The effect of grandchildren on grandparental labour supply: Evidence from Europe[1]

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Abstract: Grandparents at working-age spend a considerable amount of time taking care of their grandchildren. These time transfers might imply economic trade-offs regarding the participation in the labour market. Using an instrumental variable strategy and multiple waves of the Survey of Health, Ageing and Retirement in Europe (SHARE), we estimate the causal effect of grandparenthood on the labour supply of working-age grandparents in ten European countries. In our preferred specification, we find a large negative impact of grandparenthood on the labour supply of women aged 55 to 64. This effect is particularly pronounced following the arrival of the first grandchild and for grandmothers who live in close distance to their offspring. It further operates at the extensive margin of labour supply, resulting in grandmothers leaving the labour market entirely. By contrast, male labour supply does not significantly adjust in response to grandparenthood. Our results imply a relevant trade-off between labour supply and grandchild care for European women of later working age.

Keywords: Labour Supply, Grandparents, Child Care, Retirement

JEL Codes: D19, J13, J14, J22

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1. Introduction

Being a grandparent is a widespread characteristic among European adults during the final decade of their working life. Averaging across ten European countries[3] between 2004 and 2017, 45% of women at age 55 are already grandmothers. Till age 64, this share rises to 75%. Over the same age span, the share of grandfathers among men more than doubles from 30% to 68%.

In turn, a large proportion of grandparents spend a considerable amount of time taking care of their grandchildren (Table 1). More than one out of five (22%) grandmothers state that they take care of at least one of their grandchildren on a daily basis, while an additional 35% do so on a weekly basis. A smaller fraction (15%) of grandfathers care daily for at least one of their grandchildren, but additional 33% of them care weekly.

Table 1: Characteristics of grandparents and non-grandparents aged 55-64 years

	Grandparents		Not Grandparents	
	Women	Men	Women	Men
Share who care daily	0.229	0.154	-	-
Share who care weekly (w/o daily)	0.352	0.333	-	-
Labour force participation rate	0.378	0.445	0.520	0.607

Notes: The table reports summary statistics on the intensity of care taking for grandchildren and the labour force participation by grandparent status and by gender. Sample: SHARE waves 1, 2, 4, 5, 6, 7. Individuals aged 55-64 who have at least one child aged 14 or older. Calibrated individual weights are applied.

Grandparents of working age who commit to regular caretaking of their grandchildren may find themselves more time-constrained regarding other activities than grandparents who do not commit in a similar fashion or individuals of the same age who are not grandparents. Reductions in leisure time and formal labour supply are natural candidates for freeing up temporal resources when grandchildren arrive. Indeed, while 52% of women and 61% of men who are not grandparents between age 55 and 64 participate in the formal labour market, the labour force participation rates among grandparents of the same age group are approx. 15 percentage points (pp) lower for both men and women.

Displaying the evolution of grandparenting and labour force participation over the late working age provides an even stronger indication of a substantial trade-off between the two variables: As shown in Figure 1, the labour force participation rates of both women and men between age 50 and 70 decline monotonically as the shares of grandparents among them rise in an equally monotonic way.

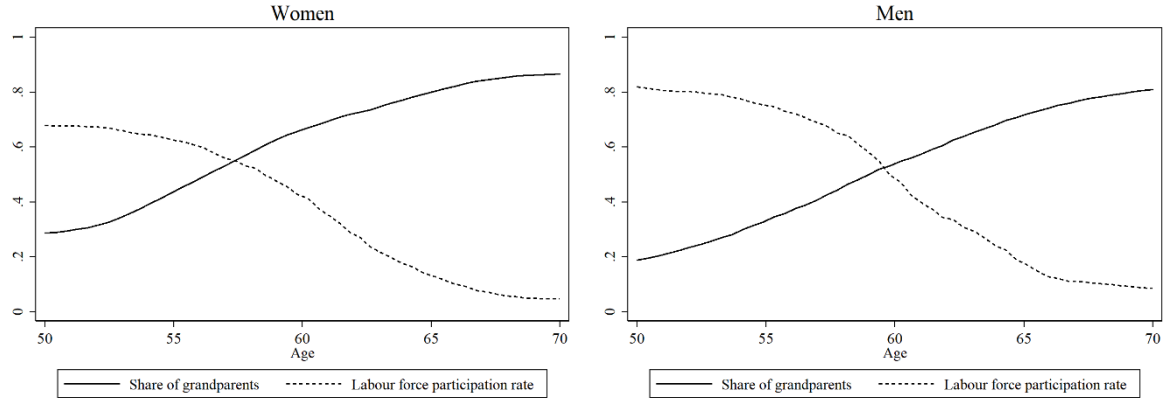

Figure 1: *Grandparenting and labour force participation. Sample: SHARE waves 1, 2, 4, 5, 6, 7. Individuals aged 50-70 who have at least one child aged 14 or older. Calibrated individual weights are applied.*

[3] Austria, Belgium, Denmark, France, Germany, Italy, the Netherlands, Spain, Sweden and Switzerland.

Clearly, this inverted pattern does not yet imply that the decline in labour force participation is caused by the increasing presence of grandchildren in the family. In fact, the fall in the labour supply of grandparents could be driven by numerous observable and unobservable characteristics which differ between grandparents and non-grandparents and which influence their respective labour supply decisions. For example, grandparents are on average 1.2 years older than non-grandparents even within this relatively narrow age bracket and labour force participation generally decreases steeply towards retirement age. However, the hypothesis that grandparenthood itself might exert a negative and causal effect on labour supply particularly in this late stage of working life has only recently received more attention in empirical research.

The limited, but growing evidence accumulated by this literature suggests that the labour supply of grandparents and grandmothers in particular is not orthogonal to the arrival of grandchildren. Rupert and Zanella (2018) find that on average, working women in the US reduce their labour supply by about 30% when they become grandmothers, relative to women who are not (yet) grandmothers. Grandfathers, in turn, do not show a significant response. The results of Asquith (2018), who also exploits US data, suggest that grandmothers are 8.5% more likely to be retired in response to a grandchild, while they reduce their labour supply by 120 hours per year on the intensive margin (equivalent to 14% of annual hours worked). Frimmel et al. (2019) estimate from Austrian data that becoming a grandmother increases the probability of exiting the labour market by approximately 8.5 percent.

These recent studies differ from earlier important contributions such as Hagestad (2006) and Ho (2015) in the sense that the former put greater emphasis on identifying the *causal* effect of the arrival of grandchildren on the labour supply of the grandparents. They propose instrumental variable strategies for dealing with the potential endogeneity of grandparental labour supply and the presence of grandchildren. The endogeneity problem arises from the conjecture that the arrival of grandchildren might depend on labour market characteristics of grandparents if these characteristics were taken into account by the grandchildren's parents. Rupert and Zanella (2018) instrument the grandparenthood status with the gender of the grandparents' first-born child. Their reasoning is that on average, women become mothers earlier than men become fathers, which is the case according to their data. A female first-born child hence represents an exogenous shock to the probability that this child in turn has children while its parents are still of working age. Asquith (2018) exploits state-year variation in access to various contraceptives to instrument fertility patterns in the US. Frimmel et al. (2019) combine a timing-of-events design with a twin-birth instrument.

Identifying the causal effect of grandparenthood on labour market participation is important for designing and implementing public policies towards parental leave, the provision of childcare and the prospective labour supply of cohorts at grandparent age. Extensive involvement of grandparents in the rearing of grandchildren may explain why some studies find a relatively small impact of more generous childcare policies on parental labour supply (Havnes and Mogstad, 2011; Bick, 2016). Making public childcare more accessible may hence substitute for both mothers' *and* grandmothers' childcare provision. A similar effect may play out for subsidized parental leave.

In addition, if the labour supply response of grandparents to grandparenthood is large in an economic sense (as both the existing evidence and our results suggest with regard to grandmothers), then changes in fertility patterns and childlessness may have substantial effects on the labour supply of older cohorts of workers with a long time lag. While we do not observe a change in the share of women being grandparents (at a given age) over our sample period 2004-2017, such changes will occur for a number of European countries over the coming decade due to a sustained increase in childlessness among women since around 1950 (Sobotka, 2017). Hence, demographic forces would ceteris paribus increase the labour supply of older cohorts in the future via a reduced number of grandchildren.

In this study, we estimate the causal effect of grandparenthood on grandparental labour supply in the European context. We use data from several waves of the Survey of Health, Ageing and Retirement in Europe (SHARE) (Börsch-Supan et al., 2013). The survey provides representative information on labour supply, parenthood and grandparenthood status of individuals in later age across a wide range of European countries. Regarding the various instrumentation strategies suggested by the literature, the SHARE data are not spatially disaggregated enough to construct an instrument in the spirit of Asquith (2018) that exploits subnational spatial variation across different years. Further, the data do not contain sufficiently many twin birth cases to adopt the approach of Frimmel et al. (2019). Hence, we follow the identification strategy of Rupert and Zanella (2018) and instrument the grandparenthood status with the gender of the first-born child. We present evidence that the First Child Female instrument is highly relevant for explaining grandparenthood at any given age in our European sample. We then estimate that grandparenthood has a negative, sizeable and significant effect on the extensive margin of grandmothers' labour force participation. The intensive margin, in turn, remains unaffected. We find no statistically significant adjustment in the labour supply of grandfathers in response to grandchildren. Complementary to their time transfers, we find some evidence that grandmothers also transfer more gifts to their descendants than women who do not have grandchildren. To the best of our knowledge, this paper is the first to present evidence on the causal effect of grandchildren on the labour supply of grandparents in the European context.

2. Data

We use waves 1, 2, 4, 5, 6 and 7 of SHARE (Börsch-Supan, 2019a-f), which span the periods 2004-2007 and 2011-2017. The harmonized data structure of SHARE allows us to merge the different waves into one dataset. Wave 3, disseminated also as SHARELIFE, is a retrospective survey which does not provide information on grandchildren, which is why we omit it. However, we use the SHARE Job Episodes Panel (Brugiavini et al., 2019a, 2019b) generated from retrospective information collected in wave 3 and wave 7 of SHARE.

More countries are added to SHARE in later waves. In order to maintain a consistent sample across waves, we use only observations from the ten countries that have been surveyed since wave 1. These countries are Austria, Belgium, Denmark, France, Germany, Italy, the Netherlands, Spain, Sweden and Switzerland. Dutch participants were for once surveyed online in wave 6. For reasons of comparability, we exclude this wave from the Dutch sample.

Table 2 presents summary statistics on our sample. Individual age is restricted to at least 55 years and less than 65 years. This choice is motivated by the fact that labour force participation above age 64 is very low across European countries. SHARE records a wide range of demographic and socioeconomic characteristics, among them whether an individual is active in the labour market and the individual hours worked in the main job and, if applicable, in the secondary job. Hence, we can examine the impact of grandparenthood on both the extensive and the intensive margin of labour supply.

Further, an individual must have at least one child aged 14 or older in order to be included in the sample; i.e. the individual must be a potential grandparent. SHARE reports gender and year of birth of the children of the survey participants, which is crucial for the construction of our instrumental variable.

The survey also reports the number of grandchildren that a respondent has, so we know whether an individual is a grandparent at a given age. However, it does not generally report the year of birth of grandchildren. This specific information is not necessary for our identification strategy, but it is helpful for validating the claim that respondents that have a female first child become grandparents earlier than respondents with a male first child. SHARE reports the age of birth of the *youngest* grandchild, from which we can compute the age at which an individual initially became a grandparent for grandparents that have only one grandchild at a given point in time. Statistics and regressions reported in the

following that utilise this information are consequently based on a relatively small subsample of grandparents.

Table 2: Summary statistics by grandparent status and gender

	All individuals	Grandparents	Grandmothers	Grandfathers
Age	59.3	59.9	59.9	60
Male	0.449	0.397	0	1
Cohabiting	0.718	0.708	0.651	0.795
Low education	0.355	0.4	0.443	0.335
Medium education	0.403	0.402	0.381	0.433
High education	0.242	0.198	0.176	0.232
Total fertility	2.26	2.53	2.50	2.58
Age became parent	26.1	23.8	22.9	25.1
Ever grandparent	0.673	1	1	1
Total no. of grandchildren	-	2.9	3.0	2.8
Age became grandparent	-	54.1	53.3	55.1
Employment rate	0.473	0.405	0.378	0.445
Individuals	20715	13605	8034	5571
Observations	34302	21352	12962	8390

Notes: The table reports summary statistics on the sample population by grandparent status and gender. Sample: SHARE waves 1, 2, 4, 5, 6, 7. Individuals aged 55-64 who have at least one child aged 14 or older. Calibrated individual weights are applied.

3. Identification strategy

Rupert and Zanella (2018) motivate their empirical analysis by a theoretical investigation into the intergenerational mechanisms between 'Seniors' (the potential grandparents) and 'Juniors' (the children of the Seniors) with regard to producing and taking care of 'Babies' (the grandchildren). Both Juniors and Seniors derive utility from consumption and spending time with a Baby, while both also experience disutility from working. In addition, Seniors care about the utility of the Juniors: Seniors can influence Juniors' utility by either transferring monetary assets or by providing time for the caretaking of the Baby.

The first important insight that emerges is that the labour supply response of Seniors in reaction to the arrival of a Baby is theoretically ambiguous. In equilibrium, this response depends on the marginal utility of grandparenting and on the strength of the Seniors' intergenerational altruism. If the marginal utility of grandparenting is sufficiently large and intergenerational altruism is sufficiently weak, then the Seniors will reduce their labour supply. In the opposite case, however, the Seniors' may care more about the well-being of the Juniors and less about spending time with the Baby, in which case they would prefer monetary over time transfers. Within the framework of the model, this also implies an increase in grandparental labour supply to finance the monetary transfers. The existing literature and our study provide indirect evidence on the occurrence of time transfers from Seniors to Juniors, as implied by reductions in the labour supply of Seniors upon the arrival of grandchildren. In addition, we also consider the occurrence of monetary transfers from Seniors to Juniors in response to grandchildren in the form of gifts.

The second insight from the theoretical analysis is the source of the endogeneity problem faced by the empirical analysis of the effect of grandparenthood on grandparental labour supply: The decision of the Juniors to produce a Baby at a given point in time depends on the time that the Seniors are willing to provide for taking care of the Baby. A more generous grandparenting profile hence increases the

probability that a Senior will actually become a grandparent. A Senior's grandparenthood status and the same Senior's labour supply response to becoming a grandparent are therefore endogenously determined.

Consequently, Rupert and Zanella (2018) propose instrumenting the grandparenthood status with the gender of the Senior's first child. The reasoning is that on average, women have children earlier than men. Having a female first child hence increases the likelihood of becoming a grandparent at any given age. In addition, the gender of the first child can be credibly assumed to exert no direct effect on labour supply in later working life.

Given that the SHARE data provide the necessary information, we utilize the same identification strategy. Assuming CRRA preferences over consumption and leisure, Rupert and Zanella (2018) show that reduced form equations for the labour supply of potential grandparents can be obtained for both the extensive and the intensive margin of labour supply. We estimate the extensive margin effect in a linear probability model (LPM) using an indicator for individual employment status as the outcome variable:

$$work_{it} = \beta g_{it} + \boldsymbol{\gamma x_{it}} + \delta a_{it} + \theta_j + \mu_t + \varepsilon_{it} \qquad (1)$$

The estimating equation for the intensive margin, measured in terms of the logarithm of the weekly hours worked by an individual who is active in the labour market, reads as:

$$\ln hours_{it} = \beta g_{it} + \boldsymbol{\gamma x_{it}} + \delta a_{it} + \theta_j + \mu_t + \varepsilon_{it} \qquad (2)$$

$work_{it}$ is a binary indicator equal to 1 if individual i works any positive number of hours in year t. g_{it} is a binary indicator equal to 1 if individual i is a grandparent in year t, and 0 otherwise. The vector $\boldsymbol{x_{it}}$ contains a constant and a vector of covariates: a restricted cubic spline in the age of individual i with four knots, the individual's self-reported health status, educational attainment, cohabitation status, total number of children, and the age when the individual became a parent for the first time. Most of these covariates control for characteristics of the potential grandparents that directly affect the latter's labour supply. The total number of children, however, controls for the increase in the probability of being a grandparent simply due to having more children that in turn can become parents. Further, the age when the individual became a parent for the first time is intended to capture differential lifetime labour supply paths between early and later parents. a_{it} is a grouped indicator based on the household net worth in year t valued in 2004 Euros. Rupert and Zanella (2018) explicitly control for the initial consumption expenditure of the household as a consequence of their theoretical model. The SHARE data do not provide as detailed consumption information as the PSID data, but we proxy this information with the data on the household's net worth, which is moreover available for every sample period. In any case, Rupert and Zanella (2018) point out that their estimates are largely invariant to the initial consumption control variable. The same applies to the sensitivity of our results reported below to the household net worth control. The country fixed effects θ_j control for unobserved time-constant heterogeneity between the sample countries. In order to capture country-specific retirement ages and retirement patterns that we cannot directly control for, we interact the country fixed effects with the age spline in all regressions. The year fixed effects μ_t absorb period-specific shocks to the labour supply common to individuals in all sample countries.

The proposed instrument for the grandparenthood indicator g_{it} is the gender of an individual's first child. The First Child Female instrument z_i is hence defined as follows:

$$z_i = \begin{cases} 1 & \text{if the first child of individual } i \text{ is female} \\ 0 & \text{if the first child of individual } i \text{ is male} \end{cases}$$

It is worth pointing out, as Rupert and Zanella (2018) do, that the local average treatment effect (LATE) identified by instrumenting the grandparenthood status with the First Child Female instrument is rather specific: The compliers, in this case, are composed of (1) those individuals who have a female

first child and who are grandparents and (2) those individuals who have a male first child and who are not (yet) grandparents. Among female grandparents, the LATE therefore applies most likely to maternal grandmothers. The latter are known to provide more care time than paternal ones, which is why our estimates will reflect this (comparatively) strong mother-daughter bond.

Rupert and Zanella (2018) support the relevance of the proposed instrument by a series of descriptive statistics and regression results. We are able to produce similarly reassuring evidence using the SHARE data.

Table 3 reports cohort-averages of the age at which women and men become parents. Due to the focus of SHARE on older individuals, we report the averages for cohorts born between 1940 and 1959. Calculating the difference between the ages when women and men first have children has a clear implication: On average, women in our European sample have children considerably earlier than men.

Table 3: Age at which women and men first have children by age cohorts

	Year of birth			
	1940-1944	1945-1949	1950-1954	1955-1959
Women	24.3 *(N=582)*	24.5 *(N=2287)*	24.6 *(N=3729)*	24.9 *(N=2205)*
Men	27.0 *(N=620)*	27.1 *(N=1998)*	27.6 *(N=3005)*	28.2 *(N=1587)*
Difference	-2.74**	-2.65**	-2.95**	-3.29**

*Notes: The table reports average ages at which different cohorts of women and men first become parents, together with the difference in the average ages. Number of unique individual observations reported in parentheses. Sample: SHARE waves 1, 2, 4, 5, 6, 7. Individuals aged 55-64. * p<0.05, ** p<0.01*

Further, Figure 2 displays the probability mass function of the age at which individuals in our sample become grandparents by gender and by gender of their first child. A first-born female child shifts the distribution to the left for both genders of the grandparents. Recall, however, that our depiction is based on a much smaller number of grandparent observations than we use in the following estimations, due to the lack of information on the years of birth of all grandchildren in the SHARE data.

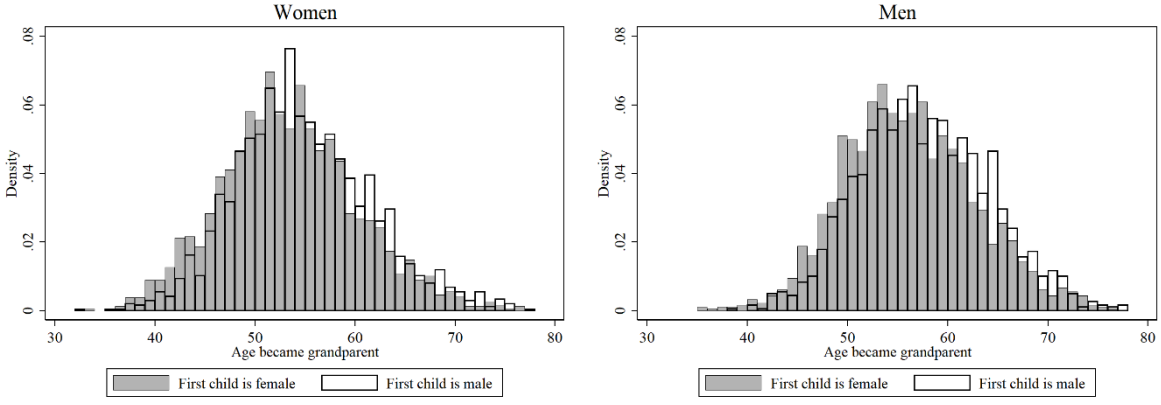

Figure 2: *Distribution of the age when individuals become grandparents. Sample: SHARE waves 1, 2, 4, 5, 6, 7. Individuals who have at least one child aged 14 or older.*

If we disregard the exact age at which an individual becomes a grandparent and focus instead on the fraction of individuals that are grandparents at a given age, we find that this fraction is consistently higher for both women and men if their first child is female compared to if their first child is male (Figure 3).

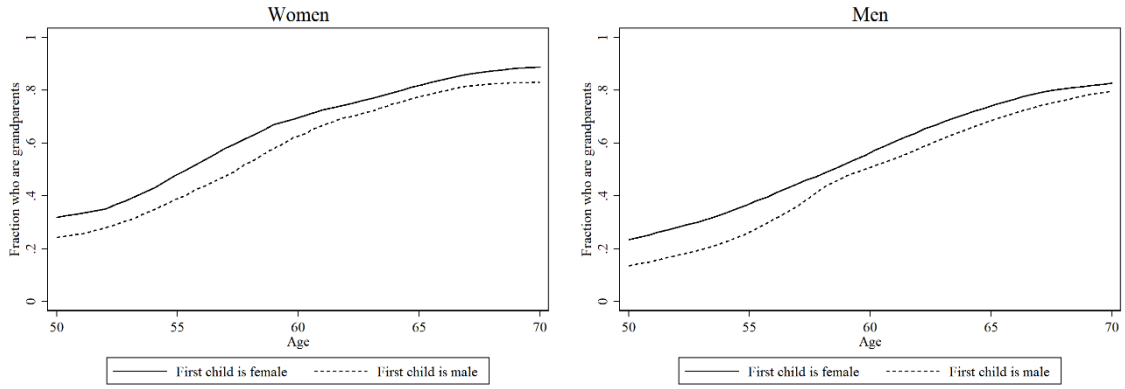

Figure 3: *Fraction of individuals who are grandparents at a given age. Sample: SHARE waves 1, 2, 4, 5, 6, 7. Individuals aged 50-70 who have at least one child aged 14 or older. Calibrated individual weights are applied.*

In addition, we regress a variety of individual characteristics on the First Child Female instrument to check whether the gender of the first child may affect the (lifetime) labour supply profile of the potential grandparents aside from the instrument's purported effect on the grandparenthood status (Table 4). As expected, having a female first child is strongly negatively associated with the age of becoming a grandparent: On average, women with a female first child become grandmothers 0.8 years earlier than women with a male first child (column 1), while the corresponding groups of men even differ by 1 year (column 2). Reassuringly, the instrument is not associated with the total fertility or the cohabitation status of the individuals regardless of their gender (columns 3-6). Hence, having a female first child does not appear to have affected either the fertility choices or the cohabitation patterns of the individuals earlier in their lives. We further use information from the SHARE Job Episodes Panel on the labour force participation of individuals at ages 30, 40, and 50 to check whether the gender of the first child affected labour supply in earlier life. The results presented in columns 7-12 suggest that this was not the case, as all estimated coefficients are small in size and not statistically different from zero.

Table 4: Effect of instrument on age of becoming grandparent, fertility, marital stability, and past labour force participation

	(1)	(2)	(3)	(4)	(5)	(6)
	Age became GP		Total fertility		Cohabiting	
	Women	Men	Women	Men	Women	Men
First Child is Female	-0.79**	-0.98**	0.021	0.0059	-0.015	0.011
	(0.25)	(0.25)	(0.023)	(0.027)	(0.0093)	(0.0087)
Observations	1851	1429	8628	6949	8628	6949
	(7)	(8)	(9)	(10)	(11)	(12)
	Working at 30		Working at 40		Working at 50	
	Women	Men	Women	Men	Women	Men
First Child is Female	-0.013	0.0011	-0.0063	0.0035	-0.018	0.0031
	(0.013)	(0.0055)	(0.012)	(0.0052)	(0.012)	(0.0076)
Observations	5805	4507	5805	4507	5799	4506

*Notes: The table reports the coefficients from linear regressions of the age of becoming a grandparent (columns 1-2), total fertility (columns 3-4), the cohabitation status (columns 5-6), and the labour force participation status at ages 30, 40 and 50 (columns 7-12) on the First Child Female instrument. A constant is included in all regressions. Only one observation per individual is used. Sample: SHARE waves 1, 2, 4, 5, 6, 7. Individuals aged 55-64 who have at least one child aged 14 or older. Robust standard errors in parentheses. * p<0.05, ** p<0.01*

Panel A in Table 5 presents the first stage results from regressing the grandparenthood indicator on the First Child Female instrument. The sample consists of women older than 54 and younger than 65 years who have at least one child and whose oldest child is at least 14 years old. Every regression includes the cubic age spline, its interaction with the country fixed effects, and the year fixed effects. The regressions reported in the second and third columns contain the additionally covariates, and the household's net worth in year 2004 Euros. Finally, the third column also adds the total number of the individual's children and the age at which an individual first became a parent to the first stage.

Across all specifications, the effect of the instrument on the grandparenthood status is positive and highly significant. The estimated coefficient from using the full set of covariates implies that the probability of being a grandmother will be 7 percentage points higher if the first child is female. This is consistent with the (unconditional) average distance between the lines in the left panel of Figure 2. The large first stage F statistics underline the relevance of the instrument.

Panel B in Table 5 displays the first stage estimates if we consider potential grandfathers instead. The magnitude of the estimates is slightly larger than in the female sample, while sign and statistical significance are alike.

Table 5: First stage estimates for individuals aged 55-64 years

	(1) Is a Grandparent	(2) Is a Grandparent	(3) Is a Grandparent
Panel A: Women			
First Child Female	0.070**	0.071**	0.069**
	(0.0092)	(0.0090)	(0.0075)
F excluded instrument	58.4	62.6	83.7
Observations	17926	17926	17926
Panel B: Men			
First Child Female	0.082**	0.082**	0.075**
	(0.011)	(0.011)	(0.0087)
F excluded instrument	58.8	59.2	74.4
Observations	12795	12795	12795
Country & Year FE	Yes	Yes	Yes
All covariates	No	Yes	Yes
Fertility covariates	No	No	Yes

*Notes: The table reports first stage estimates of the effect of the first child being female on the grandparenthood indicator. All regressions include a constant, country dummies, year dummies and a cubic spline in age interacted with the country dummies. In column 2, an indicator of educational attainment, the self-reported health status, the cohabitation status and a grouped indicator of the household's net worth are added to the regressions. In column 3, the age at which an individual first became a parent and the total number of children are added to the regressions. Sample: SHARE waves 1, 2, 4, 5, 6, 7. Individuals aged 55-64 who have at least one child aged 14 or older. Robust standard errors clustered at the individual level in parentheses. * p<0.05, ** p<0.01*

4. Results

4.1 Labour supply

Panel A in Table 6 presents results for the effect of being a grandmother on the labour market status of women in the age group 55 to 64. Columns 1 and 2 contain OLS estimates, disregarding the potential endogeneity of grandparenthood, while columns 3 and 4 instrument the grandparenthood indicator by the gender of the first child.

The OLS estimates suggest that being a grandmother is associated with, on average, an 8-percentage point lower probability of working (column 1). However, the coefficient loses both magnitude and

statistical significance once the covariates are added (column 2). Instrumenting the grandparenthood status by the First Child Female instrument raises the absolute magnitude of the coefficient considerably. Being a grandmother now reduces the probability of being active in the labour force by 28 percentage points (column 3). Adding the full set of covariates suggests an even larger negative effect (32 pp) which is now significant at the 1% level (column 4). The 2SLS estimates hence suggest a substantial negative effect of grandparenthood on the extensive margin of the labour supply of grandmothers.

Grandfathers in the age between 55 and 64 do not significantly adjust their labour supply on the extensive margin. Panel B in Table 6 shows again a negative and significant OLS estimate (column 1) that becomes small and insignificant when covariates are added (column 2). Once the grandparenthood status is instrumented, the negative effect of being a grandfather on the probability of being active in the labour market rises to 9 pp but is statistically insignificant (column 3). Adding the full set of covariates increases the absolute magnitude of the estimate but does not improve its precision (p = 0.313) (column 4).

Table 6: Second stage estimates for labour force participation at age 55-64

	(1) Is working	(2) Is working	(3) Is working	(4) Is working
Panel A: Women		Employment rate: 0.437		
Is a Grandparent	-0.080** (0.0090)	-0.014 (0.0097)	-0.28* (0.12)	-0.32** (0.12)
Observations	17926	17926	17926	17926
Panel B: Men		Employment rate: 0.529		
Is a Grandparent	-0.068** (0.0098)	-0.019 (0.011)	-0.094 (0.11)	-0.12 (0.12)
Observations	12795	12795	12795	12795
Instrumented	No	No	Yes	Yes
Country & Year FE	Yes	Yes	Yes	Yes
All covariates	No	Yes	No	Yes

*Notes: The table reports coefficients from linear regressions of an indicator for labour force participation on the grandparenthood indicator. All regressions include a constant, country dummies, year dummies and a cubic spline in age interacted with the country dummies. Columns 1 and 2 report OLS estimates. Columns 3 and 4 report second stage estimates when the grandparenthood indicator is instrumented with the First Child Female dummy. In columns 2 and 4, an indicator of educational attainment, the self-reported health status, the cohabitation status, a grouped indicator of the household's net worth, the age at which an individual first became a parent and the total number of children are added to the regressions. Sample: SHARE waves 1, 2, 4, 5, 6, 7. Individuals aged 55-64 who have at least one child aged 14 or older. Calibrated individual weights are applied to produce sample means of the dependent variable. Robust standard errors clustered at the individual level in parentheses. * $p<0.05$, ** $p<0.01$*

The results of the impact of grandparenthood on the intensive margin of grandmothers' labour supply are reported in Panel A in Table 7. The OLS estimates (columns 1 and 2) are negative and significant, implying a reduction in weekly hours worked by 4-7%. However, the coefficients are positive when instrumented in the 2SLS estimations (columns 3-4). Further, none of them is significant in statistical terms, suggesting no intensive margin effect of grandchildren on the labour supply grandmothers.

Regarding the intensive margin of grandfathers' labour supply (Panel B in Table 7), the OLS estimates are negative and insignificant (columns 1 and 2). The coefficients obtained from the 2SLS estimations are also negative, larger, but also statistically insignificant (columns 3-4).

Table 7: Second stage estimates for hours worked at age 55-64

	(1) Log hours	(2) Log hours	(3) Log hours	(4) Log hours
Panel A: Women		Mean weekly hours: 31.1		
Is a Grandparent	-0.068**	-0.042*	0.073	0.014
	(0.016)	(0.018)	(0.23)	(0.22)
Observations	8076	8076	8076	8076
Panel B: Men		Mean weekly hours: 39.6		
Is a Grandparent	-0.022	-0.011	-0.10	-0.13
	(0.014)	(0.017)	(0.18)	(0.19)
Observations	6978	6978	6978	6978
Instrumented	No	No	Yes	Yes
Country & Year FE	Yes	Yes	Yes	Yes
All covariates	No	Yes	No	Yes

*Notes: The table reports coefficients from linear regressions of log weekly hours worked conditional employment on the grandparenthood indicator. All regressions include a constant, country dummies, year dummies and a cubic spline in age interacted with the country dummies. Columns 1 and 2 report OLS estimates. Columns 3 and 4 report second stage estimates when the grandparenthood indicator is instrumented with the First Child Female dummy. In columns 2 and 4, an indicator of educational attainment, the self-reported health status, the cohabitation status, a grouped indicator of the household's net worth, the age at which an individual first became a parent and the total number of children are added to the regressions. Sample: SHARE waves 1, 2, 4, 5, 6, 7. Individuals aged 55-64 who have at least one child aged 14 or older. Calibrated individual weights are applied to produce sample means of the dependent variable. Robust standard errors clustered at the individual level in parentheses. * p<0.05, ** p<0.01*

4.2 Robustness and sensitivity

Table 8 reports the outcomes of a series of robustness checks. Column 1 displays our previous results on the effect of grandparenthood on the extensive margin of labour supply for both women (Panel A) and men (Panel B) obtained by instrumenting the grandparenthood status by the First Child Female instrument and using the full set of covariates. In column 2, we allow the year effects to vary at the country level by interacting them with the country effects while still controlling for both fixed effects separately. This more flexible specification only marginally affects the coefficients and does not alter their significance. In column 3, we control for the effect of age by including dummies for each year of age in both the first and the second stages instead of the cubic spline in age. The results are not affected by this fully flexible control for the effect of age. In column 4, we cluster the standard errors at the country-birth year level. Hence, we allow the errors to be correlated within cohorts within countries. While this procedure considerably reduces the number of clusters to about 200, the standard errors remain essentially unchanged.

Table 8: Robustness of second stage estimates for labour force participation at age 55-64

	(1) Is working	(2) Is working	(3) Is working	(4) Is working
Panel A: Women		Employment rate: 0.437		
Is a Grandparent	-0.32**	-0.30*	-0.32**	-0.32**
	(0.12)	(0.12)	(0.12)	(0.12)
Observations	17926	17926	17926	17926
Panel B: Men		Employment rate: 0.529		
Is a Grandparent	-0.12	-0.14	-0.12	-0.12

	(0.12)	(0.12)	(0.12)	(0.11)
Observations	12795	12795	12795	12795
Instrumented	Yes	Yes	Yes	Yes
All covariates	Yes	Yes	Yes	Yes
Country & Year FE	Yes	Yes	Yes	Yes
Country x Year FE	No	Yes	No	No
Country x Age FE	No	No	Yes	No
Country-cohort clusters	No	No	No	Yes

*Notes: The table reports coefficients from linear regressions of an indicator for labour force participation on the grandparenthood indicator. All coefficients are second stage estimates when the grandparenthood indicator is instrumented with the First Child Female dummy. All regressions include a constant, country dummies, year dummies, an indicator of educational attainment, the self-reported health status, the cohabitation status, a grouped indicator of the household's net worth, the age at which an individual first became a parent and the total number of children. Columns 1, 2 and 4 control for age by a cubic spline in age interacted with the country dummies. Column 3 controls for age by age dummies interacted with the country dummies. In column 2, country-year interactions are added. Column 4 clusters standard errors at the country-birth year level. Sample: SHARE waves 1, 2, 4, 5, 6, 7. Individuals aged 55-64 who have at least one child aged 14 or older. Calibrated individual weights are applied to produce sample means of the dependent variable. Robust standard errors clustered at the individual level except in column 4 in parentheses. * p<0.05, ** p<0.01*

We perform the same series of robustness checks with regard to the effect of grandparenthood on the intensive margin of labour supply. As reported in Table 9, the coefficients remain similarly unaffected in terms of both magnitude and significance as in the case of the extensive margin.

Table 9: Robustness of second stage estimates for hours worked at age 55-64

	(1) Log hours	(2) Log hours	(3) Log hours	(4) Log hours
Panel A: Women		Mean weekly hours: 31.1		
Is a Grandparent	0.014	0.024	-0.0099	0.014
	(0.22)	(0.22)	(0.22)	(0.23)
Observations	8076	8076	8076	8076
Panel B: Men		Mean weekly hours: 39.6		
Is a Grandparent	-0.13	-0.13	-0.13	-0.13
	(0.19)	(0.19)	(0.18)	(0.19)
Observations	6978	6978	6978	6978
Instrumented	Yes	Yes	Yes	Yes
All covariates	Yes	Yes	Yes	Yes
Country & Year FE	Yes	Yes	Yes	Yes
Country x Year FE	No	Yes	No	No
Country x Age FE	No	No	Yes	No
Country-cohort clusters	No	No	No	Yes

*Notes: The table reports coefficients from linear regressions of an indicator for labour force participation on the grandparenthood indicator. All coefficients are second stage estimates when the grandparenthood indicator is instrumented with the First Child Female dummy. All regressions include a constant, country dummies, year dummies, an indicator of educational attainment, the self-reported health status, the cohabitation status, a grouped indicator of the household's net worth, the age at which an individual first became a parent and the total number of children. Columns 1, 2 and 4 control for age by a cubic spline in age interacted with the country dummies. Column 3 controls for age by age dummies interacted with the country dummies. In column 2, country-year interactions are added. Column 4 clusters standard errors at the country-birth year level. Sample: SHARE waves 1, 2, 4, 5, 6, 7. Individuals aged 55-64 who have at least one child aged 14 or older. Calibrated individual weights are applied to produce sample means of the dependent variable. Robust standard errors clustered at the individual level except in column 4 in parentheses. * p<0.05, ** p<0.01*

We further extend the age interval of our sample by five years to individuals aged 50-64. On the one hand, this extension obviously increases our sample size and provides additional variation, given that a considerable number of individuals already become grandparents between age 50 and age 54. On the other hand, we expect the effect of grandchildren to be weaker in the enlarged sample, as exiting the labour market into early retirement can be assumed to be more difficult the younger an individual is when grandchildren arrive.

Repeating the estimation using the enlarged sample does not prompt a reconsideration of our previously obtained findings, which is why we relegate the results to Tables A1-A3 in the Appendix. The first stage remains strong and in the second stage, grandparenthood still exerts a negative and significant effect on the extensive margin of the labour supply of grandmothers. The effect is still substantial in magnitude, but smaller than the coefficient estimated from the smaller sample of older individuals, as expected. Same as before, any significant effect on grandfathers disappears as soon as the grandparenthood status is instrumented.

Finally, we explore the sensitivity of our results by redefining both our measures of the extensive and the intensive margin of labour force participation. Recall that up to now, we consider an individual to supply labour at the extensive margin if she works any positive number of hours per week. We now change this threshold to more than ten hours per week in order to apply a narrower definition of labour force participation. In comparison to our previous results reported in column 1 of Table 10, this change affects neither point estimates nor standard errors (column 2). Further, instead of log-transforming the positive hours worked by an individual as before (results shown again in column 3), we now use the untransformed positive hours worked as our intensive margin of labour supply. As reported in column 4, skipping the log transformation does not alter the pattern of statistically insignificant findings at the intensive margin of labour supply for both genders.

Table 10: Sensitivity of the second stage estimates for labour force participation at age 55-64

	(1) Is working > 0h	(2) Is working > 10h	(3) Log hours	(4) Hours
Panel A: Women	Employment rate: 0.437		Mean weekly hours: 31.1	
Is a Grandparent	-0.32**	-0.32**	0.014	2.68
	(0.12)	(0.12)	(0.22)	(4.68)
Observations	17926	17926	8076	8076
Panel B: Men	Employment rate: 0.529		Mean weekly hours: 39.6	
Is a Grandparent	-0.12	-0.13	-0.13	-4.55
	(0.12)	(0.12)	(0.19)	(4.37)
Observations	12795	12795	6978	6978
Instrumented	Yes	Yes	Yes	Yes
All covariates	Yes	Yes	Yes	Yes
Country & Year FE	Yes	Yes	Yes	Yes

*Notes: The table reports coefficients from linear regressions of an indicator for labour force participation and (log) weekly hours worked conditional employment on the grandparenthood indicator. All coefficients are second stage estimates when the grandparenthood indicator is instrumented with the First Child Female dummy. All regressions include a constant, country dummies, year dummies, a cubic spline in age interacted with the country dummies, an indicator of educational attainment, the self-reported health status, the cohabitation status, a grouped indicator of the household's net worth, the age at which an individual first became a parent and the total number of children. Sample: SHARE waves 1, 2, 4, 5, 6, 7. Individuals aged 55-64 who have at least one child aged 14 or older. Calibrated individual weights are applied to produce sample means of the dependent variable. Robust standard errors clustered at the individual level in parentheses. * p<0.05, ** p<0.01*

4.3 Heterogeneity

We explore the heterogeneity of the LATE of grandparenthood on grandparental labour supply with regard to the number of grandchildren, the grandparent's lifetime labour supply, and the spatial distance between a grandparent and her first child.

Column 1 of Table 11 reports again our estimate of the effect of being a grandparent on the extensive margin of labour force participation using our full sample and the full set of covariates. Column 2 reports the result from restricting our sample to potential grandparents and grandparents that have one grandchild at most. While this restriction reduces our sample size by half, the effect of the first grandchild on the labour force participation of grandmothers increases by 15 pp and is still significant at the 5% level, suggesting that a considerable share of a grandmother's labour supply response to her grandchildren is driven by the first grandchild. By contrast, the effect on grandfathers' labour force participation slightly decreases and remains statistically insignificant.

In column 3 of Table 11, we remove the restriction on the number of grandchildren, but we only use observations for which we have information on lifetime labour supply measured in terms of years worked between age 15 and 54 from the SHARE Job Episodes Panel. Lifetime labour supply can be interpreted as reflecting an individual's attachment to the labour market. Its relationship to the labour supply response to grandchildren is potentially ambiguous: On the one hand, a high lifetime labour supply might indicate a low preference for spending time with a grandchild instead of continuously participating in the labour force. On the other hand, a long work history might imply higher contributions to pension funds, thereby facilitating the transition from employment to retirement for the sake of providing grandchild care.

We perform a sample split at the median of the years worked, which is 30 years in case of potential grandmothers and 35 years in case of potential grandfathers. Results reported in columns 4 and 5 of Table 11 do not reveal any heterogeneity of the effect of grandparenthood along the dimension of lifetime labour supply: Disregarding the lack of precision due to the small sample sizes, the coefficients estimated below (column 4) and above the median (column 5) respectively are negative and very similar to each other in terms of magnitude for both grandmothers and grandfathers.

Table 11: Heterogeneity of second stage estimates by first grandchild and lifetime labour supply

	(1) Is working	(2) Is working	(3) Is working	(4) Is working	(5) Is working
Panel A: Women					
Is a Grandparent	-0.32**	-0.47*	-0.32*	-0.23	-0.25
	(0.12)	(0.23)	(0.14)	(0.23)	(0.16)
Observations	17926	8944	14065	7100	6965
Panel B: Men					
Is a Grandparent	-0.12	-0.094	-0.056	-0.043	-0.042
	(0.12)	(0.21)	(0.14)	(0.24)	(0.16)
Observations	12795	7447	9635	5127	4508
Instrumented	Yes	Yes	Yes	Yes	Yes
All covariates	Yes	Yes	Yes	Yes	Yes
Country & Year FE	Yes	Yes	Yes	Yes	Yes
First grandchild	No	Yes	No	No	No

Notes: The table reports coefficients from linear regressions of an indicator for labour force participation on the grandparenthood indicator. All coefficients are second stage estimates when the grandparenthood indicator is instrumented with the First Child Female dummy. All regressions include a constant, country dummies, year dummies, a cubic spline in age interacted with the country dummies, an indicator of educational attainment, the self-reported health status, the cohabitation status, a grouped indicator of the household's net worth, the age at which an individual first became a parent and the total number of children. Column 2 restricts the sample to individuals with zero or one grandchild. Column 3 restricts the sample to individuals for whom information on

*lifetime labour supply is available. Column 4 restricts the sample to individuals with at most median lifetime labour supply. Column 5 restricts the sample to individuals with more than median lifetime labour supply. Sample: SHARE waves 1, 2, 4, 5, 6, 7. Individuals aged 55-64 who have at least one child aged 14 or older. Robust standard errors clustered at the individual level in parentheses. * p<0.05, ** p<0.01*

SHARE collects information on the spatial distance between respondents and their children, which is condensed into nine categories. We utilize this information to define a binary indicator equal to one if a potential grandparent lives in the same household, in the same building, or less than 1km away from her first child, and zero if the potential grandparent and her first child live further afield. Results reported in column 1 of Table 12 are obtained from repeating our estimation on the sample for which the distance information is available. Column 2 shows results from including the binary distance indicator as an additional covariate. Its inclusion leaves the estimates essentially unchanged. Next, we perform a sample split along the two categories of distance defined by our indicator. Column 3 reports results from the subsample of potential grandparents that live close to their first child. The effect of grandparenthood on grandmothers increases in magnitude and remains statistically significant at the 5% level, suggesting that grandmothers living close to their first child are particularly inclined to stop working in response to grandchildren. The effect on grandmothers living further afield is still large in magnitude, but imprecisely estimated (column 4). The sample split does not indicate a relevant role of the distance between potential grandfathers and their first child for the grandfathers' labour supply response to grandchildren.

Table 12: Heterogeneity of second stage estimates by distance to first child

	(1) Is working	(2) Is working	(3) Is working	(4) Is working
Panel A: Women				
Is a Grandparent	-0.37**	-0.38**	-0.47*	-0.31
	(0.14)	(0.14)	(0.19)	(0.20)
Observations	16185	16185	5015	11170
Panel B: Men				
Is a Grandparent	-0.13	-0.13	0.045	-0.19
	(0.13)	(0.13)	(0.20)	(0.17)
Observations	11648	11648	3610	8038
Instrumented	Yes	Yes	Yes	Yes
All covariates	Yes	Yes	Yes	Yes
Country & Year FE	Yes	Yes	Yes	Yes
Distance covariate	No	Yes	No	No

*Notes: The table reports coefficients from linear regressions of an indicator for labour force participation on the grandparenthood indicator. All coefficients are second stage estimates when the grandparenthood indicator is instrumented with the First Child Female dummy. All regressions include a constant, country dummies, year dummies, a cubic spline in age interacted with the country dummies, an indicator of educational attainment, the self-reported health status, the cohabitation status, a grouped indicator of the household's net worth, the age at which an individual first became a parent and the total number of children. Column 1 restricts the sample to individuals for whom information on their distance to their first child is available. Column 2 adds an indicator equal to one if an individual lives less than 1km away from her first child and zero otherwise to the regression. Column 3 restricts the sample to individuals who live less than 1km away from their first child. Column 4 restricts the sample to individuals who live 1km and more away from their first child. Sample: SHARE waves 1, 2, 4, 5, 6, 7. Individuals aged 55-64 who have at least one child aged 14 or older. Robust standard errors clustered at the individual level in parentheses. * p<0.05, ** p<0.01*

Finally, we investigate whether our results are driven by only one or a few countries in our sample. Hence, we estimate the effect of grandparenthood separately for each of the nine sample countries. The

results on the probability of labour force participation for females are displayed in Table A4 in the appendix. As a consequence of the relatively low number of observations per country, the effect is imprecisely estimated for every country except Italy, where it is significant at the 5% level. However, the coefficient is negative for every country except Germany, suggesting that the negative association between female grandparenthood and female labour force participation is not driven by one particular country or set of countries.

The country-by-country regressions further do not prompt a reconsideration of the previously detected absence of an intensive margin effect on female labour supply. As reported in Table A5, sign and magnitude of the estimated effects differ strongly across countries. The large standard errors and the unreasonably large magnitudes for some countries suggest that this pattern does not point to a heterogeneity of the effect, but rather to a failure to produce a stable series of estimates from the small individual country samples. Similar conclusions can be drawn from the two sets of country-by-country regressions for male individuals reported in Table A6 and Table A7.

4.4 Gift transfers

In their theoretical model, Rupert and Zanella (2018) consider the possibility of monetary transfers from Seniors to Juniors if the Seniors' intergenerational altruism is high and their utility from spending time with the Baby is low. Our data allow us to investigate the empirical relevance of these monetary transfers, as SHARE provides information on whether a Senior has transferred at least one (monetary or nonmonetary) gift worth more than 250€ to any Junior in a given year. Such a gift transfer is reported by 20% of our sample observations. 2.7% further report a gift transfer directly to a grandchild, but as the data do not specify the respective grandchild's parent in this case, we are unable to exploit this information. Therefore, our estimates presented below are likely to underestimate the magnitude of gift transfers from grandparents to their offspring.

By instrumenting the grandparenthood status with the First Child Female indicator, we can test whether the presence of grandchildren increases the occurrence of intergenerational gift transfers from grandparents to their children. Our outcome variable is a binary indicator equal to one if a potential grandparent has transferred a gift worth 250€ or more to any of her children in the respective year, and zero otherwise. While we find evidence for increased gift transfers in response to grandparenthood, there is no indication that grandfathers substitute between time transfers and gift transfers. Instead, as reported in Panel A of Table 13, the likelihood that grandmothers carry out gift transfers significantly increases by 21 pp in the presence of grandchildren, while the estimated coefficient for grandfathers is about half this magnitude and statistically insignificant (Panel B).

Table 13: Second stage estimates of gift transfers from individuals aged 55-64

	(1) Gives gift	(2) Gives gift	(3) Gives gift	(4) Gives gift
Panel A: Women		Share who gives gifts: 0.191		
Is a Grandparent	-0.039**	-0.0038	0.21*	0.21*
	(0.0068)	(0.0078)	(0.095)	(0.091)
Observations	18116	18116	18116	18116
Panel B: Men		Share who gives gifts: 0.227		
Is a Grandparent	-0.020*	0.0028	0.11	0.13
	(0.0081)	(0.0094)	(0.098)	(0.10)
Observations	13220	13220	13220	13220
Instrumented	No	No	Yes	Yes
Country & Year FE	Yes	Yes	Yes	Yes

All covariates	No	Yes	No	Yes

*Notes: The table reports coefficients from linear regressions of an indicator for an effected gift transfer on the grandparenthood indicator. All regressions include a constant, country dummies, year dummies and a cubic spline in age interacted with the country dummies. Columns 1 and 2 report OLS estimates. Columns 3 and 4 report second stage estimates when the grandparenthood indicator is instrumented with the First Child Female dummy. In columns 2 and 4, an indicator of educational attainment, the self-reported health status, the cohabitation status, a grouped indicator of the household's net worth, the age at which an individual first became a parent and the total number of children are added to the regressions. Sample: SHARE waves 1, 2, 4, 5, 6, 7. Individuals aged 55-64 who have at least one child aged 14 or older. Calibrated individual weights are applied to produce sample means of the dependent variable. Robust standard errors clustered at the individual level in parentheses. * p<0.05, ** p<0.01*

Reassuringly, there is no evidence that gift transfers from grandmothers to their children are offset by corresponding transfers from children to grandmothers. Table 14 reports that neither grandmothers nor grandfathers are more likely to receive gift transfers from any of their children in reaction to grandparenthood.

Table 14: Second stage estimates of gift transfer to individuals aged 55-64

	(1) Receives gift	(2) Receives gift	(3) Receives gift	(4) Receives gift
Panel A: Women	Share who receives gifts: 0.018			
Is a Grandparent	0.0058*	-0.00025	0.037	0.033
	(0.0024)	(0.0027)	(0.030)	(0.030)
Observations	18116	18116	18116	18116
Panel B: Men	Share who receives gifts: 0.011			
Is a Grandparent	0.0047*	0.0022	0.020	0.021
	(0.0020)	(0.0023)	(0.023)	(0.025)
Observations	13220	13220	13220	13220
Instrumented	No	No	Yes	Yes
Country & Year FE	Yes	Yes	Yes	Yes
All covariates	No	Yes	No	Yes

*Notes: The table reports coefficients from linear regressions of an indicator for a received gift transfer on the grandparenthood indicator. All regressions include a constant, country dummies, year dummies and a cubic spline in age interacted with the country dummies. Columns 1 and 2 report OLS estimates. Columns 3 and 4 report second stage estimates when the grandparenthood indicator is instrumented with the First Child Female dummy. In columns 2 and 4, an indicator of educational attainment, the self-reported health status, the cohabitation status, a grouped indicator of the household's net worth, the age at which an individual first became a parent and the total number of children are added to the regressions. Sample: SHARE waves 1, 2, 4, 5, 6, 7. Individuals aged 55-64 who have at least one child aged 14 or older. Calibrated individual weights are applied to produce sample means of the dependent variable. Robust standard errors clustered at the individual level in parentheses. * p<0.05, ** p<0.01*

5. Conclusion

This paper presents evidence regarding the causal effect of grandparenthood on the labour supply of grandparents in Europe. Our results highlight an economically and statistically significant negative effect of grandparenthood on the extensive margin of grandmothers' labour force participation. More specifically, we find that on average, being a grandmother reduces the probability that a woman aged between 55 and 64 years is active in the labour market by 30 pp. This finding is robust to a large variety of checks.

Our heterogeneity analysis suggests that the negative causal effect of grandparenthood on the labour force participation of grandmothers is particularly pronounced when women first become grandmothers

and if they live in close distance to their children. Attachment to the labour market measured in terms of lifetime labour supply, however, does not appear to interact with women exiting the labour market in reaction to grandchildren.

Furthermore, we find that the intensive margin of female labour supply, measured in terms of hours worked, is not affected by grandparenthood. Hence, European grandmothers appear to exit the labour market entirely instead of partially adjusting the intensity of their participation. This conclusion stands in contrast with the results of Rupert and Zanella (2018) in the sense that the latter also find a negative effect of grandparenthood on the labour supply of US-American grandmothers which however operates only through the hours worked. We conjecture that institutional differences in the social security and retirement systems between continental Europe and the US are responsible for the differential response to grandparenthood. The European systems tend to allow early retirement more easily than the US-American one. In addition, while labour force participation rates of both men and women drop sharply in our European sample countries around age 65, extended episodes of labour force participation are not uncommon in the US. It is further worth pointing out that while policies providing for paid maternal leave are far more common across Europe than in the US, these policies have apparently not rendered grandmothers redundant for the caretaking of grandchildren.

Methodologically, our results support the identification strategy proposed by Rupert and Zanella (2018). The First Child Female instrument produces highly significant and relevant first stage estimates across specifications despite our European sample being considerably smaller than the US sample utilised by Rupert & Zanella (2018). In the second stage, the instrumentation then corrects a substantial upward bias in the extensive margin effect for grandmothers. Rupert and Zanella (2018) assess that a bias in the same direction exists in their OLS estimate at the intensive margin.

Regarding the statistically insignificant effect of grandchildren on the labour supply of grandfathers, it is worth noting that our point estimates of both the extensive and intensive margin effects on grandfathers are negative and in the economically relevant magnitude of ten percentage points. Given that our male sample is about 30% smaller than the female sample, we cannot rule out that a larger male sample would result in more precise and statistically significant estimates for grandfathers. However, it is also worth pointing out that none of our second stage estimates for grandfathers is close to being statistically significant despite the strong first stage.

We further find some evidence that gift transfers are more likely to take place from grandmothers to their children if the latter produce grandchildren. In turn, there is no evidence that grandfathers transfer more gifts to potentially compensate their insignificant time transfers. However, given the available data, we cannot rule out that the decisions on gift transfers are taken at the household level, with the grandmothers simply being more likely to carry out the act of giving.

The determinants of this substantial gender gap between grandparents remain the subject of future research. It should be kept in mind, however, that the identification strategy of instrumenting the grandparenthood status with the gender of the first child results in an overrepresentation of maternal grandmothers among the compliers. Our findings of a large and negative causal effect of grandparenthood on the labour supply of grandmothers hence does not extend to the entirety of the grandmother population.

While our estimates of the extensive margin effect of becoming a grandmother are not directly comparable to the ones reported by Frimmel et al. (2019), who consider the impact on the duration to labour market exit, their findings of a negative effect of grandchildren on grandmothers' labour supply in the Austrian data appear to generalize across more European countries. Together with the trends towards fewer children and hence fewer grandchildren mentioned in the introduction of our study and the continuing expansion of public childcare, female labour force participation rates in later working-age can be expected to rise further when the low-fertility cohorts will reach grandparenting age.

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Appendix

Table A 1: First stage estimates for individuals aged 50-64

	(1) Is a Grandparent	(2) Is a Grandparent	(3) Is a Grandparent
Panel A: Women			
First Child Female	0.073**	0.074**	0.071**
	(0.0081)	(0.0078)	(0.0065)
F excluded instrument	82.9	88.5	121.0
Observations	25186	25186	25186
Panel B: Men			
First Child Female	0.084**	0.083**	0.077**
	(0.0092)	(0.0090)	(0.0074)
F excluded instrument	82.6	83.7	107.7
Observations	17432	17432	17432
Country & Year FE	Yes	Yes	Yes
Covariates	No	Yes	Yes
Fertility controls	No	No	Yes

*Notes: The table reports first stage estimates of the effect of the first child being female on the grandparenthood indicator. All regressions include a constant, country dummies, year dummies and a cubic spline in age interacted with the country dummies. In column 2, an indicator of educational attainment, the self-reported health status, the cohabitation status and a grouped indicator of the household's net worth are added to the regressions. In column 3, the age at which an individual first became a parent and the total number of children are added to the regressions. Sample: SHARE waves 1, 2, 4, 5, 6, 7. Individuals aged 50-64 who have at least one child aged 14 or older. Robust standard errors clustered at the individual level in parentheses. * p<0.05, ** p<0.01*

Table A 2: Second stage estimates for labour force participation at age 50-64

	(1) Is working	(2) Is working	(3) Is working	(4) Is working
Panel A: Women	Employment rate: 0.513			
Is a Grandparent	-0.086**	-0.016	-0.20	-0.22*
	(0.0078)	(0.0083)	(0.10)	(0.100)
Observations	25186	25186	25186	25186
Panel B: Men	Employment rate: 0.622			
Is a Grandparent	-0.076**	-0.026**	-0.071	-0.094
	(0.0087)	(0.0092)	(0.094)	(0.095)
Observations	17432	17432	17432	17432
Instrumented	No	No	Yes	Yes
Country & Year FE	Yes	Yes	Yes	Yes
All covariates	No	Yes	No	Yes

*Notes: The table reports coefficients from linear regressions of an indicator for labour force participation on the grandparenthood indicator. All regressions include a constant, country dummies, year dummies and a cubic spline in age interacted with the country dummies. Columns 1 and 2 report OLS estimates. Columns 3 and 4 report second stage estimates when the grandparenthood indicator is instrumented with the First Child Female dummy. In columns 2 and 4, an indicator of educational attainment, the self-reported health status, the cohabitation status, a grouped indicator of the household's net worth, the age at which an individual first became a parent and the total number of children are added to the regressions. Sample: SHARE waves 1, 2, 4, 5, 6, 7. Individuals aged 50-64 who have at least one child aged 14 or older. Calibrated individual weights are applied to produce sample means of the dependent variable. Robust standard errors clustered at the individual level in parentheses. * p<0.05, ** p<0.01*

Table A 3: Second stage estimates for hours worked at age 50-64

	(1) Log hours	(2) Log hours	(3) Log hours	(4) Log hours
Panel A: Women		Mean weekly hours: 31.8		
Is a Grandparent	-0.054**	-0.023	0.00081	-0.035
	(0.012)	(0.014)	(0.16)	(0.15)
Observations	13184	13184	13184	13184
Panel B: Men		Mean weekly hours: 40.2		
Is a Grandparent	-0.019	-0.0080	-0.12	-0.13
	(0.011)	(0.013)	(0.13)	(0.13)
Observations	10884	10884	10884	10884
Instrumented	No	No	Yes	Yes
Country & Year FE	Yes	Yes	Yes	Yes
All covariates	No	Yes	No	Yes

*Notes: The table reports coefficients from linear regressions of log weekly hours worked conditional employment on the grandparenthood indicator. All regressions include a constant, country dummies, year dummies and a cubic spline in age interacted with the country dummies. Columns 1 and 2 report OLS estimates. Columns 3 and 4 report second stage estimates when the grandparenthood indicator is instrumented with the First Child Female dummy. In columns 2 and 4, an indicator of educational attainment, the self-reported health status, the cohabitation status, a grouped indicator of the household's net worth, the age at which an individual first became a parent and the total number of children are added to the regressions. Sample: SHARE waves 1, 2, 4, 5, 6, 7. Individuals aged 50-64 who have at least one child aged 14 or older. Calibrated individual weights are applied to produce sample means of the dependent variable. Robust standard errors clustered at the individual level in parentheses. * p<0.05, ** p<0.01*

Table A 4: Country-by-country estimates for labour force participation of women aged 55-64

Country	OLS Is working	2SLS Is working	Observations
Austria	-0.017	-0.39	1667
	(0.029)	(0.33)	
Germany	-0.033	0.080	1810
	(0.029)	(0.30)	
Sweden	0.025	-0.37	1661
	(0.028)	(0.45)	
Netherlands	-0.043	-0.017	1566
	(0.033)	(0.35)	
Spain	-0.0033	-0.33	1672
	(0.033)	(0.25)	
Italy	-0.020	-0.65*	1999
	(0.025)	(0.28)	
France	-0.012	-0.42	2233
	(0.030)	(0.57)	
Denmark	0.0058	-0.37	1572
	(0.037)	(0.57)	
Switzerland	-0.031	-0.31	1273
	(0.037)	(0.53)	
Belgium	-0.0026	-0.11	2473
	(0.028)	(0.45)	
Instrumented	No	Yes	
Year FE	Yes	Yes	
All covariates	Yes	Yes	

Notes: The table reports coefficients from country-by-country linear regressions of an indicator for labour force

*participation on the grandparenthood indicator. All regressions include a constant, year dummies, a cubic spline in age, an indicator of educational attainment, the self-reported health status, the cohabitation status, a grouped indicator of the household's net worth, the age at which an individual first became a parent and the total number of children. Column 1 reports OLS estimates. Columns 2 reports second stage estimates when the grandparenthood indicator is instrumented with the First Child Female dummy. Sample: SHARE waves 1, 2, 4, 5, 6, 7. Women aged 55-64 who have at least one child aged 14 or older. Robust standard errors clustered at the individual level in parentheses. * p<0.05, ** p<0.01*

Table A 5: Country-by-country estimates for hours worked by women aged 55-64

Country	OLS Log hours	2SLS Log hours	Observations
Austria	-0.13	-1.05	513
	(0.081)	(1.33)	
Germany	-0.00081	-0.14	993
	(0.056)	(0.38)	
Sweden	0.062	0.16	1210
	(0.038)	(0.46)	
Netherlands	-0.14	0.64	665
	(0.082)	(0.82)	
Spain	-0.0011	0.021	574
	(0.053)	(0.59)	
Italy	-0.037	-0.14	534
	(0.052)	(0.74)	
France	0.022	-0.33	916
	(0.050)	(0.53)	
Denmark	-0.063	1.10	936
	(0.037)	(0.81)	
Switzerland	-0.17*	-1.27	846
	(0.074)	(1.84)	
Belgium	-0.0020	1.20	889
	(0.050)	(1.38)	
Instrumented	No	Yes	
Year FE	Yes	Yes	
All covariates	Yes	Yes	

*Notes: The table reports coefficients from country-by-country linear regressions of log weekly hours worked conditional employment on the grandparenthood indicator. All regressions include a constant, year dummies, a cubic spline in age, an indicator of educational attainment, the self-reported health status, the cohabitation status, a grouped indicator of the household's net worth, the age at which an individual first became a parent and the total number of children. Column 1 reports OLS estimates. Columns 2 reports second stage estimates when the grandparenthood indicator is instrumented with the First Child Female dummy. Sample: SHARE waves 1, 2, 4, 5, 6, 7. Women aged 55-64 who have at least one child aged 14 or older. Robust standard errors clustered at the individual level in parentheses. * p<0.05, ** p<0.01*

Table A 6: Country-by-country estimates for labour force participation of men aged 55-64

Country	OLS Is working	2SLS Is working	Observations
Austria	-0.0094	-0.40	1074
	(0.036)	(0.28)	
Germany	-0.077*	0.19	1240
	(0.032)	(0.63)	
Sweden	-0.016	-0.21	1293
	(0.031)	(0.27)	
Netherlands	-0.051	0.020	1081
	(0.037)	(0.38)	
Spain	-0.054	-0.097	1033

	(0.043)	(0.29)	
Italy	-0.031	0.23	1221
	(0.035)	(0.48)	
France	0.025	0.61	1689
	(0.027)	(0.40)	
Denmark	0.066*	-0.38	1170
	(0.032)	(0.98)	
Switzerland	-0.0024	-1.06	916
	(0.034)	(0.93)	
Belgium	-0.032	-0.34	2078
	(0.029)	(0.36)	
Instrumented	No	Yes	
Year FE	Yes	Yes	
All covariates	Yes	Yes	

*Notes: The table reports coefficients from country-by-country linear regressions of an indicator for labour force participation on the grandparenthood indicator. All regressions include a constant, year dummies, a cubic spline in age, an indicator of educational attainment, the self-reported health status, the cohabitation status, a grouped indicator of the household's net worth, the age at which an individual first became a parent and the total number of children. Column 1 reports OLS estimates. Columns 2 reports second stage estimates when the grandparenthood indicator is instrumented with the First Child Female dummy. Sample: SHARE waves 1, 2, 4, 5, 6, 7. Men aged 55-64 who have at least one child aged 14 or older. Robust standard errors clustered at the individual level in parentheses. * p<0.05, ** p<0.01*

Table A 7: Country-by-country estimates for hours worked by men aged 55-64

Country	OLS Log hours	2SLS Log hours	Observations
Austria	-0.13	-0.17	387
	(0.071)	(0.82)	
Germany	0.012	5.36	733
	(0.058)	(9.69)	
Sweden	-0.0088	-0.16	1009
	(0.053)	(0.35)	
Netherlands	0.048	-0.52	641
	(0.060)	(0.31)	
Spain	-0.041	0.069	497
	(0.062)	(0.57)	
Italy	-0.049	0.53	559
	(0.057)	(1.17)	
France	0.0046	0.47	662
	(0.037)	(0.50)	
Denmark	0.032	0.28	870
	(0.041)	(0.79)	
Switzerland	-0.035	-1.65	731
	(0.051)	(1.39)	
Belgium	0.032	-1.28	889
	(0.050)	(0.94)	
Instrumented	No	Yes	
Year FE	Yes	Yes	
All covariates	Yes	Yes	

Notes: The table reports coefficients from country-by-country linear regressions of log weekly hours worked conditional employment on the grandparenthood indicator. All regressions include a constant, year dummies, a cubic spline in age, an indicator of educational attainment, the self-reported health status, the cohabitation status, a grouped indicator of the household's net worth, the age at which an individual first became a parent and the total number of children. Column 1 reports OLS estimates. Columns 2 reports second stage estimates when the grandparenthood indicator is instrumented with the First Child Female dummy. Sample: SHARE waves 1, 2, 4,

*5, 6, 7. Men aged 55-64 who have at least one child aged 14 or older. Robust standard errors clustered at the individual level in parentheses. * p<0.05, ** p<0.01*

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