]).

frequency of grandparent-provided child care, together with the geographical distance between grandparents and their grandchildren (age six and younger) for Germany, Denmark, Italy, and Spain. Across the four selected countries the frequency of care varies strongly, but common to all countries those who provide care more frequently tend to live close by.[4]

Figure 1.1: Frequency of Care for and Distance to Grandchild, ≤ 6



Data: Survey of Health, Ageing and Retirement in Europe (SHARE), 2^{nd} wave.

Hence, grandparent-provided child care – similar to other types of child care – may have positive effects on fertility and mothers' labor force participation. However, different from other types of child care it imposes spatial restrictions which may affect female labor market outcomes negatively. In this paper we document two different costs of spatial restrictions. Looking at data from the German Socio-Economic Panel (GSOEP) we find that women residing close to parents or in-laws have lower hourly and monthly wages. Furthermore, mothers are more likely to have to incur in commutes if their children are regularly cared for by relatives. Similar to other studies, we also find that women residing close to parents or in-laws are more likely to have children, and that as mothers they are more likely to hold a regular full or part time job. Given strong interdependencies of decisions regarding residence, fertility, child care arrangements, and female labor force participation, our empirical analysis faces problems of endogeneity and reversed causality.

[4]The same pattern can be observed across the rest of the countries included in the SHARE data set; see Figures A-3-A-2 of the Appendix A.

By using geographical proximity between adult children and their parents as an indirect measure of grandparent-provided child care, we address the interdependency of child care arrangements and female labor force participation. However, certain caveats remain. For instance, we cannot dismiss a reversed causality between geographical proximity and labor market outcomes or fertility. To be able to better disentangle individuals' decisions, we then build a model of residence choice, fertility decisions, and female labor force participation that can account for the observed relationships. We simulate our model to analyze how women's decisions on residence, fertility, and labor force participation would change if the availability of grandparent-provided child care or family policies were altered. We find that if child care subsidies were raised to the Swedish level, fertility and mothers' labor force participation would increase, while mobility would remain unaltered. The absence of grandparents, on the other hand, would increase mobility, while it would have only limited negative effects on aggregate fertility and labor force participation.

The current paper contributes to the literature by being the first paper, to the best of our knowledge, that explicitly incorporates spatial restrictions imposed by grandparent-provided child care into a model of fertility and labor force participation decisions. To the best of our knowledge, our paper is also the first one to document possible costs related to the geographical proximity between parents and adult children. The existing literature, on the contrary, has highlighted the positive aspects of geographical proximity between parents and adult children. Studying fertility intentions rather than outcomes, Raymo et al [2010] find that Italian and Japanese women living close to their parents have higher fertility intentions. Holdswoth and Dale [2009] study labor force participation decisions of mothers in Spain and Britain. They estimate that the probability of being in employment is 1.24 times higher for Spanish women whose parents live in the same town ('municipio'). For the US, Compton and Pollak [2011] find that married women with small children living close to mothers and mothers-in-law have a 10 percentage point higher probability to be in employment.

Our paper is also related to the literature on intergenerational time transfers. Most of this literature focuses on time transfers from children to elderly parents. One interesting paper that also incorporates residence choices is Konrad et al [2002]. The authors develop a game theoretical model of strategic choice of residence among siblings who try to avoid having to take care of elderly parents. Looking at German data, they find support for their model's predictions of older siblings locating further away from their parents than younger siblings. With a similar approach in mind, Stern [1995] estimates care choices of elderly parents together with location decisions of children. His work is closely related to the current paper as he also takes into account how the child's location decision affects his or her work decision. Apart from the aforementioned paper by Compton and

Pollak [2011], some of the few empirical works that consider time transfers from parents to children in form of grandparent-provided child care are Dimova and Wolff [2011] and Zamarro [2011]. Both studies use SHARE data and estimate simultaneous equation models of labor supply and grandparent-provided child care. Zamarro [2011] only finds a positive effect of grandparent-provided child care on mothers' labor force participation for Greece and the Netherlands. Dimova and Wolff [2011] also include financial transfers into their model. For ten European countries the authors find a positive effect of grandparent-provided child care on the extensive margin of female labor force participation but no effect along the intensive margin. Two studies by Arpino et al [2010] and Posadas and Vidal-Fernández [2012] for Italy and the US respectively, find that grandparent-provided child care – instrumented by grandparents being alive – increases in particular labor force participation of low educated mothers of young children. Alesina and Giuliano [2010] argue that how much individuals choose to carry out certain activities within the family – care of children or the elderly – is strongly determined by the value of family ties in a society. The authors find that across countries a higher value of family ties is associated with lower geographical mobility, higher fertility, but also with more traditional gender roles and thus lower female labor force participation. In the current paper, on the contrary, grandparent-provided child care – indicating a higher value of family ties within a country – is found to be related to higher female labor force participation.

Our paper is also part of the literature that uses general equilibrium models to assess how different public policies interact with family decisions.[5] Closely related is Cardia and Ng [2003] who – different from the current paper – explicitly incorporate grandparents' decisions into a general equilibrium model for grandparent-provided child care. The authors suggest that subsidizing grandparents' time is the most effective child care policy in terms of output and capital accumulation. However, the authors do not consider the spatial restrictions and potential costs in terms of labor market outcomes implied by grandparent-provided child care. Also related to this paper are the works by Bick [2010] and Mendez [2008]. Within a life cycle model, the former analyzes data for Germany and concludes that informal child care (by relatives) plays an important role given that mothers' labor force participation exceeds child care enrollment for children up to 2 years. However, different from the current paper the author does not model relative-provided child care, nor the spatial restrictions that it imposes. The paper by Mendez [2008] attempts to account for differences in geographical mobility and female labor force participation across European countries. His model of residence choice, fertility, and female labor force participation is similar to ours, but the author does not provide any evidence for individual costs associated with living close to parents or in-laws. Our aim is similar

[5] See for instance Attanasio et al [2010], Erosa et al [2010], García-Morán [2010], Greenwood et al [2000], or Guner and Knowles [2009] among others.

to these papers, as we assess the effects of the availability of grandparents and of different family policies within a framework that explicitly incorporates the spatial restrictions imposed by grandparent-provided child care. We then analyze how women's decisions regarding residence, fertility, and labor force participation change under different scenarios. The remainder of this paper is organized as follows: the next section presents our empirical analysis, Section 3 presents the model, Section 4 describes our calibration strategy, Section 5 presents the results of the model, and in Section 6 we discuss the model's mechanisms in detail. In Section 7 we perform two counterfactual experiments and Section 8 concludes.

2 Empirical Analysis

For our empirical analysis, we consider data from the German Socio-Economic Panel (GSOEP). The GSOEP is an annual household survey that has been carried out since 1984. The first sample in 1984 included 5,921 households with 16,205 individuals (76% adults, 24% children) of which 44% still remained in the sample in 2004, after 20 years. In addition, new samples for refreshment of the data and for specifically targeting certain groups of the population (East Germans, foreigners, high-income individuals) were added in 1990, 1994, 1995, 1998, 2000, and 2002. The GSOEP provides extensive information on individuals' labor market participation, marital and family status, wages, education, the size of the town they live in etc.[6]

The GSOEP includes also variables of particular interest for our analysis: child care provided by relatives and geographical distance to parents. In four waves of the GSOEP (1991, 1996, 2001, and 2006) survey participants were asked to categorize their parents' relative residence as in: i) the same house, ii) the same neighborhood, iii) the same town, iv) another town but within one hour by car, v) further away, or vi) in a foreign country. We construct a dummy variable "parents or in-laws close" that takes on value one for individuals whose mother, father, or in-law lives in the same neighborhood or town. For individuals who live in the same house as their parents or in-laws we construct a different dummy variable "parents or in-laws in same house." This particular form of co-residence mostly arises because young individuals still live at home or due to the need for intensive care of parents, and in most cases it represents a temporary living arrangement. Only in two of the four waves considered (2001 and 2006) did the household survey include questions about relative-provided child care. We construct a dummy variable "child care

[6]For more details on the GSOEP and its development, see SOEP [2005].

by relatives" that takes on value one for all mothers with children age six or younger if relatives regularly take care of this child and a dummy variable "child care non-relatives" that takes on value one if the child age six or younger attends a nursery or is being cared for by others than relatives. We also report these variables for two different age groups, for children up to the age of three and those between the ages of three and six. In Germany, for children younger than three very few spots in public or publicly subsidized nurseries are available, whereas for children between the ages of 3 and 6, those spots are almost guaranteed.[7]

For our analysis we pool the data from the available four waves. We only consider women age 25 to 50 living in Germany.[8] We exclude those born outside of Germany, because for these individuals both key variables of our analysis, (i) availability of child care by relatives and (ii) residence relative to parents, might be determined by very different aspects. Given marked differences in mothers' labor force participation rates between East and West Germany, we introduce dummy variables to distinguish between individuals living in East and West Germany.[9] To account for possible cultural differences, we also distinguish between individuals of German nationality and those of other nationalities. We define three levels of education following the International Standard Classification of Education (ISCED 1997) designed by the UNESCO[1997]. These levels correspond to (i) primary education (ISCED levels 0 and 1), (ii) secondary education (ISCED levels 2, 3, and 4), and (iii) tertiary education (ISCED levels 5 and 6). Town sizes are grouped into small communities (up to 20.000 inhabitants), medium-sized communities (20.000-100.000 inhabitants), and large communities (more than 100.000 inhabitants). We also construct dummy variables for each federal state. Table 2.1 provides summary statistics for women and mothers.[10]

[7]According to data from the Statistische Ämter des Bundes und der Länder [2011], in 2011 only around 25.2% of children younger than age three attended some form of private day care (85%) or public or publicly subsidized nurseries (15%), compared to 93.4% of children between three and six (less than 1% of them in private day care). Compulsory schooling for German children starts between the ages of 6 and 7 and hence for older children the need for child care is drastically reduced due to the time they spent in school. The variable 'regular child care by relatives' includes child care by any relative but turns out to be a good approximation for grandparent-provided child care given that among relatives it is mostly grandparents who provide child care. In addition, even for child care by relatives other than grandparents similar spatial restrictions apply.

[8]We exclude individuals living in East Germany from the 1991 wave, given that for this particular wave information for most labor market variables (participation, wages) are missing for East Germans.

[9]Labor force participation rates of East German mothers of small children (0-3 years) have traditionally been very high and even today they continue to be around 15 percentage points higher than rates for West German mothers (Bundesministerium für Familie, Senioren, Frauen und Jugend [2005].) In our sample, labor force participation rates of mothers are 67% and 48% respectively in East and West Germany.

[10]From our sample we exclude individuals who report to have worked regular full-or part time jobs

Description of the sample Our sample consists of 10,732 women and 8,129 mothers. Individuals are on average between 37 and 39 years old. We construct five different age groups, each containing about one fifth of women. Given average late birth, the first age group contains fewer mothers. Around two thirds of women and 77% of mothers are married and living together with their spouse. Approximately 1-2% has a nationality different from the German one. Approximately 75% of women between 25 and 50 have children and 10-13% are mothers of small children (age 0-2) and 14-19% have children age 3-6. The average number of children in our sample is 1.5 per woman and 2 per mother. Among both mothers and women, around 1% have only completed primary education, 72-73% finished secondary education, and approximately 30% have completed tertiary education.[11] Around 36% of women have a regular fulltime job and 24% hold a regular part time job. Mothers are more prone to hold part time jobs (29%) compared to fulltime jobs (25%).[12] More women live in small communities compared to medium sized or large communities. The large majority (72-75%) of women and mothers live in West Germany. Around 42-44% of women and mothers live in the same neighborhood or town as their parents or in-laws and 43-44% live at least one hour away. Approximately 13-14% of individuals live in the same house or household with parents or in-laws. Only 14% of mothers of children younger than age three, but 84% of mothers of children between the ages of three and six use nursery care, sitters or other types of paid child care. A little over one third has their children cared for by relatives on a regular basis.[13] The average monthly spouse's income is around 2800€.[14]

but who also report to have worked fewer than twenty hours a month as well as those who report to work regular full-or part time jobs but do not report their wage income or firm tenure or report zero or negative values for any of the two variables.

[11]For our regression analysis we group those having completed primary and secondary education and only differentiate between individuals with and without tertiary education.

[12]Note that these figures correspond to the period 1991-2006. They are thus lower compared to more recent data because female labor force participation rates in Germany have increased significantly over the last two decades (Bundesministerium für Familie, Senioren, Frauen und Jugend [2005]). While in 1996, 75.7% of women and 58.5% of mothers age 25 to 54 participated in the German labor market, by 2004 these rates had increased to 77.0% and 63.1% respectively. This increase was almost exclusively due to an increase in labor force participation rates of mothers in West Germany from 54.4% in 1996 to 61.6% in 2004. Regarding labor force participation of mothers with children under 6, those increased from 51.4% in 1991 (OECD [2001]) to 66.3% by 2009 (OECD [2008]).

[13]Those two options are not exclusive. For children ages (0-2) and (3-6), 36% and 35% of mothers who use private care also have relatives looking after their children on a regular basis, and 15% and 86% respectively of those who use relative-provided care also use private care for their children.

[14]Note that when pooling the sample we only adjust wages for the change from Deutschmark to Euro. We do not adjust for wage growth, given stagnant real hourly net wages in Germany between 2001 and 2006 (see Figure 1 in DIW [2009]).

Table 2.1: Means (Std.) - GSOEP pooled sample-
- 1991, 1996, 2001, 2006-

	Women	Mothers
	25-50	25-50
Age	37.4 (7.1)	38.8 (6.6)
30-34	0.20	0.18
35-39	0.22	0.24
40-44	0.21	0.25
45-50	0.20	0.23
Married, living together	0.68	0.79
Other than German nationality	0.02	0.01
Children	0.76	1
Children 0-2	0.10	0.13
Children 3-6	0.14	0.19
Number of Children	1.5(1.2)	2.0(0.9)
Primary education	0.01	0.01
Tertiary education	0.27	0.26
Regular fulltime job	0.36	0.25
Regular part time job	0.24	0.29
Small community	0.45	0.48
Large community	0.29	0.26
in East Germany	0.25	0.28
Parents or in-laws in same house	0.14	0.13
Parents or in-laws close	0.42	0.44
- Parents or in-laws in same neighborhood	0.19	0.21
- Parents or in-laws in same town	0.23	0.24
Parents or in-laws far away	0.44	0.43
- Parents or in-laws one hour away	0.29	0.29
- Parents or in-laws further away	0.15	0.13
Parents or in-laws in foreign country	0.01	0.01
Children in non-relative care (nursery, sitter, paid care etc.)***	-	0.65
- Children (< 3)	-	0.14
- Children ($3 - 6$)	-	0.84
Children cared for by relatives***	-	0.34
- Children (> 3)	-	0.33
- Children ($3 - 6$)	-	0.34
Spouse's income*	2844.5 (2362.0)	2865.0 (2159.0)
Hourly wage**	12.4 (6.2)	12.1 (6.2)
Tenure in firm**	8.4 (7.3)	8.9 (7.6)
Commuter****	0.50	0.49
N	10,732	8,129

*** Only available for 2001 and 2006 ($N = 761$ for < 3, $N1296$ for $3 - 6$.) *Only taking into account strictly positive income ($N = 7,323$, $N = 6,083$ for women, mothers) **Among those working regular part-or fulltime jobs ($N = 6,471$,$N = 4,348$)**** Only available for 2001 and 2006 ($N = 4363$, $N = 2913$).

Hourly wages of women and mothers are around 12€. On average, individuals have been with their current employer for the last 8 to 9 years. Waves 2001 and 2006 of the GSOEP also asked individuals if they worked and resided in the same town. Around 50% of individuals commute to their place of work.

Proximity to Grandparents and Relative-Provided Child Care Child care by relatives is not only likely to influence mothers' labor force participation decision, but at the same time its use might be determined by mothers' decision to work. This reversed causality introduces a potential bias into a direct measure of grandparent-provided child care. Using geographical proximity to grandparents as an indirect measure of grandparent-provided child care solves this problem. However, as residence choices might not be independent of mothers' labor force participation decisions, a caveat remains. Descriptives statistics show that geographical proximity to grandparents and child care provided by relatives are very much related (see Table A.1 of the Appendix A). The clear relationship displayed in Figure 1.1 regarding child care by relatives and proximity to grandparents hence also holds for our data set. We thus feel confident to use geographical proximity as an indirect measure of grandparent-provided child care. Furthermore, geographical proximity reflects more than just currently provided child care by grandparents. It might also reflect child care provided by "potential" grandparents if living close to parents or in-laws affects fertility decisions. Thus, geographical proximity proves particularly useful to test effects on fertility. In addition, geographical proximity might also reflect "child care provided in the past" if individuals continue to live close to parents or in-laws after children have grown beyond the child care age. In this case the indirect measure can also be used to test long-lasting effects of on wages.

Geographical proximity is only a necessary condition for grandparent-provided child care. Other aspects such as employment status, age, or health status of grandparents may determine if grandparents actually provide care for their grandchildren. Mothers of around 20% of women in our sample also participated in the GSOEP during the four waves considered. The number of observations for these mother-daughter pairs is extremely limited and thus not suited for regression analysis. However, considering descriptive statistics we observe that grandmothers who live close to their daughters who in turn report to use relative-provided child care are younger, and they are also less likely to work (see Table A.2 of the Appendix A). Surprisingly, these grandmothers also report worse health conditions. This might be explained by the fact that grandmothers' status of health does not only determine if they provide child care, but caring for grandchildren may have a negative effect on grandmothers' health. According to Hughes et al [2011], a " growing

literature suggests that for many people, the net health effects of grandchild care are negative"(p.111).

Benefits of Proximity to Grandparents and Child Care by Relatives: Fertility and Participation In line with findings in the literature discussed before, we find geographical proximity to ("potential") grandparents to affect fertility and labor force participation of mothers positively. Women living in the same neighborhood or town as their parents or in-laws have a 4 percentage points higher probability to have children (see Table A.3 of the Appendix A). We find this positive effect to be particularly strong for women with university education.[15] Regarding participation, we find that mothers residing close to their parents or in-laws have a 3 percentage points higher probability to hold a regular part-or fulltime job (see Table A.5 of the Appendix A).[16] This last number is close to the lower bound of estimates of 4 percentage points for the US in Compton and Pollak [2011]. The authors argue that geographical proximity is a good instrument for child care arrangements because its positive effect on labor force participation does not extend to groups for which grandparent-provided child care is not a determinant for labor supply (men, single women without children, those with sick mothers or sick mothers-in-law). Similarly, in our data the positive and significant effect does not extend neither to men nor to single childless women (see Table A.6 of the Appendix A).

Costs of Grandparent-Provided Child Care: Lower wages While grandparent-provided child care seems to promote fertility and mothers' labor force participation, the required geographical proximity to one's parents or in-laws restricts one's potential labor market. Controlling for selection effects, we find that mothers living close to their parents

[15]See Table A.4 of the Appendix A for the regressions with interaction terms. Estimation results are consistent to the inclusion of a polynomial for age instead of age group dummies as well as to including years of education instead of educational categories. Given that marital status and spouse's income might be correlated with living close to parents or in-laws we also check consistency of results, excluding both variables.

[16]For our estimations regarding labor force participation we only consider a woman in the labor force if she works a regular part-or fulltime job. All estimation results are consistent to the inclusion of a polynomial for age instead of age group dummies as well as to including years of education instead of educational categories. Marital status and spouse's income might be correlated with living close to parents or in-laws. Results are robust to the exclusion of these variables. Including interaction terms of living close to parents or in-laws and educational attainment seems to indicate that the positive effect of living close to parents or in-laws on mothers' labor force participation is driven by individuals with tertiary education. However, coefficients are only (negatively) significant for individuals with primary or secondary education.

or in-laws earn lower hourly wages.[17] The first column of Table 2.2 displays the coefficients for the Heckman selection model for log hourly wages for mothers in Germany age 25 to 50. Living close to parents or in-laws or in the same house increases the probability

Table 2.2: Effect of Close Presence of Grandparents on Hourly Wages
Coefficients of Heckman Selection Model for Mothers' Log Hourly Wages

	Log hourly wage		Selection Equation	
	(1)		(2)	
Married, living together	-0.009	(0.016)	-0.324***	(0.044)
Number of children	-0.037***	(0.010)	-0.286***	(0.017)
Other than German nationality	-0.134*	(0.077)	-0.312**	(0.140)
Tertiary education (ISCED: 5,6)	0.293***	(0.015)	0.441***	(0.036)
Parents or in-laws close	-0.049***	(0.014)	0.073**	(0.033)
Parents or in-laws in same house	-0.050**	(0.020)	0.056	(0.048)
Small community	-0.040**	(0.017)	-0.006	(0.039)
Large community	0.046**	(0.019)	0.045	(0.044)
in East Germany	-0.069	(0.044)	0.294**	(0.119)
Log (Spouse's income)†			0.015***	(0.005)
Children 0-2			-1.114***	(0.056)
Tenure in firm	0.016***	(0.001)		
Constant	1.905***	(0.046)	0.188**	(0.087)
Observations	8,129		8,129	

†Missing values and values < 1 are set to 0. Standard errors in parentheses *** p<0.01,** p<0.05, * p<0.1. Data: GSOEP unbalanced panel 91,96, 01,06; Mothers 25-50. Reference group: unmarried mothers of age 25-29 of children age 3 or older living in West Germany, with education level 1 or 2 (ISCED:0-4) in 1991, in a medium-sized West German town in North Rhine-Westphalia, far from parents or in-laws. All regressions include year dummies, age group dummies and state dummies.

of holding a regular part-or fulltime job, but it reduces hourly wages by almost 5%.[18] Other control variables show the expected signs. Wages are higher for those living in larger communities, they increase with firm tenure, and tertiary education. On the other hand, having more children, living in small communities, not being German, and living

[17] For this analysis, we only consider wage incomes of dependent workers of regular full-or part time jobs.

[18] Using log monthly wages, controlled for by hours worked, results in slightly more negative coefficients for living close (see Table A.7 of the Appendix A) as does not controlling for selection effects (see Table A.8 of the Appendix A for an OLS regression of log hourly wages).

in East Germany are all aspects that affect hourly wages negatively.[19] We also check if our results are driven by low-educated individuals. Running the regression separately for individuals with and those without tertiary education shows that this is not the case. On the contrary, the penalty in hourly wages for staying close to parents or in-laws turns out to be higher – more than 6% – for the group of highly educated individuals (see Tables A.10 and A.11 of the Appendix A).

The two exclusion restrictions that we use are: (i) having a child younger than age three and (ii) spouse's income. Both variables affect mothers' labor force participation (see Table A.5 of the Appendix A). However, none is directly related to mothers' hourly wage rates. Given that we only consider mothers, differences in a child's age are mostly explained for by the mother's own age and her years of education. We control for both of these variables in the wage estimation. The second exclusion restriction might be invalid if assortative matching leads to similar incomes of wife and spouse. As long as these similarities are mostly explained for by a common level of education or the size of the community they live in – both variables that we include as controls – the use of this exclusion restriction is justified.

Costs of Grandparent-Provided Child Care: Commuting Costs of spatial restrictions may also arise from commutes. Rupert et al [2009], looking at French data find that mothers with small children, who have a lower bargaining power as workers incur in longer commutes. We find that for working mothers of children of age six or younger the probability of having to commute is almost 9 percentage points higher if their children are regularly cared for by relatives. Table 2.3 displays marginal effects from the probit estimation for the probability of having to commute for mothers in Germany age 25 to 50.[20] Having children in a nursery or with a sitter, on the other hand, does not affect the likelihood of being a commuter. Other control variables show the expected sign. The probability of having to commute is lower for those of nationalities other than the German one and for individuals living in large communities in East Germany. It is higher for mothers in small communities.[21]

[19] Estimation results are consistent to the inclusion of a polynomial for age instead of age group dummies as well as to including years of education instead of educational categories. Marital status and spouse's income might be correlated with living close to parents or in-laws. Hence, we also check the robustness of our results to the exclusion of these variables (see Table A.9 of the Appendix A).

[20] We only consider waves 2001 and 2006 that include a question on commutes.

[21] Again results are consistent to the way the variables age and education are included. Having a child in a nursery may be correlated with child care by relatives. Hence, we also check the robustness of our results to the exclusion of this variable (see Table A.12 of the Appendix A). When running separate regressions for individuals with and without tertiary education, coefficients loose significance. However, coefficients for relative-provided child care for both groups of individuals with and without tertiary education are

Table 2.3: Effect of Grandparent-Provided Child Care on Commutes
Marginal Effects from Probit Estimation for Mothers

Married, living together	0.005	(0.055)
Number of children	0.053	(0.033)
Other than German nationality	-0.278**	(0.127)
Children 0-2	-0.026	(0.063)
Log (Spouse's income)†	-0.003	(0.011)
Tertiary education (ISCED: 5,6)	0.127**	(0.051)
Tenure in firm	0.004	(0.004)
Children cared for by relatives	0.087*	(0.048)
Children in non-relative care	-0.010	(0.072)
Small community	0.262***	(0.056)
Large community	-0.213***	(0.065)
in East Germany	-0.227*	(0.136)
Observations	537	

†Missing values and values < 1 are set to 0. Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1 Data: GSOEP unbalanced panel, 01,06; mothers 25-50 of children <= 6 years with regular full or part time job. Reference Group: unmarried mothers of age 25-29 in 2001 with education level 1 or 2 (ISCED: 0-4) in a medium-sized West German town in North Rhine-Westphalia, whose children are not in nursery, nor cared for by relatives. All regressions include dummies for age groups, states, and years.

While we find that grandparent-provided child care is related to lower wages and additional commutes for mothers, we also observe a positive relationship between grandparent-provided child care and fertility and regular labor force participation. From these opposing relationships a set of interesting questions arise: How valuable is grandparent-provided child care in terms of fertility and employment? How do family policies compare to grandparent-provided child care with respect to effects on aggregate employment and fertility? There are strong interdependencies between women's decisions regarding residence, fertility, and labor force participation. Despite some adjustments – using proximity as an indirect measure for child care – our empirical analysis still faces problems of endogeneity and reversed causality. Hence, we do not claim to have established any causal relationships. In order to better disentangle women's decision as well as to answer the pro-

similar (see Table A.13 of the Appendix A.

posed questions we build a model economy that explicitly takes into account the spatial restrictions of grandparent-provided child care. We calibrate our model to the German economy along several key dimensions and we highlight the model's mechanism behind women's decisions. These mechanisms can generate the observed relationships between grandparent-provided child care, fertility, and labor market outcomes. Finally, we perform two counterfactual experiments to analyze how women's decisions change under distinct scenarios regarding availability of grandparent-provided child care and different family policies.

3 The Model

In our model economy there are two regions where individuals can reside, 'Home' denoted by 'H' and 'Far', denoted by 'F'. The only ex-ante difference between the two regions is that grandparent-provided child care is only available in 'H'. The economy is populated by a continuum of married women of mass one.[22] Women in our economy live for two periods, each of three years. Essentially we want to capture mothers' decisions during the time when child care is most important, i.e. during early childhood.

At the beginning of the first period, each woman receives two 'life-course offers', one associated with living in 'H' and the other offer associated with living in 'F'. Each offer consists of: i) a realization of her labor productivity x and ii) an exogenous source of income, z representing a spouse's income, where $x \in x_1, x_2, ..., x_N$ and $z \in z_1, z_2, ..., z_N$. Upon observing these two offers, each woman has to decide where to reside. We assume that residence choices are only taken once during a woman's life time and cannot be reconsidered. Let D denote the residence choice that takes on value 1 if a woman decides to reside in 'F.' If she decides to reside in 'H', D is equal to 0. Women also have to decide whether to have children and how much to work. Women decide whether or not to have children, $k = 1$ or $k = 0$, in the first period and children remain with their mother during the two periods. Every period a woman has to decide how much to work. Each woman is endowed with one unit of time. Women who have no children work all their disposable time. Mothers too, decide how much to work, and they spend the remaining time taking care of their children.

[22] In our GSOEP sample only 2.4% of single women (heads of household and not living with another adult) are mothers, while 86% of married women who live together with their spouses are mothers. Hence, we only model married women's decisions. In order to keep the analysis tractable we abstain from modeling a marriage market even though marriage and residence decisions might be related, and we simply assign an exogenous income to each woman to represent her husband's income.

Working mothers with small children – from age 0 to 3 – need child care. The price of child care, $p(D)$ depends on the woman's residence choice. Living in 'H' potentially provides access to free child care by grandparents. However, with a certain probability grandparents fall sick, are not alive, still work, or are otherwise unable to take care of their grandchildren. Hence, only a share of women, $p(g)$ living in 'H' obtains free child care. The remaining $(1-p(g))$ have to purchase child care at price $p(1)$. All women who live in 'F' pay a price $p(1)$ for child care. Women might receive a subsidy ω from the government, thus actually paying $(1-\omega)p(1)$ for each unit of time their children spend in child care.[23] Mothers with children older than three do not pay child care, independently of where they reside.[24] Moreover, women receive family benefits T conditional on having children.

Women care about consumption. The utility of a childless women is given by

$$U(c) = \frac{c^{1-\sigma}}{1-\sigma}.$$

Women with children ($k = 1$) also care about the quality of their children, e. Hence, they enjoy the following utility

$$U(c, e, k) = \frac{c^{1-\sigma}}{1-\sigma} + \left(\sigma^e e - \sigma^k\right) k,$$

where σ^k are fixed costs per child. The quality of children, e is a function of the time a mother spends with her children, t_m and the time her children spend in child care t_c,

$$e = \phi_m t_m + \phi_c t_c$$

Time spent in child care is assumed be equal to the time the mother is at work. A mother spends her remaining time taking care of her children,

$$t_c + t_m = 1.$$

The way a mother decides to divide her time, crucially depends on how decisive her time is for her children's quality. This importance is captured by the two weights, ϕ_m for time

[23] We assume that this subsidy is only paid to women who purchase child care at price $p(1)$, i.e. to those living in 'F' and those living in 'H' who have no access to free grandparent-provided child care.

[24] "Germany introduced a legal entitlement for subsidized child care for children aged 3 years and up to the mandatory school age in 1996." pg. 35 (European Commission [2009])

spent with the mother and ϕ_c for time spent in child care or with grandparents. We assume time in child care and time spent with grandparents to be of equal importance for children's quality.[25]

3.1 Value functions

We solve our model backwards by first presenting the value functions for women in the second period.

Value functions in the second period For childless women with labor productivity x and exogenous income z, the value of residing in 'H' is

$$H^2(x,z) = \frac{c^{1-\sigma}}{1-\sigma},$$

subject to the budget constraint

$$c = (1-\tau)(x+z).$$

Childless women only care about consumption, they work all of their disposable time, $l = 1$ and they consume all disposable income. The value of residing in 'F' for a childless woman of type x and exogenous income z is equal to the value for living in 'H',

$$F^2(x,z) = \frac{c^{1-\sigma}}{1-\sigma},$$

subject to

$$c = (1-\tau)(x+z).$$

[25] Formal child care and grandparent-provided child might be very different. For the first nine months, Hansen and Hawkes [2009] find that formal child care is associated with higher school readiness scores, while grandparent-provided child care is associated with a higher vocabulary test score; both measured at the age of three. Hence, it is not clear whether one of them is of higher quality than the other. Bernal and Keane [2011] find that informal child care has negative effects on children's test scores while center-based care does not. However, the authors study single mothers only. This clearly introduces a bias towards more disadvantaged backgrounds of mothers and as well as towards informal care providers. In another study, Bernal [2008] finds that non-maternal child care is detrimental for children's scores. Hence if grandparent-provided child care is similar to the type of care a mother provides, then grandparents might be the second best option. Moreover, children in informal care might receive more individual attention, see Clarke-Stewart et al. [1994] and grandparents tend to guarantee a stable provider-child relationship, something found to be determinant for the quality of child care (see Walker [1991]).

When deciding how much to work, mothers, on the other hand take into account that their children's quality depends on how much time they spend taking care of them. Thus the value function for a mother living in 'H' during the second period is given by

$$H^2(x,z,k) = \max_l \left(\frac{c^{1-\sigma}}{1-\sigma} + (\sigma^e e - \sigma^k)k \right),$$

subject to the budget constraint

$$c = (1-\tau)(xl+z) + T,$$

and given the children's quality production function

$$e = \phi_m t_m + \phi_c t_c.$$

Women only decide to have children during the first period. Hence all children in the second period are three years old, and they attend child care free of charge. In the second period – for a given labor productivity type x, an exogenous income z and a fixed number of children k – the value of living in 'H' is equal to the value of living in 'F'. The availability of grandparent-provided child care is not an issue anymore. The second period value function for a mother living in 'F' is

$$F^2(x,z,k) = \max_l \left(\frac{c^{1-\sigma}}{1-\sigma} + (\sigma^e e - \sigma^k)k \right),$$

subject to the budget constraint

$$c = (1-\tau)(xl+z) + T,$$

and given the children's quality production function

$$e = \phi_m t_m + \phi_c t_c.$$

Value functions in the first period A woman who resides in 'H' has to decide whether to have children and how much to work. Only a share of working women $p(g)$ has access to free child care provided by grandparents. If a woman has access to free child care, her value function is given by

$$H^1(x,z) = \max_{l,k} \left(\frac{c^{1-\sigma}}{1-\sigma} + (\sigma^e e - \sigma^k)k + \beta H^2(x,z,k) \right),$$

subject to the budget constraint

$$c = (1-\tau)(xl+z) + T,$$

and given the children's quality production function

$$e = \phi_m t_m + \phi_c t_c.$$

Given that residence choices are only made at the beginning of the first period, the continuation value for a woman living in 'H' is equal to the discounted value of living in 'H' in the second period.

A share $(1 - p(g))$ of mothers who live in 'H' and work, have to pay for child care. Their problem is the same as that of working mothers living in 'F'.

If a woman resides in 'F', she has to decide whether to have children and how much to work, taking into account that if she has children and works, she has to purchase child care at price $p(1)$ for each unit of time she works, l. Child care services might be subsidized at a rate ω. The value of living in 'F' – as well as the value of living close but not having access to free child care – for a woman in the first period is given by

$$F^1(x, z) = \max_{l,k} \left(\frac{c^{1-\sigma}}{1-\sigma} + (\sigma^e e - \sigma^k)k + \beta F^2(x, z, k) \right)$$

subject to the budget constraint

$$c = (1 - \tau)(xl + z) + T - (1 - \omega)p(1)l$$

and given the children's quality production function

$$e = \phi_m t_m + \phi_c t_c$$

.

Residence Decisions When deciding where to reside, women do not know for sure if they will have access to free grandparent-provided child care if they choose to reside at 'H'. Thus they have to calculate the expected value of living in 'H' which is given by

$$EH^{1*} = p(g)H^{1*}(x, z) + (1 - p(g))F^{1*}(x, z)),$$

where $F^{1*}(x, z)$ and $H^{1*}(x, z)$ denote the value functions evaluated at the optimal decisions of labor supply and number of children.

Women decide where to reside by comparing the expected value of living in 'H' to the value of living in 'F'. They will decide to live in 'F' if and only if the expected value of

living in 'H' is strictly higher than the value of living in 'F'.[26] Thus,

$$\begin{aligned} &D = 1 \quad \text{iff} \quad EH^{1*}(x,z) < F^{1*}(x,z) \\ &\text{else} \\ &D = 0 \end{aligned}$$

If child care were free in both regions there would only be two reasons why women would decide to reside in 'F': (i) a higher labor productivity in 'F' and/or (ii) a higher exogenous income in 'F'. However, once child care is costly women's residence choices depend on the life-course offers for each of the two regions, the price of child care in 'F' and the availability of free child care in 'H'. A woman who receives the same life-course offer in both regions– the same productivity x and the same exogenous income z – will always decide to live in 'H' because this is where she may enjoy access to free child care. However, life-course offers can differ. Assume that a woman receives an offer $(x,z)^H$ associated with living in 'H' and an offer $(x,z)^F$ associated with living in 'F'. Her offer could include a higher productivity in 'F', $(x^F > x^H)$, a lower productivity in 'F' , $(x^F < x^H)$ or productivities could be the same, $(x^F = x^H)$. Moreover, exogenous incomes might also be different. In this case, residence choices become non-trivial. A higher offer might not be enough to compensate for the cost of child care and a woman might decide to reside in 'H' even if the life-course offer in 'F' is higher. In the following subsection we analyze the closed form solution for labor supply in our model and we discuss how changes in the price of child care and life-course offers affect women's labor supply decision.

3.2 Labor Supply

For our relatively simple model of grandparent-provided child care and women's labor market outcomes, we are able to obtain a closed-form solution for the optimal labor supply. Childless women work all their disposable time, $l^* = 1$. For mothers on the other hand, the optimal labor supply is a function of: the price of child care, the labor productivity, and the exogenous income. Mothers' optimal labor supply is given by

$$l^* = \frac{1}{\sigma^e(\phi_m - \phi_c)})^{\frac{1}{\sigma}}(x(1-\tau) - (1-\omega)p(1))^{\frac{1-\sigma}{\sigma}} - \frac{(1-\tau)z + T}{(1-\tau)x - (1-\omega)p(1)},$$

subject to

$$0 \leq l^* \leq 1.$$

[26] We assume those indifferent to move to 'F'. If instead we assumed that they would move to 'H', results would not change, with the exception of results on mobility.

Mothers' optimal labor supply depends crucially on how important time spent with their mother is for children's quality, compared to the time spent in child care or with grandparents. We assume that the importance of time with their mothers is at least as important as time in child care ($\phi_m \geq \phi_c$). Mothers' labor supply also depends on the relationship between mothers' labor productivity and the cost of child care, as well as on the relative value of the exogenous income with respect to labor productivity. Women whose marginal benefit from working – their labor productivity x – is lower than the marginal cost of working – the cost of child care, $p(1)$ – will decide to stay home. On the other hand, if the importance of mothers' time for children's quality were the same as the importance of time spent in child care, $\phi_m = \phi_c$ women whose labor productivity is high enough would work all their disposable time

$$l^* = \begin{cases} 0 & \text{for} \quad (1-\tau)x < (1-\omega)p(1) \quad \text{and} \quad \phi_m \geq \phi_c \\ 1 & \text{for} \quad (1-\tau)x > (1-\omega)p(1) \quad \text{and} \quad \phi_m = \phi_c. \end{cases}$$

In case $\phi_m > \phi_c$, women whose labor productivity suffices to pay for child care will work, $0 < l^* \leq 1$. Even though, a mother's time has a higher weight for children's quality, working increases disposable income and consequently consumption. The effect of other parameters on the optimal labor supply is as expected. A higher weight of consumption for utility(σ), increases labor supply. An increase in the importance of time spent in child care for children's quality and an increase in labor productivity have similar effects. On the other hand, an increase in the weight of a mother's time for children's quality reduces labor supply. Similarly an increase in the cost of child care and an increase in the exogenous income decrease labor supply.

4 Calibration Strategy

In order to be able to quantify the importance of grandparent-provided child care and the effect of family policies for women's decisions on residence choice, labor supply, and fertility, we calibrate our model. Some parameters of the model are fixed based on available evidence. The remaining parameters are calibrated to match the model to several labor market statistics and fertility data from Germany. Most statistics used for calibration come from pooled waves 1991, 1996, 2001, and 2006 of the German Socio-Economic Panel (GSOEP). We consider weighted statistics for married women in West Germany ages 20 to 48 for whom information on parents' residence is available.[27] Finally, we set policy

[27]Note that we join dummy variables "parents or in-laws in same house" and "parents or in-laws close." We chose ages 20 to 48 because this is the widest range for women with children ages 0-6. We only consider

parameters to represent German family policies.

4.1 Parameters

In our model economy, individuals are distributed over different life-course offers. This distribution is denoted by $\Pi(x^h, z^h, x^f, z^f)$, chosen such as to be consistent with the existence of an initial distribution of young women over labor productivities, $\Omega(x)$ and an initial distribution of men over labor productivities, $\Theta(z)$. Hence $\Omega(x_i)$ denotes the mass of women who are of productivity type x_i, for $i = 1...N$. Labor productivities x and z follow a log normal distribution.

We discretize the distribution of men's observed wages to obtain twenty different types of exogenous incomes. Mean and standard deviation of men's productivity distribution are denoted by μ_z and σ_z. The distribution of women's observed wages, on the other hand, is likely to be effected by selection into employment. Thus we assume the standard deviation of men and women's wages to be the same and we calibrate the mean of women's underlying productivity distribution to match the observed mean wage for women. Estimates for these parameters $(\mu_z, \sigma_z, \sigma_x)$ and calibration targets (μ_x) are taken from the distribution of hourly wage rates observed in our GSOEP sample. They are $\mu_z = 2.74$ and $\sigma_z = 0.41$ for men and $\mu_x = 2.46$ and $\sigma_x = \sigma_z = 0.41$ for women.

A life-course offer is a labor productivity and an exogenous income. It can be interpreted as a couple formed by a woman of productivity, x and a man of income z. Thus, the probability of an offer is equivalent to a matching probability between a woman and a man. The probability that an offer $(x_i, z_j)^d$ for $d = H, F$ is realized, or that a woman of type x_i matches with a man of type z_j is denoted by $\Phi(x, z)$. If a man and a woman are of the same type, $i = j$, this probability is equal to ψ. Otherwise the probability is given by $\frac{1-\psi}{N-1}$ for $i \in 1, ..., N$ and $j \in 1, ..., N$. To assign a value to ψ, we use the degree of assortative matching indicating how likely it is to meet your own productivity type. Fernández et al. [2005] estimate this value to be 0.7 for Germany, i.e. 70% of women in Germany match with men of the same type. The remaining 30% are equally likely to match with men of types different from their own.

In order to determine the distribution of life-course offers, $\Pi[(x, z)^H, (x, z)^F]$, we need to

individuals who provide information on if they have children, and if and how they participate in the labor market.

know how many individuals receive an offer $(x_i, z_j)^H$ in 'H' and an offer $(x_r, z_p)^F$ in 'F', for $i, j, r, p \in 1, ..., N$. For instance, how many women receive a particular offer $(x_1, z_3)^H$ in 'H' and an offer $(x_3, z_5)^F$ in 'F'? The number of individuals receiving the offer $(x_1, z_3)^H$ depends on the number of individuals of type x_1 – given by $\Omega(x_1)$ – and on the number of individuals of type z_3, – given by $\Theta(z_3)$ – and on the probability of this match happening, $\Phi(x_1, z_3)$. Thus the number of women receiving an offer $(x_1, z_3)^H$ is equal to the product of the three elements, $\Omega(x_1)\Theta(z_3)\Phi(x_1, z_3)$. It is thus equal to the probability of a woman being of type x_1 and the probability of a man with income z_3 and the probability for this match to happen. Likewise, the number of individuals receiving an offer $(x_3, z_5)^F$ is given by $\Omega(x_3)\Theta(z_5)\Phi(x_3, z_5)$. Hence the number of individuals receiving the two offers detailed above is equal to the probability of individuals receiving an offer $(x_1, z_3)^H$ times the probability of individuals receiving an offer $(x_3, z_5)^F$, normalized by the probability of receiving any offer. Given that there is a mass one of individuals, the number of individuals of a certain type is given by the probability of being an individual of that type. Each of the elements of $\Pi[(x, z)^h, (x, z)^f]$ are calculated in the same fashion. The distribution of life-course offers is key to our analysis, as it determines how individuals are distributed across different offers, which will have implications for the model's aggregate statistics.

According to SHARE around 16.8% of German grandparents who live close to their adult children who have children age three or younger take care of these grandchildren on a daily basis. Mothers of around 89% of women in our GSOEP sample are still alive. Hence we assign value 0.14 to the parameter $p(g)$ that denotes the share of women who live in 'H' and who have access to grandparent-provided child care. Given that one model period is equivalent to 3 years, the discount factor, β is set to a value of 0.957 in order to match a yearly interest rate of 4%. Table 4.4 displays all parameters set a priori.

Table 4.4: Parameters based on a priori information

Parameter	Explanation	Value
σ_x	standard deviation of women's log productivity	0.41
μ_z	mean log productivity of spouses	2.74
σ_z	standard deviation of spouses' log productivity	0.41
$p(g)$	% of women with access to free care in 'H'	0.14
ψ	assortative matching parameter	0.7
β	discount factor	0.957

We calibrate the parameters of the utility function, $(\sigma, \sigma_e, \sigma_k)$, the hourly cost of child

care, $p(1)$, women's mean log hourly wage rate μ_x, as well as the parameters of the children's quality function, (ϕ_m, ϕ_c). Note that we impose $\phi_m + \phi_c = 1$, and hence we only need to calibrate one of the two parameters. We now relate the calibrated parameters to the data moments that they are most likely to affect.

We set the mean of the distribution of women's underlying productivities $\bar{x}$ to 2.1 in order to match women's observed mean log hourly wage rate, μ_x of 2.46. The weight of consumption in the utility function, σ is set to 0.986, to match the percentage of working women in 'H'.[28] These women face lower child care costs on average and their participation decision is crucially determined by the value of consumption. We use two moments related to fertility and participation to match the cost of children in the utility function, σ_k and the weight of children's quality, σ_e. The weight of children's quality in the utility function affects the decision of whether to participate in the labor market or not. Thus, to match this parameters we use the participation rates of mothers with older children (ages $3-6$) who live in 'H' and who face no child care costs. Whether a woman wants to become a mother or not is related to the fixed cost of children. Hence we choose the percentage of women who are mothers in 'H' to match the fixed cost σ_k. We set σ_k and σ_e to 0.33 and 1.14 respectively.

The weight of mother's time for children's quality, ϕ_m determines how much a mother works depending on her children's age. We calibrate this parameter to match the percentage of mothers in 'H' who work while having small children (0-2). This parameter takes the value 0.672. For the cost of child care $p(1)$, the OECD [2008] estimates that child care costs in Germany amount to 9.1% of average income. Thus we set $p(1)$ to 1 to match this number.[29] Table 4.5 displays the calibrated parameters of the model.

Finally, the model's policy parameters are the income tax rate, τ, child care subsidies, and family benefits, i.e. ω, T. All working individuals pay a proportional tax, τ on labor income (exogenous income and wage rate). We set τ to 37% which is equivalent to the income tax revenue collected by the German government as a fraction of GDP (OECD [2010]). According to the OECD [2009], all German families receive some family benefits for each child up to the age of eighteen (*Kindergeld*). In particular, they re-

[28] In the data those who live in 'H' are those who live in the same house, neighborhood, or town as their parents or inlaws.

[29] Note that men and women in our model who are not taking care of their children work all their disposable time. Given that we targeted hourly wage rates, the resulting average income in the model is too high compared to the data. In order to calculate child care costs as a fraction of average income we impose a maximum working time, 40% of disposable time, i.e. 40 hours per week of 98 hours disposable time after subtracting 10 hours per day for sleeping, eating, personal care.

Table 4.5: Calibrated Parameters

Parameter	Explanation	Value
$\bar{x}$	mean underlying productivity of women	2.1
σ	weight of consumption	0.986
σ_e	weight of children quality	1.14
σ_k	fixed cost of children	0.33
ϕ_m	weight of mother's time	0.672
$p(1)$	cost of child care	1

ceive 184 Euros per month for the first child, 190 for the second and 205 for the third, fourth, fifth child etc. We set the amount of family benefits in our economy, T such as to match that for the average German family (in terms of income and number of children), *Kindergeld* is equivalent to around 5% of family income. Hence, T is set to 0.522. According to the same source, child care subsidies for small children (0-3) are negligible in Germany. Therefore, we set child care subsidies (ω) to zero. All policy parameters are displayed in Table 4.6.

Table 4.6: Policy Parameters

Parameter	Explanation	Value
τ	income tax	0.37
T	Family Benefits	0.522
ω	child care subsidy	0

5 Results-Benchmark Economy

In Table 5.7 we present model moments of our benchmark economy together with the corresponding data moments. We use data moments from our GSOEP sample along several dimensions relevant to the analysis of women's fertility behavior and labor force participation.

Our model does particularly well in matching the labor force participation rate of moth-

Table 5.7: Data and Model Moments

	Data	Model
% of women being mothers, 'H'	72.34	68.04
LFP rate of women, 'H'	50.36	68.22
LFP rate of mothers, children [0-3), 'H'	26.75	27.91
LFP rate of mothers, children [3-6), 'H'	46.22	79.10
Child care costs as % of average income	9.10	10.5
Mean working women log hourly wage rate	2.46	2.48

ers with small children [0-3) who live close to parents or in-laws. This rate is equal to 26.75% in the data while the model estimates it to be 27.91%. In Germany, the cost of child care is equal to 9.10% of average income. The model also matches child care costs relatively well. We also match the mean log hourly wage rate observed in the data for working women. Our model somewhat under-predicts the percentage of women who are mothers. On the other hand, the model clearly overestimates labor force participation rates of mothers with children between the ages of 3 and 6 who live in 'H'. While in the data this rate is 46.22% the model estimates a rate of 79.10%. This is the reason why the model has difficulties matching aggregate labor force participation rates in 'H'. The percentage of women who live close to parents or in-laws and work is 50.36 in the data while in the model this number is 68.22. Given our model set-up matching both the participation rate of mothers with small children and the overall participation rate is not possible. In our model, mothers with children ages 3 to 6 do not face any child care costs. This is a simplification, because while availability of child care is almost guaranteed for these children, child care is not free. We could introduce a cost of child care in the second period in order to match this statistic better but we consider that the focus of this paper is on the period of early childhood when child care is most costly. We believe that we would not gain important additional insights by adjusting the model to better match this statistic. Hence, while our model misses an additional channel that determines why some mothers do not work, it does replicates well the fact that more mothers work as their children become older.

The model performs better along some dimensions than others. However, model moments in Table 5.7 were targeted explicitly to calibrate certain parameters. In order to assess the model's validity for carrying out policy analysis, we need to consider the model's performance in matching moments that have not been used for calibration. To this end we

consider the following statistics. Table 5.8 shows these un-targeted moments of the model and the corresponding data moments. In our model, individuals do not value leisure and hence when a mother is not working, she is taking care of her children. Hence, time spent taking care of children is a residual in our model. Despite the lack of leisure, the model does quite well in matching time spent with children. According to the OECD [2008], women spend 14 per cent of their time taking care of their children, while in our model this number is 11%. Furthermore, the model predicts that 52 per cent of women live in 'H', while in the data, 43 per cent of women live close to parents or in-laws. While the model somewhat overestimates this statistic, taking into account that we did not target this number in the calibration the model does fairly well. As expected our model overestimates the aggregate labor force participation of married women.

Table 5.8: Data and Model Moments: Not used for calibration

	Data	Model
% of women being mothers, 'F'	66.75	64.05
Aggregate LFP rate of women	48.90	67.40
LFP rate of women, 'F'	47.62	66.51
LFP rate of mothers children [0-3), 'F'	20.55	20.30
LFP rate of mothers children [3-6), 'F'	44.10	75.08
Average time spent with child, as % of total time	14.9	11.15
% of women being mothers, far	66.75	6402
share of female married population living in 'H'	43.43	52

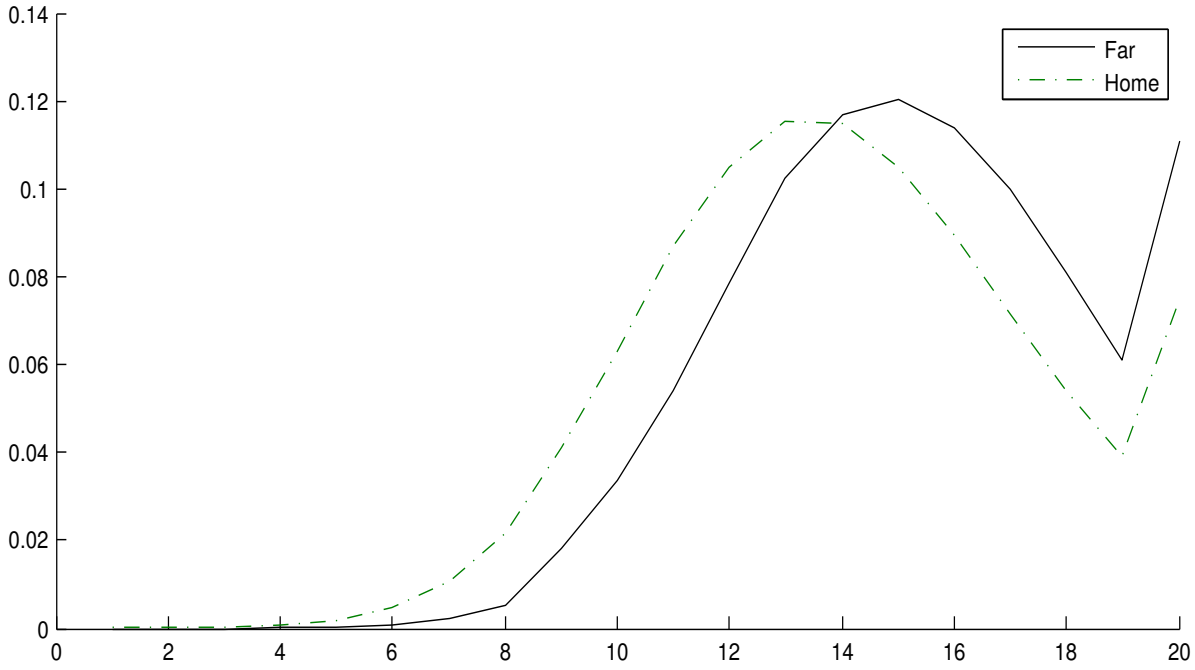
6 Discussion

6.1 Cost in terms of wages

In the empirical analysis of the paper we showed that there exists a negative relationship for mothers between living close to parents or in-laws and hourly wages. In our model, where women's residence is a choice and depends on life-course offers received and on child care costs the same relationship arises. Figure 6.2 shows the wage distributions of

working mothers in both regions.[30] We obverse that the mean of the wage distribution in 'F' (15.52) is higher than in 'H' (13.79). The model thus generates endogenous differences in wage rates of working mothers. In our model it is differences in child care costs that generate these differences in wage rates. In 'F', there is no access to free grandparent-provided child care, and women who work have to pay for child care. This leads to a selection of high productivity type working women into residing in 'F'.

Figure 6.2: Working Mothers' Wage Distribution

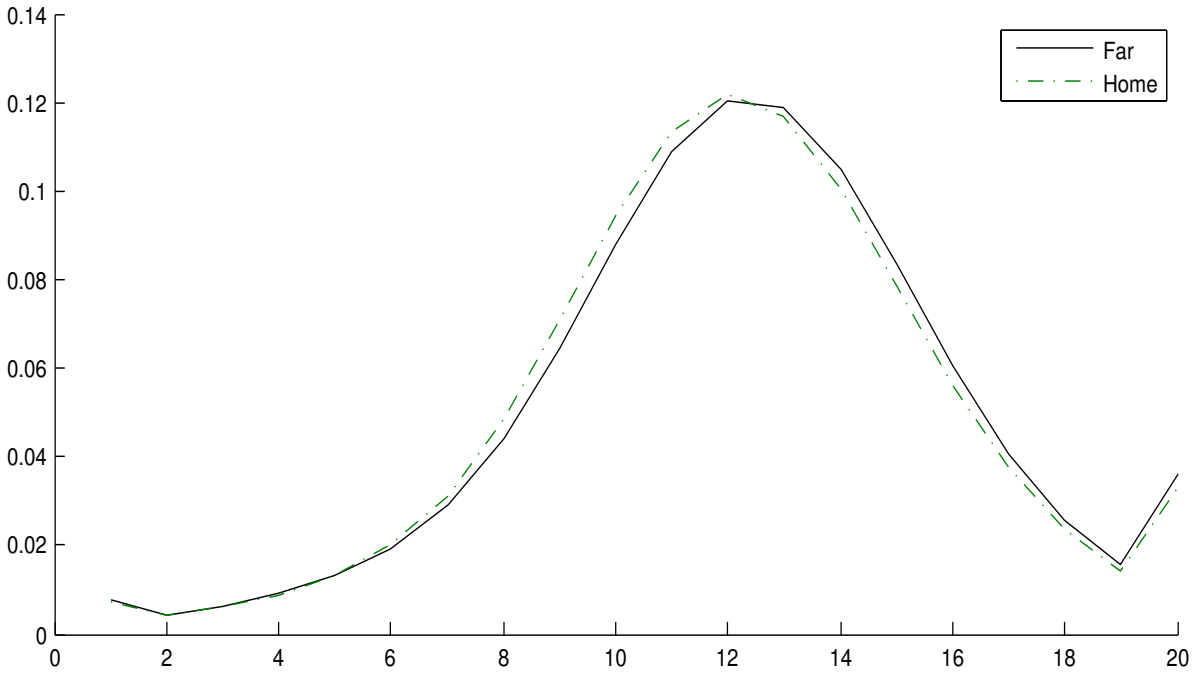


In our empirical analysis, we used a Heckman selection model to control for the fact that observed wages might be biased upward by a selection of women into employment. However, we were not able to control for a selection into residing close or far from parents or in-laws. In the model on the other hand, we are able to also control for this additional selection effect. Figure 6.3 displays the underlying or potential wage distributions of mothers in both regions, before employment decisions. Women reside in 'F' to take

[30] We generate a fat tail at the far end of the distribution. This is due to the modeling choice that individuals receive with positive probability an offer that includes the highest productivity type. We could eliminate this kink by introducing an additional parameter but we believe that this does not change our results and that it is not central to the question we analyze.

advantage of higher wages. To analyze whether those who reside in 'H' despite lower average wages do so because of grandparent-provided child care, we consider the underlying wage distributions in both regions when there are no grandparents. When this is the case - and due to our assumption that individuals who are indifferent move to 'F' - we observe more high productivity type women in 'H'.[31] In addition to the effect of selection into employment, residence choices also contribute to the differences in the wage distributions of women in 'H' and in 'F'. While these differences are small they clearly vary according to the availability of grandparent-provided child care.

Figure 6.3: Women's Wage Distribution



In the model, women decide where to reside, based on the life-course offers they receive and taking into account the higher costs of child care faced in 'F'. Life-course offers consist of different wages and different exogenous incomes in both regions.[32] In order to better

[31] If we were to distribute those indifferent equally among 'H' and 'F', distribution would be equal across the two regions.

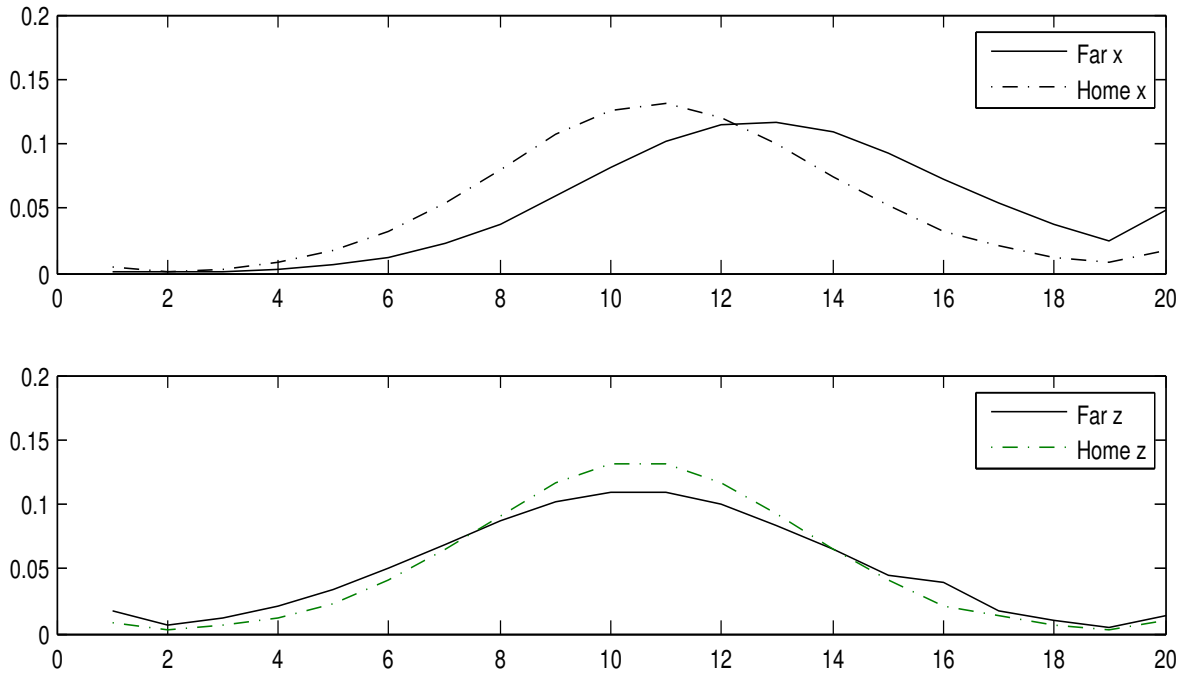
[32] See the seminal paper by Mincer [1978] for determinants of family migration decisions. The author finds husbands' wage offers to be determinant, but to a lesser extent if wives are working and if their work is permanent and well paid. Hence, both husbands' and wives' wages determine migration decisions.

analyze the role of life-course offers for women's decisions, we consider life-course offers that only differ in one of the two dimensions. First we analyze the role of women's wages by only allowing offers to differ across the woman's wage in each region. In this case, a life-course offer consists of a pair of wage and exogenous income in 'H' and a different wage and the same exogenous income in 'F'. In a second step we maintain wage offers fixed and only vary exogenous incomes across regions.

6.2 Effect of women's wages on decisions

To study the importance of women's wages for residence choices, we shut down the exogenous income channel. Therefore, women receive the same exogenous income in both 'H' and 'F'. In this case, the only reason to move to 'F' is a higher wage rate and the wage distribution of women who live in 'F' is skewed to the right (see Figure 6.4). The distribution of exogenous incomes in 'F', on the other hand is symmetric. Only 22 % of women live in 'F' compared to 48 % in the benchmark economy. Without any variation in exogenous income 58% fewer women live in 'F'.

Figure 6.4: Women's Wage Distribution and Women's Exogenous income distribution



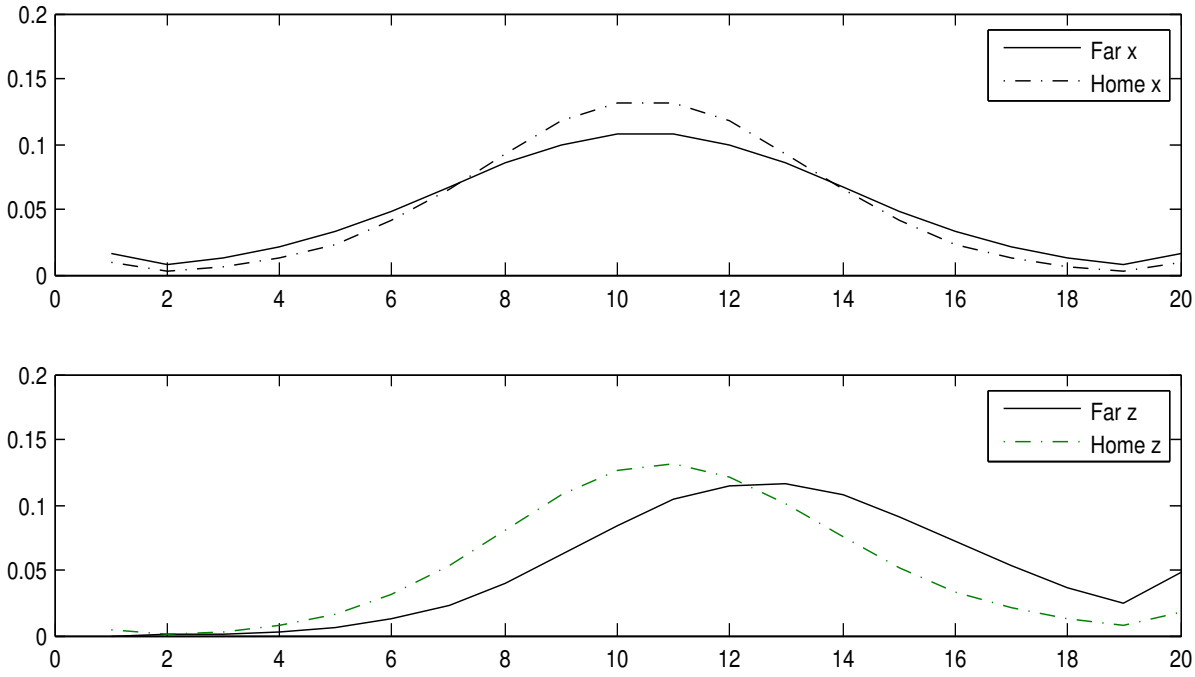
Given restrictions on possible exogenous incomes, on the aggregate women receive lower

exogenous incomes and they thus participate more. In particular, in 'F' 65 % of mothers with small children participate. These women can afford to pay for child care but would decide not to work if they had higher exogenous incomes.

6.3 Effect of exogenous income on decisions

If now we assume that women receive the same productivity type offer in both regions, we observe that the distribution of productivity types in 'F' displays a larger variance than the distribution in 'H'. On the other hand, the distribution of exogenous incomes in 'F' is skewed to the right (see Figure 6.5). The main reason for moving to 'F' now lies in a higher exogenous income and we thus observe women with relatively higher exogenous income in 'F'. Again, the share of women living in 'F' is lower than in the benchmark, 21% versus 48%, i.e. 60 per cent fewer women live in 'F'. We also observe a decrease in female labor force participation as women face lower wages on average.

Figure 6.5: Women's Wage Distribution and Women's Exogenous income distribution



Thus both channels - women's own wages and their spouses' wages - are important when understanding women's residence choices as well as decisions regarding labor force participation. If we were to shut down both channels, by assumption only those individuals

who are indifferent would live in 'F'. Hence, the majority of women (99%) would live in 'H'.

7 Counterfactual Experiments

In our first counterfactual experiment we analyze a situation where grandparents are not available to take care of their grandchildren and everyone has to pay for child care. Our second counterfactual experiment considers an increase in subsidies for paid child care. The purpose of our first experiment is to quantify the importance of grandparent-provided child care. There are several reasons why the provision of child care by grandparents might be reduced in the future. Women's age at first child birth has been increasing over the last decades. In 2009, German mothers were on average 30 years old when giving birth to their first child, while in 1970 average age at first birth was 24 (OECD [2008]). As successive generations of women delay birth, grandparents may be to be too old or too sick to take of their grandchildren. On the other hand, women's labor force participation and individuals' retirement age has been and is increasing in many countries. Situations where both generations of women – grandmothers and adult daughters – are of working age when grandchildren come along are going to be even more likely in the future.[33] Regarding our second experiment, we consider a subsidy for child care. Given the positive relationship found in the literature between availability and low cost of child care and female labor force participation, we would expect such a policy to lead to an increase in mothers' labor force participation. We set the subsidy to 53 per cent of child care costs. This is the amount of subsidy needed to reduce the cost of child care in our benchmark model such as to be equal to the cost that families in Sweden face. In Sweden, child care costs are among the lowest compared to other OECD countries, and they amount to 4.6 per cent of average income (OECD [2008]).

No grandparent-provided child care Table 7.9 provides moments from our first counterfactual experiment when there is no grandparent-provided child care available, together with the corresponding moments from our benchmark economy. In the benchmark economy, women in 'F' and a share of $(1 - p(g))$ of women in 'H' face high child care costs. Without the availability of grandparents, the incentive to remain close disappears. We thus observe that the share of women living in 'F' is 4 percentage points higher than

[33] Individuals' increasing life expectancy and better health might counteract the problem of late first child birth. However, this increased life expectancy is again likely to lead to successive increases in retirement age.

Table 7.9: No Grandparent-provided child care

	No grandparents	Benchmark economy
Aggregate LFP rate of women	66.17	67.40
% of women being mothers, 'H'	64.25	68.04
% of women being mothers, 'F'	65.67	64.05
LFP rate of mothers children [0-3), 'H'	20.42	27.91
LFP rate of mothers children [3-6), 'H'	75.37	78.67
LFP rate of mothers children [0-3), 'F'	18.28	20.30
LFP rate of mothers children [3-6), 'F'	77.70	75.08
share of women living in 'H'	47.73	52.35

in the benchmark economy. We also observe that labor force participation of mothers with older children $(3-6)$ who do not face child care costs increases slightly for those in 'F'. But it decreases for those in 'H'. Meanwhile labor force participation of mothers with small children decreases in both regions. This result is due to a composition effect. More women decide to live in 'F' as free child care in 'H' ceases to exist. In the first period, women in 'F' will be constrained and might decide not to work, but in the second period when children are older these women will be able to work for a higher wage. This leads to lower participation when children are small and more participation when children are older. For mothers who live in 'H', we observe that only those women who can afford to pay for child care work. Thus participation in 'H' falls in both periods. Labor force participation of women in 'H' drops by 7 percentage points in the first period. On the aggregate, labor force participation by women drops by 1 percentage point compared to our benchmark economy. Finally, we observe a one percentage point reduction in the number of women who become mothers. Women who would decide to reside in 'H' if there was grandparent-provided child care, react by moving more, participating less, and having fewer children. However, given that in our benchmark economy only 14% of grandparents are readily available for child care, effects of a loss in availability of grandparents are small on the aggregate.

Child Care Subsidies In our second counterfactual experiment we consider an increase in child care subsidies. In particular, we consider a policy that subsidizes 53% of child care costs, i.e. the policy parameter ω is set to 0.53. Table 7.10 displays moments from this

counterfactual experiment, next to moments from our benchmark economy, with $\omega = 0$. Under this policy, every woman can afford to become a mother and around 84 per cent of women work. A child care subsidy not only affects women who live in 'F', but also those who live in 'H' and who do not have access to grandparent-provided child care. Thus, subsidizing child care increases labor force participation of mothers living in 'H' as well as of mothers in 'F'. A share of $p(g)$ of women still has access to free grandparent-provided child care, which leads to a slightly higher participation of mothers in 'H' compared to 'F'. It is for the same reason that we do not observe any change in the share of women living in 'F'. The significant increases in both the aggregate number of mothers and mothers' labor force participation rates, indicate that subsidizing child care costs can lead to higher fertility and participation.

Table 7.10: Child care subsidized, $\omega = 0.53$

	$\omega = 0.53$	Benchmark economy
Aggregate LFP rate of women	83.85	67.40
% of women being mothers, 'H'	100	68.04
% of women being mothers, 'F'	100	64.05
LFP rate of mothers children [0-3), 'H'	83.45	27.91
LFP rate of mothers children [3-6), 'H'	85.41	78.67
LFP rate of mothers children [0-3), 'F'	82.15	20.30
LFP rate of mothers children [3-6), 'F'	84.15	75.08
share of women living in 'H'	52.35	52.35

8 Conclusion

In this paper we document benefits and costs of grandparent-provided child care. Looking at German data we find that women residing close to parents or in-laws are more likely to have children and that as mothers they are more likely to hold a regular full-or part time job. However, we find that their wages are lower and that they are more likely to incur in commutes. We build a simple model of residence choice, fertility decisions, and female labor force participation to account for this trade-off. We simulate the model to match the German economy in terms of fertility and female labor force participation. We then perform two counterfactual experiments to analyze how women's decisions on residence,

fertility, and labor force participation change under distinct scenarios regarding availability of grandparent-provided child care and different family policies. We find that if there was no grandparent-provided child care, fewer women would participate in the labor market and fewer would become mothers. We also observe that mobility increases. Hence, grandparent-provided child care imposes a geographical restriction on women. One way to remove this restriction would be to subsidize child care. However, we find no effect on mobility when we subsidize 53% of child care costs. However, this subsidy leads to increases in both, aggregate female labor force participation and fertility.

In absence of child care subsidies, grandparent-provided child care plays an important role for mothers' labor force participation. However, grandparent-provided child care imposes spatial restrictions that limit labor mobility. Women who remain close to their parents or in-laws have access to a confined labor market, which might imply worse labor market opportunities and thus lower wages. Hence, when designing policies aimed at increasing labor force participation of mothers, policy makers should take into account the wide-spread presence of grandparent-provided child care as well as the spatial restrictions it implies. For instance, a policy that subsidizes grandparents' time may not only affect mothers' labor force participation but it may also have an impact on their wages and/or commutes.

In this paper we simply assume that being close to one's grandparents' implies that with a certain probability grandparents take care of their grandchildren, and we did not consider grandparents' decisions to provide or not child care. However, this decision might be very related to individuals' retirement age and especially in the case of grandmothers to previous decisions about labor force participation. In this sense, opposing forces for cohort effects of female labor force participation could arise. On the one hand, having a working mother increases the likelihood for her daughters to also become working mothers.[34] On the other hand, a grandmother who is actively participating in the labor market might be less likely to provide child care for her grandchild, something that is found to increase mother's labor force participation rates. We believe that a very interesting road for future research could be an analysis of how late first birth and improved health after retirement interact with these counteracting force.

[34]See Fernandez et al [2004] and Farre and Vella [2007] on the intergenerational transmission of attitude towards the role of women in the economy and its effect on female labor force participation.

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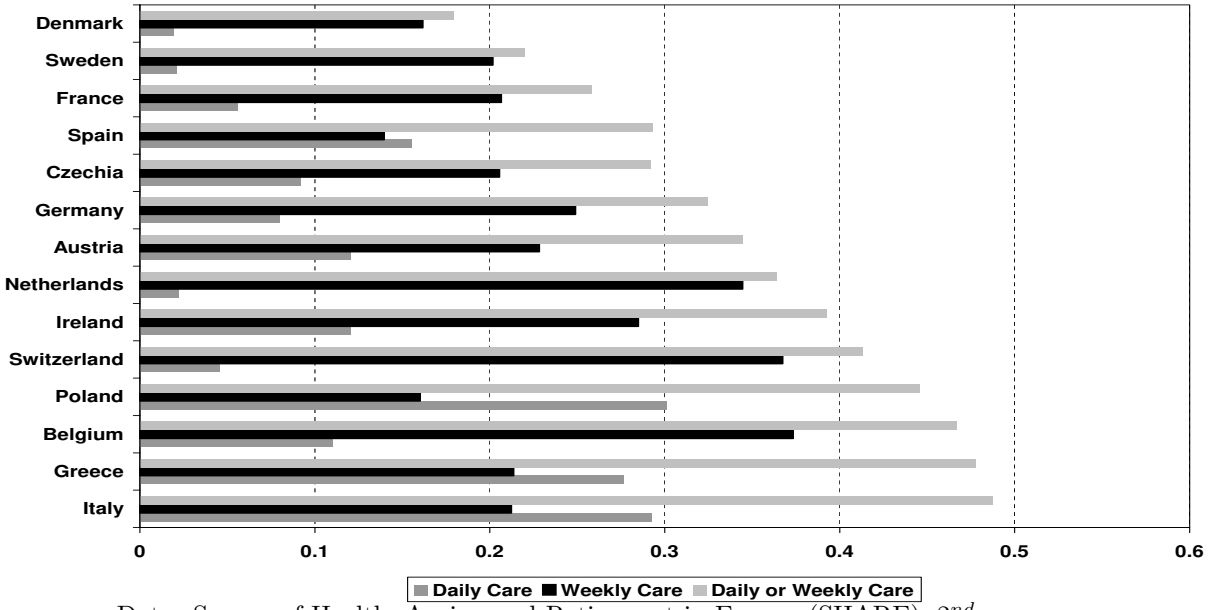
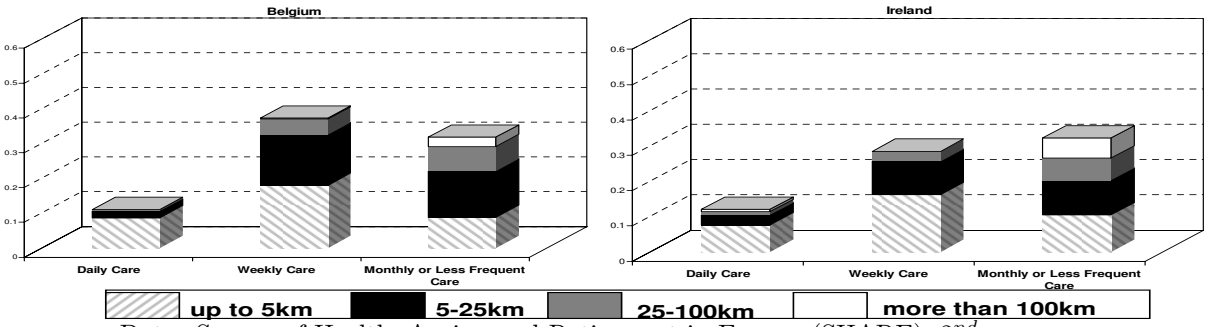
A Appendix

Figure A-1: Grandparent-Provided Care for Grandchildren, ≤ 6



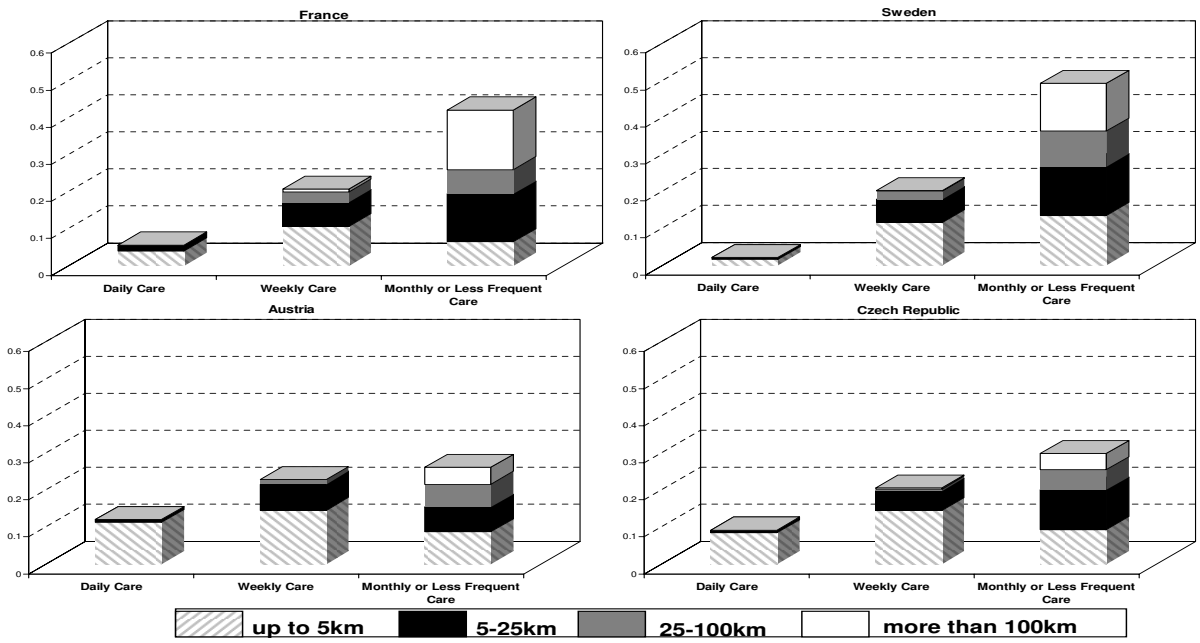
Data: Survey of Health, Ageing and Retirement in Europe (SHARE), 2^{nd} wave.

Figure A-2: Frequency of Care for and Distance to Grandchild, ≤ 6



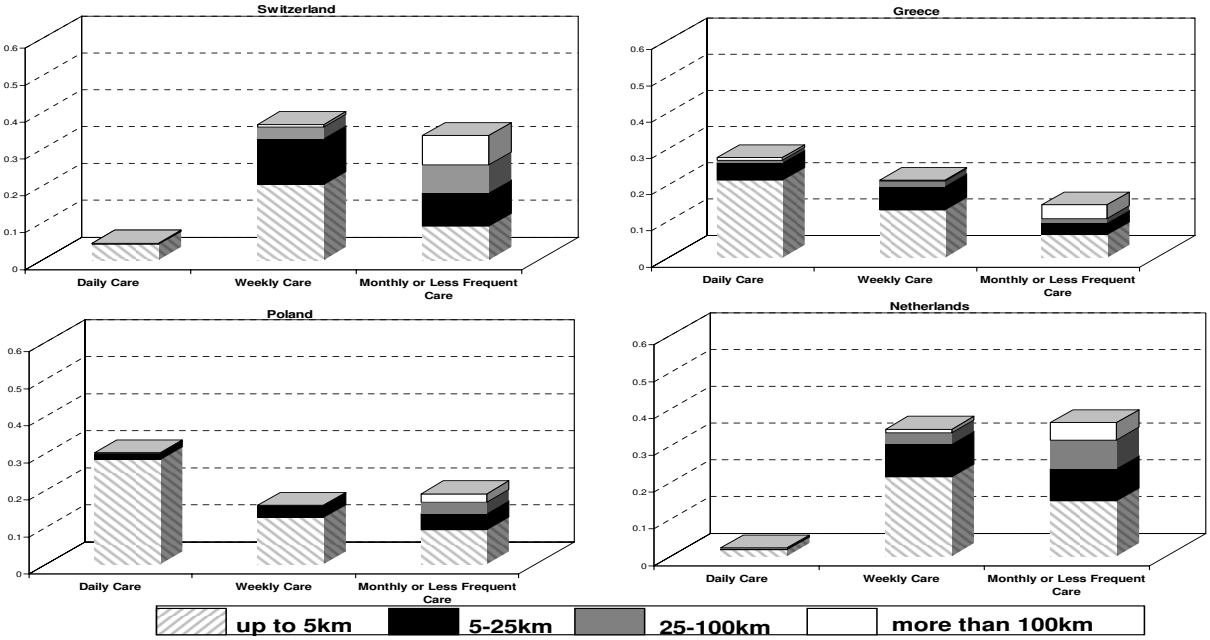
Data: Survey of Health, Ageing and Retirement in Europe (SHARE), 2^{nd} wave.

Figure A-3: Frequency of Care for and Distance to Grandchild, ≤ 6



Data: Survey of Health, Ageing and Retirement in Europe (SHARE), 2^{nd} wave.

Figure A-4: Frequency of Care for and Distance to Grandchild, ≤ 6



Data: Survey of Health, Ageing and Retirement in Europe (SHARE), 2^{nd} wave.

Table A.1: Use of Relative-Provided Child Care by Proximity to Parents or In-laws (Number of Observations)

	Mothers with children <= 6	Working Mothers with children <= 6	Mothers with children < 3	Working Mothers with children < 3
All	34.9% ($n = 2148$)	44.4% ($n = 786$)	33.3% ($n = 901$)	46.6% ($n = 176$)
Parents or in-laws in same house	49.8% ($n = 265$)	64.6% ($n = 99$)	48.6% ($n = 111$)	77.8% ($n = 18$)
Parents or in-laws close	45.1% ($n = 990$)	53.8% ($n = 379$)	43.7% ($n = 398$)	57.6% ($n = 85$)
- Parents or in-laws in same neighborhood	50.7% ($n = 489$)	56.8% ($n = 190$)	49.5% ($n = 204$)	60.5% ($n = 43$)
- Parents or in-laws in same town	39.5% ($n = 501$)	50.8% ($n = 189$)	37.6% ($n = 194$)	54.8% ($n = 42$)
Parents or in-laws far away	19.1% ($n = 893$)	26.3% ($n = 308$)	18.4% ($n = 392$)	26.0% ($n = 73$)
- Parents or in-laws one hour away	24.7% ($n = 635$)	32.1% ($n = 224$)	24.6% ($n = 280$)	32.7% ($n = 52$)
- Parents or in-laws further away	5.4% ($n = 241$)	11.3% ($n = 80$)	2.8% ($n = 107$)	10.0%($n = 20$)
Parents or in-laws in foreign country	5.9% ($n = 17$)	0 ($n = 4$)	0 ($n = 5$)	0 ($n = 1$)

Women 25-50, pooled waves 2001 and 2006.

Table A.2: Use of Relative-Provided Child Care, Age, Health Status and Labor Force Participation of Grandmothers (Number of Observations)

	All		Close to own parents and using relative-provided care	
	Mothers with children <= 6	Working Mothers with children <= 6	Mothers with children <= 6	Working Mothers with children <= 6
Age grandmother	58.0 (7.8) ($n = 503$)	57.9 (7.7)($n = 151$)	57.3 (7.7)($n = 81$)	55.4(7.4) ($n = 33$)
Grandmother not employed	51.5% ($n = 410$)	45.2% ($n = 126$)	64.2% ($n = 67$)	61.5% ($n = 26$)
Grandmother works full time	25.8% ($n = 410$)	32.5% ($n = 126$)	17.9% ($n = 67$)	30.8% ($n = 26$)
Grandmother works part time	18.0% ($n = 410$)	15.9% ($n = 126$)	13.4% ($n = 67$)	7.7% ($n = 26$)
Grandmother very good or good health	30.2% ($n = 410$)	21.4% ($n = 126$)	28.4% ($n = 67$)	26.9% ($n = 26$)
Grandmother not good or bad health	23.7%($n = 410$)	23.0%($n = 126$)	28.4% ($n = 67$)	26.9% ($n = 26$)

Women 25-50, pooled waves 2001 and 2006.

Table A.3: Marginal Effects from Probit Estimation for Having Children

Married, living together	0.286***	(0.012)
Other than German nationality	0.008	(0.027)
Log (Spouse's income)†	0.004***	(0.001)
in East Germany	0.177***	(0.023)
Tertiary education (ISCED: 5,6)	-0.089***	(0.010)
Parents or in-laws close	0.041***	(0.009)
Parents or in-laws in same house	0.002	(0.013)
Small community	0.036***	(0.011)
Large community	-0.065***	(0.012)
Observations	10,732	

†Missing values and values < 1 are set to 0. Standard errors in parentheses: *** p<0.01,** p<0.05,* p<0.1 Data: GSOEP unbalanced panel 91,96,01,06; Women 25-50. Regression includes year, state, and age group dummies. Reference group: unmarried women age 25-29, with education level 1 or 2(ISCED:0-4), living in West Germany in North Rhine-Westphalia in 1991, in a medium-sized town, far from parents or in-laws.

Table A.4: Marginal Effects from Probit Estimation for Having Children with Interaction Terms

Married, living together	0.286***	(0.012)	0.286***	(0.012)
Other than German nationality	0.008	(0.027)	0.008	(0.027)
Log (Spouse's income)†	0.004***	(0.001)	0.004***	(0.001)
in East Germany	0.178***	(0.023)	0.178***	(0.023)
Tertiary education (ISCED: 5,6)	-0.102***	(0.013)		
Primary/Secondary edu (ISCED: 0-4)			0.102***	(0.013)
Parents or in-laws close	0.032***	(0.010)	0.064***	(0.016)
Parents in-laws close*Tert edu	0.031*	(0.017)		
Parents in-laws close*Non-Tert edu			-0.033*	(0.020)
Parents or in-laws in same house	0.001	(0.013)	0.001	(0.013)
Small community	0.036***	(0.011)	0.036***	(0.011)
Large community	-0.065***	(0.012)	-0.065***	(0.012)
Observations	10,732		10,732	

†Missing values and values < 1 are set to 0. Standard errors in parentheses: *** p<0.01, ** p<0.05,* p<0.1 Data: GSOEP unbalanced panel 91,96,01,06; Women 25-50. Regressions include year, state, and age group dummies. Reference group: unmarried women age 25-29 with education level 3 (ISCED 5,6) and education level 1 or 2(ISCED:0-4) respectively living in West Germany in North Rhine-Westphalia in 1991, in a medium-sized town, far from parents or in-laws.

Table A.5: Marginal Effects from Probit Estimation for Mothers' Labor Force Participation

	Regular Part or Fulltime Job	
Number of children	-0.114***	(0.007)
Children 0-2	-0.398***	(0.016)
Married, living together	-0.128***	(0.017)
Other than German nationality	-0.123**	(0.054)
Log (Spouse's income)†	0.006***	(0.002)
in East Germany	0.116**	(0.046)
Tertiary education (ISCED: 5,6)	0.171***	(0.014)
Parents or in-laws close	0.029**	(0.013)
Parents or in-laws in same house	0.022	(0.019)
Small community	-0.003	(0.015)
Large community	0.018	(0.017)
Observations	8,129	

†Missing values and values < 1 are set to 0. Standard errors in parentheses;*** p<0.01, ** p<0.05, * p<0.1; Data: GSOEP unbalanced panel, 91,96,01,06; Mothers 25-50. Reference group: unmarried mothers age 25-29 with education level 1 or 2(ISCED:0-4) in 1991, in a medium-sized town in West Germany North Rhine-Westphalia , far from parents or in-laws, with children age 3 or older. Regression includes year, state, and age group dummies.

Table A.6: Marginal Effects from Probit Estimation for Labor Force Participation of (1) Men and (2) Single Childless Women

	Regular Part or Fulltime Job		Regular Part or Fulltime Job	
	(1)		(2)	
Married, living together	0.106***	(0.008)		
Other than German nationality	-0.096***	(0.032)	-0.097	(0.071)
in East Germany	-0.067**	(0.027)	-0.299**	(0.136)
Tertiary education (ISCED: 5,6)	0.088***	(0.006)	0.135***	(0.024)
Parents or in-laws close	0.009	(0.007)	0.033	(0.028)
Parents or in-laws in same house	-0.008	(0.010)	-0.100***	(0.037)
Small community	0.003	(0.009)	-0.034	(0.036)
Large community	-0.013	(0.010)	-0.125***	(0.033)
Observations	8,653		1,176	

1) Men 25-50. Reference group: unmarried men age 25-29 with education level 1 or 2 (ISCED: 0-4) in 1991, in a medium-sized town in West Germany in North Rhine-Westphalia, far from parents or in-laws 2) single childless women (25-50). Reference group: women age 25-29 in 1991, with education level 1 or 2 (ISCED: 0-4), in a medium-sized town in West Germany in North Rhine-Westphalia. Regressions include year, state, and age group dummies.

Table A.7: Coefficients of Heckman Selection Model for Mothers' Log Monthly Wages

	Log monthly wage		Selection Equation	
	(1)		(2)	
Married, living together	-0.035**	(0.017)	-0.326***	(0.044)
Number of children	-0.047***	(0.010)	-0.287***	(0.017)
Other than German nationality	-0.116	(0.083)	-0.311**	(0.140)
Tertiary education (ISCED: 5,6)	0.282***	(0.016)	0.441***	(0.036)
Parents or in-laws close	-0.056***	(0.015)	0.073**	(0.033)
Parents or in-laws in same house	-0.059***	(0.022)	0.056	(0.048)
Small community	-0.038**	(0.018)	-0.007	(0.039)
Large community	0.053***	(0.020)	0.046	(0.044)
in East Germany	-0.081*	(0.042)	0.296***	(0.119)
Log (Spouse's income)†			0.016***	(0.005)
Children 0-2			-1.105***	(0.056)
Tenure in firm	0.017***	(0.001)		
Monthly hours worked	0.007***	(0.000)		
Constant	5.787***	(0.055)	0.186**	(0.087)
Observations	8,129		8,129	

†Missing values and values < 1 are set to 0. Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1. Data: GSOEP unbalanced panel 91,96,01,06; mothers 25-50. Reference group: unmarried mothers of age 25-29 of children age 3 or older with education level 1 or 2 (ISCED: 0-4) in 1991, in a medium-sized West German town in North Rhine-Westphalia , far from parents or in-laws. Regressions include age group, state, and year dummies.

Table A.8: Effect of Close Presence of Grandparents on Hourly Wages
Coefficients of OLS Estimation of Mothers' Log Hourly Wages

Married, living together	0.000	(0.015)
Number of children	-0.026***	(0.008)
Other than German nationality	-0.121	(0.077)
Tertiary education (ISCED: 5,6)	0.280***	(0.014)
Tenure in firm	0.016***	(0.001)
Parents or in-laws close	-0.052***	(0.014)
Parents or in-laws in same house	-0.052**	(0.020)
Small community	-0.040**	(0.017)
Large community	0.045**	(0.019)
in East Germany	-0.081*	(0.044)
Constant	1.955***	(0.041)
Observations	4,348	
R-squared	0.262	

Standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1 OLS Estimation; Data: GSOEP unbalanced panel 91,96,01,06; mothers 25-50 with full-or part time regular job. Regression includes age group, state, and year dummies. Reference group: unmarried mothers age 25-29 living in West Germany in North Rhine-Westphalia , with education level 1 or 2 (ISCED: 0-4), in 1991, in a medium-sized town, far from parents or in-laws.

Table A.9: Effect of Close Presence of Grandparents on Hourly Wages
Coefficients of Heckman Selection Model for Mothers' Log Hourly Wages without Variables Posing a Possible Endogeneity Problem: Marital Status and Income of Spouse

	Log hourly wage		Selection Equation	
	(1)		(2)	
Number of children	-0.038***	(0.010)	-0.292***	(0.017)
Other than German nationality	-0.135*	(0.077)	-0.340**	(0.139)
Tertiary education (ISCED: 5,6)	0.293***	(0.015)	0.433***	(0.036)
Parents or in-laws close	-0.049***	(0.014)	0.061*	(0.033)
Parents or in-laws in same house	-0.051**	(0.020)	0.037	(0.047)
Small community	-0.040**	(0.016)	-0.014	(0.038)
Large community	0.046**	(0.019)	0.056	(0.044)
in East Germany	-0.067	(0.044)	0.314***	(0.119)
Children 0-2			-1.117***	(0.056)
Tenure in firm	0.016***	(0.001)		
Constant	1.897***	(0.047)	0.061	(0.083)
Observations	8,129		8,129	

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1. Heckman Selection Model; Data: GSOEP unbalanced panel 91,96,01,06; mothers 25-50. Reference group: mothers of age 25-29 of children age 3 and older living in West Germany, with education level 1 or 2 (ISCED: 0-4) in 1991, in a medium-sized West German town in North Rhine-Westphalia , far from parents or in-laws. Regressions include age group, state, and year dummies.

Table A.10: Effect of Close Presence of Grandparents on Hourly Wages
Coefficients of Heckman Selection Model for Low Educated Mothers' Log Hourly Wages

	Log hourly wage		Selection Equation	
	(1)		(2)	
Married, living together	-0.002	(0.019)	-0.341***	(0.051)
Other than German nationality	-0.207**	(0.090)	-0.435***	(0.155)
Number of children	-0.038***	(0.012)	-0.290***	(0.020)
Parents or in-laws close	-0.042**	(0.017)	0.059	(0.038)
Parents or in-laws in same house	-0.038	(0.024)	0.035	(0.054)
Small community	-0.043**	(0.020)	-0.013	(0.044)
Large community	0.042*	(0.022)	0.048	(0.050)
in East Germany	-0.135***	(0.048)	0.477***	(0.117)
Children 0-2			-1.102***	(0.070)
Log (Spouse's income)†			0.018***	(0.006)
Tenure in firm	0.017***	(0.001)		
Constant	1.895***	(0.055)	0.190*	(0.097)
Observations	6,035		6,035	

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1. Heckman Selection Model; Data: GSOEP unbalanced panel 91,96,01,06; mothers 25-50 with primary pr secondary education. Reference group: mothers of age 25-29 of children age 3 and older living in West Germany, with education level 1 or 2 (ISCED: 0-4) in 1991, in a medium-sized West German town in North Rhine-Westphalia , far from parents or in-laws. Regressions include dummies for age groups, states and years.

Table A.11: Effect of Close Presence of Grandparents on Hourly Wages
Coefficients of Heckman Selection Model for High Educated Mothers' Log Hourly Wages

	Log hourly wage		Selection Equation	
	(1)		(2)	
Married, living together	-0.015	(0.028)	-0.286***	(0.095)
Number of children	-0.026	(0.016)	-0.265***	(0.038)
Other than German nationality	0.089	(0.148)	0.220	(0.353)
Parents or in-laws close	-0.066***	(0.024)	0.090	(0.068)
Parents or in-laws in same house	-0.069*	(0.038)	0.159	(0.107)
Small community	-0.038	(0.030)	-0.029	(0.084)
Large community	0.047	(0.033)	0.042	(0.091)
in East Germany	-0.146**	(0.064)	0.307*	(0.174)
Children 0-2			-1.095***	(0.098)
Log (Spouse's income)†			0.007	(0.011)
Tenure in firm	0.013***	(0.002)		
Constant	2.266***	(0.088)	0.679***	(0.208)
Observations	2,094		2,094	

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1. Heckman Selection Model; Data: GSOEP unbalanced panel 91,96,01,06; mothers 25-50, with tertiary education. Reference group: mothers of age 25-29 with children age 3 and older living in West Germany, with education level 3 (ISCED: 5-6) in 1991, in a medium-sized West German town in North Rhine-Westphalia, far from parents or in-laws. Regressions include age group, state, and year dummies.

Table A.12: Effect of Grandparent-Provided Child Care on Commutes
Marginal Effects from Probit Estimation for Mothers without variable posing a possible endogeneity problem: Children in non-relative care

	Commuter	
Married, living together	0.006	(0.055)
Number of children	0.053	(0.033)
Other than German nationality	-0.278**	(0.127)
Children 0-2	-0.024	(0.060)
Log (Spouse's income)†	-0.003	(0.011)
Tertiary education (ISCED: 5,6)	0.126**	(0.051)
Tenure in firm	0.004	(0.004)
Children cared for by relatives	0.088*	(0.048)
Small community	0.263***	(0.055)
Large community	-0.213***	(0.065)
in East Germany	-0.228*	(0.135)
Observations	537	

Standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1; Data: GSOEP unbalanced panel 01, 06; mothers 25-50 of children <= 6 with regular full or part time job. Regression includes year, state, and age group dummies. Reference group: unmarried mothers age 25-29 in 1997 living in West Germany, in North Rhine-Westphalia with education level 1 or 2 (ISCED:0-4) in 1991, in a medium-sized town in 2001, far from parents or in-laws, with children who are not cared for by relatives.

Table A.13: Effect of Grandparent-Provided Child Care on Commutes
Marginal Effects from Probit Estimation for
(1) Low Educated and (2) High Educated Mothers

	Commuter		Commuter	
	(1)		(2)	
Married, living together	0.003	(0.071)	0.015	(0.095)
Number of children	0.057	(0.042)	0.022	(0.056)
Other than German nationality	-0.438***	(0.108)	-0.016	(0.217)
Children 0-2	-0.148*	(0.086)	0.125	(0.093)
Log (Spouse's income)†	-0.019	(0.015)	0.019	(0.018)
Tenure in firm	0.008	(0.005)	-0.000	(0.008)
Children cared for by relatives	0.097	(0.061)	0.106	(0.088)
Children in non-relative care	0.017	(0.086)	-0.098	(0.133)
Small community	0.268***	(0.068)	0.260**	(0.106)
Large community	-0.222***	(0.082)	-0.264**	(0.119)
in East Germany	-0.280*	(0.156)	0.125	(0.232)
Observations	352		183	

Standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1; Data: GSOEP unbalanced panel 01, 06; mothers 25-50 of children <= 6 with regular full or part time job. Regressions include year, state, and age group dummies. Reference group: unmarried mothers age 25-29 in 2001 living in West Germany, in North Rhine-Westphalia in 1991, in a medium-sized town, far from parents or in-laws, with children who are not in nursery, nor cared for by relatives.