

With Strings Attached: Grandparent-Provided Child care, Fertility, and Female Labor Market Outcomes

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Abstract

Grandparents are regular providers of free child care. Similar to any other form of child care, availability of grandparent-provided child care affects fertility and labor market decisions of women positively. We find that women in Germany, 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 part-or fulltime job. However, different from any other type of child care, for individuals to enjoy grandparent-provided child care on a regular basis, residence choices must coincide with those of parents or in-laws. Thus while living close provides access to free child care, it imposes costly spatial restrictions. We find that hourly wages of mothers residing close to parents or in-laws are lower compared to those residing further away, and having relatives taking care of ones' children increases the probability of having to commute. We build a general equilibrium model of residence choice, fertility decisions, and female labor force participation that can account for the relationships between grandparent-provided child care, fertility and labor market outcomes. We simulate our model to analyze how women's decisions regarding residence, fertility, and labor force participation change under different family policies and how these decisions affect their wage income.

JEL classification: J13, J61, H42, R23

Keywords: informal child care, fertility, labor force participation, spatial restrictions, regional labor markets

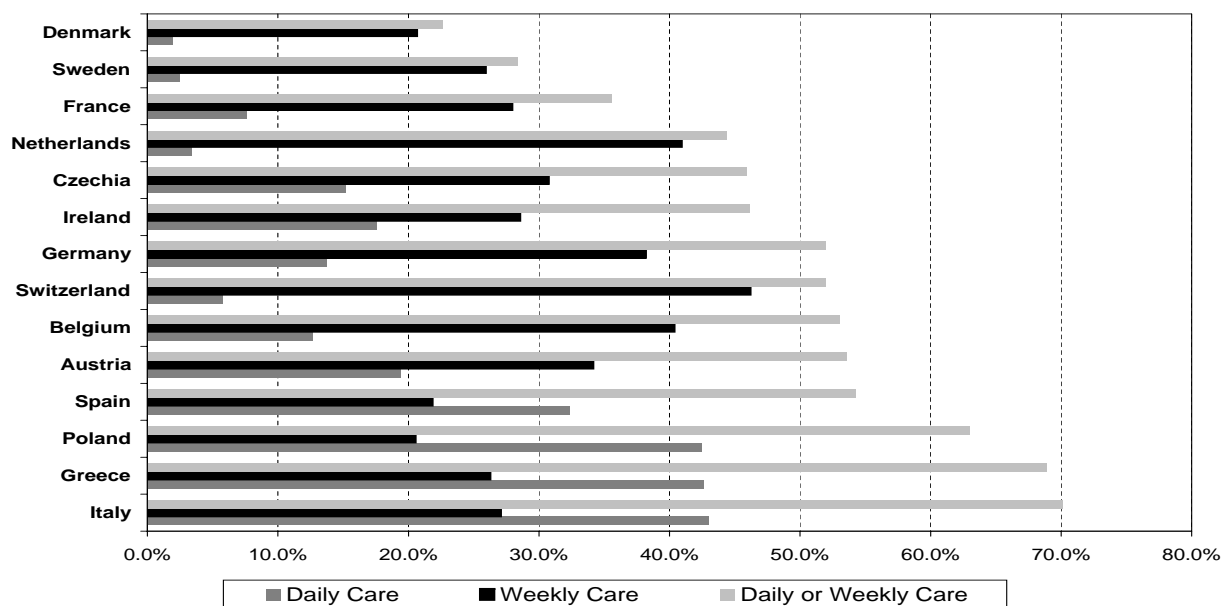
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1 Introduction

Grandparents are an important source of child care. According to data from the 2nd wave of the Survey of Health, Ageing and Retirement in Europe (SHARE), between 23% (Denmark) and 70% (Italy) of grandparents take care of their grandchildren age ten or younger on a daily or weekly basis. In the Netherlands, Belgium, and Switzerland more than 40% of grandparents take care of their small grandchildren each week, while in Italy, Greece, and Poland more than 40% of grandparents provide daily care for grandchildren age ten or younger (see Figure 1.1).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 last decades, mothers are still participating significantly less than other women.

Figure 1.1: Grandparent-Provided Care for Children ≤ 10 years



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

There exists an extensive empirical literature that has studied the link between female labor force participation and child care. Many papers propose a joint analysis of the effect of child care costs on fertility and labor force participation. For Italy, Del Boca [2002]

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

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 participation rates in Sweden, Møerck et al [2009] is one of the few papers that focuses exclusively on the effect of child care costs on fertility. In a literature summary, Del Boca and Viuri [2007] point out that most studies find that high child care costs deter female labor supply, while availability of child care has a positive effect on labor force participation by mothers. Thus these findings suggest that the main barrier that mothers face at the time of working is to obtain affordable child care (e.g. child care costs in the US can amount to 30% of the income of a family living below the poverty line).²

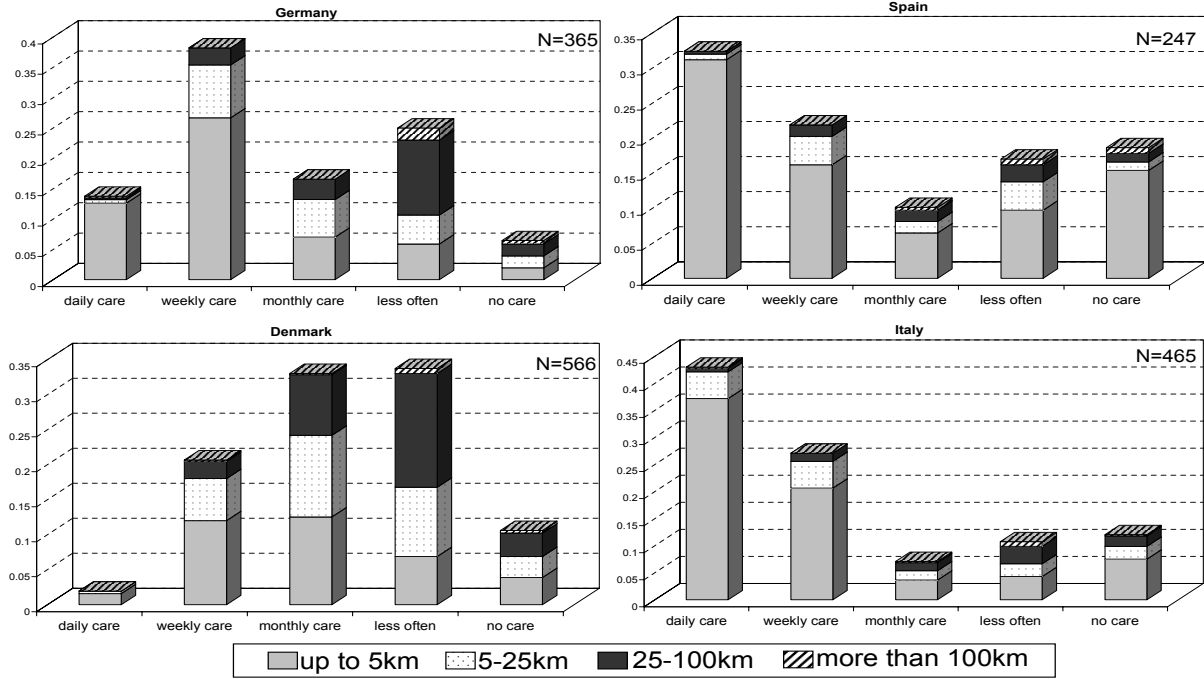
In this sense, free grandparent-provided child care seems to be the perfect solution for working mothers. However, in order to enjoy grandparent-provided child care on a regular basis, residence choices of adult children and elderly parents have to coincide. Data from the 2nd wave of the Survey of Health, Ageing and Retirement in Europe (SHARE) shows that the frequency of grandparent-provided child care is clearly linked to the geographical distance between caregivers and caretakers. Figure 1.2 displays the geographical distance between grandparents and their small grandchildren (younger than 10 years) together with the frequency of care provided, for Italy, Spain, Germany, and Denmark. As already suggested in Figure 1.1, the overall frequency of care varies strongly across the four selected countries, with Italian and Spanish grandparents clearly providing child care more frequently than German or Danish grandparents. However, similar across all countries, those who provide more frequent care tend to live close by.³

Hence, while grandparent-provided child care may induce positive effects on fertility and mothers' labor force participation, different from any other type of child care, it imposes spatial restrictions that might affect labor market outcomes negatively. 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 as mothers they are more likely to hold a regular full-or part time job. However, their wages are lower and they are more likely to incur daily commutes. We then build a general equilibrium model of residence choice, fertility decisions, and female labor force participation that can account for the relationships between grandparent-provided child care, fertility and labor market outcomes. We simulate our model to analyze how women's decisions on residence, fertility, and labor force participation change under different family

²US Census Bureau [2011].

³The same pattern can be observed across the rest of the countries included in the SHARE data set; see Figures A-1-A-3 of the Appendix A.

Figure 1.2: Frequency of Care and Distance to closest grandchild age 10 and younger



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

policies and how these decisions affect their wage income.

The current paper thus 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 general equilibrium model of fertility and labor force participation decisions. To the best of our knowledge, our paper is also the first one to document both costs and benefits of the geographical proximity between parents and adult children implied by grandparent-provided child care. The existing literature, on the contrary, has solely highlighted the positive implications of geographical proximity between parents and adult children. Holdsworth and Dale [2009] study labor force participation of mothers in Spain and Britain and estimate that for Spanish women whose parents live in the same town ('municipio') the probability of being in employment is 1.24 times higher than for those who do not live close to their parents. 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.

Our paper is also related to the literature on intergenerational transfers. The majority

of this literature focuses mainly on two aspects: (i) monetary transfers in terms of bequests from parents to children and (ii) time transfers in terms of care from children to elderly parents. One interesting paper regarding the latter aspect 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. Some of the few empirical works that consider time transfers from parents to children in form of grandparent-provided child care is Dimova and Wolff [2011] who look at data from the Survey of Health, Ageing and Retirement in Europe (SHARE) and find a positive effect on the extensive margin of female labor force participation but no effect along the intensive margin. For Italy, Arpino et al [2010] find that grandparent-provided child care increases in particular labor force participation of low educated mothers of young children. Other authors such as Smith Koslowski [2009] have focused on the costs that grandparent-provided child care implies for grandparents.

With this in mind, Cardia and Ng [2003] explicitly incorporate grandparents' decisions into a general equilibrium model for grandparent-provided child care. The authors suggest that subsidizing grandparents' time to be the most effective policy in terms of output and capital accumulation. However, different from the current paper, the authors do not consider the spatial restrictions and potential costs in terms of labor market outcomes implied by grandparent-provided child care. Both papers, that we view as complementary, are also part of the literature that uses general equilibrium models to assess how different public policies interact with family decisions.⁴ Greenwood, Guner and Knowles [2000] for instance, investigate the effect of the rise in the generosity of welfare payments on the rising incidence of single motherhood while García-Morán [2010] evaluates the effect of child care subsidies on female labor force participation, fertility and children's educational levels. She finds that child care subsidies promote employment, fertility and education, especially for children in single parent households. Erosa, Fuster and Restuccia [2010] develop a model of fertility choice and labor market decisions to account for the observed gender differences in job attachment, employment and earnings. Their aim is to provide a framework to study the interactions of fertility choice and labor market turnover in the determination of employment and wages. They argue that having this framework is important for the evaluation of family policies. Our aim is similar to these papers, as within a general equilibrium framework we assess the effects of different family policies on women's

⁴See Attanassio, Low and Sanchez-Marcos [2010], Guner and Knowles [2009] among others

decisions regarding residence, fertility, and labor force participation and we analyze how these decisions affect their labor market outcomes in the presence of spatial restrictions imposed by grandparent-provided child care. However, for the sake of tractability we abstain from several features present in the papers mentioned, such as a marriage market or employers' demand for labor.⁵ Also related to this paper is Bick [2010] who within a life cycle model 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 does he take into account the spatial restrictions that it imposes.

The remaining of this paper is organized as follows. The next section presents our empirical analysis. Section 3 presents the general equilibrium model. Section 4 describes our calibration strategy and Section 5 presents the results of the paper. In Section 6 we describe the mechanisms at work in greater detail and we perform two counterfactual experiments in Section 7. 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 sample 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 For our analysis we only consider women age 25 to 50 living in Germany. We exclude those born outside of Germany, given that 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 compared to individuals who were born in Germany. Given stark differences in mothers' labor force participation rates between East and West Germany, we introduce dummy variables to

⁵However, these features could be included in future analysis.

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

distinguish between individuals living in East and West Germany.⁷ In addition, high migration rates between East and West Germany lead us to differentiate also among those who moved from East to West Germany after 1989.⁸ To account for possible cultural differences, we also distinguish among those 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).

For our empirical analysis we make use of two alternative ways of measuring the effect of grandparent-provided child care. The first one is an indirect measure that consists of the variables 'where does mother live' and 'where does father live'. However, only during four waves of the survey (1991, 1996, 2001, and 2006) were participants 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. Thus, for our analysis we use an unbalanced sample of individuals with information on the relative residence of parents or in-laws and we pool observations from these four waves.⁹ We construct a dummy variable "parents close" that takes on value one for individuals whose mother, father, or in-law lives in the same neighborhood or town and another dummy variable "parents far" for individuals who live more than one hour or further away from their parents or in-laws. For individuals who live in the same house as their parents or in-laws we construct a different dummy variable "parents in same house", given that this particular form of co-residence often arises due to the need for intensive care of parents and in most cases represents a temporary living arrangement. This indirect measure reflects "potentially" provided child care by grandparents and thus proves particularly useful to test effects on fertility.

⁷Labor force participation rates for 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 first sample, labor force participation rates for women with small children (0-3 years) are 36% and 28% respectively for mothers from East and West Germany.

⁸In total we construct six dummy variables. To this end we use information on the region of residence at the time of the survey together with answers to the question "Where did you live in 1989?": (i) West German residents as of 1989 currently in West Germany, (ii) West German residents as of 1989 currently in East Germany, (iii) East German residents as of 1989 currently in East Germany, (iv) East German residents as of 1989 currently in West Germany and (v) Residents in foreign country as of 1989 in West Germany, and (vi) Residents in foreign country as of 1989 in East Germany.

⁹For 1991, we exclude individuals living in East Germany given that in this particular wave information for most labor market variables (participation, wages) are missing for these individuals.

Our second measure is a more direct one and uses the variable 'regular child care by relatives'. While this includes child care by any relative, grandparent-provided child care is the most common form of relative-provided child care and even for child care by relatives other than grandparents similar spatial restrictions apply. The variable 'regular child care by relatives', on the other hand is only available for the waves: 1997, 1999, 2000, 2001, 2002, 2004, 2005, and 2006. For our analysis we focus on individuals with children younger than six years and again we pool data from the available waves. We consider mothers of children age six and younger, given that children in Germany enter compulsory education at age six or seven, thus making child care particularly important for mothers of children age six and younger. We thus construct a dummy variable "child care by relatives" that takes on value one for all mothers with children younger than six years if relatives regularly take care of this child. Another dummy variable "child care nursery" takes on value one if the child of age six and younger is attending nursery school. Tables 2.1 and 2.2 provide weighted summary statistics for both samples, for both women and mothers.¹⁰ We also use individual weighting factors for all estimations.

Description of the sample Our first sample consists of 11,522 observations for women and 8,749 observations for mothers. In the second sample we have information for 30,919 and 6,074 observations for women and mothers of children age six or younger respectively. Both samples only include women between 25 and 50 years, with an average age of 37 to 38 years. With an average age of around 34 years, mothers in our second sample are slightly younger given that in this sample we only consider mothers of children age six and younger. Around two thirds of women and 75% of mothers in both samples are married and less than 1% has a nationality different from the German nationality. Approximately 70% of women between 25 and 50 in both samples have children and around 15% are mothers of small children of age up to three. Among both mothers and women, around 1% only completed primary education, 70% finished secondary education and around 30% completed tertiary education. For mothers this last percentage is slightly lower, while a larger fraction of mothers has completed secondary education. However, while around 40% of women have a regular full time job and only 24% hold a regular part time job, for mothers both percentages are similar of around 25% and 30% respectively in our first sample and very different with 11% and 25% in our second sample, that only considers mothers of children age 6 and younger. Slightly more women live in small and large communities than in medium sized communities.

¹⁰Unweighted statistics are very similar.

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

First Sample:	Women 25-50	Mothers 25-50
Age	37.20 (7.13)	38.66 (6.62)
Married, living together	0.63 (0.48)	0.77 (0.42)
Other than German nationality	0.009 (0.09)	0.006 (0.08)
Children	0.70 (0.46)	1
Children 0-3	0.16 (0.37)	0.23 (0.42)
Primary education	0.01 (0.10)	0.01 (0.10)
Secondary education	0.71 (0.45)	0.74 (0.44)
Tertiary education	0.28 (0.45)	0.25 (0.43)
Regular fulltime job	0.40 (0.49)	0.25 (0.44)
Regular part time job	0.24 (0.43)	0.30 (0.46)
Small community	0.39 (0.49)	0.43 (0.49)
Medium community	0.27 (0.45)	0.29 (0.45)
Large community	0.34 (0.47)	0.29 (0.45)
West German in West Germany	0.80 (0.40)	0.77 (0.42)
West German in East Germany	0.04 (0.19)	0.04 (0.19)
East German in East Germany	0.15 (0.36)	0.19 (0.39)
East German in West Germany	0.006 (0.08)	0.007 (0.08)
Other in West Germany****	0.001 (0.04)	0.001 (0.03)
Other in East Germany****	0.0002 (0.01)	0.0002 (0.01)
Parents or inlaws in same house	0.12 (0.32)	0.12 (0.32)
Parents or inlaws close	0.41 (0.49)	0.43 (0.50)
- Parents or inlaws in same neighborhood	0.18 (0.38)	0.19 (0.40)
- Parents or inlaws in same town	0.23 (0.42)	0.23 (0.42)
Parents or inlaws far away	0.47 (0.50)	0.46 (0.50)
- Parents or inlaws one hour away	0.30 (0.46)	0.30 (0.46)
- Parents or inlaws further away	0.17 (0.37)	0.15 (0.35)
Parents or inlaws in foreign country	0.005 (0.07)	0.006 (0.07)
Spouse' income*	2777.29 (1779.80)	2814.37 (1829.15)
Hourly wage**	12.43 (6.67)	12.17 (7.21)
Tenure in firm***	8.07 (7.12)	8.42 (7.30)
N	11,522	8,749

*Only taking into account strictly positive income ($N = 7629$, $N = 6366$ for mothers) **Only considering those working regular part or fulltime jobs, more than 20 hours a month, earning a strictly positive hourly wage ($N = 6208$, $N = 4168$ for mothers) *** Only those working regular part or fulltime jobs, more than 20 hours a month, earning a strictly positive hourly wage with firm tenure strictly positive ($N = 6146$, $N = 4130$, for mothers) ****Resided in foreign country in 1989

Table 2.2: Weighted Means (Std.) - GSOEP pooled sample -
-1997, 1999, 2000, 2001, 2002, 2004, 2005, 2006-

Second Sample:	Women 25-50	Mothers 25-50 of children age ≤ 6
Age	37.97 (7.14)	34.47 (4.71)
Married, living together	0.58 (0.49)	0.76 (0.43)
Other than German nationality	0.01 (0.11)	0.02 (0.13)
Children	0.70 (0.46)	1
Children 0-3	0.15 (0.35)	0.57 (0.50)
Primary education	0.01 (0.10)	0.009 (0.09)
Secondary education	0.71 (0.45)	0.73 (0.45)
Tertiary education	0.28 (0.45)	0.26 (0.44)
Regular fulltime job	0.40 (0.49)	0.11 (0.31)
Regular part time job	0.24 (0.43)	0.25 (0.43)
Small community	0.41 (0.49)	0.41 (0.49)
Medium community	0.27 (0.44)	0.31 (0.46)
Large community	0.33 (0.47)	0.28 (0.45)
West German in West Germany	0.75 (0.43)	0.79 (0.41)
West German in East Germany	0.05 (0.21)	0.05 (0.22)
East German in East Germany	0.19 (0.40)	0.15 (0.36)
East German in West Germany	0.006 (0.08)	0.009(0.09)
Other in West Germany*****	0.002 (0.04)	0.002 (0.04)
Other in East Germany*****	0.0002 (0.01)	0 (0)
Children in Nursery	-	0.64 (0.48)
Children cared for by relatives	-	0.35 (0.48)
Spouse' income*	2956.59 (1749.22)	3160.16 (1861.69)
Tenure in firm**	8.32 (7.44)	7.56 (6.47)
Distance to work***	17.55 (32.37)	14.59 (16.83)
Job in town***	0.54 (0.50)	0.55 (0.50)
N	30,919	6,074

*Only taking into account strictly positive income ($N = 19,148$, $N = 4,497$ for mothers)*** Only those working regular part or fulltime jobs, more than 20 hours a month, with firm tenure strictly positive ($N = 19,731$ $N = 2,144$, for mothers) ***Only those working regular part or fulltime jobs, more than 20 hours a month, with distance to work strictly positive ($N = 15,141$, $N = 1,684$, for mothers) ****Only those working regular part or fulltime jobs, more than 20 hours a month ($N = 19,882$, $N = 2,172$ for mothers)*****Resided in foreign country in 1989

The large majority (75-80%) of women and mothers in both samples are West Germans living in West Germany, followed by East Germans living in East Germany. Percentages of women who lived abroad in 1989 are negligible. Around 41% of women and mothers in the sample live in the same neighborhood or town as their parents or in-laws, while 12% live in the same house or household and around 47% live at least one hour away from their parents or in-laws. Considering only those women or mothers whose spouse has a strictly positive income, the average monthly spouse's income is around 3000€. ¹¹ Hourly wages of women and mothers who work regular part or full time jobs of more than 20 hours a month are around 12€. On average, these individuals have been with their current employer for the last 7 to 8 years. A little over half of all women in the second sample work and reside in the same town. Their average distance to work is between 15 to 18 kilometers.

Proximity to Parents and Fertility Women living in the same neighborhood or town as their parents or in-laws are 1.3 times more likely to have children. Table 2.3 displays odd ratios from the logit estimation for the probability of having children. Controlling for marital status, spouse's income, the size of the community, age, year effects, and education, geographical proximity to potential grandparents has a significantly positive effect on fertility. Concerning the other variables of the regression, the likelihood of being a mother for women in Germany between 25 and 50 is clearly positively influenced by their marital status. Being married raises the odds of having children by more than 5 times. Furthermore, higher spouse's income increases the odds as does being of a different nationality than the German one. Higher education reduces the odds as does living in a small or large community, relative to living in a medium-sized community. Living in the same house as parents or in-laws also increase the odds of having children but to a smaller extent than living in the same neighborhood or town. This difference could be due to the fact that this particular form of co-residence often arises due to the need for intensive care of parents or that it represents a temporary living arrangements for young women still living with their parents. ¹²

¹¹Note 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 1991 and 2006 (see Figure 1 in DIW [2009]).

¹²Results are consistent to the inclusion of a polynomial for age instead of age dummies as well as to using years of education instead of education dummies. 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 (see Table A.1 of the Appendix).

Table 2.3: Effect of close presence of grandparents on fertility
 Odd Ratios from Logit Estimation for Having Children

Married, living together	5.291***	(0.005)
Other than German nationality	1.222***	(0.005)
Log (Spouse'income)*	1.039***	(0.000)
Primary education (ISCED: 0,1)	2.014***	(0.008)
Tertiary education (ISCED: 5,6)	0.535***	(0.000)
Parents or inlaws close	1.322***	(0.001)
Parents or inlaws in same house	1.148***	(0.002)
Small community	0.890***	(0.001)
Large community	0.534***	(0.001)
Constant	0.245***	(0.001)
Observations	42,913,096	

*Missing values and values < 1 are set to 0.

Standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1 Logistic Estimation; Data: GSOEP unbalanced panel 91,96,01,06; Women 25-50. All regressions include age dummies, year dummies, as well as dummies for East and West Germany. Reference group: unmarried women age 25 living in West Germany who lived in West Germany in 1989, with education level 2 (ISCED: 2,3,4) in 1991, in a medium-sized town, far from parents or in-laws.

Proximity to Parents, Child Care by Relatives and Participation of Mothers

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. The probability to hold a regular part or full time job for mothers residing close to their parents or in-laws is around 5 percentage points higher compared to mothers residing further away. The first column of Table 2.4 displays the marginal effects from a probit regression for the probability of having a regular part or full time job in Germany for mothers age 25 to 50. In addition to the control variables of the first regression, we also include a dummy variable that indicates if the mother has a small child (age 0 to 3). The probability of holding a regular part-or fulltime job decreases strongly in the presence of a small child, decreases with marriage, and increases with tertiary education compared to secondary education. Contrary to our results for the estimation on fertility, living in the same house with parents or in-laws has a stronger effect on mother's labor force participation than simply living close by. This result might be due to the fact that if living in the same house as parents or in-laws is due to the need for intensive care for parents or represents a temporary living arrangement

this might detain women from having children. However, for women who have decided to become mothers living in the same house as parents or in-laws is most likely not related to the same type of situation. On the contrary, for mothers having parents or in-laws as close as possible facilitates their participation in the labor market.

Table 2.4: Effect of grandparent-provided child care on mothers' labor force participation
Marginal Effects from Probit Estimation for Mothers' Labor Force Participation

	Regular Part or Fulltime Job		Regular Part or Fulltime Job	
	(1)		(2)	
Children 0-3	-0.342***	(0.023)	-0.210***	(0.022)
Married, living together	-0.129***	(0.024)	-0.042	(0.026)
Other than German nationality	0.010	(0.125)	0.109	(0.100)
Log (Spouse' income)*	-0.000	(0.003)	0.000	(0.003)
Primary education (ISCED: 0,1)	-0.089	(0.084)	-0.073	(0.144)
Tertiary education (ISCED: 5,6)	0.200***	(0.019)	0.150***	(0.022)
Parents or in-laws close	0.053***	(0.019)		
Parents or in-laws in same house	0.069***	(0.025)		
Children cared for by relatives			0.226***	(0.021)
Children in nursery			0.124***	(0.021)
Small community	0.027	(0.021)	-0.008	(0.023)
Large community	0.015	(0.023)	0.035	(0.027)
Observations	8,749		7,054	

*Missing values and values < 1 are set to 0.

Standard errors in parentheses;*** p<0.01, ** p<0.05, * p<0.1; Probit Estimation; Data: GSOEP unbalanced panel

1) 91,96,01,06; mothers 25-50. Reference group: unmarried mothers age 25 with education level 2 (ISCED: 2,3,4) in

1991, in a medium-sized community in West Germany (who lived in West Germany in 1989), far from parents or

in-laws, with children older than 3. 2) 97,99,00,01,02,03,05,06; mothers (25-50) of children <= 6 years. Reference group:

unmarried mothers age 25 in 1997, with education level 2 (ISCED: 2,3,4), in a medium-sized town in West Germany

(who lived in West Germany in 1989), with children older than 3 who are nor in nursery nor cared for by relatives.

All regressions include age dummies, year dummies, as well as dummies for living and being from West or East Germany.

We obtain stronger results for our alternative analysis that uses the more direct measure 'child care by relatives' (see column two of Table 2.4). For mothers of children age six and younger, having relatives taking care of their child increases chances of holding a regular

full-or part time job by 22 percentage points, an effect much stronger than that caused by having the child attending a nursery school, associated to an increase of 12 percentage points. Hence, the net effect of relative-provided child care on the probability of holding a regular part-or fulltime job is given by the difference of 10 percentage points. For this alternative estimation, marginal effects of all other variables on the probability of holding a regular part-or fulltime job are similar, with the exception of the coefficient for being married and living together not being significant.¹³

Proximity to Parents and Wages While grandparent-provided child care seems to be a way to promote fertility and mothers' labor force participation, the required proximity to one's parents or in-laws may imply a cost given the spatial restrictions it imposes on one's potential labor market. In order to study the possible negative effect of living close to parents or in-laws on wage incomes of mothers we only consider wage incomes of dependent workers working regular full or part time jobs.¹⁴ All other individuals We exclude individuals who report to have worked regular full or part time jobs but who also report to have worked fewer than twenty hours a month and/or to have earned zero or negative hourly wages. Controlling for selection effects, we find that mothers living close to their parents or in-laws earn significantly lower hourly wages. The first column of Table 2.3 displays the coefficients for the Heckman selection model for log hourly wages for mothers in Germany age 25 to 50. While living close to parents or in-laws increases the probability of holding a regular part-or fulltime job, it reduces hourly wages by 4.3%.¹⁵

Concerning the other variables and controlling for selection effects (see column two of Table 2.5), hourly wages in Germany of mothers between 25 and 50 increase with firm tenure, each additional year increases hourly wages by 1.6%.¹⁶ Having tertiary education

¹³Again results are consistent to the way age and education are included. Marital status and spouse's income might be correlated with living close to parents or in-laws, and 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 these variables (see Table A.2 of the Appendix).

¹⁴The effect of spatial restrictions on wages is best measured by "living close to one's parents or in-laws", more so than by the fact if children are actually cared for by grandparents, because any effect on wages will be long-lasting even after children are grown up. This consideration together with the fact that our second sample only includes mothers of children age six and younger of which only 14% work fulltime (see Table 2.2) is the reason why we consider our first indirect measure of grandparent-provided child care to measure the effect on wages.

¹⁵Log monthly wages, controlled for by hours worked, show the same discount for living close (see Table A.3 of the Appendix). Not controlling for selection produces a similar discount of 5.5% (see Table A.4 of the Appendix for a simple OLS regression of log hourly wages).

¹⁶Note that coefficients of the selection equation and marginal effects for our participation equation (see column 1 of Table 2.2) are comparable but not equivalent due to the additional restrictions made on the sample.

rather than secondary education increases hourly wages by around 35%.¹⁷

Table 2.5: Effect of close presence of grandparents on hourly wages
Coefficients of Heckmann Selection Model for Mothers' Log Hourly Wages

	Log hourly wage		Selection Equation	
	(1)	(1)	(2)	(2)
Married, living together	-0.028	(0.017)	-0.417***	(0.043)
Other than German nationality	-0.045	(0.093)	0.185	(0.186)
Primary education (ISCED: 0,1)	0.106	(0.085)	-0.236	(0.154)
Tertiary education (ISCED: 5,6)	0.349***	(0.017)	0.520***	(0.037)
Parents or in-laws close	-0.043***	(0.016)	0.140***	(0.033)
Parents or in-laws in same house	-0.016	(0.023)	0.159***	(0.050)
Small community	0.010	(0.018)	0.080**	(0.037)
Large community	0.020	(0.019)	0.070*	(0.040)
Log (Spouse income)*			0.017***	(0.005)
Children 0-3			-0.950***	(0.044)
Tenure in firm	0.016***	(0.001)		
Constant	1.650***	(0.093)	-0.175	(0.146)
Observations	7,845		7,845	

*Missing values and values < 1 are set to 0.

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: unmarried mothers of age 25 of children older than 3 living in West Germany who lived in West Germany in 1989, with education level 2 (ISCED: 2,3,4) in 1991, in a medium-sized West German town, far from parents or in-laws. All regressions include age dummies, year dummies, as well as dummies for being from and living in East or West Germany.

Proximity to Parents and Commutes Lower wages are just one way in which costs of spatial restrictions may become apparent. Other costs may arise from longer commutes, as suggested by Rupert et al [2009] who looking at French data find that mothers in particular with small children who have low bargaining power as workers incur in longer commuting times. We find that for working mothers of children age six and younger the odds of residing and working in the same town are around 8% lower, and hence they are

¹⁷Again results are consistent to the way age and education are included. Marital status and spouse's income might be correlated with living close to parents or in-laws. Hence, we also check the robustness results to the exclusion of these variables (see Table A.5 of the Appendix).

more likely to have to incur in costly commuting if their children are regularly cared for by relatives. Table 2.6 displays odd ratios from the logit estimation for the probability of working and residing in the same town, i.e. not having to commute, for mothers in Germany age 25 to 50 with children of age six and younger.¹⁸ While having relatives caring for children on a regular basis increases chances of having to commute, having children in a nursery on the other hand, clearly increases the odds of being able to work and reside in the same town. These odds are also higher for foreign mothers, those living in large communities and mothers with primary education or a higher spouse’s income. Odds to work and reside in the same town, on the other hand, decrease with marriage, firm tenure, and tertiary education, and they are smaller for mothers living in small communities.¹⁹ Similarly, we find that distance to work is increasing in having relatives taking care of children (see Table A.7 of the Appendix).

Individual Fixed Effects We also try to exploit the panel nature of this data set and run individual fixed effect regressions. This allows us to control for unobservable individual heterogeneity (for instance in preferences for living close to one’s parents) which might be correlated with the outcome variables: having children or participating in the labor market. To this end, we consider two groups of women in Germany aged 25 to 50: (i) those who stayed in the sample from 1991 to 1996 and (ii) those remaining in the sample from 1996 through 2006.²⁰ Given the reduced size of the balanced samples, we join the variables “parents or in-laws in same house” and “parents or in-laws close” into one variable. As very few women become first-time mothers during the course of staying in the sample, none of the coefficients in individual fixed effect regressions for fertility turn out to be significant. Similarly, in individual fixed wage regressions for the two samples coefficients for the dummy variable “parents or in-laws close” are not significant. However, we can report significant estimates for the probability of holding a regular part-or full time job (see Table 2.5). Controlling for individual fixed effects, mothers living close to their parents or in-laws are more likely to hold a regular part-or fulltime job. Coefficients of other control variables of the individual fixed effect estimation are comparable to

¹⁸We exclude women who do not have a regular full or part time work as well as those reporting to have worked fewer than twenty hours a month. Contrary to the effect of grandparent-provided child care on wages, the effect on commuting is much more contemporaneous and can thus in principle be measured using any of the two measure. However, given data restriction we cannot provide results for commuting for our first sample (the question for commuting was introduced in 1997 into the GSOEP data set, thus is not available for 2 out of 4 years of our first pooled sample).

¹⁹Again results are consistent to the way age and education are included of the Appendix). Having a child in a nursery may be correlated with child care by relatives. Hence, we also check the robustness results to the exclusion of this variable (see Table A.6 of the Appendix).

²⁰Longitudinal weights were constructed as products of the cross-section weight of the first sample year considered and the inverse staying probabilities, as suggested in SOEP [2005].

Table 2.6: Effect of grandparent-provided child care on commutes
 Odd Ratios from Logit Estimation of Working and Residing in same town

Married, living together	0.543***	(0.001)
Other than German nationality	3.941***	(0.034)
Log (Spouse' income)*	1.050***	(0.000)
Primary education (ISCED: 0,1)	101.395***	(8.750)
Tertiary education (ISCED: 5,6)	0.829***	(0.002)
Tenure in firm	0.984***	(0.000)
Children cared for by relatives	0.920***	(0.002)
Children in nursery	1.391***	(0.003)
Small community	0.217***	(0.000)
Large community	2.347***	(0.006)
Constant	2.559***	(0.009)
Observations	5,876,535	

*Missing values and values < 1 are set to 0.

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1 Logit Estimation Data: GSOEP unbalanced panel, 97,99,00,01,02,03,05,06 , mothers 25-50 of children <= 6 years. Reference Group: unmarried mothers of age 25 in 1997 with education level 2 (ISCED: 2,3,4) in a medium-sized West German town (who for by lived in West Germany in 1989), with children older than 3, who are nor in nursery nor cared for by relatives. All regressions include age dummies, year dummies as well as dummies for being from and living in West or East Germany.

the marginal effects found for the pooled sample (see Table 2.2). While higher education increase the probability of holding a regular full-or part time job, marriage, having small children and a higher spouse's income negatively affect mothers' labor force participation, as does living in large communities compared to medium sized towns.

While we find a positive relationship between grandparent-provided child care and fertility, and grandparent-provided child care and regular labor force participation by mothers, on the other hand, we observe that for mothers, grandparent-provided child care is related to lower wages and longer commutes. From these opposing relationships a set of interesting questions arise: What are the net effects of grandparent-provided child care on aggregate employment and fertility? How costly is grandparent-provided child care for parents in terms of forgone wages and additional commutes? How valuable is grandparent-provided child care in terms of fertility and employment?. In order to answer these question, in the

Table 2.7: Grandparent-provided child care and participation
Coefficients of Individual Fixed Effects Estimation

	Regular Part or Fulltime Job	Regular Part or Fulltime Job
	(1)	(2)
Children 0-3	-1.857*** (0.006)	-1.985*** (0.005)
Married, living together	-1.933*** (0.012)	-1.504*** (0.007)
Log (Spouse'income)*	-0.041*** (0.001)	-0.104*** (0.001)
education level 3 (ISCED: 5,6)		0.819*** (0.006)
parents or in-laws close**	0.046*** (0.009)	1.150*** (0.006)
small community	1.077*** (0.013)	-0.944*** (0.011)
large community	-0.159*** (0.014)	-3.842*** (0.014)
Observations	380	450
Number of person.	190	225

*Missing values and values < 1 are set to 0. **includes in same house.

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; Fixed Effect Estimation Data: (other nationality and education level one omitted because of no within-group variance) (1) GSOEP balanced panel 91-96 (education level three omitted) (2) GSOEP balanced panel 96-06 mothers 25-50 Reference group: unmarried mothers with education level 2 (ISCED: 2,3,4) in a medium-sized town, living far from their parents or in-laws, with children older than 3. All regressions include age dummies, year dummies as well as dummies for and living in West or East Germany.

next section we present our model economy that explicitly takes into account the spatial restrictions of grandparent-provided child care. Our goal is to account for the relationships between grandparent-provided child care, fertility and labor market outcomes observed in the data. Hence, we then calibrate our model to the German economy along several key dimensions and highlight the model's mechanism behind women's decisions that can potentially generate the observed relationships. Finally, we perform several counterfactual exercises to analyze how women's decisions change when public policy changes.

3 The Model

We have a model of fertility and employment choice where individuals also decide where to live. They choose between living close or far from their parents, and thus whether to be able to access free child care and whether to access a restricted or unrestricted labor

market. We only model women's decisions and even though marriage and joint residence choices may have an important impact on the distance to ones' parents we do not model a marriage market in order to keep the analysis tractable.

The model economy is inhabited by a continuum of overlapping generations of female individuals of mass one. Individuals live for three periods, one as children (0-20 years), one as fertile adults (20-40 years), and one as old adults (40-60 years).²¹ Decisions in this economy are only taken by fertile adults. They decide where to reside - close to their parents or far away -, how many children to have, and how much time to spend working and how many resources to spend on their children's education - in terms of money and their own time. There is also a government in this economy that taxes labor income at rate τ , and may provide family benefits T conditional on having children and/or conditional on family income being below a certain threshold (\bar{T}). The government may also subsidize child care at rate ω . Individuals are born close to their parents so initially they reside in 'Home', H . If they decide to move they will reside in 'Far', F . We assume that moving away provides access to a labor market with better wage opportunities. The region of residence of each individual is denoted by j , where $j = H, F$.

Residence Choice Individuals decide whether to exclusively access the labor market of their region in order to stay close to their parents or whether to move away so as to access the labor market of the whole economy. Individual's residence choice, D is thus a binary variable that takes on value 0 if individuals reside close to their parents and 1 if their possible residence covers the whole economy

$$D = \begin{cases} 1 & \text{if } j = F \\ 0 & \text{if } j = H. \end{cases}$$

Endowments Individuals differ in productivity, x . As young adults, individuals randomly draw their productivity, x from a distribution with cdf $F(x)$ and density $f(x)$. Individuals' productivity is time invariant. Individuals are also endowed with one unit of productive time. They potentially dispose of an exogenous source of income (z) representing their spouse's income, where z is drawn from a distribution $g(z)$. The probability that a woman of type x has an exogenous income z is given by the matching matrix $\Pi(x, z)$.

²¹Availability of free child care obviously depends on grandparents being able to take care of grandchildren. Even though individuals might still work as old adults, we assume that there is some type of family network that takes care of children free of charge.

Working Choice Individuals can decide on the extensive and intensive margin of their labor force participation where l is the fraction of time they allocate to work.

They thus have the following after-tax wage income

$$w = (1 - \tau)(1 + D\kappa)xl,$$

where κ is the wage premium in region F . Therefore, individuals earn wages that depend not only on how productive they are, but also on their region of residence.

Children Individuals can have children when they are fertile. Children receive education depending on the resources that the mother decides to spend on the child. We denote by b the amount of money that an individual decides to spend on her children, and t is the amount of time that she dedicates to take care of the child. Time spent in child care (t_c) can enhance the child's education. We assume that time spent in child care is equal to the amount of time an individual is at work, and thus t_c is actually equal to l . The child's education function is denoted by

$$e = E(k, t, t_c, b).$$

Child care Individuals with children who work require child care. The price of child care, $p(D)$ depends on the individuals' residence choice in the following way: $p(0) = 0$ and $p(1) > 0$. Thus, if the individual lives close to her parents she obtains free child care, else she has to purchase child care at price $p(1)$. The individual might receive a subsidy ω from the government, thus actually paying $(1 - \omega)p(1)$ for each unit of time the child spends in child care.²²

Utility Fertile adults derive utility from consumption, children, and leisure. Let k be the number of children an individual decides to have. The utility that individuals enjoy each period is given by

$$U(c, 1 - l, k, e) = u(c) + u^l(1 - l) + u^e(k, e),$$

Children and old adults do not take any decisions. Children receive education and old adults continue to work as much as they did when they were young.

²²We assume that this subsidy is only paid to those individuals who purchase child care at price $p(1)$, i.e. to those living in Far.

Timing of Decisions When individuals become fertile adults, they observe their productivity and decide whether to reside close to their parents or not. After residence decisions have been taken, individuals have to decide how many children to have, and how to split their time between working, taking care of children, and leisure. Individuals move or not, they work the respective share of time, and if they have children, they might purchase child care if they live away from their parents, they decide on how many resources to devote to their children, and they consume. From then on, they remain in the chosen region of residence and take no further decisions.

Government The government in this economy collects labor income taxes τ , pays lump-sum transfers T conditional on having children and having an income below a certain threshold, \bar{T} , provides a child care subsidy, ω and consumes G . The budget constraint of the government has to be balanced each period.

$$(\tau)Y = G + P,$$

where Y is the total income in the economy and P is the amount of subsidies and transfers that the government pays out to individuals.

3.1 Value functions

We start by defining the value functions of old adults. In the last period of individuals' lives, residence decisions do not change and children are no longer present in the household. Thus old adults have neither benefits nor costs from children. Old adults derive utility from consumption and leisure.

Old adult living close An old individual who has not moved when young only has access to a restricted labor market. She has a source of extra income, $z(x)$ representing her husband's labor income. She has to choose how much to work when old. The value of being an old individual living close is given by

$$H^o(x, z(x)) = \max_l U(c, 1 - l, 0, 0)$$

subject to the following budget constraint

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

The old individual will pay taxes on her labor income and her husband's income. As she has no other expenditures, she will consume all of her disposable income. The optimal labor decision of an old individual living close is $L_o^c(x, z(x))$.

Old adult living away An old individual living further away earns more per unit of time than if she would had she stayed close to her parents. As her children do not live in her household anymore, she does not have to pay for child care. The value function for an old individual living far away is

$$F^o(x, z(x)) = \max_l U(c, 1 - l, 0, 0)$$

subject to the following budget constraint

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

Again she consumes all of her disposable income. The only difference between living further away and living at Home in the individuals' last period of life is that living further away implies higher wages per unit of time. Child care costs are no longer an issue as children are now young fertile adults. The optimal labor decision of an old individual living further away is $L_o^f(x, z(x))$.

Young fertile adult Young fertile adults have to decide whether to stay close to home or not. If they stay close they face a restricted labor market but they obtain free child care. If they move they earn a wage premium κ , but if they have children they have to pay child care costs per unit of time worked. Once they have decided where to live, they decide how much to work and how many children to have and how many resources to spend on educating their children. The value of being a young fertile woman remaining close to her parents ($D = 0$) is given by

$$H^y(x, z(x)) = \max_{k,l,t,b} U(c, k, e, l) + \beta H^o(x, z(x)),$$

subject to the following budget constraint

$$(1 - \tau)(xl + z(x)) + TI_{\bar{T}}I_k = c + b$$

and the education production function

$$e = E(k, t, t_c, b).$$

Note that young fertile adults living at home have access to free child care as they remain close to their parents. Thus, they spend an amount b of resources on their children and during a fraction t of their available time they take care of their children. If they work they leave their children under their grandparents' care. Women staying close to home work in a restricted labor market thus they do not earn as much as they could if they were living further away. If the individual has children and her family income is below the threshold \bar{T} she might receive some family benefits from the government, T . We denote by $I_{\bar{T}}$ the indicator function that takes on value one if the family income is below the threshold, \bar{T} . The indicator function I_k equals one if the individual has children. The continuation value of living at home is the value of being an old woman living at home given that there is no uncertainty about the future and no residence decisions are made in the last period of individuals' lives. For a woman living close to her parents or in-laws, the optimal decision regarding how much to work is denoted by $L_y^c(x, z(x))$, the optimal number of children is given by $K_y^c(x, z(x))$, and the optimal resources she spends on her children are $T_y^c(x, z(x))$, referring to the amount of time spent taking care of her children, and the amount of money spent on her children, $B_y^c(x, z(x))$.

If the individual decides to move away ($D = 1$), then the value of living further away is denoted by

$$F^y(x, z(x)) = \max_{k, l, t, b} U(c, k, e, l) + \beta F^o(x, z(x)),$$

subject to the following budget constraint

$$(1 - \tau)((1 + \kappa)xl + z(x)) + TI_{\bar{T}}I_k = c + (1 - \omega)p(1)l + b$$

and the education production function

$$e = E(k, t, t_c, b).$$

A young fertile adult living further away has to purchase child care at price $p(1)$ for each unit of time she decides to work. She has to decide how to divide her time between work, l taking care of her children, t , and leisure. She also decides on how much to spend on the education of her children, b . She also disposes of an additional source of income, $z(x)$. If her family income is below a certain threshold and she has children she receives family benefits from the government. Moreover, if she works, she might also receive child care subsidies, ω per unit of time her children spend in child care. Optimal decisions for a woman living further away are denoted by $L_y^f(x, z(x))$, $K_y^f(x, z(x))$, $T_y^f(x, z(x))$ and, $B_y^f(x, z(x))$.

Residence Decision Women have to decide whether to stay home or move away. They face a trade-off between higher wage rates and lower child care costs. They decide to move away if the utility of living further away exceed the utility of staying close by, i.e.

$$D(x, z(x)) = \begin{cases} 1 & \text{if } F^y > H^y \\ 0 & \text{otherwise.} \end{cases}$$

Equilibrium The optimal decision rules for fertile young adults are as follows: $L_y^j(x, z(x))$ is the labor decision, $T_y^j(x, z(x))$ is time spent with her children, $B_y^j(x, z(x))$ is the amount of money spent on children and $C_y^j(x, z(x))$ is the level of consumption, where $j = H, F$ denotes the region where the individual resides. Optimal decision rules for old individuals are as follows: $L_o^j(x, z(x))$ is the labor decision and $C_o^j(x, z(x))$ is the level of consumption, where $j = H, F$. The distribution of residence is given by $\Omega^j(x, z)$. Given a government policy $(\tau, T, \bar{T}, \omega, G)$, an initial distribution of women $\Omega(x)$, and an initial distribution of men $\Theta(z)$, a stationary equilibrium is a set of decision rules, a distribution of residential choices, and the number of children born, K such that

1. The decision rules are the solutions to the value functions.
2. The distribution of residential choices is consistent with the decisions.
3. The government budget is balanced.

4 Calibration Strategy

4.1 Functional Forms

In this part of the paper we present the explicit functional forms for the utility function and the education function. Individuals' utility is separable in consumption, children, and leisure. We assume log utility in consumption and in leisure, while the utility in children's quality is linear. There are two weighting parameters. The weighting parameter for children is denoted by ϕ_e and the weighting parameter for leisure in the utility function is ϕ_l . The weighting parameter for consumption is normalized to 1. The utility of an individual is thus given by

$$W(c, e, k, l) = \log(c) + \phi_e Q(e, k) + \phi_l \log(1 - l - t).$$

Individuals receive utility from the number of children in the household and from the level of education that their children have received. Following Becker and Tomes [1976], we

assume that there is a trade-off between the number of children in the household and the education that households can provide for their children which is represented by $Q(e, k)$. To obtain this quantity-quality trade-off regarding children in the utility function, we choose the following Cobb Douglas specification .

$$Q(e, k) = e^\lambda k^{1-\lambda},$$

where λ denotes the share of education in the production function of child quality.²³

The education production function depends on the woman's time spent taking care of the children, t , the amount of money spent on the education of children, b and the form of child care. Money and time are assumed to have a unit elasticity of substitution. The share of time spent taking care of children in the education production function is equal to θ . There are two types of child care: grandparent-provided child care and privately or publicly provided child care. Grandparent-provided child care is only available to those living close to their parents. We assume that both types of child care are equally productive in terms of education.²⁴

If women live far away from their parents, money can be spent on children in two different ways. If the mother works an amount of time, l her children have to spend that same amount of time in private or public child care and she has to pay an hourly cost of $p(1)$. Private child care enhances children's education. The other possible expenditure on children is b , which represents any other type of expenditure related to children's education. If the woman lives close to her parents she does not have to spend the money she would otherwise spend on child care. To her the price for child care is 0. Given that time spent with grandparents is assumed to be as productive as time spent in private or public child care, leaving her children with her parents while working is equivalent to investing in child care. The chosen functional form to represent the relationship between expenditure in private child care and other education related expenditure is of the CES type. The elasticity of substitution between these two types of expenditures is equal to $\frac{1}{(1-\rho)}$ and the weight of expenditures b is represented by α . This functional form is flexible enough to capture the degree of substitutability between these two different types of expenditure. We thus specify the functional form of the education function as

$$e = ((\alpha(b)^\rho + (1 - \alpha)l^\rho)^{\frac{1}{\rho}})^\theta t^{1-\theta}.$$

²³Other papers in the literature use this specification; see for instance Greenwood et al [2000].

²⁴However, this assumption can easily be relaxed.

4.2 Parameters

Some parameters of the model are fixed based on available evidence. We calibrate the model's remaining parameters to match several labor market statistics of the German economy as well as German data on fertility. Most statistics used for calibrating the remaining parameters come from the German Socio-Economic Panel (GSOEP). For our statistics we use pooled data from waves 1991, 1996, 2001, and 2006, in which information on the relative location of parents and adult children is available (see Section 2 for more details on the GSOEP). Finally, we have a set of policy parameters which we will set such as to represent German family policies. We only consider data on married women for our calibration.

In the model economy, there is an initial distribution of young women, $\Omega(x)$ and an initial distribution of men $\Theta(z)$. We assume a log normal distribution over types. We discretize the distribution to obtain different productivity levels, where the mean and standard deviation are denoted by μ_x and σ_x respectively for women and μ_z and σ_z for men. Women and men are matched according to the matching matrix $\Pi(x, z)$ where the probability that a woman of type x_1 (being the lowest type) meets with a man of the same type, z_1 is equal to ψ . In the benchmark calibration there are ten different types of individuals where the type refers to the productivity of the individual and hence we have ten types of different exogenous incomes. There will thus be a hundred different types of matches between a woman and an exogenous income (husband). The exogenous income z assigned to a woman of type x comes from the distribution $g(z)$.

Parameters set a priori are the discount factor β , parameters related to the productivity distribution over individuals $\mu_x, \mu_z, \sigma_x, \sigma_z$, the wage premium earned in Far, κ and the assortative matching parameter, ψ . One model period is equivalent to 20 years. The discount factor, β is set to match a yearly interest rate of 4%. Estimates for mean and standard deviation of the productivity distribution for women are taken from log-hourly wages in the GSOEP data, which gives us the following parameter values, $\mu_x = 2.44$ and $\sigma_x = 0.479$. Similarly for men we have $\mu_z = 2.98$ and $\sigma_z = 0.72$. As we abstain from modeling a marriage market we assign an exogenous income to each woman to represent her husband's income. To this end, we use a matching matrix that assigns this income to each woman based on information on who marries whom in the German economy. In order to build this matrix we take the degree of assortative matching, i.e. how likely it is to meet your own type, ψ in Germany from Fernandez et al. [2005]. The authors calculate this value to be 0.7 in Germany, i.e. 70% of each type of women matches with the exactly same type of men while the remaining 30% are equally likely to match with other types of men. From our regressions, we obtain that women living far from their parents earn

4.1% more than women who remain close to their parents (see Table 2.3). Therefore, we set κ equal to 0.041. Table 4.8 displays all parameters set a priori.

Table 4.8: Parameters based on a priori information

Parameter	Explanation	Value
β	Discount Factor	0.44
μ_x	mean log productivity of women	2.44
σ_x	standard deviation of women's log productivity	0.479
μ_z	mean log productivity of men	2.98
σ_z	standard deviation of men's log productivity	0.72
n	average working time of men	0.4
κ	wage premium for living far away	0.041
ψ	assortative matching parameter	0.7

Parameters to be calibrated are the utility parameters, ϕ_e, ϕ_l and the children's education parameters, $\lambda, \rho, \alpha, \theta$. Even though in a general equilibrium model all parameters affect all targets, we discuss briefly the data moments that each parameter is most likely to determine. The weight of children's quality in utility, ϕ_e is set to a value of 5, such as to match the difference in fertility between women living close to their parents or in-laws, 1.73 and those living far away, 1.69. The weight of leisure in the utility function, ϕ_l is given a value of 2.4 in order to match a labor force participation rate of 54% for married women in Germany. The share of the number of children in the quality-quantity trade-off function, λ is set to 0.47 in order to match a fertility rate of married women in Germany of 1.71.

Values for the three parameters of the education production function, ρ, α, θ are chosen such as to match data on expenditure on children as a percentage of average income, time spent with children by parental working status, and mothers' productivities. According to the German Federal Office of Statistics, in 2003, on average families spent 500 euros per month on each child. The average family income in Germany was 3,750 Euros per month in 2003 (German FSO) and German households with children have on average 1.9 children. Therefore, the expenditure on children for an average household is close to 10% of family income. The ratio of time that a working mother spends on her children in comparison to a non working mother is 0.65. We take this data from Ichino and Sanz de Galdeano [2004]. Using data provided by Sayer et al. [2004], we calculate the ratio of time a highly educated mother (corresponding to a highly productive woman in our

economy) dedicates to her children in comparison to a low educated mother to be equal to 1.4. Hence parameters ρ, α, θ of the education production function are assigned values 0.43, 0.8, and 0.58 respectively. Table 4.9 displays the calibrated parameters of the model.

Table 4.9: Calibrated Parameters

Parameter	Explanation	Value
ϕ_e	weight of children	5
ϕ_l	weight of leisure	2.4
λ	share of education in Q function	0.47
α	weight of b in the education function	0.8
ρ	elasticity parameter between b and child care	0.43
θ	share of expenditures in the education function	0.58

Finally, the model's policy parameters are the income tax rate, τ , and the family policy in terms of child care subsidies and family benefits, i.e. ω, T , and the threshold for eligibility of family benefits \bar{T} respectively. All working individuals pay a proportional tax, τ on labor income. We set τ to be equal 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 receive 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 the amount of *Kindergeld* as a percentage of average family income received by a family with the average number of children in Germany (1.9). Hence, T is set equal to 1.04. As all families receive this help, the threshold $I_{\bar{T}}$ is not binding and $\bar{T} = 0$. According to the same source, child care subsidies are negligible in Germany and therefore, we set child care subsidies (ω) to be equal to zero. 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 the price of child care per hour such that child care costs in our model economy matches the average cost in Germany. It takes the value of 0.32. All policy parameters are displayed in Table 4.10.

Table 4.10: Policy Parameters

Parameter	Explanation	Value
Calibrated		
T	Family Benefits	1.04
$p(1)$	cost of child care	0.32
Set a priori		
ω	child care subsidy	0
\bar{T}	eligibility threshold	0

5 Results: Benchmark Economy

In Table 5.11 we present data moments of our benchmark economy together with the corresponding data moments. Our model underestimates the labor force participation of

Table 5.11: Data and Model Moments

	Data	Model
Fertility rate	1.71	1.5
Labor force participation of married women	54.21	49.94
Difference in Fertility close vs far	1.02	1.09
Time spent with non-working vs working mother	1.32	1.2464
Time spent with high vs medium educated mother	1.08	1.1332
Expenditure on children as per cent of income	25	33.21
Child care costs as per cent of average income	9.1	2.0
Family benefits as per cent of income	10	10

married women by four percentage points. The share of women who participate in the labor market in Germany is equal to 54.21%, while in our economy this share is slightly below 50%. In terms of fertility and the fertility differential between women living close to and far away from their parents, the model does a fairly good job. The fertility rate in Germany is equal to 1.71 while in our economy it is equal to 1.5. The difference in fertility between women living close and far is not large and this is also true in our model. Regarding time spent by non working mothers with their children in comparison to time

spent by working mothers, the model predicts that non-working mothers spend 25% more time with their children than working mothers. In the data this number is 32%. As for differences in time spent with children by highly educated and medium educated women, we calculate this figure by assuming that medium educated women are those whose productivity is below the mean productivity of the economy. Our model overestimates the time that more educated mothers spend looking after their children by 5 percentage points. In our model, highly educated mothers spend 13% per cent more time with their children than medium educated mothers while according to German data this figure is approximately 8%. According to data, the average German family spends 25% of their income on children. In our model this number is equal to 33%. The model replicates well the amount of family benefits available in Germany. However, we underestimate the cost of child care. On average, the cost of child care is 9% of average income, while in our model it is only 2%.

Turning to other statistics of the model that have not been used for calibration (see Table 5.12). In Germany, women living close to their parents or in-laws participate more in the labor market compared to those living further away. This difference in participation rate is equal to 4 percentage points. We find that in the model there is also a difference but it is smaller than in the data. Even though in Germany there is a difference between participation rates of all women and mothers, our benchmark economy is not able to capture this given that under the current calibration scenario all women decide to have children. Our model also produces statistics on how many women move away from both parents or in-laws. In Germany, around 45% per cent of women live far from their parents (see Figure 1.2). In our model, only 20% per cent live far away from parents or in-laws. Therefore, given the conservative estimate of living away from parents, our model can account for around 40% of women moving in the German economy.

Table 5.12: Data and Model Moments: Not used for calibration

	Data	Model
Labor force participation of mothers	55.18	49.94
Labor force participation of mothers, close	56.55	49.96
Labor force participation of mothers, away	53.70	49.85
Labor force participation of women, away	53.31	49.85
Labor force participation of women, close	55.07	49.96
share of population moving away	45	20

6 Mechanisms at work: Who moves and who works

When women decide whether to move or not they face a trade-off between better labor market opportunities and free child care. If they move away they face better opportunities in the labor market. However, if they have children and they want to work, they will have to pay child care services for each unit of time they work. We represent better labor market opportunities by the fact that women who choose to live in the Far region earn a higher wage rate, receiving a wage premium, κ . If women decide to stay Home, they only have access to a restricted labor market and they earn their labor market productivity. However, if they have children, they have access to free informal child care. Thus we would expect high productivity type women to move away as they can afford to pay for child care if they work. However, the woman's exogenous income (husband's type) also plays an important role in the residence decision.

In our model we observe that high productivity type women who are married to relatively lower productivity type men move away from their parents and in-laws. In the Far region they earn more and they can afford the necessary child care costs. On the other hand, low productivity type women who are married to higher type men also move away. While these women could also afford to pay for child care, they decide not to work. In this case, the reason for moving is not a higher wage premium but the fact that if they remain close to their parents, they would find it optimal to work. However, if they move away, they will not work and they receive higher utility from leisure. Moving away and enjoying leisure is preferred to staying close and working. As these women dispose of a relatively high exogenous income they prefer not to work and their marginal value of leisure is higher in the Far region.

Remaining in the Home region are thus those women who have married similar productivity type men. In terms of the allocation of income according to the matching matrix, those who are on the diagonal of the matching matrix are the ones remaining close to parents or in-laws. Low productivity women who are married to low productivity men will work as their income effect dominates. While high productivity type women married to high productivity type men will also decide to stay close to parents and in-laws but not to work. They prefer to spend their time between leisure and taking care of their children. High productivity type women married to high productivity type men will not work in any of the two regions. Child care costs do not have any effect on their working decision.

We can thus identify four subgroups of women in our model: (i) low productivity type women married to low productivity type men, (ii) low productivity type women married

to high productivity type men, (iii) high productivity type women married to low productivity type men, and (iv) high productivity type women married to high productivity type men. Two sub-groups will remain close: the low-low productivity and the high-high productivity. Therefore, women in the diagonal of the matching matrix will remain in the Home region. The other two sub-groups will move to the Far region: low-high productivity and high-low productivity.

In Table 6.13 we display the share of women who move away in the model and in the data by these four sub-groups. In our model low productivity individuals are identified as the six lowest types on the productivity distribution while the high productivity individuals are the four highest types. The six lowest types represent 70% of the total population. This is equivalent to the share of individuals who have less education than college or tertiary type of education in Germany.²⁵ We see that all women belonging to the high-low subgroup and 77% of the low-high subgroup move away. Meanwhile, only around 11% of women in the low-low subgroup move away. The same is true for the high-high subgroup, where only also around 4% of them move away. The majority of women in these last two subgroups remain close to their parents or in-laws. However, in the data it looks like around 50% of individuals in each sub-group move away. Therefore, the model is underestimating the share of low-low and high-high couples who live away and we are overestimating the share of couples moving away from the two other sub-groups.

Table 6.13: % of women moving away by type and husband's type

	Low productivity men		High productivity men	
	data	model	data	model
Low productivity women	45	11.2	51	77
High productivity women	54	100	55	4.07

We find that women work less if they live far away from their parents or in-laws, even after controlling for education and wage of their spouses (see Table 2.2). Our model replicates this fact as in both regions there are both high productivity women, equivalent to high educated women, and low productivity women. And in both regions there are women who are married to high productivity type men and also low productivity type men. In

²⁵In the model, types refer to hourly wage rates. However, we are comparing productivity in the model to data on education of the women as some of these women might not be working and so their wage rate is zero. Therefore, we consider education to be a proxy for productivity.

the presence of child care costs, the existence of free informal child care arrangements allows mothers with low productivity to work. In absence of grandparents, their income would be too low to pay for child care costs and therefore they would not work. These are the women who remain in the Home region. Meanwhile women who have relatively high exogenous income will have a higher marginal value of leisure in the Far region and they will decide to move but will not work.

7 Counterfactual Experiment

First, we analyze a situation in which there are no grandparents available and everyone has to pay for child care. Under these conditions all women who are of higher productivity than their husbands will move away and all of them will work. Women whose husbands are of a higher productivity type will remain close and none of them will work. Women who cannot afford child care, stay close and are not able to participate in the labor market. Therefore, we observe a decrease in the participation rate of women. In a situation without informal child care arrangements, the labor force participation rate for married women drops to 12.37%, from approximately 50% in the benchmark economy. Also note that the share of women moving away decreases because the marginal value of leisure becomes the same in both regions as informal child care arrangements disappear. Table 7.14 provides the moments for this counterfactual experiment when there is no grandparent-provided child care available.

Table 7.14: No Grand-parent provided child care

	No grandparents	Benchmark economy
Fertility rate	1.36	1.5
Labor force participation of married women	12.37	49.94
Difference in Fertility close vs far	1.2	1.09
Labor force participation of women, away	1	49.85
Labor force participation of women, close	0	49.96
share of population moving away	12.37	20

In a second counterfactual experiment we consider a public policy meant to encourage mothers' labor force participation: child care subsidies. Child care subsidies are financed through taxes. Therefore, child care subsidies might imply higher taxes. This policy will

be government consumption neutral. Thus the amount of tax revenue collected that is going to government consumption is the same as in the benchmark economy. We consider subsidizing 50% care costs. Therefore, the policy parameter corresponding to child care subsidies, ω is set equal to 0.5.

We can see from Table 7.15 the effects of subsidizing half of the child care costs with respect to zero subsidy in the benchmark case. The fertility rate remains unaltered by this policy, even though it seems that women moving far now have fewer children as the ratio of fertility between close and far has increased. In terms of aggregate employment rate, there are no changes, the same percentage of women participate in the labor market as before which is consistent with some findings in the literature that argue that child care subsidies might not affect maternal employment but simply induce a shift from informal child care to formal child care, see Havnes and Mogstad [2011]. However, we find that if there is no informal child care available, some women will not work. In fact, there are still some women who cannot afford to work even if 50% of child care costs are subsidized. These women remain close to their parents so they have access to free child care. In particular, 10% of all women remain close and work as they still cannot afford the child care costs.

Table 7.15: Child care subsidized, $\omega = 0.5$

	$\omega = 0.5$	Benchmark economy
Fertility rate	1.54	1.5
Labor force participation of married women	49.94	49.94
Difference in Fertility close vs far	1.2	1.09
Labor force participation of women, away	95	49.85
Labor force participation of women, close	5	49.96
share of population moving away	49.74	20
Tax rate	0.38	0.37

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 mothers are more likely to hold a regular full-or part time job. However, we find that their wages are lower and they are more likely to incur daily commutes. We build a general equilibrium 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, women's labor force participation and other dimensions related to time spent with children and expenditures made on children. We then perform two counterfactual exercises to analyze the effect of grandparent provided child care and publicly provided child care on women's decisions. We find that if there is no grandparent-provided child care, there are fewer women participating in the labor market. They cannot afford child care costs and hence they decide not to work. In addition, fertility decreases. This is consistent with empirical evidence showing that having access to free child care increases fertility. We also show that subsidizing 50% of child care costs does not increase aggregate women's employment rates with respect to the benchmark case. However, most of the women working before move away and thus labor mobility is increased. Still, 10% of all women remain close to their parents or in-laws and work. These women still cannot afford these reduced child care costs. In this sense it seems that providing child care subsidies does not increase women's labor market participation but rather encourages labor mobility. However, in the absence of child care subsidies, grandparent-provided child care plays an important role by allowing some women to work.

In this paper we simply assumed that being close to one's grandparents' implies that grandparents take care of their grandchildren and we do not consider grandparents' decisions to provide or not child care to their grandchildren. However, this decision might be very related to individuals' retirement age and 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 mother who is actively participating in the labor force could increase chances for women to also do so, while a negative effect could come from the fact that a grandmother actively participating in the labor market might be less likely to provided child care for her grandchild. We consider further analysis of how late first birth and improved health after retirement might interact with these aspects a very interesting road for future research. Another interesting path for future research could be to consider the macroeconomic effects of spatial restrictions imposed by grandparent-provided child care on optimal labor mobility and the optimal allocation of talent.

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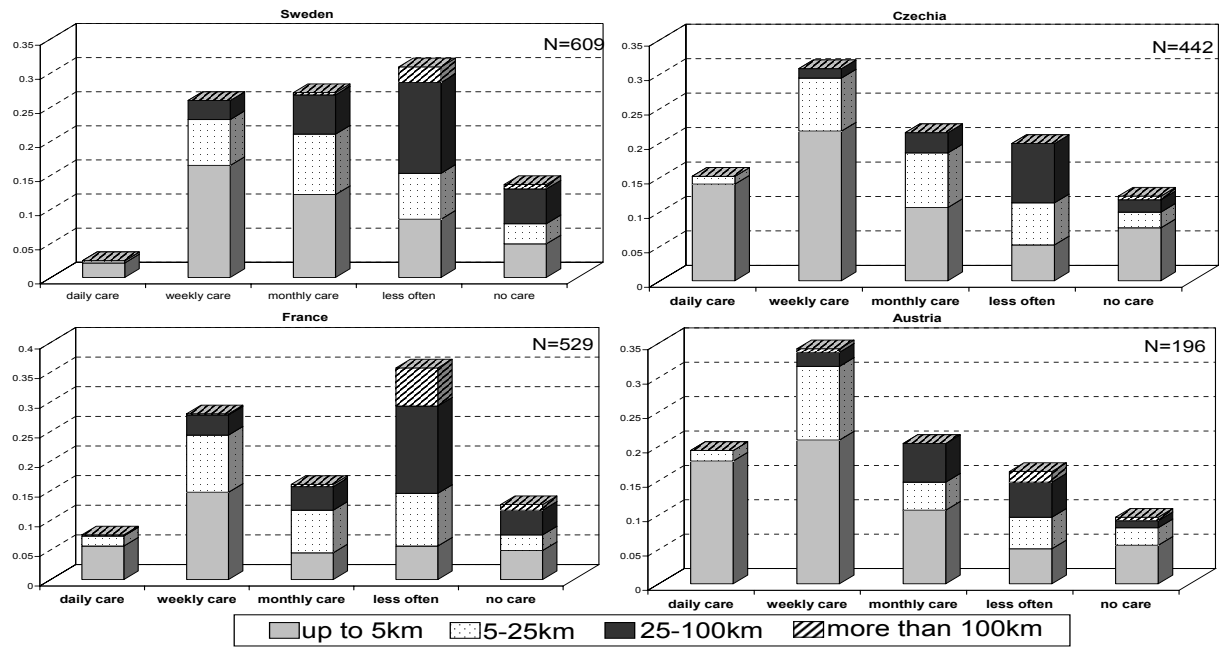
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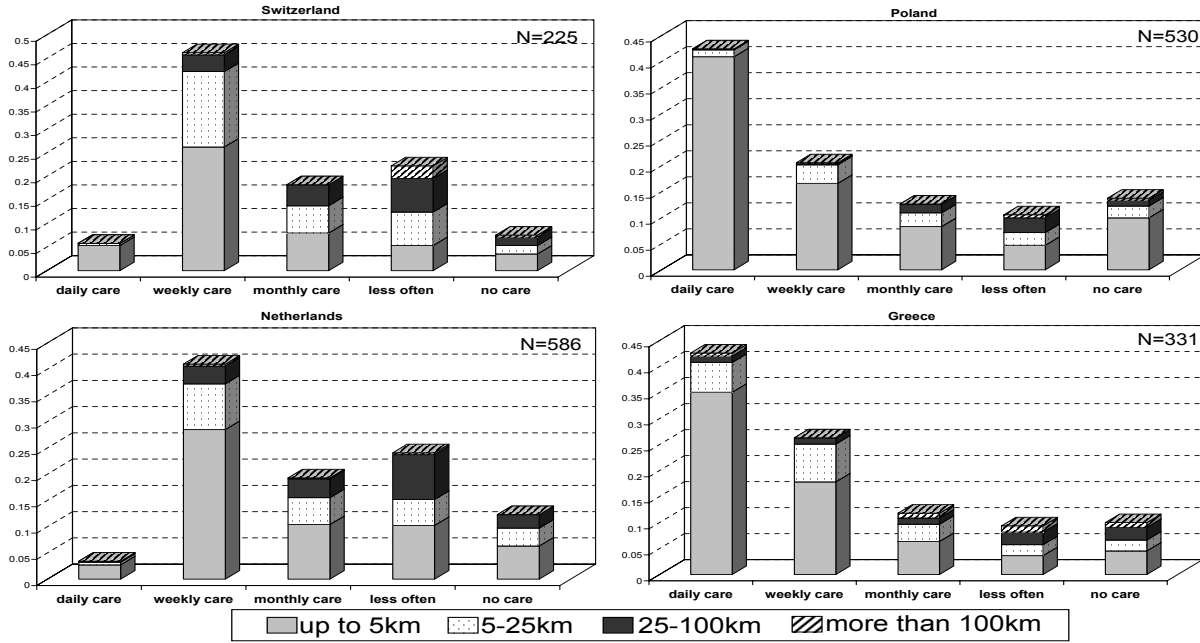
A Appendix

Figure A-1: Frequency of Care and Distance to closest grandchild age 10 and younger



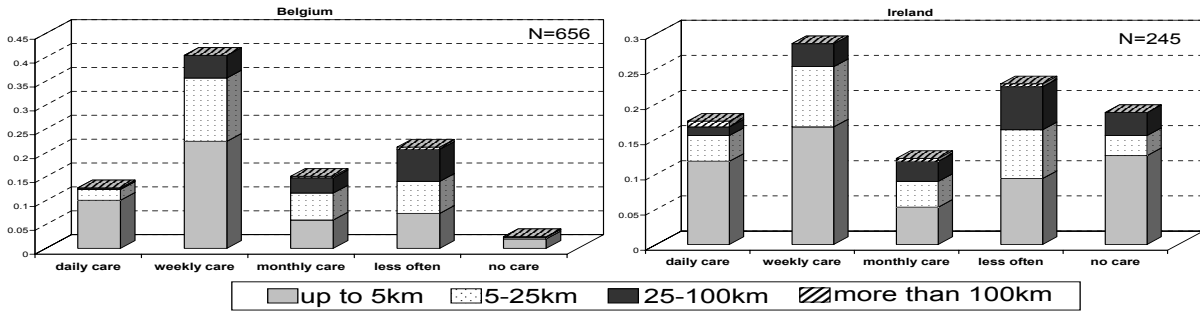
Data: Survey of Health, Ageing and Retirement in Europe (SHARE), 2nd wave.

Figure A-2: Frequency of Care and Distance to closest grandchild age 10 and younger



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

Figure A-3: Frequency of Care and Distance to closest grandchild age 10 and younger



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

Table A.1: Effect of close presence of grandparents on fertility
 Odd Ratios from Logit Estimation for Having Children exclusive of marital status and
 spouse's income

Other than German nationality	1.527***	(0.006)
Primary education (ISCED: 0,1)	1.540***	(0.005)
Tertiary education (ISCED: 5,6)	0.548***	(0.000)
Parents or inlaws close	1.458***	(0.001)
Parents or inlaws in same house	1.282***	(0.002)
Small community	1.011***	(0.001)
Large community	0.463***	(0.001)
Constant	0.584***	(0.001)
Observations	42,930,293	

Standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1 Logistic Estimation; Data:
 GSOEP unbalanced panel 91,96,01,06; Women 25-50. All regressions include age dummies,
 year dummies as well as dummies for East and West Germany. Reference group: women
 age 25 living in West Germany who were living in West Germany in 1989, with education
 level 2 (ISCED: 2,3,4)in 1991, in a medium-sized town, far from parents or in-laws.

Table A.2: Effect of grandparent-provided child care on participation
Marginal Effects from Probit Estimation for Mothers' Labor Force Participation without
variables posing a possible endogeneity problem: (1): marital status and income of
spouse and (2): child care by nursery

	Regular Part or Fulltime Job		Regular Part or Fulltime Job	
	(1)		(2)	
Children 0-3	-0.350***	(0.023)	-0.272***	(0.020)
Married, living together			-0.040	(0.026)
Other than German nationality	-0.021	(0.123)	0.116	(0.101)
Log (Spouse' income)*			0.001	(0.003)
Primary education (ISCED: 0,1)	-0.068	(0.081)	-0.091	(0.134)
Tertiary education (ISCED: 5,6)	0.195***	(0.019)	0.153***	(0.022)
Parents or in-laws close	0.048**	(0.019)		
Parents or in-laws in same house	0.059**	(0.025)		
Children cared for by relatives			0.229***	(0.021)
Small community	0.018	(0.021)	-0.007	(0.023)
Large community	0.020	(0.023)	0.038	(0.026)
Observations	8,757		7,054	

*Missing values and values < 1 are set to 0.

Standard errors in parentheses;*** p<0.01, ** p<0.05, * p<0.1; Probit Estimation; Data: GSOEP unbalanced panel

1) 91,96,01,06; mothers 25-50. Reference group: mothers age 25 with education level 2 (ISCED: 2,3,4) in

1991, in a medium-sized community in West Germany (who were living in West Germany in 1989), far from parents

or in-laws, with children older than 3. 2) 97,99,00,01,02,03,05,06; mothers (25-50) of children <= 6 years. Reference

group: unmarried mothers age 25 in 1997, with education level 2 (ISCED: 2,3,4), in a medium-sized town in West

Germany (who were living in West Germany in 1989), with children older than 3 who are not cared for by relatives.

All regressions include age dummies, year dummies, as well as dummies for living and being from West or East Germany.

Table A.3: Effect of close presence of grandparents on monthly wages
Coefficients of Heckmann Selection Model for Mothers' Log Monthly Wages

	Log hourly wage		Selection Equation	
	(1)		(2)	
Married, living together	-0.064***	(0.018)	-0.422***	(0.043)
Other than German nationality	-0.021	(0.096)	0.189	(0.186)
Primary education (ISCED: 0,1)	0.128	(0.088)	-0.240	(0.153)
Tertiary education (ISCED: 5,6)	0.335***	(0.018)	0.517***	(0.037)
Parents or in-laws close	-0.051***	(0.016)	0.141***	(0.033)
Parents or in-laws in same house	-0.021	(0.024)	0.156***	(0.050)
Small community	0.017	(0.018)	0.082**	(0.037)
Large community	0.046**	(0.020)	0.072*	(0.040)
Log (Spouse' income)*			0.018***	(0.005)
Children 0-3			-0.945***	(0.044)
Tenure in firm	0.016***	(0.001)		
Monthly hours worked	0.007***	(0.000)		
Constant	5.560***	(0.098)	-0.183	(0.146)
Observations	7,845		7,845	

*Missing values and values < 1 are set to 0.

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: unmarried mothers of age 25 of children older than 3 with education level 2 (ISCED: 2,3,4) in 1991, in a medium-sized West German town, far from parents or in-laws. All regressions include age dummies, year dummies, as well as dummies for being from and living in East or West Germany.

Table A.4: Effect of close presence of grandparents on hourly wages
Coefficients of Simple OLS Estimation of Mothers' Log Hourly Wages

Married, living together	-0.003	(0.016)
Other than German nationality	-0.073	(0.090)
Primary education (ISCED: 0,1)	0.112	(0.083)
Tertiary education (ISCED: 5,6)	0.319***	(0.015)
Tenure in firm	0.016***	(0.001)
Parents or inlaws close	-0.056***	(0.015)
Parents or inlaws in same house	-0.028	(0.022)
Small community	0.001	(0.017)
Large community	0.014	(0.018)
Constant	1.801***	(0.085)
Observations	4,158	
R-squared	0.263	

*Missing values and values < 1 are set to 0.

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.

All regressions include age dummies, year dummies, as well as dummies for East and West Germany. Reference group: unmarried women age 25 living in West Germany who were living in West Germany in 1989, with education level 2 (ISCED: 2,3,4) in 1991, in a medium-sized town, far from parents or in-laws.

Table A.5: Effect of close presence of grandparents on hourly wages
Coefficients of Heckmann 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)	
Other than German nationality	-0.134*	(0.076)	-0.309**	(0.135)
Primary education (ISCED: 0,1)	-0.162	(0.102)	-0.606***	(0.174)
Tertiary education (ISCED: 5,6)	0.297***	(0.015)	0.429***	(0.036)
Parents or in-laws close	-0.055***	(0.014)	0.081***	(0.033)
Parents or in-laws in same house	-0.058***	(0.021)	0.081*	(0.047)
Small community	-0.031*	(0.016)	-0.026	(0.036)
Large community	0.061***	(0.018)	0.063	(0.041)
Children 0-3			-1.010***	(0.045)
Tenure in firm	0.016***	(0.001)		
Constant	1.601***	(0.098)	-0.304**	(0.155)
Observations	8,127		8,127	

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 of children older than 3 living in West Germany who lived in West Germany in 1989, with education level 2 (ISCED: 2,3,4) in 1991, in a medium-sized West German town, far from parents or in-laws. All regressions include age dummies, year dummies, as well as dummies for being from and living in East or West Germany.

Table A.6: Effect of grandparent-provided child care on commutes
 Odd Ratios from Logit Estimation of Working and Residing in same town without
 variable posing a possible endogeneity problem - child care by nursery

Married, living together	0.547***	(0.001)
Other than German nationality	4.197***	(0.036)
Log (Spouse' income)*	1.047***	(0.000)
Primary education (ISCED: 0,1)	83.236***	(7.182)
Tertiary education (ISCED: 5,6)	0.826***	(0.002)
Tenure in firm	0.984***	(0.000)
Children cared for by relatives	0.932***	(0.002)
Small community	0.217***	(0.000)
Large community	2.311***	(0.006)
Constant	3.153***	(0.011)
Observations	5,876,535	

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1 Logit Estimation Data: GSOEP unbalanced panel, 97,99,00,01,02,03,05,06 , mothers 25-50 of children <= 6 years. Reference Group: unmarried mothers of age 25 in 1997 with education level 2 (ISCED: 2,3,4) in a medium-sized West German town (who lived in West Germany in 1989), with children older than 3, who are not cared for by relatives. All regressions include age dummies, year dummies as well as dummies for being from and living in West or East Germany. *Missing values and values < 1 are set to 0.

Table A.7: Effect of grandparent-provided child care on distance to work
Coefficients of OLS Estimation of Distance to Work

Married, living together	2.876***	(0.018)
Other than German nationality	-8.991***	(0.062)
Log (Spouse' income)*	0.390***	(0.003)
Primary education (ISCED: 0,1)	-13.281***	(0.097)
Tertiary education (ISCED: 5,6)	3.888***	(0.017)
Tenure in firm	-0.018***	(0.001)
Children cared for by relatives	1.190***	(0.016)
Children in nursery	-3.745***	(0.020)
Small community	2.792***	(0.019)
Large community	-1.297***	(0.022)
Constant	11.636***	(0.030)
Observations	4,766,395	

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1 Logit Estimation Data: GSOEP unbalanced panel, 97,99,00,01,02,03,05,06 , German mothers 25-50 of children <= 6 years. Reference Group: unmarried West German mothers of age 25 in 1997 with education level 2 (ISCED: 2,3,4) in a medium-sized West German town, with children older than 3, who are nor in nursery nor cared for by relatives. All regressions include age dummies, year dummies as well as dummies for being from and living in West or East Germany.

*Missing values and values < 1 are set to 0.